

# LAKE MICHIGAN POTENTIAL DAMAGES STUDY

## For the U.S. Army Corps of Engineers

Planning & Zoning Center, Inc. and Wade-Trim

### TASK 8.2 REPORT

**Purpose:** Document observations, conjecture and issues of debate as to whether or not local governments and individuals would adopt adaptive measures in land use management practices to changing conditions that could occur under alternate hydrologic scenarios that would change the magnitude of economic losses.

#### INTRODUCTION

*Relationship to 1993 IJC Report, Tasks 8.1, 3.1 and 3.3.1*

In the 1993 IJC Report, a wide range of shoreland management measures were described and evaluated for effectiveness in reducing potential damages from changing Lake Michigan levels. These measures included setbacks, structural shore protection, nonstructural shore protection, legislation, loans, grants, insurance programs and others. In 1999, shoreland management measures were again inventoried and evaluated for Task 8.1. Compared to the 1993 IJC Report, the 1999 Task 8.1 Report focused on more land use management approaches, including local planning and zoning efforts. A survey of riparians was conducted as part of the 1993 IJC Report in which respondents were asked about likely shoreline protection structures they would choose. In 1999 a series of focus groups was used to assess commitment to property protection, values at which property owners would act or amounts they would invest and awareness of the range of shoreline management approaches. By 1999, most riparians appeared to be already aware of the costs of different shoreline protection measures, what might be permitted and the extent of protection they might be afforded. This (Task 8.2) report is an extension of the 1999 Task 8.1 Report.

Task 8.2 speculates on whether local governments and individuals would apply shoreline management approaches with a resulting change in the magnitude of economic damage. This task draws heavily on Task 8.1 as well as the findings of Tasks 3.1 and 3.3.1. Task 3.1 considered the various information time interval needs/concerns of various stakeholder groups, while Task 3.3.1 gathered information about property owner and local government responses to potential lake level change through a series of focus groups.

Task 8.2 looks at the information gathered about available shoreland management tools and the responses of focus group participants and interview subjects, *in light of possible changes in Lake Michigan levels*. Task 8.2 examines this information from several different directions:

1. Given the extreme high and low lake levels that the US Army Corps of Engineers recently calculated are possible (greater than experienced in the past 30 years), what damages (descriptive, not quantitative) can be expected.
2. Given different sequences of lake level change, how will the various stakeholder groups respond?

3. What, given the experience of extreme lake levels, will be the response of the different stakeholder groups toward the different shoreland management measures? How effective will the different stakeholders believe the shoreland management measures will be?
4. What will the stakeholders think of the measures recommended in Task 8.1?

## **SUMMARY OF ANTICIPATED DAMAGES DUE TO EXTREME HIGH AND LOW HYDROLOGIC SCENARIOS**

The following section briefly reviews the two *extreme* Lake Michigan hydrologic scenarios and outlines potential results of those extremes. Obviously these are not the only possible scenarios—Lake Michigan is not likely to reach an extreme high or low and remain at that level for the next 50 years. The most probable scenario is some combination of high, moderate and low water levels. However, it is useful to examine the extremes first, to best understand the potential damages possible. Three hypothetical, combination scenarios, each with a variety of different, sequential hydrologic occurrences are discussed beginning on page 6 this report. These latter, combination scenarios are used to discuss stakeholder responses.

### *High Water Hydrologic Scenario*

For the purposes of this report, it was assumed that Lake Michigan could rise to a level of 583.5' IGLD 85 (US Army Corps of Engineers) at some point within the next 50 years. This level is based on studies of historic records of lake level fluctuation. With a major storm that includes winds out of the west, the Michigan side of the lake could rise another 2' due to storm surge and the Wisconsin side another 1.5'. At these levels, the result would be high-energy waves striking the toe of shoreline bluffs and inundation of the banks of rivers flowing into Lake Michigan. This level is nearly 2' higher than has been recorded on Lake Michigan in the 20<sup>th</sup> century. More specific results include:

- Property Damage Due to Bluff Erosion. Extensive damage to residential, commercial and industrial property and community infrastructure and facilities is possible due to bluff recession. At the time of this writing, an estimate of those damages was planned for but not yet completed.
- Loss of Infrastructure. While most of the immediate shoreline contains residential or other land use parcels, there are networks of roads, sewer and water and other utilities that parallel shorelines. These can be damaged when bluff recession overtakes such installations or when flooding occurs along estuarine rivers.
- Loss of Buildable Area on Private Property. Lake level change can lead to a loss of capacity to build on private property. There can be either a physical loss or a regulatory loss. A physical loss occurs primarily on shallow, bluff or dune lots where the land slumps into Lake Michigan. The distance between the top of the bluff to the frontage road becomes inadequate to build a structure. A regulatory loss of buildable area occurs when, as a result of setbacks or floodplain regulations, significant portions of the property are prohibited from being built upon. It is possible, due to a lack of foresight when the parcel was originally split or platted, that there is insufficient space for building construction.
- Flooding of Buildings. When a line depicting a projected high Lake Michigan level is drawn on aerial photographs of estuaries, it is possible to identify buildings that would be flooded when the lake reaches that high level. Flooding can cause water damage to

contents and some structural damage, depending on length of inundation. If waves are associated with the floods, there is the possibility of damage from wave energy or from floating debris. Even without the projected hydrologic scenario of a high Lake Michigan level, buildings along the river shorelines already experience flooding due to snowmelt and spring rains or stationary storm systems of the river's watershed. However, a high Lake Michigan level may flood a greater number of buildings than have land-based floods. This depends on the physiography and level of development of different areas along the coast.

- Flooding of Septic and Sanitary Sewer Systems. When residential properties flood, this also means that septic systems are inundated. This can lead to contamination of the flood waters and is a public health hazard. Many shoreline areas are not served by public sewer and thousands of shoreline properties are served by septic systems. There are shoreline areas in which properties are served by public sewers. If flooded, sanitary sewers can cause bacterial and viral contamination of floodwaters. This can occur either if the sewage treatment plant or the piping system is flooded. It is possible to seal the sewage piping system in floodplains. There will be no protection from contamination if a sewer pipe is broken due to bluff slumping. Houses have been condemned because bluff erosion led to a loss of the septic system and all available space to relocate a new system.
- Flooding of Roads and Loss of Roads to Erosion. Shoreline roads may suffer damage, washout of certain segments or remain impassable for extended periods due to bluff erosion or flooding. In portions of the study area, roads parallel eroding bluffs and are within thirty feet of the top of the bluff. These roads may be severed if that portion of the bluff is at an unstable angle and eventually slumps to a more stable angle.
- Damage to Recreational Sites. This damage is usually minor in relative dollar amounts, but can cause loss of use. Park or golf course flooding usually is temporary and the most important buildings sited out of the floodplain. Marinas could suffer longer-term damage. Docks could be overtopped by extremely high waters requiring major repairs. Boats should not remain at docks during very high water or hull damage could occur.

#### *Low Water Hydrologic Scenario*

The projected potential low water level for Lake Michigan is 574' IGLD 85 (US Army Corps of Engineers). This is more than 2' lower than has been recorded in the 20<sup>th</sup> century. The effective low water, for the duration of a storm, could be as much as 1.5' lower due to "set down," an opposite phenomena to storm surge. In a "set down," water is driven away from shore by sustained winds with the effect of lowered water levels along that shore. Such wind-driven effects can create as much as a 14' elevational difference between the east and west ends of Lake Erie, which in still conditions would be level. A smaller effect occurs on Lake Michigan where the west-to-east distance is not as great.

While many lake users and riparians hail low Lake Michigan levels as an ideal situation (broad beaches and diminished storm damage to bluffs), there can be extensive problems associated with low lake levels. These include:

- Offshore Bottomland Loss and Shore Effects. In some, but not all offshore areas of Lake Michigan, low water can result in a scouring of the sand deposits just off shore. Sand is transported along the shore for a considerable distance or is transported farther off shore. As a result, the sand deposits that naturally buffer wave action along

the toe of the bluff during periods of higher water are no longer available, and hastened bluff erosion may result.

- **Property Damage Due to Bluff Erosion During Low Water Periods.** A degree of bluff erosion generally still occurs during low water levels. However, it is usually not as extensive as during periods of high lake level. Storms cause the greatest amount of erosion of the foot of the bluff but other factors contribute to bluff slumping (a collapse of very steep bluffs to a more gentle angle). These other factors include ground water intrusion and surface water runoff.
- **Sanitary Sewer System Problems Due to Low Water.** Sanitary sewer systems rely on the dilution of treated effluent with water from rivers or lakes. If the receiving body of water has less water, due to low levels, the treated effluent receives less dilution. This may elevate nutrient levels, such as phosphorus, above permitted concentrations. Extended periods of low water may require extending water pipes farther into the Lake.
- **Water Supply System Problems Due to Low Water.** Hundreds of thousands of people obtain their drinking water from Lake Michigan. Municipal water supply lines extend into the lake. The treatment regime of lake water prior to dispensing it to customers depends on the characteristics of the water at the opening of the pipe. Water characteristics are different when the lake level is low compared to when it is high. Treatment of water taken while the lake is low is more extensive and thus more expensive, than when the lake level is high. Extended periods of low water could require extending water pipes farther into the Lake.
- **Loss of Deep Water Access.** There can be a loss of use of marina slips due to low lake levels. The depth of channels or of boat slips may not be sufficient during periods of low water to permit passage of bigger boats. Dredging can be employed to deepen channels or slips, but there are concerns over contaminants in the bottom sediments. Dredging may spread these contaminants and there may be problems finding a safe disposal site for the spoils.
- **Structural Damage of Shore Protection Due to Low Water.** Shore protection structures, such as seawalls and breakwaters, depend, in part, on the lake bottom or the volume of water in the lake for support. There is speculation, although no formal research has been conducted, that some structures may fail or decline in capacity when lake levels fall dramatically. When the lake level drops below the base of the structure, a portion of the forces acting on the structure, and that were considered in the engineering of the structure, may be gone. Off shore structures, such as breakwaters, sit on the bottom. During periods of low water, sand transport may move a large amount of sand away from the bottom where the structure was placed, undermining it. Sand transport takes place closer to shore when the lake level is high.

## **WHAT WILL BE THE RESPONSE OF STAKEHOLDER GROUPS TO LAKE LEVEL CHANGE?**

This section provides conjecture on the likely knowledge and decision making of the various players on shoreline property issues over the next fifty years. The various interest groups include (as indicated in the Task 3.1 Report):

## Government (elected and administrative)

### *Federal -*

- Congress & the White House (budget, policy and regulatory interest)
- The Army Corps of Engineers (planning, budgeting, policy and regulatory interest)
- EPA (planning, budgeting, policy and regulatory interest)
- FEMA (planning, budgeting, policy and regulatory interest)

### *State -*

- Lawmakers (budget, policy and regulatory interest)
- Dept. of Environmental Quality (planning, budgeting, policy and regulatory interest)

### *Local (city, village, township and county)*

- Elected officials (budget, policy and regulatory interest)
- Zoning and building officials (regulatory interest)
- Professional planners and planning commissioners (planning, policy and regulatory interest)
- Tax assessors (tax assessing interest)

## Riparians and Floodplain Owners

- Lake Michigan shoreline landowners will have interests that may differ depending on the land use and its orientation to or dependency on the water. The most common land use along the Lake Michigan shoreline is single family residential. Other land uses include: multiple family residential, commercial, industrial, institutional (government buildings and churches), parks and recreation, utilities, transportation facilities, and agricultural. The impacts of prolonged periods of high water are likely the greatest concerns of this group.
- Rivermouth floodplain landowners and landowners in low-lying areas along the Great Lakes often include many more nonresidential land uses than residential and, have generally smaller lots with less depth than other lots along the Lake Michigan shoreline. Prolonged periods of low water are often the greater concern to the portion of this group that is riparian, while prolonged periods of high water are often the greater concern of owners of other flood-prone property.
- These landowners have interests that may be expressed individually or as organized groups.

## Shore Protection Dealers

- This category incorporates the range of parties who design, sell, supply, install and/or repair shore protection. This group will be interested in the information on damage potential as a predictor of potential market size and to use in marketing their products and services.

## Recreational Boaters/Commercial and Sport Fishing

- This large group of recreationists (and the dealers, suppliers and maintenance companies that support them) and commercial fish fleets depends on being able to easily get their boats into and out of the water. Prolonged periods of either high or low water can greatly disrupt this. Lake level change does promote wetland regeneration and helps support fish populations.

### Commercial Shipping

- These are the freighters, ore boats and a host of associated vessels (tugs, barges, etc.) that rely on relatively stable Great lakes levels for predictable and cost effective shipping.

### Realtors & Developers

- These parties will be interested in potential damage information because it may enhance or detract from the way they typically market their services and products. It may open some niche markets, and may affect the way they buy, sell or develop property.

### Policy Wonks

- This is the growing cadre of academics, private and nonprofit firms that study Great Lakes and related issues, and advise their clients or constituencies on appropriate courses of action. Their interests will range from staying abreast of contemporary thinking on the subject, to providing support to groups that advocate a particular point of view or policy position on Great Lakes levels and/or damage potential.

### Environmental Organizations

- These are nonprofit advocacy organizations and their members who strive to maintain the integrity of natural systems and to prevent pollution of the Great Lakes. The principal interest of these groups in potential damages information will likely focus on use of the information to support their environmental protection policy positions.

### Business Organizations

- These are local chambers of commerce, downtown development or redevelopment organizations that promote new business development, retention of existing businesses and redevelopment of business areas. Their interest will likely focus on how potential damages may result in net declines of business and businesses in an area.

### Citizens in General

- These are interested persons who do not fit into one of the above categories, but who stay somewhat informed on issues of local interest and periodically vote for elected officials and on ballot measures based on their perceptions, beliefs or knowledge about an issue or candidate.

### **Three Variable Lake Level Change Scenarios**

Listed below are three scenarios comprised of combinations of different Lake Michigan levels that are possible in the next 50 years. Many other scenarios are also possible, but since the list could be endless, only these are described. These three listed scenarios could have considerable impact on development trends in shoreland communities and development responses to these scenarios could have dramatic affects on potential damages.

The first part of the discussion describes the scenarios. This is followed by a *general* discussion of likely responses. Then, Table 1 lists likely, more specific responses of each of the stakeholder groups to each of the three scenarios. Conjecture on responses to lake

level change scenarios is based on focus group responses, trends in shoreline protection permits and trends in shoreline protection identified in the shoreline protection inventory.

*Scenario 1: A long period of low water levels followed by a period of high water level, late in the 50-year period.* Many communities could be close to, or even reach, buildout (at least of the shoreland areas) before experiencing the high water level. Buildout is when all the vacant, buildable land in a community is developed. The level of development, and a future, potential population of the community at buildout can be estimated through calculations based on the zoning map.

As a result of continued low water, the shoreline may be built out in some communities at an earlier point than if a cycle of high water had appeared. This means that there would be the maximum development possible at risk of damage when extremely high water occurs toward the end of the 50 year period.

This scenario probably presents the least impetus to take action to protect properties from high water levels. Complacency about potential high water could lead to relaxation of enforcement of regulations that place restrictions on building in high water hazard zones and could even lead to efforts to relax the regulations themselves. Anecdotal evidence from Wisconsin points to continued legislative efforts to repeal that state's setback regulation. At the least, there will probably be continued pressure to build closer to bluffs and close to or within 100-year floodplains. Local authorities may succumb to continued property owner pressure as low water levels continue, with the resulting granting of variances in local floodplain, setback, lot coverage and related regulations. In addition, where recession rates are revised to reflect slower rates of bluff recession, the MDEQ will likely reduce regulatory setbacks.

Continued low water may divert attention from high water and bluff recession concerns, even though experts warn that a return to high water is inevitable. Communities may be distracted from a holistic view by the need to focus on low water problems associated with water intakes and sewage treatment outflows. They will also be dealing with dredging for recreational boating access. There could also be considerable pressure from shoreline property owners for continued investment and reinvestment in roads, bridges and other infrastructure serving shoreline properties.

Educational efforts aimed at reducing high water damages may be very difficult to implement.

*Scenario 2: A rapid progression to an extremely high water level followed by low water levels.* In this scenario, the high lake level is reached before most shoreline communities reach buildout. There will be considerable undeveloped land in the shoreland area in a few communities, especially in Wisconsin. See the discussion and maps in the Task 5.2 Report.

This is probably the scenario that would do the most to instruct coastal populations regarding the potential damages from high water. There will be highly apparent damages from both flooding and bluff collapse. As the lake rises closer to the projected extreme high, damages will exceed any previously experienced by property owners, government

officials and general citizens. Those with interests in shoreline properties will become highly mobilized to find solutions to the damages.

Shoreline development may slow. It is likely that vacant properties where bluff recession or flooding occurs may remain vacant for a longer period. Property owners will seek technical assistance regarding low risk building methods or shore protection approaches that could assure any development does not receive further damage. Due to the strong attraction of lakefront property, it is uncertain if high water will deter property purchases and development in any but the parcels with recent evidence of damage.

There will be an examination of both short and long-term solutions. Most riparians will likely begin with short-term solutions to protect existing structures. As these fail, they will later look at long-term solutions. Government officials will likely look at dealing both with short and long-term solutions. There will be flood of permit applications for shoreline protection structures at the state level. Local officials will at least discuss the implications of high water levels on development, but few will take any action. Probably a few will revise their zoning ordinances to provide property owners more guidance in siting buildings on parcels that include bluffs or floodplains. Without stronger new state legislation, most local communities will likely defer to existing state regulations and not adopt new, adaptive measures on their own. The federal government will be the target of proposals to mechanically control, or regulate Great Lakes levels to limit damages.

*Scenario 3: A cycling of moderate lake levels throughout the 50 year period without ever reaching an extreme high or low level.* This scenario assumes Lake Michigan will reach potential extremes, but only after the 50 year period.

Development will likely continue at recent rates, with only slight variations tied to lake level cycles. Building may accelerate slightly during low water periods and drop slightly during higher lake levels. However, there could be a greater effect from market and other factors, such as interest rates and consumer confidence.

This scenario would be the most likely to result only in remedial actions to change current approaches to development regulation during the planning period. Proactive or sweeping approaches will be more difficult to adopt.

Table 1 that follows, looks at more specific responses of each of the stakeholder groups.

**Table 1  
CONJECTURED INTEREST GROUP RESPONSE TO LAKE LEVEL HYDROLOGIC SCENARIOS**

Interest Group	A long period of low water levels followed by a period of high water level, late in the 50-year period.	A rapid progression to an extremely high water level followed by low water levels.	A cycling of moderate Lake levels throughout the 50 year period without ever reaching an extreme high or low level.
<b>Government (elected and administrative)</b>			
<i>Federal -</i>			
Congress & the White House	An opportunity to deal with other priorities. May be unprepared when high water occurs late in 50 year period.	Pressure from legislators from districts suffering damage to provide relief. Difficult politically not to provide short-term aid. Long-term solutions may be proposed, but uncertain future. Return to low waters may dry up any legislation in the works. 2000 elections may influence direction of responses, either to promote sustainable solutions or to leave solutions up to locals and states.	Even moderately high lake levels will prompt requests for relief from constituents. Return to low waters may dry up any legislation in the works. 2000 elections may influence direction of responses, either to promote sustainable solutions or to leave solutions up to locals and states.
The Army Corps of Engineers	May be inundated with permit and funding requests for dredging of recreational harbors. May be diverted from efforts to provide education regarding high water shore processes and appropriate responses.	Extreme pressure to permit shore protection and to find long-term solution to high water damage. Lake level regulation will be raised as the preferred alternative by many groups. Good opportunity to educate on shore processes and move toward state, local and private measures to limit damages.	A harder sell for long-term solutions that place emphasis on state and local decision-making. Every small extreme will be used as an education opportunity. Increased knowledge of sand transport and likely greater extremes in level change makes it more difficult to continue approval of shoreline structural protection solutions.
EPA	Likely to act on concerns over water treatment and sewage discharge problems associated with low water. Also will be concerned over potential release through dredging of buried contaminants.	May seek relocation of sewage and water treatment facilities that face inundation.	May have little interest in lake level issues related to water quality. Primary interest will be potential development pressure on wetlands.

**Table 1 (continued)**

<b>Interest Group</b>	<b>A long period of low water levels followed by a period of high water level, late in the 50-year period.</b>	<b>A rapid progression to an extremely high water level followed by low water levels.</b>	<b>A cycling of moderate Lake levels throughout the 50 year period without ever reaching an extreme high or low level.</b>
FEMA	Will have difficulty generating interest in hazard mitigation.	My find broader interest in hazard mitigation similar to small successes along Mississippi River following 1993 floods. Could find interest in change in regulations from 100-year to 500-year flood levels.	Will have only moderate, if any, success in generating interest in hazard mitigation.
<i>State -</i>			
Lawmakers	Will find other priorities. May introduce legislation to eliminate or reduce setbacks in response to property owner/builder/realtor pressure.	Best opportunity to strengthen legislation to manage shoreline areas to limit economic damages and to establish a more uniform regulatory structure among all Great Lakes states and Ontario.	Will be difficult to gather support for adoption of adaptive measures unless educated constituents (property owners, builders, lenders, realtors, etc.) provide support or an inspired Governor takes the lead.
Dept. of Environmental Quality	Likely to act on concerns over water treatment and sewage discharge problems associated with low water. Also will be concerned over potential release through dredging of buried contaminants. Will initially receive permit applications for structural shore protection from property owners wanting to take advantage of construction opportunity and will receive more requests for variances in HREA setbacks.	Will receive increased number of permit applications for structural shore protection. Without increased staff, will operate in a holding pattern of responding to short-term solutions proposed by property owners. May propose long-term solutions that place substantial responsibility elsewhere, perhaps in private sector, so DEQ would serve primarily in advisory and final approval capacity.	Likely to remain in a holding pattern of understaffed review of permit applications. Eventually may propose long-term solutions that place substantial responsibility elsewhere, perhaps in private sector, so DEQ would serve primarily in advisory and final approval capacity.

**Table 1 (continued)**

<b>Interest Group</b>	<b>A long period of low water levels followed by a period of high water level, late in the 50-year period.</b>	<b>A rapid progression to an extremely high water level followed by low water levels.</b>	<b>A cycling of moderate Lake levels throughout the 50 year period without ever reaching an extreme high or low level.</b>
<i>Local (city, village, township and county)</i>			
Elected officials	Likely to become lax in enforcing setbacks, floodplain and other regulations to limit high water damages in order to maximize tax revenues from shoreline development.	Will discuss solutions to high water damages, but unlikely to adopt many adaptive measures, without state backing, for fear of being the “bad guys” to local constituents. May seek reinvestment in damaged infrastructure to appease shoreline citizens. An opposite reaction by some enlightened officials will be to engage in hazard mitigation planning. The amount of education and technical assistance available will make the most difference.	Without significant damages, likely to seek ways to foster continued development of shoreline. Will flirt with relaxing regulations during periods of low water.
Professional planners and planning commissioners	Professional planners will attempt to propose changes in plans and land use regulations to reduce damages related to both low and high water hazards. Planning Commissioners may be uninterested in planning for high water hazards until high water occurs again.	Communities with professional planning assistance will likely engage in at least minimal hazard mitigation planning while other communities may attempt hazard mitigation planning without adequate results.	Communities will embrace planning to reduce potential damages to the extent they believe damages are likely or if they experience damages with only moderately high and low water levels. Professional planning assistance will make hazard mitigation planning more likely where communities are undecided.
Zoning and building officials	Will be under extreme pressure from property owners, builders and elected officials to relax setback, floodplain and similar hazard reduction regulations.	Will find citizen support for strictly administering hazard area regulations. May be able to help fashion hazard mitigation plans or stronger regulations.	Will respond as best they can to cyclical pressure from property owners, builders and elected officials to relax setback, floodplain and similar hazard reduction regulations. Also will continue to try to educate property owners on reasons for regulations.

**Table 1 (continued)**

<b>Interest Group</b>	<b>A long period of low water levels followed by a period of high water level, late in the 50-year period.</b>	<b>A rapid progression to an extremely high water level followed by low water levels.</b>	<b>A cycling of moderate Lake levels throughout the 50 year period without ever reaching an extreme high or low level.</b>
Tax assessors	May increase assessed value of Lake Michigan shoreline property but decrease value where boat access is diminished.	May decrease assessed value of shoreline properties during high water period.	May decrease assessed value of shoreline properties during high water period and raise during low water where boating access is not affected.
<b>Riparians and Floodplain Owners</b>			
Estuarine Riparians and Floodplain Owners	Many of this group will seek help for dredging projects to improve boating access. There will be a divided response among members of this group regarding placement of structures. New property owners will likely try to push closer to the water's edge. Those in residence long enough to remember high waters will resist.	A portion of this group will seek governmental relief. A portion will seek technical assistance for mitigating measures. A portion will seek and support adaptive measures. The proportion of these relative factions may depend on understanding of shoreline processes and upon established policies of governments at different levels. Education and technical assistance opportunities may make the difference.	There will be a divided response among members of this group regarding placement of structures. New property owners will likely try to push closer to the water's edge, both bluffs and floodplains during low water periods. Those in residence long enough to remember high waters will resist. There will be some support for long-term solutions. Education and technical assistance opportunities may make the difference.
Lake Michigan shoreline landowners	There will be a divided response among members of this group. New property owners will likely try to push closer to bluff edges. Those in residence long enough to remember high waters will resist. Investment in shore protection will generally diminish over time--except perhaps among those with large investments in structures on shallow lots.	A portion of this group will seek governmental relief. A portion will seek technical assistance for mitigating measures. A portion will seek and support adaptive measures. The proportion of these relative factions may depend on understanding of shoreline processes and upon established policies of governments at different levels. Education and technical assistance opportunities may make the difference.	There will be a divided response among members of this group. New property owners will likely try to push closer to bluff edges during low water periods. Those in residence long enough to remember high waters will resist. There will be some support for long-term solutions. Education and technical assistance opportunities may make the difference.

**Table 1 (continued)**

<b>Interest Group</b>	<b>A long period of low water levels followed by a period of high water level, late in the 50-year period.</b>	<b>A rapid progression to an extremely high water level followed by low water levels.</b>	<b>A cycling of moderate Lake levels throughout the 50 year period without ever reaching an extreme high or low level.</b>
<b>Shore Protection Dealers</b>	The low water period is an easier construction time for shore protection structures. This group will promote structural protection approaches. They may promote more multi-property structures.	The high water period will be a positive marketing opportunity for structural protection approaches and this group will vigorously promote their products. They may also be more successful in challenging efforts to adopt adaptive measures to reduce damages.	This group will cycle through high water marketing opportunities and low water, optimal construction periods. This group will promote structural protection approaches.
<b>Recreational Boaters/Commercial and Sport Fishing</b>	This group will seek relief through dredging permit applications and funding requests for dredging.	This group will be pleased with high waters until they reach the projected extreme at which time improved access to marinas and estuary access sites will be cut off in many locations. This group may then support lake level regulation.	Even at moderately low water levels, boaters experience access and damage problems and will seek dredging projects to enhance recreational boating.
<b>Commercial Shipping</b>	Will strongly promote dredging and expansion of channels used for shipping. Will likely also apply significant pressure to regulate Great Lakes water levels.	At the peak, some piers and wharves may be under water. This would lead to increased pressure to regulate Great Lakes water levels.	This group will demand continued dredging during low water periods. They have a history, that will likely continue, of opposing regulation of Great Lakes water levels as long as extremes are not reached.
<b>Realtors &amp; Developers</b>	This group will enjoy enhanced business activity and will fight efforts at hazard mitigation unless some regulatory responsibilities are privatized and/or they are made liable for damages when high water returns.	This group may support hazard mitigation and other adaptive measures if they see them as promoting long-term shoreline business opportunity and if likely to be uniformly administered.	This is a business as usual scenario and there may be negative support for change in legislation or local regulation except where it provides for greater certainty.

**Table 1 (continued)**

<b>Interest Group</b>	<b>A long period of low water levels followed by a period of high water level, late in the 50-year period.</b>	<b>A rapid progression to an extremely high water level followed by low water levels.</b>	<b>A cycling of moderate Lake levels throughout the 50 year period without ever reaching an extreme high or low level.</b>
<b>Policy Wonks</b>	Those groups that understand coastal processes will promote adoption of adaptive measures that consider both extremes of lake levels. Others may only listen to those measures dealing with low water problems. An extreme low level situation may help find audiences for the views of these groups.	Those groups that understand coastal processes will promote adoption of adaptive measures that consider both extremes of Lake levels. Others may only listen to those measures dealing with high water problems. An extreme high level situation may help find audiences for the views of these groups.	Those groups that understand coastal processes will promote adoption of adaptive measures that consider both extremes of Lake levels. Others may not listen as long as they are not experiencing extremes for themselves.
<b>Environmental Organizations</b>	These groups may be primarily interested in the issues of dredging contaminated sediments. They will also serve as a contrary voice to those seeking relaxation of development restrictions of hazard zones. They will likely also oppose efforts to regulate Great Lakes water levels.	These groups may advocate abandonment of bluff hazard areas and will likely renew discussions of floodplain and wetland protection as these areas experience cyclical inundation.	These groups could provide educational programs regarding coastal processes and wetland values as coastal areas experience lake level cycles. They will continue to push for acquisition of sensitive or hazard areas.
<b>Business Organizations</b>	These groups will seek to exploit coastal areas to take advantage of exposed beaches and increased tourism. They will also seek aid for boating access and navigation problems of low water.	These groups may support hazard mitigation if they can be assured of equitable treatment and sufficient business opportunity in the future. Some members of this group will support lake level regulation.	These groups will not likely mobilize unless they buy into educational information on coastal processes and potential future damage estimates. The greatest support for implementing adaptive measures will occur where the greatest risk is perceived or where damages are experienced even with sub-extreme lake level change.

**Table 1 (continued)**

<b>Interest Group</b>	<b>A long period of low water levels followed by a period of high water level, late in the 50-year period.</b>	<b>A rapid progression to an extremely high water level followed by low water levels.</b>	<b>A cycling of moderate Lake levels throughout the 50 year period without ever reaching an extreme high or low level.</b>
<b>Citizens in General</b>	Non-riparians will support programs that they perceive are a wise use of taxes, protect natural resources for future generations and enhance their opportunity to enjoy Lake Michigan, if they choose to do so. Media attention will increase their interest and support for adaptive measures. However, the majority will be apathetic, unwilling to act.	Non-riparians will support programs that they perceive are a wise use of taxes, protect natural resources for future generations and enhance their opportunity to enjoy Lake Michigan, if they choose to do so. Media attention will increase their interest and support for adaptive measures. However, the majority will be apathetic, unwilling to act.	Non-riparians will support programs that they perceive are a wise use of taxes, protect natural resources for future generations and enhance their opportunity to enjoy Lake Michigan, if they choose to do so. They will be less interested in Lake level issues when levels are not at extremes and there is little media attention. However, the majority will be apathetic, unwilling to act.

## **RESPONSE OF STAKEHOLDERS TO SHORELAND MANAGEMENT MEASURES**

The following discussion in Table 2 provides conjecture on how the different stakeholder groups would respond to different shoreland management approaches. These are the same measures described in Task 8.1. While most stakeholder groups would probably be in favor of the measures or would lend support for implementation, some groups may have qualifications for that support. Other stakeholders may be uncertain about a particular measure, especially if they have had little exposure to it. A second look at stakeholder groups and the management measures speculates on how effective the group may see a particular measure in reducing damages (Table 3). Again, conjecture on these responses is based on interviews and focus group sessions. Actual responses will depend considerably upon the timing and extent of access to pertinent information, as well as on the personal experiences and biases of stakeholders. There is also a strong bias inherent in the conjectured responses to current attitudes, perceptions and beliefs. The 50-year time frame for lake level changes is so long, that actual responses are least likely to be consistent with conjectured responses, the farther one is from the present.

**Table 2  
STAKEHOLDER RESPONSES TO SHORELAND MANAGEMENT MEASURES  
(First Set of Measures)**

<b>Stakeholder</b>	<b>Land use and resource inventories</b>	<b>Master Plans</b>	<b>Zoning Ordinances</b>	<b>Setbacks</b>	<b>Public infrastructure investment policy</b>	<b>Flood and erosion hazard mitigation planning</b>	<b>Land acquisition policy</b>
<b>Government (elected and administrative)</b>							
<i>Federal -</i>							
Congress & the White House	Favorable to knowledge sources that can foster sound local decision making.	Favorable to local decision making.	Favorable to local decision making.	Favorable to fairness of a uniformly applied measure.	Likely supports policy that limits wasteful spending such as investment where damage likely.	Probably supportive of planning that helps reduce or avoid future disaster expenditures.	Likely supportive within budget limitations.
The Army Corps of Engineers	Favorable to knowledge sources that can foster sound local decision making.	Favorable to local decision making.	Favorable to local decision making.	Favorable to fairness of a uniformly applied measure. Uniform setback may be easier to administer in permit programs but like greater protection from site specific setbacks.	Concerned about wasteful spending of public monies. Finds it harder to justify public facilities where hazards are known.	Supportive of efforts to reduce damages but realizes that natural hazards are more severe than planned for in past.	Probably supportive if acquired land and subsequent uses do not need expensive protection structures.
EPA	Favorable to knowledge sources that can foster sound local decision making.	Favorable to local decision making.	Favorable to local decision making.	May prefer a site specific, variable setback to one that is uniform.	Probably favors policy of lowered investment in shore zone to limit development impacts on sensitive water resources.	Probably favors mitigation planning that emphasizes removal of development to areas away from sensitive water resources.	Probably supportive if acquired land and subsequent uses do not impact sensitive water resources.

**Table 2 (First Set of Measures Continued)**

<b>Stakeholder</b>	<b>Land use and resource inventories</b>	<b>Master Plans</b>	<b>Zoning Ordinances</b>	<b>Setbacks</b>	<b>Public infrastructure investment policy</b>	<b>Flood and erosion hazard mitigation planning</b>	<b>Land acquisition policy</b>
FEMA	Favorable to knowledge sources that can foster sound local decision making.	Favorable to local decision making.	Favorable to local decision making.	May prefer a site specific, variable setback to one that is uniform.	Would favor policy of lowered investment in shore hazard zones to limit future damages.	Favors mitigation planning.	Probably supportive if acquired land and subsequent uses are not developed into expensive, vulnerable facilities.
<i>State</i>							
Lawmakers	Favorable to knowledge sources that can foster sound local decision making.	Favorable to local decision making.	Favorable to local decision making.	Probably favorable if fairly administered and a uniform setback.	Does not want to be wasteful of tax revenues but may want to reward constituents with local construction grants.	Would probably be in favor of the activity but may be reluctant to either require it or provide funding.	May not favor the state acquiring more land but favor instead keeping shorelands in private ownership.
Dept. of Environmental Quality	Favorable to knowledge sources that can foster sound local decision making.	Favorable to local decision making.	Favorable to local decision making.	Favorable. Uniform setback is easier to administer but variable setback may better reflect natural environment and change processes. Would probably support a combination.	Would favor policy that limits development impacts on sensitive water resources.	Would favor activities that minimize risks to property, public and environment but may not have the staff to participate.	May favor a policy that removes development risks from land and reduces impacts on sensitive water resources, but may not want to shift new management responsibilities for the acquired lands to the state.

**Table 2 (First Set of Measures Continued)**

Stakeholder	Land use and resource inventories	Master Plans	Zoning Ordinances	Setbacks	Public infrastructure investment policy	Flood and erosion hazard mitigation planning	Land acquisition policy
<i>Local (city, village, township and county)</i>							
Professional planners and planning commissioners	Favorable to knowledge sources that can foster sound local decision making. May have difficulty acquiring in-house GIS staff.	Favorable to local decision making. However, may be busy with day-to-day activities and find development of a master plan with a shoreline element is onerous.	Favorable to local decision making. However, may be busy with day-to-day activities and find development of a new or updated zoning ordinance is onerous.	Probably find a uniform setback easy to administer but would prefer the state to administer it.	Would likely favor a policy if there was broad support. Otherwise, it will be a contentious issue, difficult to sustain over a long period of time.	Would favor if work load not already crushing and there were broad support within the community.	Would favor if not seen as an erosion of the tax base of community. Regional revenue sharing could relieve concerns.
Zoning and building officials	Could find inventories useful in educating property owners.	Could find master plan useful in educating property owners.	Could find zoning ordinance useful in educating property owners. However, would likely prefer state dealt with difficult variance requests.	Probably find a uniform setback easy to administer but would prefer the state to administer it.	Would be caught in the middle of the issue. Policy to limit infrastructure on local level should be matched by zoning requirements for the same zones. (e.g. if sewer not extended to a zone, minimum lot size should facilitate septic systems.)	Would be at front of issue and could provide insight. Could be educational opportunity for property owners.	May be in favor as it could reduce amount of contentious development.
Tax assessors	Should find digital parcel mapping and resource inventories useful.	Should help predict future use of properties.	Should help predict limits of change of properties and neighborhoods.	Would reduce uncertainty and protect property value for a longer time.	Infrastructure policy would help provide some certainty on property values.	Could help increase property values where there is greater certainty that risks have been avoided through mitigation.	Could serve to limit the value of some properties that are removed from development.

**Table 2 (First Set of Measures Continued)**

Stakeholder	Land use and resource inventories	Master Plans	Zoning Ordinances	Setbacks	Public infrastructure investment policy	Flood and erosion hazard mitigation planning	Land acquisition policy
<b>Riparians and Floodplain Owners</b>							
Lake Michigan Shoreline	Should be in favor of those serious about purchasing safe properties or siting buildings in a safe manner.	Should be in favor as it provides some certainty about future of neighborhoods.	Many property owners like protection against negative actions of neighbors but find ordinances limiting of own intentions.	Generally in favor unless setbacks place property owner in a bind on a property with siting limitations.	Mixed response. Many do not want infrastructure improvements and do not want to pay for them, but subsequent owners often want increased services.	Probably in favor unless it places a restriction on use of own property.	Will favor voluntary programs but not mandatory.
Estuarine Shoreline and Floodplain	Should be in favor to those serious about purchasing safe properties or siting buildings in a safe manner.	Should be in favor as it provides some certainty about future of neighborhoods.	Many property owners like protection against negative actions of neighbors but find ordinances limiting of own intentions.	Generally in favor unless setbacks place property owner in a bind on a property with siting limitations.	Mixed response. Many do not want infrastructure improvements and do not want to pay for them, but subsequent owners often want increased services.	Probably in favor unless it places a restriction on use of own property. Those who experienced multiple floodings will be the most receptive.	Will favor voluntary programs but not mandatory. Those who experienced multiple floodings may want to participate.
<b>Shore Protection Dealers</b>	Should favor as these provide useful information in design of structures.	Should be in favor as long as residential land use predominates along shoreline.	Should favor or have no response as long as it doesn't add layers to permit process or restrict development that could be at risk.	May not be in favor of deep setbacks that reduces erosion or flooding risks to shoreline properties.	Probably against policies that result in lowered development intensity of shoreline.	May not favor if mitigation plans focus on non-structural solutions.	Likely opposed where acquisition significantly reduces potential risk to properties.

**Table 2 (First Set of Measures Continued)**

Stakeholder	Land use and resource inventories	Master Plans	Zoning Ordinances	Setbacks	Public infrastructure investment policy	Flood and erosion hazard mitigation planning	Land acquisition policy
<b>Recreational Boaters/Commercial and Sport Fishing</b>	Would favor inventories that include resources that support fishing or scenic resources and could lead to protecting those resources.	Would favor plans that promote access but retention of fisheries and scenic resources.	Would favor ordinances that help promote scenic and fisheries resources while maintaining or enhancing access. Likely not in favor of ordinance provisions that restrict use of own riparian properties.	Probably in favor.	Probably opposed if the policy reduces access to Lake Michigan.	Would be in favor if mitigation planning increased access to water resources for recreation.	Likely in favor where acquisitions improved recreational fishing and boating access.
<b>Commercial Shipping</b>	Probably not interested except for updated bathymetric mapping.	Probably not interested except where port facilities are affected and industrial uses provided for.	Probably not interested except where port facilities are affected and an adequate zone provided for coastal industrial uses.	Probably not interested except where port facilities are affected.	Will want the infrastructure investment to remain high where port facilities are located.	Will want to protect investments in port facilities but may not want to re-invest to accommodate potential extreme highs and lows.	May support if some outdated port facilities are acquired but may want flexibility to return to a coastal site to build a modern facility in the future.
<b>Realtors &amp; Developers</b>	Should be supportive because of additional information useful in development and property analysis.	Supportive as long as plenty of residential areas are provided in highly attractive settings.	Supportive as long as ordinance provisions fit perception of market forces.	Supportive if uniformly administered and still permit buildings to have good water views.	Will want policy to replace damaged infrastructure and to extend infrastructure to shoreline areas not already served. Not likely supportive of a policy that limits infrastructure investment in shoreline hazard areas.	Probably supportive of mitigation planning if it permits reoccupation of the hazard areas.	Probably not very supportive of acquisitions that reduce the opportunity to develop shoreline properties.

**Table 2 (First Set of Measures Continued)**

<b>Stakeholder</b>	<b>Land use and resource inventories</b>	<b>Master Plans</b>	<b>Zoning Ordinances</b>	<b>Setbacks</b>	<b>Public infrastructure investment policy</b>	<b>Flood and erosion hazard mitigation planning</b>	<b>Land acquisition policy</b>
<b>Policy Wonks</b>	Would be in favor of information being available for sound decision making.	Would be in favor of local decision making but would like to see local plans conform to broad policies.	Would be in favor of local decision making but would like to see local plans conform to broad policies.	Probably most in favor but some may prefer longer setbacks and some may favor variable setbacks where it is fixed.	Would favor a policy to limit infrastructure investment in or serving hazard zones.	Would favor mitigation planning, especially if it includes removal of buildings from hazard zones.	Would favor if acquired lands remain in low intensity use and access provided that doesn't overwhelm shore environment.
<b>Environmental Organizations</b>	Would be in favor of information (especially mapped natural resource data) being available for sound decision making.	Would be in favor of local decision making but would like to see local plans conform to broad resource protection policies.	Would be in favor of local decision making but would like to see local zoning conform to broad policies to protect sensitive natural resources.	Would be in favor but prefer longer setbacks and some may favor variable setbacks where it is fixed.	Would favor a policy to limit infrastructure investment in or serving hazard zones.	Would favor mitigation planning, especially if it includes removal of buildings from hazard zones.	Would favor if acquired lands remain in low intensity use or returned to natural state and limited access. Would be interested that responsible parties manage acquired lands and that conservation status of lands be permanent. Would prioritize unique habitats.
<b>Business Organizations</b>	May not have strong opinions but some may appreciate mapped information.	Will be supportive if plan provides adequate opportunity for commercial and industrial development and does not limit development in desirable areas.	Will be supportive if zoning is perceived as flexible.	Will be supportive if setbacks are not too extreme and are uniformly administered.	Will probably not favor a policy to limit infrastructure development in highly desirable, but hazardous shoreland areas.	Would favor mitigation planning, but not if it includes removal of buildings from hazard zones (unless buildings suffer repeated damages).	Probably not in favor of acquisition programs unless business is primarily tourists.

**Table 2 (First Set of Measures Continued)**

<b>Stakeholder</b>	<b>Land use and resource inventories</b>	<b>Master Plans</b>	<b>Zoning Ordinances</b>	<b>Setbacks</b>	<b>Public infrastructure investment policy</b>	<b>Flood and erosion hazard mitigation planning</b>	<b>Land acquisition policy</b>
<b>Citizens in General</b>	Likely apathetic about resource inventories.	Supportive of planning but probably not conversant with shoreland issues.	Supportive of zoning unless it interferes with desired actions on own property or limits access to lakes and rivers.	Probably apathetic about shoreland setbacks.	Probably apathetic unless aware of risks and costs related to infrastructure in hazard areas.	Probably apathetic about hazard mitigation planning. But more aware they become, the more supportive they become.	Probably supportive if acquired lands offer additional water access opportunities.

**Table 2 Second Set of Measures**

Stakeholder	Shoreland regulations	Habitat regulations	Deed restrictions and real estate disclosures	Loans	Grants	Insurance programs	Tax incentives
<b>Government (elected and administrative)</b>							
<i>Federal -</i>							
Congress & the White House	Supportive but reluctant to make the regulations onerous.	May be supportive but do not want regulations to prohibit development.	Supportive in principle, but lobbyists for real estate interests will oppose.	Will be supportive but will not want to provide a large amount of funds.	Will be supportive but will not want to provide a large amount of funds.	Would favor if it doesn't increase bureaucracy.	Supportive if revenues not significantly affected.
The Army Corps of Engineers	Supportive if administration not too complex.	Supportive where regulations do not interfere with harbor and other navigation projects.	Supportive of tools that educate potential property owners in hazard areas.	Will be supportive of programs that help mitigate in hazard areas if criteria limit future damages and reliance on federal disaster prevention projects.	Will be supportive of programs that help mitigate in hazard areas if criteria limit future damages and reliance on federal disaster prevention projects.	Will be supportive of programs that help mitigate in hazard areas if criteria limit future damages and reliance on federal disaster prevention projects.	Will be supportive of programs that help mitigate in hazard areas if criteria limit future damages and reliance on federal disaster prevention projects.
EPA	Supportive, especially if regulations help protect sensitive natural resources.	Supportive.	Likely supportive of tools that educate potential property owners in hazard areas.	Will be supportive of programs if criteria help limit potential pollutant discharge.	Will be supportive of programs if criteria help limit potential pollutant discharge.	Will be supportive of programs if criteria help limit potential pollutant discharge. May want liability to include pollution.	Will be supportive of programs if criteria help limit potential pollutant discharge.
FEMA	Supportive of programs that limit potential damages.	Supportive if programs also have effect of limiting potential damages.	Likely supportive of tools that educate potential property owners in hazard areas.	Likely to be supportive and to push for greater funding.	Likely to be supportive and to push for greater funding.	Already fosters insurance programs and would probably like to see an expansion, but only if it helps remove buildings from hazard areas.	Likely to be supportive.

**Table 2 (Second Set of Measures Continued)**

Stakeholder	Shoreland regulations	Habitat regulations	Deed restrictions and real estate disclosures	Loans	Grants	Insurance programs	Tax incentives
<i>State</i>							
Lawmakers	Many will be supportive but some will want to limit restrictions on development.	Many will be supportive but some will want to limit restrictions on development.	May be supportive except for those wanting to appease real estate interests.	Likely to be supportive but with a limited budget.	Likely to be supportive but with a limited budget.	Will be supportive of programs that do not require state involvement. Some may be opposed if criteria promote removal from shore zone.	Likely to be supportive but not if there is a significant drop in revenues.
Dept. of Environmental Quality	Supportive if administration not too complex.	Supportive if administration not too complex.	Supportive if administration not too complex.	Supportive if administration not too complex.	Supportive if administration not too complex.	Supportive if administration not too complex.	Supportive if administration not too complex.
<i>Local (city, village, township and county)</i>							
Professional planners and planning commissioners	Many will be supportive but some will want to limit restrictions on development.	Many will be supportive but some will want to limit restrictions on development.	May be supportive except for those wanting to appease real estate interests.	Supportive if local administration not too complex and funds are sufficient. May find lack of support for implementing mitigation plans that displace people.	Supportive if local administration not too complex and funds are sufficient. May find lack of support for implementing mitigation plans that displace people.	Supportive where potential public safety hazards exist. May find lack of support for programs that encourage relocation of people out of high value shorelands.	May be supportive unless program leads to losses of revenue at local level.
Zoning and building officials	Supportive if local administration not too complex.	Supportive if local administration not too complex.	Supportive if local administration not too complex.	Supportive if local administration not too complex.	Supportive if local administration not too complex.	Supportive if local administration not too complex.	Supportive if local administration not too complex.
Tax assessors	May see as a tool that helps protect value of certain properties.	May see as a tool that adds value to certain properties.	May see as a tool that limits increase in value of certain properties.	May support if they see as ultimately improving value of certain properties.	May support if they see as ultimately improving value of certain properties.	May not support if seen to encourage relocation of homes outside of high value shorelands.	May not support if believed it will lower local revenues.

**Table 2 (Second Set of Measures Continued)**

Stakeholder	Shoreland regulations	Habitat regulations	Deed restrictions and real estate disclosures	Loans	Grants	Insurance programs	Tax incentives
<b>Riparians and Floodplain Owners</b>							
Lake Michigan Shoreline	Some will welcome but many will see as restrictive and preventing protection of buildings.	A few will support as helping to enhance enjoyment and value of property but some will find onerous.	Those buying likely to support but those selling may fear loss of sale or diminished value.	May find difficult to support if loans are to help move away from shoreline. May support if program is to relocate on existing lots. Only works where lots are deep.	May find difficult to support if grants are to help move away from shoreline. May support if program is to relocate on existing lots. Only works where lots are deep.	May support but not provisions that require relocation away from lake front.	Would likely support programs that enable siting or relocation on lot or improvements that stabilize bluffs.
Estuarine Shoreline and Floodplain	Some will welcome but many will see as restrictive and preventing location of buildings close to water.	A few will support as helping to enhance enjoyment and value of property but some will find onerous.	Those buying likely to support but those selling may fear loss of sale or diminished value.	May find difficult to support if loans are to help move away from shoreline. May support if program is to relocate on existing lots. Only works where lots are deep.	May find difficult to support if grants are to help move away from shoreline. May support if program is to relocate on existing lots. Only works where lots are deep.	May support but probably not provisions that require relocation away from river front.	Would likely support programs that enable siting or relocation on lot or improvements that protect against flood damage.
<b>Shore Protection Dealers</b>	Probably supportive (used to dealing with agencies) but not of more restrictive provisions.	Supportive until regulations restrict structural shoreline protection approaches.	May see as potentially limiting business if shore protection restricted on deed and may see disclosure as limiting new buyers and construction.	Supportive if shore protection included in loan programs.	Supportive if shore protection included in grant programs.	Supportive if shore protection included in insurance programs.	Supportive if shore protection included in tax incentive programs.

**Table 2 (Second Set of Measures Continued)**

Stakeholder	Shoreland regulations	Habitat regulations	Deed restrictions and real estate disclosures	Loans	Grants	Insurance programs	Tax incentives
<b>Recreational Boaters/Commercial and Sport Fishing</b>	Supportive unless restricts water access.	Supportive unless restricts water access. Likely very supportive of regulations that help protect or enhance fishery.	Supportive unless restricts water access.	Supportive unless restricts water access.	Supportive unless restricts water access.	Supportive unless restricts water access.	Supportive unless restricts water access.
<b>Commercial Shipping</b>	Supportive unless restricts port maintenance or development of new facilities.	Supportive unless restricts port maintenance or development of new facilities.	Supportive unless restricts port maintenance or development of new facilities.	Supportive unless restricts port maintenance or development of new facilities.	Supportive unless restricts port maintenance or development of new facilities.	Supportive unless restricts port maintenance or development of new facilities.	Supportive unless restricts port maintenance or development of new facilities.
<b>Realtors &amp; Developers</b>	Supportive of provisions that enhance the shoreline character and protection of buildings but not where development might be limited.	Supportive of provisions that enhance the shoreline character but not where development might be limited.	Only most enlightened likely supportive. Most opposed as potentially limiting business if potential buyers have better understanding of hazard area risks.	Supportive of programs that help improve property but not where focus is on relocation out of high value hazard areas.	Supportive of programs that help improve property but not where focus is on relocation out of high value hazard areas.	Supportive of programs that help improve property but not where focus is on relocation out of high value hazard areas.	Supportive of programs that help improve property but not where focus is on relocation out of high value hazard areas.

**Table 2 (Second Set of Measures Continued)**

<b>Stakeholder</b>	<b>Shoreland regulations</b>	<b>Habitat regulations</b>	<b>Deed restrictions and real estate disclosures</b>	<b>Loans</b>	<b>Grants</b>	<b>Insurance programs</b>	<b>Tax incentives</b>
<b>Policy Wonks</b>	Probably supportive but may want a reduction in use of structural shore protection.	Likely to encourage inventory of all sensitive habitats and policy to protect priority habitats through regulation and other approaches.	Probably favors widespread use of this approach.	Would support use of loan program, especially if expanded from floodplains to bluff shorelines.	Would likely support but prefer use of grants for land acquisition.	Would support but prefer criteria to emphasize relocation out of hazard areas.	Would support but likely to seek provisions that help preserve sensitive natural areas.
<b>Environmental Organizations</b>	Probably supportive but may want a reduction in use of structural shore protection.	Likely to encourage inventory of all sensitive habitats and policy to protect priority habitats through regulation and other approaches.	Probably favors widespread use of this approach.	Would support use of loan program, especially if expanded from floodplains to bluff shorelines.	Would likely support but prefers use of grants for land acquisition.	Would support but prefers criteria to emphasize relocation out of hazard areas.	Would support but likely to seek provisions that help preserve sensitive natural areas.
<b>Business Organizations</b>	Supportive as long as they perceive it enhancing the community and is does not limit business opportunities.	Supportive as long as they perceive it enhancing the community and is does not limit business opportunities.	Not likely to support. Likely to favor "buyer beware."	Likely to support (if loans also apply to businesses, not just residential) and don't mandate relocation.	Likely to support (if grants also apply to businesses, not just residential) and don't mandate relocation.	Likely to support if criteria don't mandate relocation.	Likely to support if criteria don't mandate relocation.

**Table 2 (Second Set of Measures Continued)**

Stakeholder	Shoreland regulations	Habitat regulations	Deed restrictions and real estate disclosures	Loans	Grants	Insurance programs	Tax incentives
<b>Citizens in General</b>	Supportive if seen as enhancing environment without limiting water access.	Supportive if enhances environment without limiting water access.	Probably support as a consumer protection measure.	Supportive if seen as enhancing environment and doesn't limit access to water.	Supportive if seen as enhancing environment and doesn't limit access to water.	Supportive if seen as enhancing environment and doesn't limit access to water.	Supportive if seen as enhancing environment and doesn't limit access to water.

**Table 3**  
**LIKELY STAKEHOLDER ESTIMATE OF CAPACITY OF**  
**SHORELAND MANAGEMENT MEASURES TO REDUCE POTENTIAL DAMAGES**  
**(First Set of Measures)**

Stakeholder	Land use and resource inventories	Master Plans	Zoning Ordinances	Setbacks	Public infrastructure investment policy	Flood and erosion hazard mitigation planning	Land acquisition policy
<b>Government (elected and administrative)</b>							
<i>Federal -</i>							
Congress & the White House	Helpful	Helpful	Helpful	Probably a range of estimates	Effective.	Very effective if includes removal to risk free areas.	Very effective for those small areas governments or nonprofits can afford to acquire.
The Army Corps of Engineers	Very helpful	Effective if policy adopted to reduce damages and consistent zoning is adopted.	Effective if constructed to reduce risk <i>and</i> followed by community.	Effective if tied to accurate recession rates and variances not granted excessively.	Effective	Very effective if seriously developed and implemented.	Very effective but not likely to be widely applied.
EPA	Helpful	Helpful	Helpful	Effective	Effective	Effective	Effective for small areas
FEMA	Very helpful	Very helpful	Very helpful	Effective if tied to accurate recession rates and variances not granted excessively.	Very effective	Very effective	Very effective for small areas.

**Table 3 (First Set of Measures Continued)**

<b>Stakeholder</b>	<b>Land use and resource inventories</b>	<b>Master Plans</b>	<b>Zoning Ordinances</b>	<b>Setbacks</b>	<b>Public infrastructure investment policy</b>	<b>Flood and erosion hazard mitigation planning</b>	<b>Land acquisition policy</b>
<i>State</i>							
Lawmakers	Helpful	Helpful	Helpful	Probably a range of estimates	Effective	Effective	Effective
Dept. of Environmental Quality	Very helpful	Very helpful if community adopts policies that limit development in hazard areas.	Effective if community takes responsibility and consistently follows through.	Very effective	Effective	Effective	Effective
<i>Local (city, village, township and county)</i>							
Professional planners and planning commissioners	Very helpful	Very helpful	Very helpful	Very effective	Effective but difficult to implement	Effective but difficult to build support	Effective but difficult to build support
Zoning and building officials	Helpful	Helpful	Helpful	Very effective	Effective	Effective	Effective
Tax assessors	Helpful	Helpful	Helpful	Helpful	Effective	Effective	Effective
<b>Riparians and Floodplain Owners</b>							
Lake Michigan Shoreline	Helpful after education	Effective	Effective	Effective	Helpful	Mix of opinions	Mix of opinions
Estuarine Shoreline and Floodplain	Helpful after education	Effective	Effective	Effective	Helpful	Mix of opinions	Mix of opinions
<b>Shore Protection Dealers</b>	Effective	Not effective	Not effective	Effective	Helpful	May not have an opinion depending on the measure	Effective
<b>Recreational Boaters/Commercial and Sport Fishing</b>	Helpful	Helpful	Helpful	Effective	Helpful	Helpful	Effective
<b>Commercial Shipping</b>	Helpful	Helpful	Helpful	Helpful	Helpful	Effective	Effective

**Table 3 (First Set of Measures Continued)**

<b>Stakeholder</b>	<b>Land use and resource inventories</b>	<b>Master Plans</b>	<b>Zoning Ordinances</b>	<b>Setbacks</b>	<b>Public infrastructure investment policy</b>	<b>Flood and erosion hazard mitigation planning</b>	<b>Land acquisition policy</b>
<b>Realtors &amp; Developers</b>	Helpful	Helpful	Helpful	Effective	Helpful	Effective	Effective
<b>Policy Wonks</b>	Effective after education	Effective	Effective	Effective	Very effective	Very effective	Very effective
<b>Environmental Organizations</b>	Effective	Effective	Effective	Helpful	Effective	Effective	Very effective
<b>Business Organizations</b>	Effective	Helpful	Helpful	Effective	Helpful	Helpful	Effective
<b>Citizens in General</b>	May not have opinion	Helpful	Effective	Effective	Helpful	Helpful	Effective

**Table 3 Second Set of Measures**

Stakeholder	Shoreland regulations	Habitat regulations	Deed restrictions and real estate disclosures	Loans	Grants	Insurance programs	Tax incentives
<b>Government (elected and administrative)</b>							
<i>Federal -</i>							
Congress & the White House	Effective	Effective	Helpful	Helpful	Helpful	Helpful	Effective
The Army Corps of Engineers	Helpful	Helpful	Effective	Helpful	Helpful	Effective	Helpful
EPA	Effective	Effective	Effective	Effective	Effective	Helpful	Effective
FEMA	Helpful	Helpful	Effective	Very effective	Effective	Very effective	Effective
<i>State</i>							
Lawmakers	Effective	Effective	Helpful	Helpful	Helpful	Helpful	Effective
Dept. of Environmental Quality	Very effective	Very effective	Helpful	Helpful	Effective	Effective	Effective
<i>Local (city, village, township and county)</i>							
Professional planners and planning commissioners	Effective	Effective	Effective	Helpful	Helpful	Helpful	Effective
Zoning and building officials	Effective	Effective	Helpful	Helpful	Helpful	Helpful	Effective
Tax assessors	Effective	Effective	Helpful	Helpful	Helpful	Helpful	Effective
<b>Riparians and Floodplain Owners</b>							
Lake Michigan Shoreline	Helpful	Helpful	Effective	Helpful	Helpful	Helpful	Helpful
Estuarine Shoreline and Floodplain	Helpful	Helpful	Effective	Effective	Effective	Effective	Effective
<b>Shore Protection Dealers</b>	Effective	Helpful	Helpful	Helpful	Helpful	Helpful	Helpful
<b>Recreational Boaters/Commercial and Sport Fishing</b>	Effective	Effective	Helpful	Helpful	Helpful	Helpful	Helpful
<b>Commercial Shipping</b>	Effective	Effective	Helpful	Helpful	Helpful	Helpful	Helpful
<b>Realtors &amp; Developers</b>	Effective	Effective	Very effective	Helpful	Helpful	Effective	Effective
<b>Policy Wonks</b>	Effective	Effective	Effective	Effective	Effective	Effective	Effective
<b>Environmental Organizations</b>	Effective	Very effective	Very effective	Helpful	Effective	Effective	Very effective
<b>Business Organizations</b>	Effective	Effective	Helpful	Effective	Effective	Effective	Very effective
<b>Citizens in General</b>	Effective	Effective	Helpful	Helpful	Helpful	Helpful	Effective

## **ANALYSIS, CONJECTURE & ISSUES FOR FUTURE DEBATE**

This section evaluates the likelihood of adoption of the various adaptive measures and provides conjecture on a continuum when they would be adopted (at what level of economic losses).

Because there has, as yet, been no estimation of economic losses, it is difficult to conjecture about adoption of adaptive measures along a continuum of those losses. What is possible is to conjecture about response to different levels of loss and different sequences of loss and periods without loss.

Table 4, beginning on the next page, provides conjecture on stakeholder responses to the various recommendations in the Task 8.1 Report. Again, these were:

1. Develop consensus between Michigan and Wisconsin (at a minimum) and the other Great Lakes states and Ontario (preferred) on a common set of goals and a common management approach to minimize hazards from flooding and erosion in shoreline areas.
2. The Great Lakes states and Ontario need to pass or modify existing laws to reflect the management strategy.
3. Provide education and technical assistance to real estate and financial institutions on the hazards associated with shoreline development, as well as on the risks of such development to their respective occupations and businesses.
4. Determine if implementation of shoreline management strategies can be achieved in great measure by actions of real estate and financial institutions and other private sector groups.

**Table 4  
STAKEHOLDER RESPONSES TO RECOMMENDATIONS**

	<b>Recommendations from Task 8.1</b>			
<b>Stakeholder</b>	1. Develop consensus between Michigan and Wisconsin (at a minimum) and the other Great Lakes states and Ontario (preferred) on a common set of goals and a common management approach to minimize hazards from flooding and erosion in shoreline areas.	2. The Great Lakes states and Ontario need to pass or modify existing laws to reflect the management strategy.	3. Provide education and technical assistance to real estate and financial institutions on the hazards associated with shoreline development, as well as on the risks of such development to their respective occupations and businesses.	4. Determine if implementation of shoreline management strategies can be achieved in great measure by actions of real estate and financial institutions and other private sector groups.
<b>Government (elected and administrative)</b>				
<i>Federal -</i>				
Congress & the White House	Positive	Positive	Positive	Positive
The Army Corps of Engineers	Positive	Positive	Positive	Positive
EPA	Positive	Positive	Positive	Positive
FEMA	Positive	Positive	Positive	Positive
<i>State</i>				
Lawmakers	Positive among some	Positive among some	Positive	Positive among some
Dept. of Environmental Quality	Positive	Positive	Positive	Positive
<i>Local (city, village, township and county)</i>				
Professional planners and planning commissioners	Positive	Positive	Positive	May be wary
Zoning and building officials	Positive	Positive	Positive	Probably oppose
Tax assessors	Positive	Positive	Positive	May be wary
<b>Riparians and Floodplain Owners</b>				
Lake Michigan Shoreline	Positive	Positive	Positive	Positive but may fear loss of strong state oversight
Estuarine Shoreline and Floodplain	Positive	Positive	Positive	Positive but may fear loss of strong state oversight

**Table 4 (Continued)**

	<b>Recommendations from Task 8.1</b>			
<b>Stakeholder</b>	1. Develop consensus between Michigan and Wisconsin (at a minimum) and the other Great Lakes states and Ontario (preferred) on a common set of goals and a common management approach to minimize hazards from flooding and erosion in shoreline areas.	2. The Great Lakes states and Ontario need to pass or modify existing laws to reflect the management strategy.	3. Provide education and technical assistance to real estate and financial institutions on the hazards associated with shoreline development, as well as on the risks of such development to their respective occupations and businesses.	4. Determine if implementation of shoreline management strategies can be achieved in great measure by actions of real estate and financial institutions and other private sector groups.
<b>Shore Protection Dealers</b>	Positive	Positive	Positive	Positive
<b>Recreational Boaters/Commercial and Sport Fishing</b>	Positive	Positive	Positive	Positive
<b>Commercial Shipping</b>	Positive	Positive	Positive	Positive
<b>Realtors &amp; Developers</b>	Uncertain, may fear change in policy	Uncertain, may fear change in policy	Somewhat positive	Likely opposed
<b>Policy Wonks</b>	Positive	Positive	Positive	Positive
<b>Environmental Organizations</b>	Positive	Positive	Positive	Very wary
<b>Business Organizations</b>	Uncertain, may fear change in policy	Uncertain, may fear change in policy	Somewhat positive	Somewhat positive
<b>Citizens in General</b>	Uncertain, may fear strong state control and cross-jurisdiction agreements	Uncertain, may fear strong state control and cross-jurisdiction agreements	Positive	Somewhat positive

## **IDENTIFY ISSUES OF DEBATE THAT WOULD BE FACTORS IN FURTHER ANALYSIS**

This section explores issues that figure in discussions about future development of hazard areas and how existing development will be dealt with, especially in the event of damage from lake level fluctuation. Depending on the outcome of discussions on these issues at the national, state and local levels, policy may be formed that will affect potential damages in the Lake Michigan coastal zone.

Land use management approaches and practices in natural hazard areas vary among communities. Land use management approaches are typically of three types:

1. Encourage development in the hazard zone because it is often an attractive, high value area for development that generates relatively high tax income.
2. Discourage development in the hazard zone because there are public safety risks. These risks occur to individuals in terms of their own property or lives but are also health, safety and welfare concerns to the general public through the debris and contaminates generated by damaged property and because of visual blight.
3. Permit development in hazard zones without encouragement, but only with constraints that serve to reduce the level of potential damage.

Land use management is the result of local, state and federal plans, policies and programs. Most planning and regulatory review occurs at the local level in the study area. To some degree these efforts are coordinated among and between different levels of government but mostly they are not. Many construction projects require local, state and federal permits, but there is no coordinated policy for the review of those permits. Each level of government has its own review standards. In the study area, no plans are coordinated regionally or at the state level. Zoning ordinances in Wisconsin are required to contain certain provisions for the shoreland areas. In Michigan, most development permit review in high risk erosion areas is administered at the state level, but could be done at the local level if communities chose to participate.

Often, communities make a distinction between general planning and zoning for the community and that for hazard areas. There really should be no distinction, because if a land use or facility cannot be accommodated in a hazard zone, it may need to be accommodated elsewhere in the community (or region). Also, development in a hazard zone can present risks to the community at large.

Some communities do little planning to reduce damage to structures while others make a concerted effort. A minimalist effort, above that of doing nothing, is to permit construction in a hazard area but only according to hazard resistant building codes. This does nothing to prevent structures from being exposed to the hazard, it just trusts that better construction will enable the structures to survive with minimum damage. An example of this is to elevate buildings in the

flood fringe on stilts or fill. Such an approach helps maintain the strong sense of belonging to a particular place among residents: "Things should remain just the way they were." This is especially the case among older citizens. In contrast, a maximum effort is to develop plans to relocate development from the hazard zone and prohibit future development there. Entire neighborhoods and business districts that suffer frequent flooding, have been relocated to higher ground. Typically, the areas that were formerly developed are now parks. Given the high cost of shoreline property and the perception of the heavy hand of government at work, this option will likely continue to be sparingly used.

**Infrastructure Relocation and Changes in Investment Policy.** As potential damages becomes clearer to state agencies and legislators, it is likely that there will be less investment in infrastructure in the hazard areas. Where feasible, especially where infrastructure nears its constructed life expectancy, there will likely be a reluctance to repair and an increased tendency to dismantle existing infrastructure and to relocate it out of hazard zones. Although roads and bridges could be included in this category, it will be increasingly difficult over the next 50 years to do so as much of the land becomes developed making it cost prohibitive to build new roads and bridges near to, but out of hazard zones.

**Land Consolidation & Replatting.** Land consolidation is the acquisition of multiple parcels of land in order to change the land use or to increase the scale of an existing land use. There is a history of this practice in hazard areas; primarily in flood damaged zones. Other examples include sites of environmental contamination or where major recreation facilities are planned (such as the Sleeping Bear Dunes National Lakeshore). Replatting is where the configuration of existing parcels is changed. This is an extreme measure that has not been practiced widely in the United States. Often the concept is that unbuildable lots would be combined with other lots to make new, buildable lots, according to a certain formula. In the Netherlands, this has been done to turn many, small, unprofitable farm parcels into fewer, larger parcels that would be profitable to farm. The program also included substantial relocation of families to the "New Lands," or new farming areas claimed from the sea. It is doubtful that such a program could be developed in the United States within the next fifty years if the program were not voluntary. There have been several relocation programs along the Mississippi River flood hazard zones, and these were voluntary. Along the Lake Michigan shoreline, it would be difficult to displace people with expansive lake views for inland properties. Along estuarine flood zones, such an effort might meet greater success. One of the keys is that there be land available for relocation. Where communities are already built out, success may be limited without interjurisdictional cooperation. With the exception of recreation projects, the state is rarely involved in land consolidation.

**Permit Review Policy Changes.** It is clear that permit review policy may change in the 50 year planning period. These changes are likely to be:

- Increased pressure for state government to decentralize (turn over to local governments) or privatize (turn over to the private sector) this function. This will be due to continued funding constraints that keep staffing levels too low to do the job adequately, while an increase in shoreline development increases the number of permit applications and the threats of extreme high or low lake levels are exhibited.
- A decrease in the permitting of shoreline protection structures. The belief that shoreline protection structures inevitably fail will likely become more widespread as the experience and research demonstrates. There will continue to be permitting of shore protection structures where residences and other facilities are in imminent danger. Gradually, as these fail, there will be, at some point, no more small structures to protect--only the massive ones. The latter may receive permits for very extensive shore protection well beyond fifty years.
- A new set of permitting criteria that considers sand transport. Permits for shore protection may be tied to calculations of the amount of sand denied the lake transport system. Permit holders may have to compensate for the loss by providing artificial nourishment. While this type of permit has already been granted in Michigan by the US Army Corps of Engineers, it has been challenged. Because sand transport is so vital to coastal processes, there is a good chance that such a permit criterion will take hold within fifty years.
- Fair warning will be given to property owners in the highest risk zones that at some point they will not be afforded shore protection opportunities. This may include second tier bluff property owners whose homes are across the street from endangered structures, but whose properties may become first tier at some point during or after the fifty year period.

Changes in Public and Private Financing Parameters. To date, it has been relatively easy for private property buyers (when financially qualified) to obtain mortgages on shoreland property, even in hazard areas. Lending institutions may become more careful in protecting their investments by either requiring adequate shoreline protection structures, movability, or by refusing to grant mortgages to homes or businesses in locations where damage is likely before payoff of the mortgage. While insurance could make some of these mortgages less risky to the lender, if insurance is not available, the mortgage may not be either. Insurance is required for mortgages from federally backed lending institutions where a flood risk has been identified. At the current time this does not include all properties in flood or erosion hazard areas, but could in the future. Significant changes could also occur in lending practices if designated floodplains were based on 500-year flood levels, not the current 100-year flood level.

Participation in Insurance Programs. National Flood Insurance is required for mortgages from lending institutions backed by federal guarantees, only where a flood hazard has been identified. This does not include all coastal hazard areas and may be part of the reason only about 10% of all properties at risk of flooding

in Michigan are estimated to have flood insurance. In the future, all flood hazard areas may be identified with the result that all properties at risk will have to obtain insurance. Given such a large level of risk to the insurance pool, the National Flood Insurance Program (and any other carriers that become involved) may develop more strict rules for hazard mitigation. As stated above, there could also be a recognition that the 500-year flood should be used as the base line for development-related decisions in flood hazard areas, and this could further influence insurance programs with a greater emphasis on mitigation approaches.

Local Public Facility Planning in Response to Hazards. Local governments will change the planning of public facilities to the extent that they believe the predictions of lake level change. Where they believe lake level changes will place public facilities at risk they will plan for new facilities in risk-free zones. In flood hazard areas in other parts of the country, many communities focused on 100 year flood potentials and discounted the probability of larger floods, such as 500 year floods. Several communities along the Mississippi River experienced two or more, 500 year floods in one year in 1993. Most of their flood protection efforts were set to the 100 year flood level. As a part of public facility planning as well as administration of floodplain ordinances, local communities will seek periodic review of flood elevations. This will occur as community leaders begin to understand the role of development in the watershed on both flood generation and extent of development at risk.

## **SUMMARY**

This report provides conjecture on whether different stakeholder groups would adopt adaptive land use measures to limit potential damages from changing Lake Michigan levels.

While it is likely that many stakeholder groups would support or seek adoption of adaptive shoreline management measures, this conclusion does not suggest a simple result. Actions by stakeholder groups would likely depend on how much lake levels changed and in what sequence and how they perceived the adaptive measures to meet the needs of their own interests.

Three combination hydrologic scenarios were described to better estimate stakeholder response. These scenarios were:

- A long period of extremely low water followed by an extremely high water period late in the 50 year planning period.
- An extremely high lake level early in the planning period followed by low water.
- A cycling of moderate highs and lows similar to that of the past 30 years.

The first scenario of an early, extremely low water period will likely divert attention from preventing high water damages in the future. Federal and state regulatory agencies will spend considerable time reviewing permits for dredging and other projects to insure recreational boating and commercial shipping activities continue. Local governments may become lax in enforcing setbacks

and other regulations aimed at protecting properties and the health and safety of the public. It will be a difficult period to educate property owners and legislators about high water impacts.

The second scenario of an early, extremely high lake level will provide the best opportunity to educate property owners, local, state and federal officials about shore processes, the potential for damages and adaptive measures to limit damages. This scenario would probably provide the most impetus to look at investment policy and at hazard mitigation planning as well as loans and grants and insurance programs. At the same time, there will be increased pressure to regulate lake levels.

The third scenario will provide repeated educational efforts on lake processes and adaptive measures, but responses may depend on stakeholder perceptions of risk and on leadership in government. Local governments will likely continue to defer to state government to "be the bad guys" in development permit review. If lake level change is moderate, the level of adoption of adaptive measures may be moderate as well.

The discussion also looks at how stakeholders might respond to adaptive shoreland management measures (as identified in Task 8.1). Many of the groups would be supportive of most of the measures. Support may vary depending on how specific were the interests of the stakeholder group. For example, FEMA might be in favor of all of the adaptive measures as they limit investment in hazard zones or guide investment wisely. But recreational boating interests may be most interested in access to the water, and would provide weak support or opposition to some of the measures if they perceived access would be limited.

This report also speculates on stakeholder estimate on the effectiveness of the various adaptive measures. While most stakeholder groups would find most adaptive measures effective, or at least helpful in reducing damages, some groups would find a few of the measures difficult to support. These latter measures are the less familiar ones, such as hazard mitigation planning and policies to limit infrastructure investment. Also, these would be viewed by some stakeholder groups as limiting their own interests.

Four recommendations were made in the Task 8.1 Report. These were:

1. Develop consensus between Michigan and Wisconsin (at a minimum) and the other Great Lakes states and Ontario (preferred) on a common set of goals and a common management approach to minimize hazards from flooding and erosion in shoreline areas.
2. The Great Lakes states and Ontario need to pass or modify existing laws to reflect the management strategy.
3. Provide education and technical assistance to real estate and financial institutions on the hazards associated with shoreline development, as well as

on the risks of such development to their respective occupations and businesses.

4. Determine if implementation of shoreline management strategies can be achieved in great measure by actions of real estate and financial institutions and other private sector groups.

Conjecture on the response of the different stakeholder groups to these recommendations is provided in Table 4 of this report. Most stakeholders would find these recommendations positive, although a few would be wary. Property owners may fear a loss of state oversight if more of the management responsibility of shoreline development were turned over to the private sector. Some of the private sector interests, such as realtors and developers may be opposed to assuming liability.

Certainly some responsibility for development decisions resides in all involved parties and includes state, federal and local governments, private property owners, builders, realtors, appraisers, financial institutions, surveyors, architects, engineers and others. Decisions about how the responsibility should be split will be key to debate on future potential damage reduction alternatives. There are many issues that need consideration in this debate.

A still missing piece is the actual estimate of damages. Until this estimate is made, or property owners and officials witness considerable damage, many stakeholder groups may defer a commitment to adopting adaptive measures. This is somewhat of a "head in the sand," approach, but given the many activities of the various stakeholders, it may take dramatic information to gain action.

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