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REGULATIONS TO REDUCE COASTAL EROSION LOSSES

Prepared by

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for the Wisconsin Coastal Management Program

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PREFACE

This report discusses the role that local zoning and subdivision regulations can play in reducing monetary losses from erosion along Wisconsin's Great Lakes coast. It is designed for local governmental officials and their planning advisors. Part I describes the basic causes of erosion, the measures that reduce and increase erosion, and procedures for estimating erosion hazard. It also discusses the use of zoning and subdivision regulations to adjust land use to the erosion hazard, and the legal factors that should be considered in selecting regulatory policies. Part II contains some erosion hazard provisions that can be included in zoning ordinances and subdivision ordinances. The ordinance provisions are accompanied by explanatory commentary.

ACKNOWLEDGEMENTS

A number of people have contributed to this report in their review and comment and in some cases in providing specific items which have been included. Special assistance was given by Edmund Brick, Department of Natural Resources; Ellen Fisher, Environmental Resources Unit, UWEX; Philip Keillor, U. W. Sea Grant Advisory Services; and James O. Peterson, Environmental Resources Unit. In addition, a grateful acknowledgement is made of the contributions of: Stephen Andrews, Northwest Wisconsin Regional Planning Commision; Stephen Born, U. W. Urban and Regional Planning Department; Kim Bro, U. W. Sea Grant Advisory Services; Carol Cutshall, Bay Lake Regional Planning Commission; Tuncer Edil, U. W. Department of Civil Engineering; Greg Hedden, U. W. Sea Grant Advisory Services; Dan Holzman, Department of Natural Resources; Al Miller, Wisconsin Coastal Management Program; Joe King, Department of Natural Resources; William Lontz, U. W. Extension; David Mickelson, U. W. Department of Geology; Don Reed, Southeastern Wisconsin Regional Planning Commission; Carol Schultz, Department of Natural Resources; Roger Springman, U. W. Soils Science Department; and Roland Tonn, Southeastern Wisconsin Regional Planning Commission.

REGULATIONS TO REDUCE COASTAL EROSION HAZARD LOSSES

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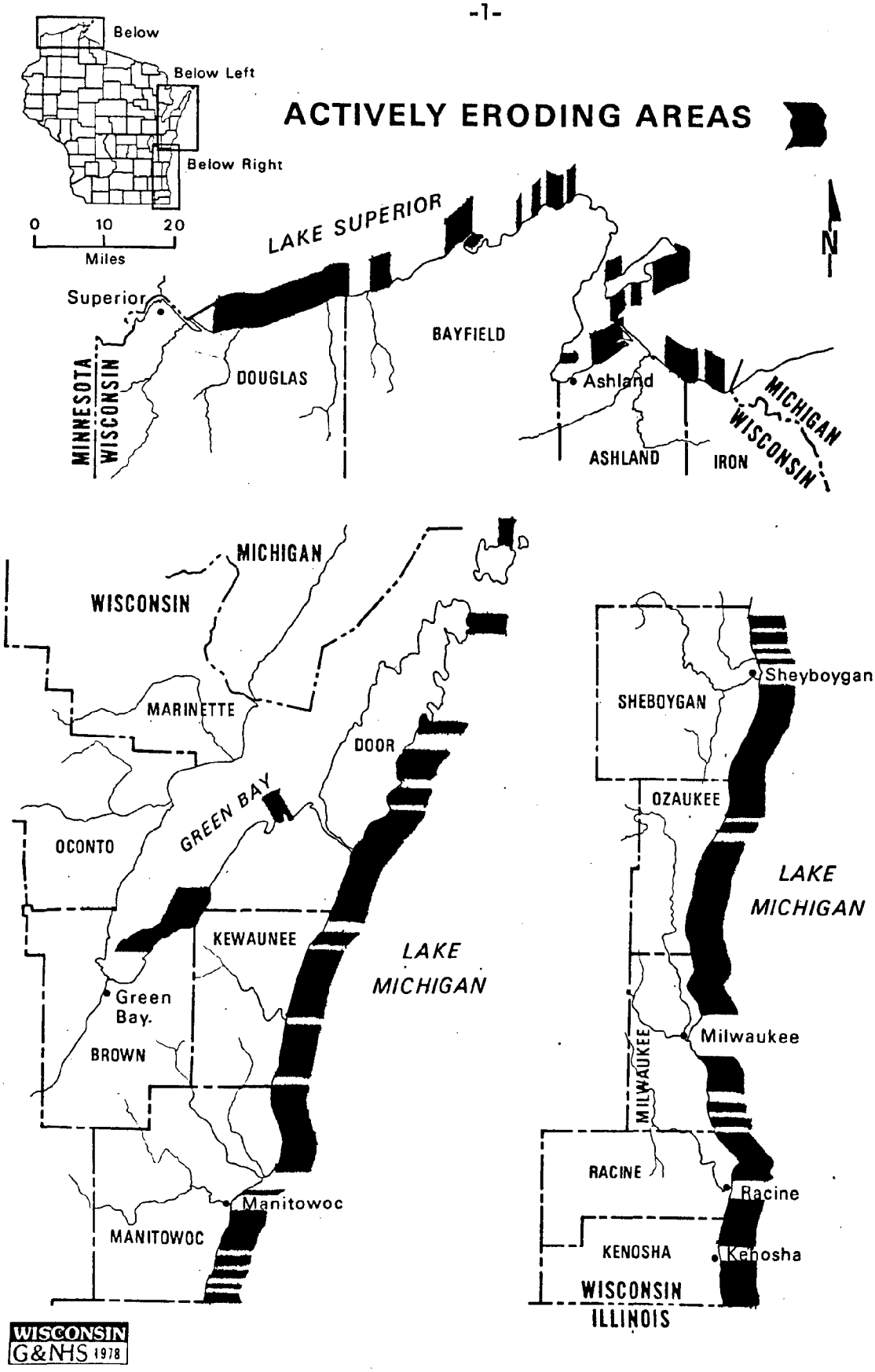
ACTIVELY ERODING AREAS



REGULATIONS TO REDUCE COASTAL EROSION LOSSES

Overview and Highlights

1. Significant erosion is taking place along almost one-half of Wisconsin's shoreline on Lake Michigan and Lake Superior. On Lake Michigan, short-term recession rates of 3-15 feet per year have been recorded along sandplains and 2-6 feet per year along high blufflines. On Lake Superior, recession rates of 2-5 feet per year are common along blufflines and rates in excess of 10 feet per year have been recorded around bays. As the shoreline recedes, houses and other structures are damaged or destroyed. Damages of over $16 million occurred during the 1972-76 high water period. Damages will increase as erosion continues and additional development takes place in erosion hazard areas.

2. Several types of erosion occur along the shoreline. The first is wave attack which eats away the land. Along steep bluffs there may be an additional problem, i.e., unstable slope conditions. The stability of a slope depends upon its height, steepness, the strength of the material of which it is composed, and other factors. Even if a bluff is protected against wave attack, it will continue to erode until it reaches a stable slope angle. A bluff will be further unstabilized by increasing water runoff or adding weight which overloads the blufftop. One form of bluff failure is known as slumping. Slumping usually takes place fairly rapidly and the movement of one slump block can remove up to 50 or 100 feet of blufftop.

3. There are two basic approaches to reducing erosion damages: the structural method and the land use control method. The structural method

relies on slowing down the erosion process by constructing devices to protect against wave attack or to stabilize the bluff. The land use control method focuses on adjusting land use to the erosion hazard by setting structures back a safe distance and controlling runoff.

4. Common structural methods to reduce wave attack are to armor the shore by rip-rap revetments or bulkheads and to build protective beaches by devices such as groins or nearshore breakwaters. Devices to stabilize bluffs including reshaping the bluff to a stable angle and constructing terraces with retaining walls. Structural methods are most appropriate for protecting existing development against erosion. They may also be necessary for protecting sewage treatment plans, ports and other high value new developments which have to be located in the immediate shoreland area. There are a number of problems with structural methods, however. Structural measures may not be feasible from an engineering point of view. Most protective works are expensive and may exceed the value of the site. The effective life of a structure is reflected in its construction cost. Improperly designed, installed or maintained protective measures will fail and are a waste of money. Protection of one area may accelerate erosion on nearby property.

5. The land use control approach focuses on the safe location of development in shoreland areas. It adjusts land use to the erosion hazard by the appropriate setback of buildings and other vulnerable uses in erosion-prone areas. Local zoning ordinances and subdivision regulations can require that

new development be placed landward of erosion hazard setbacks. Establishing a safe setback involves several steps: (a) identifying the areas subject to erosion; (b) determining shore recession rates; (c) selecting the length of time during which regulated uses are to be protected from recession; and (d) in the case of bluffs, the additional step of estimating the stable slope angle.

6. There are two basic approaches to determining erosion hazard -- the site specific method and the reach method. The site specific method requires a geotechnical engineering analysis at each site at the time development is proposed. This method may require a report analyzing among other things: (a) wave-induced erosion based upon recession rates and wave energy calculations; (b) geologic conditions including the soils at the site and their properties and stability; and (c) groundwater and surface water conditions. While the site specific approach may be technically accurate, it is too costly and time consuming for all but the most expensive development.

7. The reach method uses generalized formulas to estimate the erosion hazard. Much of the information needed is available from studies made through the Wisconsin Coastal Zone Management Program. Erosion Hazard Area Maps at a scale of 1 inch equals 2,000 feet delineate areas with erosion potential. These maps also show short-term recession rates (1966-1975) and long-term recession rates at selected intervals. In general, it is preferable to use the long-term rate as a measure of recession. Selecting the appropriate length of time during which regulated uses are to be protected from recession is up to

the judgment of local officials. A 50-year time period appears to be a reasonable minimum since it approximates the useful life of a typical residence. Assuming a 50 year time period and a long-term recession rate of 2 feet per year, a building would have a recession rate setback of 100 feet from the ordinary high watermark.

8. If an erodible bluff is present, it is also necessary to determine the additional setback required to locate buildings outside unstable slope areas. A generalized stable slope angle of 2-1/2 feet horizontal distance to 1 foot vertical distance (21.8°) appears to be a reasonable figure for most Lake Michigan erosion hazard areas. The predominantly clayey soils on Lake Superior tend to be less stable so a generalized stable slope angle of 3 feet horizontal distance to 1 foot vertical distance (18.4°) has been suggested. Assuming an erodible bluff 50 feet high, a stable slope setback of 125 feet from the ordinary high watermark would be required on Lake Michigan and 150 feet on Lake Superior. The recession rate setback is added to the stable slope setback to establish the erosion hazard setback. Using the example of the 50 foot bluff on Lake Michigan, the erosion hazard setback would be 225 feet from the ordinary high watermark. The regulations should provide an opportunity for property owners to provide data justifying a lesser setback.

9. Sample erosion hazard provisions designed to supplement local zoning ordinances and subdivision regulations are contained in this report. In general, these provisions regulate erosion prone lands by: (a) establishing an

erosion hazard setback line; (b) restricting or prohibiting uses which are vulnerable to erosion damage or which may impair public rights in navigable waters; (c) requiring special review of erosion protection devices to ensure that they are properly designed and installed and do not have substantially adverse environmental impacts; and (d) regulating land disturbance, vegetation removal, runoff and other activities which may increase erosion.

Flexibility in the zoning is achieved through conditional use provisions which allow landowners to prove that: slope conditions are more stable than assumed; a slower recession rate is warranted; or that erosion hazards can be mitigated by structural protection or placing a moveable building on the site. After public notice and a hearing on a conditional use, the local Zoning Agency may grant development permission, deny it, or allow development to take place subject to specified conditions.

10. Subdivision regulations are an important tool for reducing erosion damages and/or protecting potential purchasers of erosion-prone lands. The subdivision regulations contain provisions that allow local government to: (a) require each lot to have adequate area to meet the erosion hazard setbacks; (b) prohibit the subdivision of lands subject to serious erosion unless the hazards are overcome; (c) require the designation of erosion hazard setbacks on the plat; (d) limit the use of hazardous lands through deed restrictions or dedication of the land to the public; (e) review proposals for stormwater drainage, grading and similar activities which may accelerate erosion to ensure they are undertaken in a manner compatible with conditions on the site; (f) require the subdivider to install reasonably necessary public improvements,

including erosion control measures or provide a surety that the improvements will be installed; and (g) require that erosion protection measures are maintained by a properly constituted private agency with assessment powers.

11. The report analyzes statutory law in Wisconsin and court cases from Wisconsin and other states. It concludes that regulations of the type described will probably be found valid by a Wisconsin court. The sample regulatory provisions are more detailed than those that many local governments may choose to enact. The report, however, sets out detailed ordinance provisions with explanatory comment so that local governments can select the provisions which they believe are most appropriate for their particular circumstances. Many of the regulatory provisions could be adopted as an erosion hazard policy plan which could be incorporated into regulations by reference.

12. Technical assistance, from a variety of sources, is available to help local governments to prepare, adopt and administer erosion hazard regulations. This help includes establishing appropriate erosion hazard setbacks, reviewing structural protection proposals and assisting with runoff problems. Among these agencies are the Department of Natural Resources, County Soil and Water Conservation Districts, Regional Planning Commissions and the University of Wisconsin.

For further information or assistance, contact:

<u>In Kenosha, Racine, Milwaukee, and Ozaukee Counties</u>

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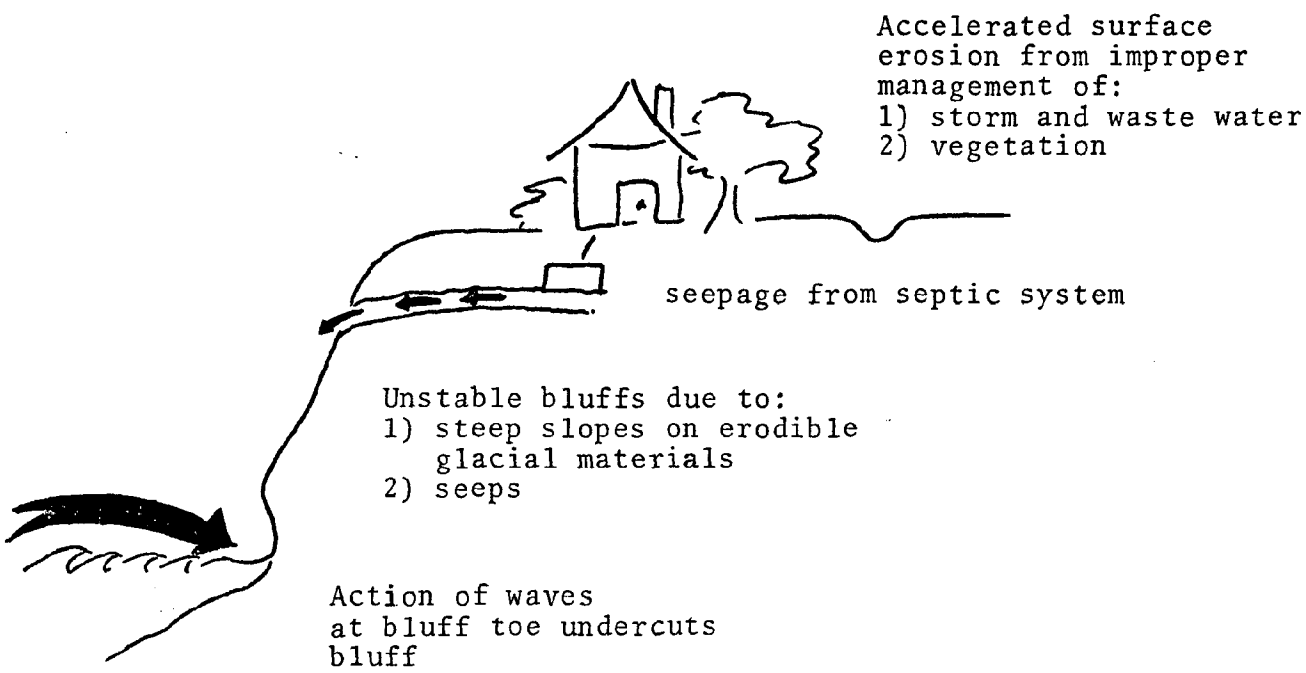
WHY DOES THE SHORELINE ERODE?



HOW MUCH OF THE SHORELINE IS ERODIBLE?

- The National Shoreline Study of 1971 recognized 290 miles of Wisconsin's 620 mile mainland shoreline as being erosion-prone.

WHAT IS THE MAGNITUDE OF WISCONSIN'S EROSION HAZARDS AND DAMAGES

- Of the 1.4 million residents of coastal communities, 3,500 live (permanently or seasonally) within 75 feet of the bluff/beach edge.
  Between 25,000 and 35,000 people live within 500 feet of the shoreline.
- Recorded damages during the 1972-1976 high water period were approximately $16 million
- As erosion continues, it endangers more coastal development and increases damage potential.

INTRODUCTION

Shoreline erosion is a significant problem along substantial parts of Wisconsin's Great Lakes coast. Structures located in erosion hazard areas are subject to damage from undermining and flooding. Shore erosion is a natural process which has been taking place for many thousands of years. It cannot be halted, but people's actions can speed it up or slow it down. People can also adjust land use to the erosion hazard in a way that minimizes damages. Severe property losses have resulted from development which failed to take erosion into account.

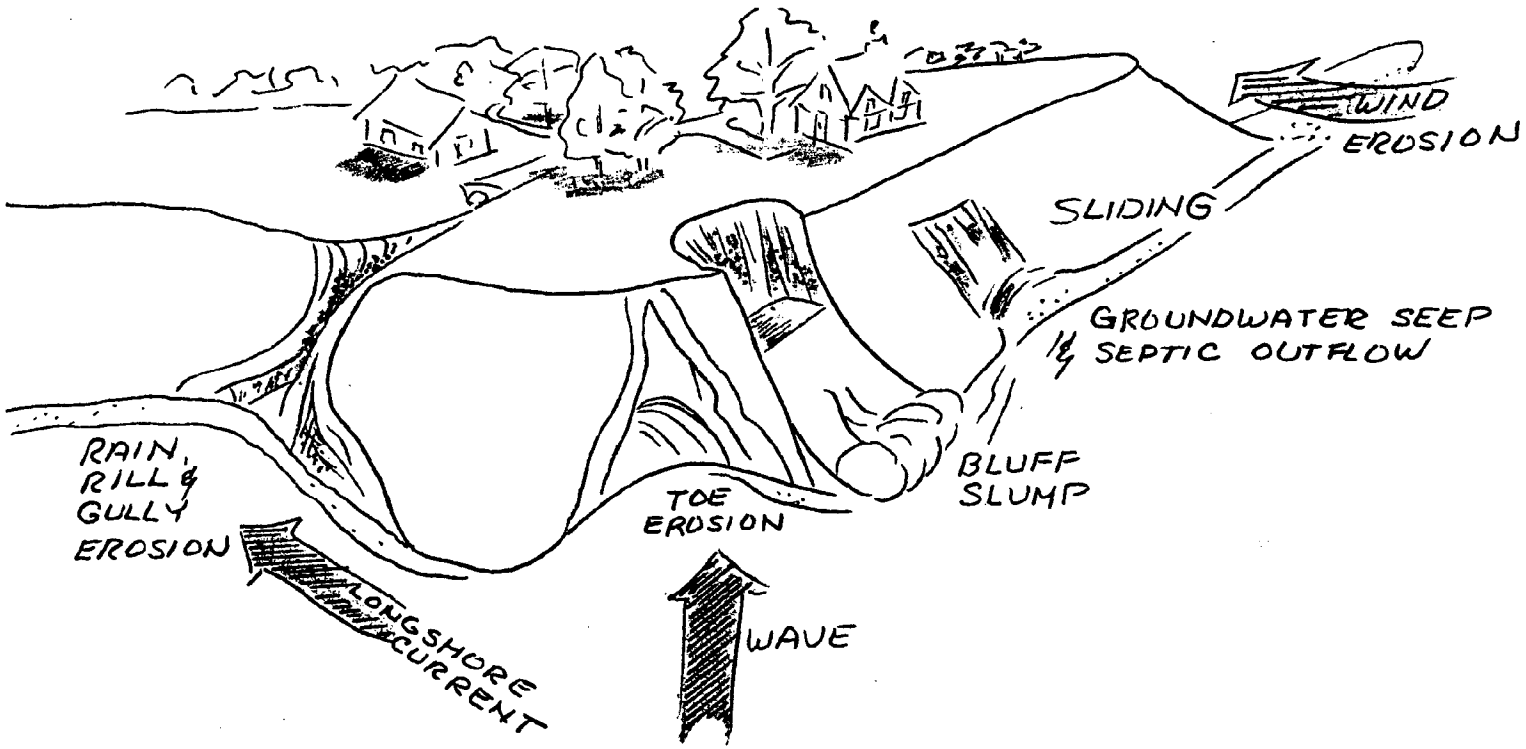
There are three general types of erosion-hazard situations found along the coast. The first involves erosion of beaches. Beaches are periodically being worn away in some areas while accumulating in other areas. Structures placed too close to eroding beaches will be subject to flooding and undermining by waves. A second related type of shore erosion involves sand dunes. Dunes protect against wave attack and flooding. Disturbance of dunes and removal of vegetation will subject them to wind and wave erosion and result in a loss of their protective function. Bluff retreat is the third type of erosion hazard. It is the most prevalent and most serious problem in Wisconsin and is the major focus of this report.

CAUSES OF SHORE EROSION

Wave Erosion

Wind driven waves are the primary erosive force on Wisconsin's Lake Michigan and Lake Superior coasts. Beaches are continuously changing as waves add or remove materials. During storms, high steep waves remove beach materials and carry them lakeward. In periods between storms, small waves tend to carry material shoreward and build up the beaches. Waves that approach the shore at an angle create a "longshore current" that runs parallel to the shore. Longshore currents move materials along the shoreline in a process called "littoral drift" that can help replenish beaches. If this littoral drift is blocked, however, rapid erosion may occur.

The extent to which waves and currents erode shorelines depends upon a variety of factors. Among these factors are: storm direction and intensity; wind strength and duration; the configuration of the lake bottom; structures which affect littoral drift; and lake levels. Higher lake levels caused by increased rainfall in the drainage basin or storm surges allow waves to attack the shoreline farther back than usual, greatly accelerating erosion. Lake Michigan varies between a historic high of 580.2 feet and a low of 575.4 feet. Lake Superior levels range from 598.2 feet to 602.0 feet. In addition, a storm surge on the open coast can raise water levels several feet during the storm. In some bays the storm surge can be even greater, reaching four to six feet on occasion.



EROSION PROBLEMS

Property owners may build too close to the shore during periods of low lake levels because they believe the shoreline is stable. When higher lake levels occur the protective beaches which normally dissipate the force of the waves are again submerged and waves directly attack the shoreland. Shorelands downdrift from structures which trap the movement of sand, such as groins, piers and off-shore breakwaters, are subject to particularly severe erosion.

Bluff Retreat

Wave attack undercuts or steepens bluffs causing unstable slope conditions. Even if wave-induced erosion could be completely halted, bluff recession would continue as the force of gravity acts to move material on the unstable slope to a lower position. Over a long period of time, the slope would reach a stable angle of repose where the stresses acting to move material down the slope and the resistance of the materials on the bluff to these stresses are in balance. The texture (size and shape) of the materials comprising the bluff and the ground water pressures determine the resistance to shearing. The shear stress of the materials in the bluff is primarily influenced by the bluff height and the angle of the slope. Water entering the soil and frost action can further weaken the bluff. Localized ground water conditions may greatly reduce slope stability. When water percolating through the soil reaches an impermeable layer, the water may push material out from the bluff face causing collapse of the overlying soil. Building development and other activities which add weight or water to the bluff also increase its instability.

Most bluff retreat occurs as slope failure, that is, periodic land slides. The most common forms of land slides are slumping and translational sliding. Bluffs composed of silt and sand tend to slough off in shallow layers in the form of translational slides. This occurs when material moves down the sloping bluff face along a single slide surface in a layer several inches to one or two feet thick. Along some parts of the shoreline, this type of bluff failure is probably the most important. However, it is impossible to quantify the effects of translational sliding without detailed measurement or to predict its occurrence in more than a general sense. Slumps tend to occur in more cohesive materials where a large intact mass of the bluff slides downward in a rotational motion. Slumping usually takes place fairly rapidly and the movement of one slump block can remove up to 50 or 100 feet of bluff top. This type of landslide could result in both loss of life and considerable property damage.

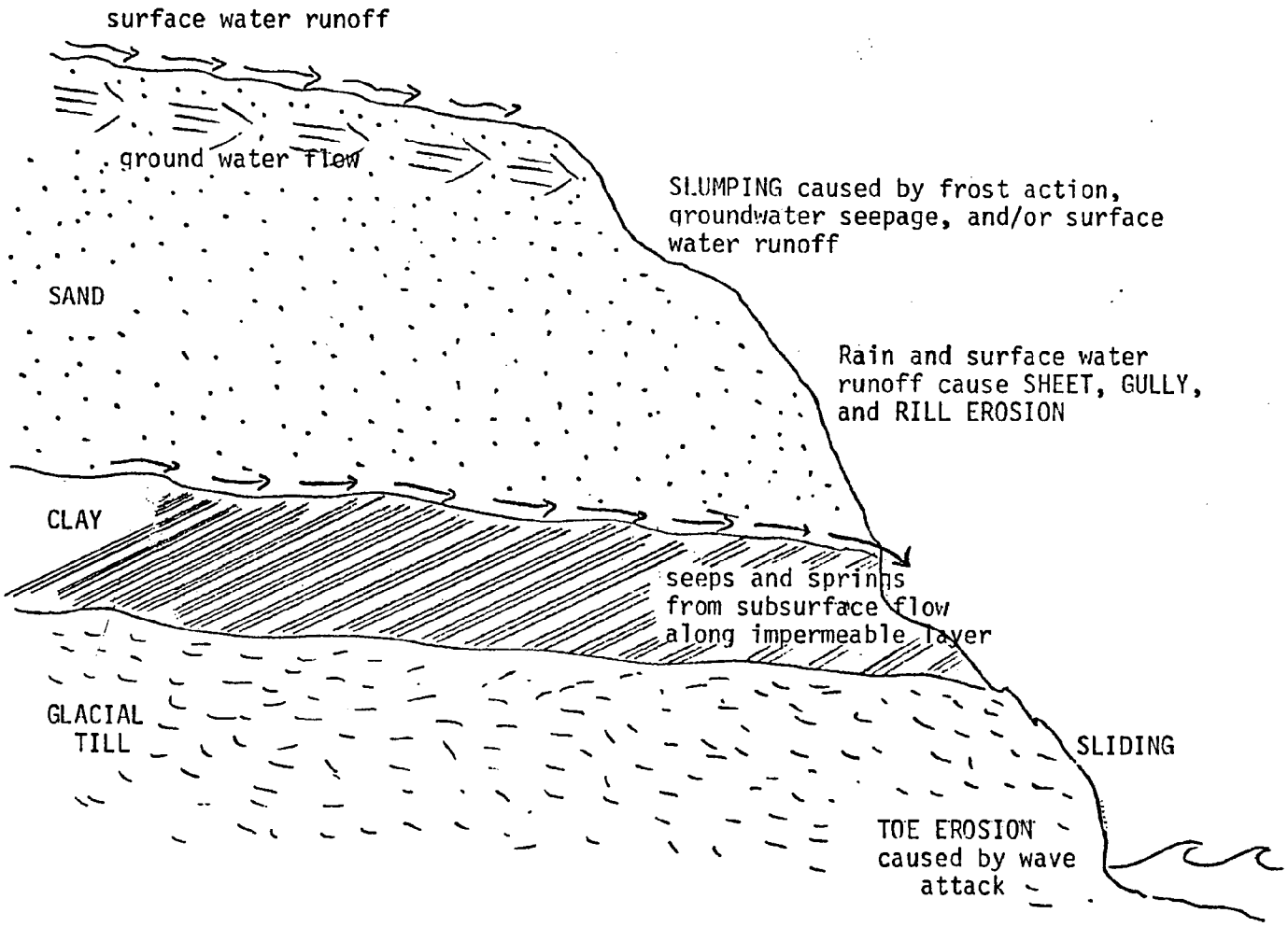
The absence of vegetation on the face of a bluff indicates an active state of erosion. Bluffs with an unvegetated face are subject to surface erosion from rain and runoff. Development which removes vegetation, creates impervious surfaces, and increases runoff accelerates this erosion. Ravine erosion is common along many bluffs. Stormwater drainage from intermittent streams, road ditches, storm drains and other sources of concentrated runoff causes ravines to form. Over time, these ravines may enlarge to threaten structures placed too close to them. Vegetation on the top of the bluff in combination with storm water controls such as earthen berms may intercept and

divert surface runoff preventing it from eroding the bluff. In some cases, the amount of material removed by surface erosion may exceed the amount removed by slumps and slides.

Wave erosion, landslides and surface erosion often occur in combination at a particular site. In these cases, attempts to deal with erosion which do not take into account all three of these factors will be unsuccessful. Thus, vegetation and storm water controls will not control bluff recession that is due to sliding and slumping unless the slope has been stabilized. The slope cannot be stabilized unless the toe of the bluff has been protected against further wave attack.

Bluff recession is influenced by many factors. These factors do not occur in a uniform or continuous process over the short term; e.g., wave attack which is related to fluctuating lake levels. After each increment of slope failure the slope temporarily stabilizes until the net effect of the many influencing factors once again decreases slope stability and precipitates another slope failure. A slope may appear stable and become heavily vegetated for a period of years. However, active recession during the life span of a typical building is inevitable for many of the coastal bluffs.

Bluff Erosion Processes



DETERMINING THE EROSION HAZARD

There are two basic approaches to determining erosion hazard -- the site specific method and the reach method. The site specific method requires a geotechnical engineering analysis at each site at the time development is proposed. This method requires a report analyzing among other things: (1) wave-induced erosion based upon recession rates and wave energy calculations; (2) geologic conditions including the soils at the site and their properties and stability; and (3) groundwater and surface water conditions. While the site specific approach may be technically accurate, it is too costly and time consuming for all but the most expensive development.

The reach method uses generalized formulas to estimate the two components of the erosion hazard, i.e., the recession rate and stable slope angle. Much of the information needed is available from studies made through the Wisconsin Coastal Management Program. There is a Shore Erosion Technical Report with technical appendices. Erosion Hazard Area Maps at a scale of 1 inch equals 2,000 feet delineate areas with erosion potential. These maps also show short-term recession rates (1966-1975) and long-term recession rates at selected intervals. For a further description of this information see Appendix A.

Estimating A Stable Slope Angle

Assuming for a moment that no further wave-induced erosion takes place, it is possible to estimate the stable angle of repose of a bluff. The ultimate angle of repose of a stable slope reflects the angle of internal friction of the materials comprising the bluff. The angle of internal friction of various materials has been documented by engineering analysis. Even

though actual bluff failure at a particular site depends upon local variations in the soil profile, groundwater conditions, vegetative cover, surface drainage and other factors, the stable angle of repose of various classes of materials can provide a reasonable rule of thumb to estimate slope stability. Thus knowing the height of a bluff, its slope angle, and the predominant material of which it is comprised takes into account some key site-specific factors.

It is possible to generalize further and establish an average stable slope angle for a range of erodible materials. A stable slope angle of 21.8 degrees (2-1/2 feet horizontal distance to 1 foot of vertical distance) appears to be a reasonable general figure based upon studies of relative slope stability of bluffs along Lake Michigan which took into account stratigraphy, parent materials, bluff height and slope angle (Shore Erosion Study -- Technical Report, February, 1977). This report shows an average drained angle of internal friction based upon laboratory tests, of 31.4° - 29.8° with one unit showing a 22.3° angle. However, the report also states that below the groundwater table, water pressure reduces the stable slope angle to about half the drained internal angle of friction. It further states that localized conditions such as artesian pressures and excess hydrostatic pressures due to seepage effects tend to reduce this stable slope angle even more. More importantly, the study did not take into account frost actions, surface wash, mudflow and similar forms of mass wasting. A recent study suggests that these processes may be responsible for up to 50 percent of bluff retreat in some cases. Investigators on the Shore Erosion Study have

indicated that on Lake Michigan slopes of approximately 21.8 degrees (2 1/2: 1), natural vegetation occurs and that vegetation can effectively control many mass wasting processes. The predominantly clayey soils on Lake Superior tend to be less stable. A generalized stable slope angle of three feet horizontal distance to one foot vertical distance (18.4°) has been suggested for regulatory purposes in Douglas County as a result of studies done by the Red Clay Project.

Estimating Recession Rates

Wave-induced erosion can be expressed in terms of an average annual recession rate. The Wisconsin Coastal Management program has measurements of recession rates in the form of a reconnaissance survey. Two types of recession rate data are available: (1) Long-term (approximately 100 years) which integrates periods of high and low erosion and thus reflects fluctuation of lake levels; (2) Short-term (1966-75) recession rates. The measurement points along the shoreline are generally closer together for short-term rates. Short-term rates are usually considerably higher than long-term rates because the short-term rates were measured during high lake levels when erosion is accelerated. In some instances short-term rates are lower. This may reflect the episodic nature of slope failure (a bluff which failed and is now temporarily stable) or the effects of structural protection.

In general it is preferable to use the long term rate as a measure of recession. In speaking of the variation over time in average retreat rates, a technical paper of the Corps of Engineers notes:

"Engineers are sometimes criticized for placing too much reliability in average retreat rates derived from a limited number of measurements widely spaced along the shore. However, the practicing engineer is interested in overall conditions affecting a large section of shore, and in long-term results affecting the lifetime of a project or structure (e.g., 30 years). It is worth pointing out that as the temporal scale increases some of the problems that originally contaminated data tend to cancel one another rather than accumulate as the time between observations is extended."

"A problem frequently faced by engineers is to choose a sampling interval adequate to determine a mean recess in rate for a given beach...It is well known that for a fixed level of long shore variability, the precision of the estimated regional mean can be improved by increasing the number of survey stations. Less well recognized is that inherent variability usually does not increase greatly with time. Thus, the probable error or mean rates and the percent error in mean recession tend to decrease with time. The variance of these estimates would also tend to decrease (thus, the precisions increase) in direct proportion between the number of years between surveys."

Source: Hands, Edward B. "Changes in Rates of Shore Retreat, Lake Michigan, 1967-76. Technical Paper No. 79-4, U. S. Army Corps of Engineers, p. 27-30

Determining the Recession Rate Setback

A recession rate setback distance can be established by multiplying the average annual recession rate by the assigned design life of the structure to be protected (e.g., 30 years, 50 years or 100 years for a residence). The selection of the appropriate regulatory time span during which buildings are to be protected from recession is a decision to be made by local policy makers in Wisconsin. The State of Michigan requires permanent structures to be set back the distance of the 30 year recession rate, but recommends that a greater setback is desirable. The Province of Ontario measures the 100 year recession rate and the stable slope angle.

"The 100-year erosion limit was established by extending inland from the edge of the bluff the average annual recession rate multiplied by 100 years, with an additional distance added on for a stable slope. To determine stable slopes, soil characteristics, stratigraphy, bluff height and observed stable bluff profiles were analyzed. As a result of this analysis, slopes of 2:1 and 3:1 were most frequently used." (A Guide For The Use Of Canada/Ontario Great Lakes Flood and Erosion Prone Area Mapping, Ministry of Natural Resources, Ontario, March, 1978, p 16)

A 50 year rate appears to be a reasonable minimum figure, since it approximates the useful life of a typical residence. To illustrate, assuming a 50 year design life and a long term recession rate of 2 feet per year; regulated structures would have to be set back 100 feet from the ordinary high watermark. The recession rates shown in the Technical Report Appendices and Erosion Hazard Maps should be considered as a general guide for determining the recession rate in a given area. In areas with highly variable recession rates or where structures have accelerated erosion, it may be necessary to make additional studies or to determine the recession rate at the particular site when development is proposed.

Determining the Stable Slope Setback

Structures, such as residences, that would be damaged by slope failure can be protected by requiring them to be located outside of unstable slope areas. This determination can be made by applying general rules to a specific site. Here is an example of the way it would work. Assume a bluff is 50 feet high. An angle of 21.8° (2 1/2 feet horizontal distance to 1 foot vertical distance) is measured from the ordinary high watermark. The point at which this angle intersects the bluff is the edge of the stable slope. This means that the stable slope setback would be 2.5 feet (stable slope angle) x 50 feet (bluff height) or 125 feet from the ordinary high watermark.

Establishing The Erosion Hazard Setback

These computations of recession rate and stable slope angle can be used to establish an erosion hazard setback in a zoning ordinance. Within this setback line high value structures which would be severely damaged by erosion

or activities which would accelerate erosion can be regulated. Using our previous examples, in an ordinance that required a 50 year period for protection against recession the erosion hazard setback would be 100 feet from the ordinary high watermark for a beach area with a 2 foot per year recession rate. Assume there is another area with the same recession rate but which also has a 50 foot high bluff. Here the erosion hazard setback would be the stable slope setback (50 ft. x 2.5 ft.) = 125 feet plus the recession rate setback of 100 feet or a 225 foot erosion hazard setback line.

The erosion hazard setback can be modified if the landowner provides technical data proving that a different recession rate is warranted, slope conditions are more stable than assumed, or that the erosion hazard, although correctly estimated, can be mitigated by structural protection.

REDUCING THE EROSION HAZARD

The basic causes of shoreline erosion, i.e., wave erosion, unstable slopes and surface erosion, can be reduced in some instances by protecting the shoreline from waves, stabilizing slopes, and controlling surface erosion.

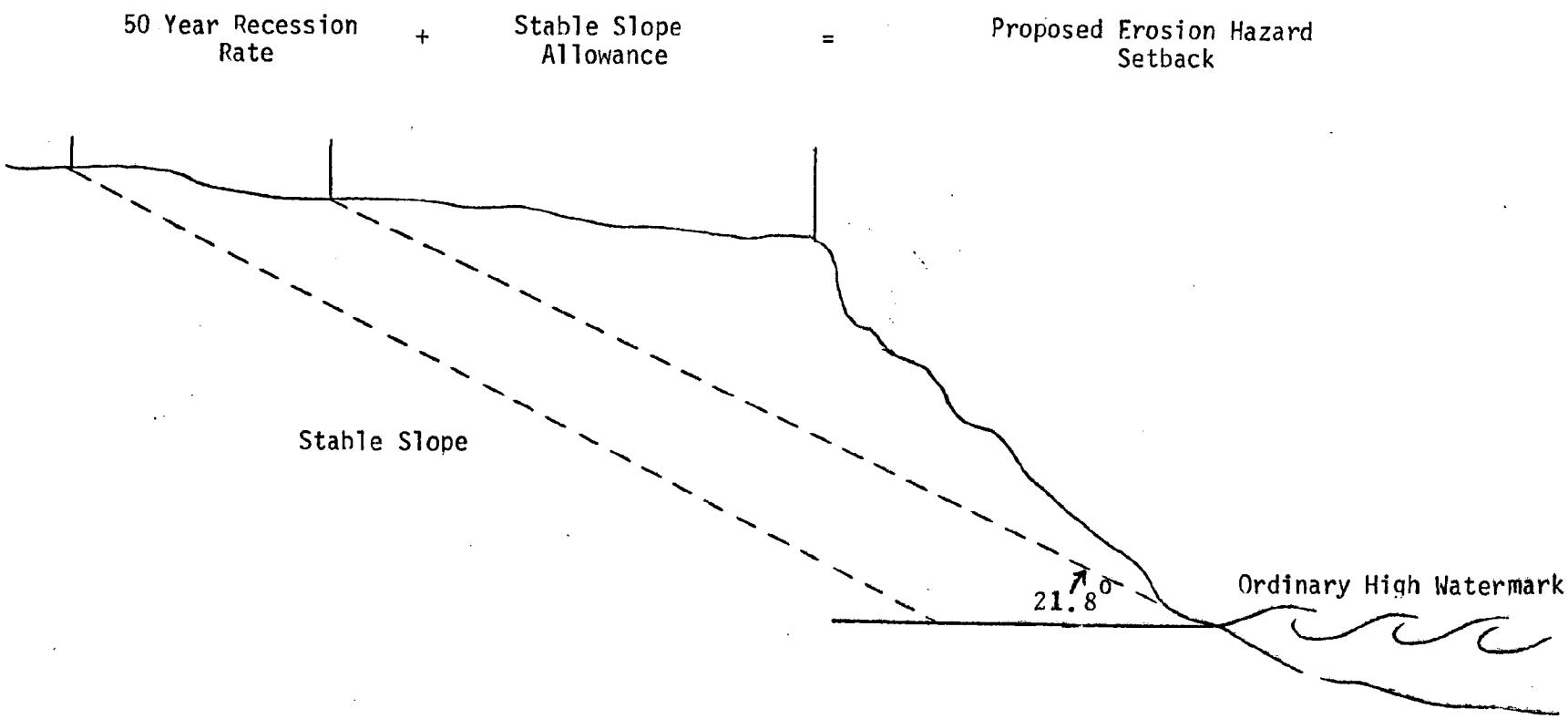
Protecting The Shoreline From Waves

There are two primary methods for structural protection against waves. The first method directly armors the shoreline against wave attack through the use of revetments, bulkheads or similar structures. Revetments are sloping rock or concrete structures placed parallel to the shoreline to protect against wave action. Bulkheads are vertical walls with their base well below the lake level, whose primary purpose is to prevent the sliding of earth or slope failure with a secondary purpose of protecting against wave action. The second method

of protecting against waves is to build a protective beach by promoting beach accretion and retarding beach erosion. This method involves the use of nearshore breakwaters or groins.

For structures placed above the ordinary high water mark the regulatory jurisdiction lies primarily with local government. In the case of structures extending below the ordinary high water mark, local government can exercise concurrent jurisdiction with the Wisconsin Department of Natural Resources and the U. S. Army Corps of Engineers.

Further information about these methods of structural shore position is contained in the publications Great Lakes Shore Erosion Protection: A General Review with Case Studies; Great Lakes Shore Protection: Structural Design Examples, both available from the Wisconsin Coastal Management Program; and Help Yourself -- a pamphlet discussing erosion problems and alternative methods of shore protection, and the three volume Shore Protection Manual, an engineering handbook -- both available from the North Central Division of the U. S. Army Corps of Engineers. A few general comments about shore protection measures are warranted, however. Improperly designed, installed or maintained protective works are a waste of money and may have adverse off-site effects. Most classes of protective works are expensive. The effective life of a structure is generally reflected in its construction cost. "Careful site analysis and design must precede the placement of all structural devices, and even then the 'success' is measured in terms of a few decades. Without proper engineering and maintenance, structural failure can be expected at an even earlier point. Virtually all emergency structures and many low cost


50 Year Recession Rate
+
Stable Slope Allowance
=
Proposed Erosion Hazard Setback
Stable Slope
21.8°
Ordinary High Watermark

structures (those under $100 per lineal foot) do not last beyond ten years." [Wisconsin Shore Erosion Plan p. 25] The chances for an effective structural approach are enhanced if a group of lot owners join together to build protective devices that are compatible and complement one another. For example, revetments and bulkheads constructed along a reach of shoreline which is exposed to wave attack may be subject to erosion (flanking) at either end of the structure. It may be difficult to secure both ends of the structure against flanking where the property involved constitutes only part of the reach subject to wave approach from a given direction.

Bluff Stabilization and Surface Erosion Control

It is virtually impossible to stabilize a bluff unless the base of the bluff has been protected against wave attack. However, once this has been done several methods of bluff stabilization are available. These methods include reshaping the bluff to a stable angle, mechanically terracing the bluff face through retaining walls, increasing the strength of the soil by removing excess groundwater, and controlling runoff over the top of the bluff. They are usually employed in combination. The most common method is regrading the bluff to a stable slope and constructing a rip-rap revetment at the toe, but different procedures may be required depending upon the particular situation. The publication Harmony With The Lake: Guide To Bluff Stabilization suggests the following stabilization measures be taken as necessary in the following order of priority: (1) When necessary, and if possible, reshape the bluff face to a stable angle of slope; (2) Control any excessive surface

water runoff; (3) Control any excessive groundwater seepage; (4) Revegetate the bluff face as necessary.

Vegetation is important in surface erosion control because it protects the soil from the impact of rain, slows runoff, acts as a filter to catch sediment, and helps hold soil particles in place. Grasses and low-growing shrubs are preferred when establishing a vegetative cover. They provide protection soon after growth begins, form a denser root mat, and do not tend to loosen soil around the roots as would occur with tree roots during wind storms. The presence of vegetation, especially trees and shrubs, may be a general indicator that the bluff is stable at the present time, i.e., the toe is not undercut and the slope is at a stable angle of repose. It does not mean that continued erosion will not occur in the future.

INCREASING THE EROSION HAZARD

As previously indicated, structural attempts to control shore erosion may increase erosion of nearby properties. Improperly managed storm water may also increase erosion. During periods of heavy rainfall, surface water flows over the top of the bluff and can erode the entire face of the bluff. Development which increases runoff by creating impervious surfaces, concentrating runoff, or destroying vegetation, accelerates this erosion. A bluff may also fail because of the added weight of buildings, swimming pools, and other heavy structures placed too close to the bluff top. Septic tank sewerage systems add weight, and the liquid effluent can reduce friction between soil particles causing unstable bluff material to slump and slide toward the beach.

ADJUSTING LAND USE TO THE EROSION HAZARD

Types of Land Uses and Development Patterns

The damages that will result from shoreline erosion depend upon both the severity of the erosion hazard and the type of land use that will be affected. As the shoreline continues to erode, the land will eventually be lost but the major portion of the damage comes from destruction of structures on the land. Open space land uses such as agriculture, forestry and parks may be the most appropriate land use in many erosion hazard areas, other things being equal. However, some facilities such as marinas, water intakes, sewage treatment plants, ports, and certain industries may require a location in the immediate shoreline area. For these shoreline dependent uses careful siting to avoid high hazard erosion areas and well designed erosion mitigation measures are important to avoid unnecessary damage. In the main, these uses are ones for which it may be economically feasible to provide effective structural protection. An investigator of shoreline erosion in Southeastern Wisconsin, commenting on structural erosion protective measures, notes "For the most part, the successful structures observed were built either by units of government or, to a lesser extent, by industry. These structures are massive, well engineered and constructed, and probably much too expensive to be justified for even the most valuable residential properties." (Shoreline Erosion In Southeastern Wisconsin, David W. Hadley, Wisconsin Geological and Natural History Survey, 1976, Special Report Number 5, p. 27.)

It is up to the comprehensive land use planning and zoning process to allocate lands to their most appropriate use. In this discussion we assume

that the proposed use is appropriate. The focus here is on ensuring that the use is developed in a manner consistent with the erosion hazard through the use of land use controls. Special erosion hazard provisions for a zoning ordinance and a subdivision regulation ordinance are presented in Part II to illustrate how this may be accomplished.

Since regulations generally apply only to new development, the effectiveness of regulations depends upon the existing land use development and ownership patterns. These patterns vary widely but may be characterized by the following general categories: (1) Rural areas where the land consists of large tracts of open space use in single ownership, e.g., farms and forests; (2) Rural areas where the land has been divided into smaller tracts through subdivision plats or sale of individual lots but is not yet developed or only partially developed; (3) Suburban areas where the land has been substantially developed along the immediate shoreline and development consists of infilling, i.e., construction on the undeveloped shoreline lots; (4) Developed areas where the first tier of lots has been largely built upon and development is occurring within the second tier of lots within an area still subject to erosion; and (5) Urban areas where almost the entire shoreline is developed in depth. (In general, regulations have their best potential in relatively undeveloped areas.)

Developed Areas

Lots already occupied by buildings are largely beyond the scope of regulations. The only appropriate regulatory provisions are those designed to

control activities which would accelerate erosion or which control the expansion of structures subject to damage. The owner of an existing structure subject to substantial erosion damage has two basic options: (1) attempt to mitigate the erosion hazard by protecting against wave erosion and stabilizing the slope or (2) relocate the structure. Permanent relocation outside the erosion hazard area could mean moving the structure to the rear of the same parcel if the lot is of sufficient depth, or moving it to a different lot not subject to erosion. "Relocation is an alternative that cannot be overemphasized. Erosion is a natural geologic process that is extremely difficult to stop. The alternatives to build shore protection or to relocate must be weighed against the consequence of failure. Depending upon the type of structure you might consider, it may cost the same to relocate as it would to build shore protection. Should a protective structure fail, then your investment in the structure is lost and your home or cottage still in danger." [Help Yourself, U. S. Army Corps of Engineers, North Central Division. p. 14]

A number of factors affect the cost of relocation. "They include lot depth, the availability of new building sites, ease of site access, building configuration and size, amont of subfloor access, number of public utility disconnections, and the availability of experienced movers. Because relocation is typically only considered during emergency periods, the amount of land lakeward of a building is a critical factor. Between 15 to 20 feet of clearance is normally required for safe operation of equipment. Moving costs of a small cabin or cottage, medium size ranch style house, and large mansion

can be expected to range between $3,000-$4,000, $7,000-$9,000, and $30,000-$40,000, respectively. These costs do not include site preparation costs at the new location." (Note: 1979 cost estimates) [Wisconsin's Shore Erosion Plan. p.87]

In cases of individual hardship where lots are too shallow to permit construction meeting the erosion hazard setback, it may sometimes be reasonable to permit a moveable structure such as a mobile home or residence designed so that it can be readily relocated. Allowing such structures within the setback line should be done only on a case by case basis after a careful investigation of the particular situation. Appropriate conditions should be attached to development permission in these instances.

Undeveloped Areas

On lots of adequate depth the most satisfactory approach is to properly locate the structure in the first place. This means that structures should be safely set back from erosion hazard areas. The setback should be based upon a consideration of the recession rate, in all cases, and a stable slope angle in the case of erodible bluffs. The setback approach is preferable largely because of the limitations of structural attempts from both a private and public point of view. Among these limitations are: (1) Attempts to adequately protect against waves may not be feasible from an engineering point of view, e.g., effective protection may require stabilization of a coastal reach which is longer than the site in question; (2) Structural measures are usually too costly in relation to the value of the land proposed to be pro-

tected. 1977 figures for approximate cost ranges per lineal foot of protected shoreline are as follows: temporary devices (less than 5 years expected life) $50-$100, intermediate life devices (5-25 years) $100-$200, and "permanent" devices (25-50 years) above $200. The actual life of a structure depends upon proper design, construction and maintenance [Great Lakes Shore Erosion Protection: Structural Design Examples, p. 5]; (3) Structural measures may have adverse off-site effects. Groins may cause accelerated erosion by starving down drift beaches. Shore armorment may deflect waves which erode adjoining property; (4) The form of shore protection most commonly used by individual property owners is loose dumping of stone or concrete rubble. This practice affords only short term protection. Besides destroying the natural beauty of the shoreline, this material often ends up on the bed of the lake, impairing the public rights in navigable waters.

REGULATIONS TO ADJUST LAND USE TO EROSION HAZARD

Zoning and Subdivision Regulations

Zoning ordinances and subdivision regulations are important tools that local government can use to require that new land uses take erosion hazard into account. Subdivision regulations and zoning complement each other. Zoning focuses primarily on the uses of land, the dimension of lots, and the location of structures on the lot. Lot dimensions are important to ensure the lot is deep enough to permit structures to be safely located behind the required erosion hazard setback line. Zoning can also control grading, filling, vegetative removal, installation of protective devices

and other activities that may accelerate erosion. Thus activities can be made conditional uses to require that they be undertaken in a manner that avoids adverse effects.

Subdivision regulations focus on the process of dividing larger tracts of land into lots for purposes of sale or building. For undeveloped areas which have not been divided into lots, subdivision regulations have particular promise. The larger size of the parcel involved makes it more likely that economically feasible engineering solutions can be found to storm water management, grading and filling and erosion protection measures. Subdividers can be required to designate erosion hazard areas on the plat, and restrict this area to park or open space for the use of the residents of the subdivision.

Status of Zoning and Subdivision Regulations Along the Coast

All Wisconsin coastal counties have adopted shoreland regulations which include zoning ordinances and subdivision regulations which apply to the unincorporated portions of the Great Lake shorelands. [Milwaukee County does not contain any unincorporated areas.] County shoreland regulations were designed primarily for inland lakes and most do not take into account the special erosion hazards of the Great Lakes. [Exceptions are Douglas, Ozaukee and Racine Counties.] All of Wisconsin's 33 coastal cities and all but two of its villages have zoning ordinances. Twenty-five of the coastal municipalities have also adopted subdivision regulations. Most municipal regulations do not contain special provisions for coastal erosion hazard areas.

Sample erosion hazard provisions for zoning ordinances and subdivision regulations are contained in Part II. The general approach suggested in these provisions is to: identify erosion hazard areas; restrict or prohibit uses which are vulnerable to erosion damage or which may impair public rights in navigable waters; require special review of erosion protection devices to ensure that they are properly designed, installed and maintained; and regulate land disturbance, storm drainage and other activities which may increase erosion. Erosion hazard regulations which restrict the use of private property must meet certain basic constitutional tests or they may be found invalid by a court. These legal tests provide guidelines for drafting and administering erosion hazard regulations.

CONSTITUTIONAL CONSIDERATIONS IN SELECTING REGULATORY POLICIES

General Tests of Validity

Regulations which restrict the right to use private property will usually be found constitutionally valid if they meet the following basic conditions:

(1) The regulations serve valid public objectives which promote public health, safety and general welfare.

(2) The regulatory provisions are a reasonable means to achieve these objectives.

(3) There is a reasonable basis for the classification of uses and lands subject to the regulations.

(4) The property owner is left with some reasonable use (usually framed in economic terms) of the property, i.e., there is no taking of property without compensation.

(5) The ordinance provides sufficient standards to prevent the arbitrary exercise of power by administering agencies in reviewing conditional uses and in other discretionary activities.

Zoning regulations are presumed to be valid but this presumption may be rebutted by evidence provided by persons contesting the validity of the regulations. The importance of the particular facts in each case has been emphasized. "However, each case in which the validity of such regulations is challenged, must be determined on the facts that are directly applicable to the property of the parties complaining." Kmiec v. Town of Spider Lake (Wis. 1974) 211 NW2d 471, 477. As a consequence, in most instances the court determines the validity of the regulations only as they apply to the particular property in question. Landowners typically challenge the validity of zoning where their land is zoned differently from nearby lands and the zoning prohibits a use which would permit a higher economic return than the use to which it is restricted. In Kmiec the Wisconsin court invalidated the application of agricultural zoning to the particular lakeshore property in question on two grounds: (1) The parcel was improperly mapped, i.e., the classification was without a reasonable basis; and (2) the classification resulted in a substantial negative value of the land.

Erosion hazard regulations which severely restrict the use of private property on the basis of generally delineated erosion hazard areas may be

particularly subject to challenge on the grounds of "taking, i.e., the restrictions permit no reasonable use of the property; and improper classification, i.e., the area is not subject to severe erosion or the estimated erosion hazard has been incorrectly "mapped".

The possibility of challenge to erosion hazard regulations makes it important to carefully review legal precedents which validate reasonable erosion hazard regulations.

Erosion Hazard Regulations Serve Valid Public Objectives

Shorelands of navigable waters are lands over which state and local governments have a special management responsibility. In Just v. Marinette County (Wis. 1972) 201 NW2d 761, a case which upheld the validity of shoreland regulations requiring a conditional use permit for the filling of wetlands, the court noted:

> "The active public trust duty of the state of Wisconsin in respect to navigable waters requires the state not only to promote navigation but also to protect and preserve those waters for fishing, recreation, and scenic beauty (citations omitted). To further this duty, the legislature may delegate authority to local units of government, which the state did by requiring counties to pass shoreland zoning ordinances (citation omitted)." at 768-769.

The court also pointed out the valid public objectives served by shoreland regulations:

> "There can be no disagreement over the public purpose sought to be obtained by the ordinance. Its basic purpose is to protect navigable waters and the public rights therein from the degredation and deterioration which results from uncontrolled use and development of shorelands." at 765.

The court has also noted, in passing, that control of erosion is a legitimate exercise of local regulatory authority. "The trial judge correctly

stated that erosion control should be exercised by zoning and subdivision and land use regulation" State v. Deetz (Wis. 1974) 229 NW2d 407, 418.

There are no Wisconsin cases specifically dealing with regulation of hazardous areas such as floodplains or erosion prone areas. Courts in other states, however, have upheld the validity of these regulations. In Just v. Marinette County (Wis. 1972) 201 NW2d 761, 771 the court noted:

> "A recent case sustaining the validity of a zoning ordinance establishing a flood plain district is Turnpike Realty Company v. Town of Dedham (June, 1972) 72 Mass. 1303, 284 NE2d 891. The court held the validity of the ordinance was supported by valid considerations of public welfare, the conservation of "natural conditions, wildlife and open spaces". The ordinance provided that lands which were subject to seasonal or periodic flooding could not be used for residences or other purposes in such a manner as to endanger the health, safety or occupancy thereof and prohibited the erection of structures or buildings which required land to be filled. This case is analogous to the instant facts. The ordinance had a public purpose to preserve the natural condition of the area. No change was allowed which would injure the purposes sought to be preserved and through the special-permit technique, particular land within the zoning district could be excepted from the restrictions."

Additional public objectives of regulation of hazardous flood plains identified by the Massachusetts court in Turnpike were: (1) protection of individuals who might choose to build there; (2) protection of others from damages arising from development on the floodplain and obstruction of the floodways; and (3) protection of the entire community from individual action, which may require the state to provide disaster relief and public works. Turnpike Realty Co. v. Dedham (Mass. 1972) 284 NE2d 891, 896.

Regulatory Provisions Are A Reasonable Means to Achieve These Objectives

Erosion hazard provisions which (1) require that uses subject to damage be setback a safe distance, (2) control land disturbance and other activities

which cause erosion, and (3) require review of structures which may accelerate erosion on adjacent property or impair the public rights in navigable waters, meet these objectives. Erosion hazard setbacks are a major feature of the regulations. In Spiegle v. Bourough of Beach Haven 218 A2d 129 (N. J. 1966) the New Jersey Supreme Court upheld an ordinance establishing a setback line for coastal areas subject to severe storm damage. In County of Pine v. State Department of Natural Resources 280 NW2d 625 (Minn. 1979) the Minnesota court upheld an ordinance which established special regulations along a river corridor. The ordinance included, among other things, provisions which established setbacks from the highwater line and from blufflines, and regulated dredge and fill operations, and the harvesting of timber and other vegetation in the management district. In upholding the ordinance the court noted these requirements promoted valid zoning objectives. "For instance, the bluff line setback requirement reflects a concern that construction too near the edge of a bluff may be structurally unsafe and may create a potential for harmful pollution from erosion of the bluff" at 629.

There is A Reasonable Basis for Classification of Uses and Lands Subject to The Regulations

The presumption of validity of zoning is broad in the features it covers.

> "This rule applies not only to the necessity and extent of zoning but also to rezoning, classification, establishment of districts, boundaries, uses, and to determination of whether or not there has been such a change of conditions as to warrant rezoning (citations omitted) Buhler v. Racine County (Wis. 1966) 146 NW2d 403, 408.

Zoning ordinances are occasionally challenged on the basis of an unreasonable classification of uses. The more frequent challenge is that the land is unreasonably classified by being placed in the wrong zoning district, i.e., it is incorrectly mapped. The court has recognized the difficulty of drawing district boundaries. "Boundaries of districts must be drawn somewhere if there are to be districts." State ex rel American Oil Co. v. Bessent (Wis. 1965) 135 NW2d 317, 323. The court also noted:

> "Because of the impossibility the law does not require in a comprehensive zoning plan that each district be drawn with scientific or mathmatical accuracy (citation omitted); provisions are generally made for variances and hardship cases. Each district's boundaries need not be independently and solely justified directly in relationship to the exercise of the police power." at 322.

In relating the location of district boundaries to the presumption of validity of zoning the court said:

> "It follows as a corollary to the presumption of validity and from the fact that the shaping of zoning districts for land use is primarily a legislative function that when the validity of the ordinance in this respect is fairly debatable it should be upheld and the court should not substitute its judgement for that of the municipality." (citations omitted). Id at 323.

Most Wisconsin cases involving a challenge to zoning on constitutional grounds are framed primarily in terms of a reasonable classification but also involve a substantial reduction in property values. In a typical situation the land in question is zoned differently from adjoining properties and thus land values are substantially reduced below what they would be if the land could be developed for uses permitted in the adjoining zoning district.

The Property Owner Is Left With Some Reasonable Use of The Property; i.e., There Is No Taking of Property Without Compensation.

To constitute a proper exercise of the regulatory power an ordinance must not so severely limit the use or depreciate the value of the land as to constitute a taking without compensation. In Just v. Marinette County (Wis. 1972) 201 NW2d 761, the court began its discussion of the taking issue by stating traditional tests such as: (1) the degree of damage to the property owner (extent of dimunition of value); (2) whether the land is rendered useless for all reasonable purposes; and (3) whether the restrictions create a public benefit rather than prevent a public harm. The court then went on to point out that there are special considerations which apply to environmentally sensitive lands.

"This case causes us to reexamine the concepts of public benefit in contrast to public harm and the scope of an owner's right to use of his property. In the instant case we have a restriction on the use of a citizen's property, not to secure a benefit for the public, but to prevent a harm from the change in the natural character of the citizens' property at 767,768.

The court also emphasized that the value of the land should be based upon use in its "natural" state.

"The Justs argue their property has been severely depreciated in value. But this depreciation of value is not based upon the use of the land in its natural state but on what the land in its natural state but on what the land would be worth if it could be filled and used for the location of a dwelling. While loss of value is to be considered in determining whether a restriction is a constructive taking, valued based upon changing the character of the land at the expense of harm to public rights is not an essential factor or controlling." Id at 771.

The court also apparently considered it important that some development was potentially allowable through the conditional use technique. "This is not a case where an owner is prevented from using his land for natural and indigenous uses. The uses consistent with the nature of the land are allowed

and other uses recognized and still others permitted by special permit" (conditional use permit). Id at 768. The court further stated: "The special permit technique is now common practice and has met with judicial approval, and we think it is of some significance in consulting whether or not a particular zoning ordinance is reasonable." Id at 770, 771.

The Ordinance Provides Sufficient Standards to Prevent The Arbitrary Exercise of Power by Administering Agencies in Reviewing Conditional Uses and In Other Discretionary Activities

Zoning districts often list two categories of allowable uses, i.e., permitted uses and conditional uses. Permitted uses are allowed as a matter of right if they meet the specified dimensional requirements. Conditional uses, on the other hand, may create special problems and hazards if allowed as a matter of right. Whether they can be appropriately located in a given district depends upon the facts and circumstances of the particular case. The conditions which may be attached to development permission can, in some instances, avoid potential adverse effects on adjoining lands or the public welfare. The agency authorized to issue conditional uses must be designated in the ordinance. For cities it can be the board of appeals, city plan commission or common council (s.62.23(7)(e)Wis.Stats.) For counties it can be the board of adjustment, planning and zoning committee or county board. (s.59.99(1)Wis.Stats.) The conditional use has grown in popularity as a zoning device because of its potential to determine: (1) the characteristics of the proposed use; (2) the characteristics of the proposed site; (3) what would be the adverse effects of permitting the use at that location; and (4) whether adverse effects can be eliminated or substantially mitigated by

attaching appropriate conditions to the location, design or operation of the use. The Wisconsin court has commented:

> "Conditional uses or as they are sometimes referred to, special exception uses, enjoy acceptance as a valid and successful tool of municipal planning on a virtually universal scale. Conditional uses have been used in zoning ordinances as flexibility devices, which are designed to cope with situations where a particular use although not inherently inconsistent with the use classification of a particular zone, may well create special problems and hazards if allowed to develop and locate as a matter of right in a particular zone." State ex rel Skelly Oil Co. v. Delafield (Wis. 1973) 207 NW2d 585, 587.

The zoning flexibility achieved through conditional uses raises the question of whether the ordinance contains sufficient standards to avoid the arbitrary exercise of discretionary power. This issue was stated in the following way in State ex rel Humble Oil Co. v. Wahner (Wis. 1964) 130 NW2d 304: "Where a local zoning board of appeals is given authority to exercise discretion and judgement in the administration of a zoning ordinance, some standards must be prescribed for the guidance of the board in exercising the discretion and judgement with which it is vested. Where no such definite standards are written into the ordinance the door is open to favoritism and discrimination..."at 309. Generally speaking, the court has not required detailed standards for conditional uses. In Town of Richmond v. Murdock (Wis. 1975) 235 NW2d 497, 502 the court stated: "Our court has recognized that in zoning matters of the type before us, the town board or village council is faced with the practical difficulty of defining in advance the conditions under which permits shall be granted. What is to be avoided is the exercise of purely arbitrary power".

The court pointed out the importance of the ordinance provision that required the submission of information about "the location and plan of operation" in passing upon conditional use permits and cited the case of Smith v. City of Brookfield (Wis. 1956) 74 NW2d 770. In Smith the court placed emphasis on the requirement for submitting information on the location and plan of operation and the role this information played in the decision making process.

> "The phrase [location and plan of operations] itself is very broad, and necessarily so, since the facts in one application may vary greatly from the facts in another, and obviously it would be impossible for the framers of the ordinance to anticipate all the possible details which might be enumerated therein... In exercising its discretion under this ordinance, the board is obligated to take into consideration every factor in the plan of operation which would have any bearing on the purpose for which the ordinance is enacted. In order to approve an application, the board must determine that the particular proposed plan will not conflict with those purposes." 74 NW2d at 775.

It can be argued that to require the landowner to provide detailed data about the proposed use and the site may be an unreasonable financial burden. This contention arose in the context of a coastal erosion hazard regulation in the case of Kopetzke v. County of San Mateo, Bd. of Super. (1975) 396 F. Supp. 1004. Here the lot owners claimed a "taking" because the coastal hazard regulations required a geological report showing soil stability as a condition to obtaining a building permit. The properties in question were vacant lots in a subdivision in which some residences had already been constructed. The lots were on a high ocean bluff in an area that had been designated as unstable by a geological engineering report. The regulations required the land owner to submit, at his expense, a soils report prepared by a licensed geologist

showing that the building site was safe or could be made safe for development. The evidence was that the cost of these requirements compared to the value of the lots was so prohibitive that the properties became unmarketable. The court upheld the regulations.

"[R]estrictions on the issuance of building permits in the coastal areas designated as geologically unstable by the Leighton Report also constitute a valid exercise of the police power. The Board's concern was clearly safety. Its information was that those areas might well be unsafe for residential use. The Board's duty to guard against hazards to the public presented by California's unique and unpredictable geologic qualities is manifest.... Moreover, the Board did not preclude outright all further construction; rather, it imposed no more than the minimum restrictions necessary to assure the safety of any future dwellings constructed in the area. Indeed, plaintiffs have suggested no alternate means by which the Board could have achieved that thoroughly legitimate purpose, and the Court can think of none."

"Since the exercise of police power was proper, it did not constitute a taking and no compensation is due (citation omitted). To the extent plaintiff's losses result from any inherent geologic defects in their properties, the ancient rule of *caveat emptor* must apply. And to the extent their losses result from the regulatory activities of the Board based on the geologic findings of the Leighton Report, they constitute the unequal burden which citizens are frequently called upon to bear in the interests of the general welfare (citation omitted) at 1009, 1010."

SAMPLE EROSION HAZARD ZONING PROVISIONS

The following coastal erosion hazard provisions are designed for inclusion in a municipal comprehensive zoning ordinance or a county shoreland zoning ordinance. Erosion hazard provisions are similar to shoreland zoning in several general respects. Both regulations have natural resource-oriented features which provide for setbacks from the ordinary high watermark, regulate filling, grading and dredging, and control removal of shore cover. However, shoreland regulations were intended for inland lakes and their provisions are not designed for the special erosion problems of the Great Lakes coast. Therefore, shoreland zoning should be modified to: (1) provide additional requirements directed at coastal erosion hazard; and (2) revise certain provisions which are incompatible with erosion hazard protection. Municipal zoning ordinances are less likely to contain these natural resource-oriented features although some do.

These sample coastal erosion hazard provisions are more detailed and elaborate than those a local government would likely incorporate into its own zoning ordinance. There are several reasons for this: (1) some typical shoreland zoning provisions are repeated in this ordinance as illustrations for municipal regulations or as examples of provisions counties may wish to modify in the coastal context; (2) setting forth a full array of provisions gives a better picture of possible items for inclusion in a particular ordinance; (3) the more detailed provisions and accompanying commentary give insight into some of the factors that should be considered in administering a simpler ordinance; and (4) some of the regulatory provisions could be adopted as an erosion hazard

policy plan which would be incorporated into the regulations by reference; and (5) the choice of the most appropriate provisions will depend upon the local land use policies, the type of hazard, and the data available.

1.0 Findings of Fact and Statement of Purpose

1.1 Finding of Fact

The coastal erosion hazard areas of _____ are subject to substantial erosion. These hazard areas have been identified on the basis of studies of shoreline recession, stable slope angles and other engineering and geological studies and principles. Improper land use within these areas causes erosion damages in the form of property losses, environmental degradation and impairment of public rights in navigable waters. These erosion damages are the result of: (1) structures placed in areas which will be undermined by erosion; (2) land use activities which accelerate erosion; and (3) improperly designed, installed and maintained protective measures which accelerate erosion on nearby properties and cause environmental damage.

1.2 Statement of Purpose

It is the purpose of these regulations to protect the public health, safety and general welfare and to reduce erosion damages by: (1) establishing a setback line designed to minimize losses over a __(50)__ year period; (2) restricting uses which are vulnerable to erosion damage; (3) regulating land disturbance, stormwater drainage and other activities which increase erosion; and (4) requiring

that proposed protective measures are properly designed, installed and maintained.

COMMENTARY

Section 1.0 Findings of Act and Statement of Purpose

This section points out the objectives of the regulations and the relationship between the regulations and stated objectives. This enables the enacting unit of government, administrative personnel and the courts to understand the basic rationale of the erosion hazard provisions. The Wisconsin court has looked at the preamble of a zoning ordinance to uphold the reasonableness of the regulations Smith v. City of Brookfield (Wis. 1956) 74 NW2d 770.

2.0 Lands to Which Regulations Apply

(Option #1) These regulations shall apply to all lands which are within (500) feet of the ordinary high watermark of Lake _____.

(Option #2) These regulations shall apply to all lands within the Erosion Hazard Overlay District as shown on the Official Zoning Map. Where specific distances from the ordinary high watermark are described on the map, these distances shall control.

COMMENTARY

2.0 Lands to Which Regulations Apply

Two options are indicated. The first describes the general area affected by specifying a distance from the ordinary high watermark. The second is a mapped Erosion Hazard Overlay district. The intent of both of these options is the same, i.e., to identify the general

areas within which special regulations apply. This puts existing and prospective property owners on notice that these areas may be subject to erosion and that land use must take erosion hazard into account. The land use regulations require a conditional use permit for shoreline erosion protection measures, whether installed above or below the ordinary high watermark; regulate land disturbing activities; and require a setback of permanent buildings and related structures from the ordinary high watermark. The setback is a variable distance because it is determined by calculating the recession rate and stable slope angle and these factors may vary. In addition, the location of the shoreline itself will change over the years as erosion continues. Option #1 describes the area in terms of a specified distance from the ordinary high watermark. The depth (i.e., landward extent) of the zone can be adjusted depending upon the general severity of erosion. A 500 foot depth would accomodate a four foot/year recession rate for 50 years = 200 feet plus a 2-1/2:1 stable slope setback for a 120 foot bluff = 300 feet. This option may be satisfactory where all of the shoreline is erodible and where recession rates and bluff heights are relatively uniform. It has the disadvantage of not being as obvious to someone checking whether an area may be erodible because it is not mapped.

Option #2 creates a mapped Erosion Hazard Overlay District. Mapping the areas determined to be subject to erosion gives the most obvious hazard warning. The proposed boundaries can only be approximately

located because of the reasons indicated above and problems with typical map scale and accuracy which make it difficult to delineate the exact location. However, Option #2 specifies that where specific distances from the ordinary high watermark are described on the map, these distances shall control. Thus, the actual depth of the zone will vary over time with changes in the location of the shoreline. Where recession rates are different for different parts of the shoreline the varying depth of the erosion hazard district can only be approximately delineated on the map. Thus the map should contain a statement that the setback is to be determined for each site by calculating the specified recession rate for that area on the map and by measuring the stable slope angle.

In cases where only a portion of the shoreline is erodible it is necessary to describe the end points (i.e., lateral extent) of the erosion hazard districts. The Erosion Hazard Areas maps prepared by the Wisconsin Coastal Zone Management Program are the basic source for determining whether a particular shoreline is erodible. This information can be supplemented by data contained in the Technical Appendix. If an area is mapped as having either a high erosion hazard potential or a low to moderate erosion potential it should be placed within the erosion hazard district. For most counties, the entire shoreline is delineated as erodible but in Ashland, Bayfield, Brown, Door and Iron Counties there are significant areas shown to be not erodible. The end point of the erosion hazard district will

thus have to be shown on the map and perhaps supplemented by words of description, e.g., section lines or metes and bounds. In addition there are provisions in the ordinance which permit a landowner to demonstrate that the land is not erodible.

3.0 General Provisions

3.1 Effect on Other Regulations

3.11 These provisions are intended to supplement and not to repeal other applicable regulations; however, where these provisions impose greater restrictions they shall control.

3.12 No lot shall hereafter be created, subdivided or otherwise established without sufficient depth to accomodate structures in compliance with these provisions.

3.2 Warning and Disclaimer of Liability

These provisions are considered the minimum reasonable requirements necessary for reducing erosion damages for a _____ year period. These requirements are based upon engineering, geological and other scientific studies and principles. Faster rates of erosion may occur. Erosion rates may be increased by natural causes such as major storms or high lake levels or by man-made causes such as the construction of erosion control measures or land disturbing activities. These regulations do not guarantee or warrant that development in compliance with its terms will be free from all erosion damage. Reliance on these regulations shall

not create liability on the part of the enacting government or any officer or employee thereof.

COMMENTARY

3.0 General Provisions

3.11 points out that these provisions supplement existing local and state regulations rather than replacing them. In case of conflict, the most stringent regulations apply. The basic uses permitted are determined by the underlying zoning district. In the main, the erosion hazard regulations impose more stringent requirements, e.g., require a greater setback than the 75 feet waterline setback in shoreland zoning. There are other cases where the underlying zoning is modified. Many ordinances have a rule that permits proportionate reduction of setbacks where nearby structures are built at a lesser setback. This rule does not and should not apply to erosion hazard setbacks. To automatically permit a lesser setback in these instances would be akin to allowing new development to be located in the flood plain because there was already development there.

3.12 builds the erosion setback into the minimum dimensions of the lot when (1) a regulated building or structure is proposed or (2) when a lot is created. Subdivision regulations are the mechanism for implementing the latter requirement.

3.2 The legal effect of a warning and disclaimer of liability clause has not been tested in Wisconsin. Another version of this

warning should be contained in an explanatory handout given to property owners proposing development within an erosion hazard area. This latter explanation is more likely to give actual notice.

4.0 Erosion Hazard Setback Lines

Within the boundaries of the erosion hazard areas established by Section 2.0 the minimum erosion hazard setback shall be as follows:

4.1 Bluffs

4.11 A stable slope angle setback shall be established at a ratio of 2 1/2 feet horizontal distance to every one foot vertical distance. The measurement shall be made from the ordinary high water mark perpendicular to the shoreline. There shall be two such measurements made for every 100 feet of shoreline at points not less than 50 feet apart. The stable slope angle setback shall be a line connecting these two points or such line extended. In cases of an irregular shoreline or where the lots are not perpendicular to the shoreline, the Zoning Administrator may require that additional points of measurement be used to determine the stable slope angle setback.

4.12 An additional recession rate setback shall be measured from the stable slope angle setback. The _____ year recession rate shall be calculated using the average annual recession rate indicated on the official zoning map. Where

no recession rate is shown, the safety factor shall be calculated by assuming a _____ foot per year average annual recession rate.
(2) (3)

4.13 A "Bluff" is "that segment of the shoreline which is 10 feet or more in height and which has a rise of 10 feet or more vertical distance in less than 25 feet horizontal distance".

4.2 Ravines

A stable slope angle setback shall be measured at a ratio of 2 1/2 feet horizontal distance to every one foot vertical distance for all ravines 10 feet or deeper. The measurement shall be made from the center of the deepest part of the ravine.

4.3 Dunes and Beaches

4.31 A recession rate setback shall be measured from the ordinary high water mark. The _____ year recession rate shall be calculated using the average annual recession rate indicated on the official zoning map. Where no recession rate is shown, the safety factor shall be calculated by assuming a _____ foot per year average annual recession rate.
(50) (2) (3)

4.32 "Dunes and beaches" are those erodible segments of the shoreline which are not bluffs.

4.4 There shall be a minimum setback of 75 feet from the ordinary high water mark in all cases. "Ordinary high watermark" means the point on

the bank or shore up to which the presence and action of surface water is so continuous as to leave a distinct mark such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation, or other easily recognized characteristic. Where the bank or shore at any particular place is of such character that it is difficult or impossible to ascertain where the point of ordinary high watermark is, recourse may be had to the opposite bank of a stream or to other places on the shore of a lake or flowage to determine whether a given stage of water is above or below the ordinary high watermark.

4.5 The ordinary high water mark and setback lines shall be determined by the zoning administrator on the basis of data submitted by a licensed surveyor or on the basis of field inspection. Where conflicts arise the zoning administrator shall contact the Department of Natural Resources to make an official determination of the ordinary high watermark.

4.6 The Zoning Agency may issue a conditional use permit as provided in 6.0 allowing modification of the erosion hazard setback upon presentation by the applicant of acceptable engineering studies documenting (1) lower recession rates, (2) more stable slope conditions, (3) plans for structural protection against wave attack, (4) plans for stabilization of the bluff or shoreline.

COMMENTARY

4.0 Erosion Hazard Setbacks

The erosion hazard setbacks are a major feature of the regulations. There are three general types of erosion hazard situations, i.e., (1) bluffs, (2) ravines, and (3) dunes and beaches. The most common type involves bluff retreat caused by wave attack and unstable slopes.

4.1 For bluffs it is necessary to determine the stable slope angle. A general stability factor of 21.8° (2 1/2 feet horizontal distance to one foot vertical distance) is suggested. To this is added the recession rate setback. See p. 17-22, Part I for further details. Bluffs are defined in terms of a height and stable slope angle.

4.2 Ravines. A building located near the side of a ravine may be endangered by expansion of the ravine, thus a stable slope setback is required.

4.3 Dunes and beaches. Dunes and beaches are lower relief landscape features than bluffs. Here the recession rate is the important factor. There are some beach areas where recession rates are so rapid and variable (e.g., Carol Beach in Kenosha County) that additional studies must be made before a reasonably accurate recession rate can be determined.

4.5 Measurements are made from the Ordinary High Watermark (OHWM). The OHWM is the boundary used to separate private and public ownership on lakes. It is also the landward boundary of the major water regulation authority of the Department of Natural Resources and the U. S. Army

Corps of Engineers. It is the point from which waterline setbacks are determined in shoreland regulations. DNR field staff determine the location of OHWMs by on-site investigation of distinct marks by erosion, destruction of vegetation, or other easily recognized characteristics. [Ordinary High Watermark Great Lakes p. 1] Dunes may be subject to wind erosion if natural vegetation is removed. Section 6.25 addresses this issue.

4.6 permits a modification of the erosion hazard setback if the landowner can show that the area is not erodible, is eroding at a slower rate, or that the erosion can be substantially reduced by protective measures. Modification is allowable as a conditional use. The landowner is required to provide technical documentation.

5.0 Regulation of Uses Within Erosion Hazard Setbacks

These provisions supplement the underlying zoning which remains in effect to the extent its provisions are more restrictive. The following uses are prohibited uses, permitted uses and conditional uses within the erosion hazard setbacks established by 4.0.

5.1 Prohibited Uses

5.11 Residential, institutional, commercial, industrial, agricultural and public buildings designed for permanent use at the proposed location

5.12 Septic tank systems and other on-site waste disposal facilities

5.2 Permitted Uses

5.21 Open space uses

5.22 Storage of portable equipment, machinery or materials

5.23 Accessory buildings which can be easily and economi-called moved, such as storage sheds, dog kennels and animal housing units

5.24 Minor structures such as driveways, walkways, patios and fences

5.3 Conditional Uses

5.31 Building and structures which are readily removable in their entirety provided they are so located and constructed that they may be removed prior to erosion damage

5.32 Other uses similar to those permitted in 5.2 and 5.3 which are determined by the Zoning Agency to be compatible with the purpose and intent of these regulations. (See also 6.0, Regulation of Shoreline Protection Devices and Land Disturbances.)

COMMENTARY

5.0 Regulation of Uses Within Erosion Hazard Setbacks

5.1 Prohibits buildings which are permanent in nature. Public buildings include those of the regulating unit of government, other local units of government, and state buildings which are subject to local regulations under sec. 13.48(13) Wis. Stats. Septic tank systems are prohibited because they add moisture and weight to a bluff

and may cause unstable slope conditions. In addition, they are unlikely to be removed when eroded and can cause pollution of the shoreline environment.

5.2 Permits minor structures and buildings, and uses which are portable and can be moved prior to damage.

5.3 Allows as conditional uses, major buildings and structures provided they are designed and located so as to be removeable. Mobile homes meet this requirement as do residences and other buildings designed to be moveable. These are conditional uses and 7.51 which lists conditions which may be attached includes "design and construction of structures to be moveable in accordance with accepted architectural or engineering standards", and "the removal and relocation of uses prior to erosion damage". These requirements raise the question of whether they are in conflict with the State Uniform Dwelling Code. The Code establishes uniform statewide construction standards and inspection procedures for one- and two-family dwellings. The code provides "No additional standards within the scope of this code shall be adopted by the municipalities (cities, villages, towns and counties) unless specific approval has been granted by the department pursuant to section Inc. 20.20" (section Inc. 20.06(1)). The moveability requirements can be accomodated with the code without conflict; for example, permitting a house on any type of foundation (i.e., poured concrete basement or on-grade slab). However, if the standards prohibit a basement and require an on-grade

slab, or impose additional design standards not in the code, this would constitute the imposition of "additional standards prohibited by Ind. 20.06(1). In this instances a municipality intending to impose these additional standards in a municipal dwelling code could apply to the Department of Industry, Labor and Human Relations for a variance necessary to protect individual health, safety or welfare because of "specific climate or soil conditions" (Ind. 20.20(1)(a)). See p. 29-30 Part I for a discussion of relocation.

5.32 is an "unassigned use" provision which makes uses not listed conditional uses. An unassigned use provision was upheld in American Oil Co. v. Bessant (Wis. 1965) 135 NW2d 317.

6.0 Regulation of Shoreline Protection Devices and Land Disturbances

6.1 The following shoreline protection activities are conditional uses:

6.11 All structures or deposits, which are shoreline protection devices, below the ordinary high watermark.

6.12 The placement of shoreland protection devices above the ordinary high watermark.

6.13 "Shoreline protection devices" means breakwaters, groins, revetments, seawalls, bulkheads, riprap, deposition of materials such as stone and concrete rubble, bluff stabilization projects and similar measures.

6.2 The following land disturbing activities are conditional uses when conducted within 300 feet of the ordinary high watermark or the erosion hazard setback, whichever is a greater distance.

6.21 Alteration of more than _____ square feet of wetlands. (500)
For purposes of this regulation, "wetlands" are defined as "those areas where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation, and which have soils indicative of wet conditions". The provisions of NR 115 shall control where applicable.

6.22 Filling or grading on all slopes of 20 percent or more

6.23 Filling or grading of more than _____ square feet on (1000)
slopes of 12-20 percent

6.24 Filling or grading of more than _____ square feet on (2000)
slopes of 12 percent or less

6.25 Dredging, construction or other work on any artificial waterway, canal, ditch, lagoon or similar waterway

6.25 Removal of more than _____ square feet of vegetation. (500)
Where vegetation is removed it shall be replaced, as far as practical, with other vegetation that is effective in retarding runoff, preventing erosion and preserving natural beauty.

COMMENTARY

6.0 Regulation of Shoreline Protection Devices and Land Disturbances

6.1 All shoreline protection devices are conditional uses whether located above or below the ordinary high watermark. Some shoreline

protection devices do not extend below the ordinary high watermark although they may eventually end upon the lake bed due to erosion. In 6.11 the local unit of government is exercising concurrent jurisdiction with the Department of Natural Resources (DNR). DNR is working with counties to develop a uniform permit application and procedures for these activities. Local units of government have the primary responsibility for these same activities when conducted above the ordinary high watermark. Although DNR may not have regulatory jurisdiction over the latter activities, it is a valuable source of technical review.

6.21 is a provision for wetland alteration in incorporated municipalities because they are not subject to NR 115 which regulates wetlands. Coastal wetlands buffer the shore against wave attack in addition to the many other important natural functions they perform. Counties are subject to NR 115 which was recently amended. These amendments require modification of a county shoreland ordinance to meet the new NR 115 standards within six months after the county receives the final Wisconsin Wetland Inventory Map. The county regulations then must permit wetland uses allowed by NR 115.

The rest of 6.2 repeats, in slightly modified form, typical provisions found in shoreland zoning ordinances. The figures in parentheses come from shoreland regulations. Since the erosion potential is substantially higher in coastal areas these provisions could be made

more restrictive. 6.26 is an example of such a modification. It supplements the tree cutting provisions of shoreland zoning which were designed primarily for protection of scenic beauty and control of erosion. However, grasses, other ground covers, and shrubs are also important in controlling certain types of erosion. An example is beach grasses which are particularly effective in protecting sand dunes from wind erosion. Valuable technical assistance is available through the County Soil and Water Conservation District to deal with erosion problems associated with land disturbance.

7.0 Conditional Uses

7.1 In General

Conditional uses are uses which may create special problems and hazards if allowed as a matter of right. Whether such uses can be appropriately established depends upon the facts and circumstances of the particular situation. The conditions which may be attached to development permission can, in some instances, avoid adverse effects on adjoining property or the public welfare.

Conditional uses are allowable only upon approval by the Zoning Agency authorized to issue conditional use permits. The Zoning Agency may, after public notice and hearing, permit, deny, or permit the use subject to attached conditions. In passing upon a conditional use the Zoning Agency shall specify the information to be supplied, evaluate the proposed use according to specified standards, and attach appropriate conditions to development permission.

7.2 Procedure

7.21 Any use listed as a conditional use shall be permitted only upon application to the Zoning Administrator and issuance of a Conditional Use Permit by the Zoning Agency.

7.22 Before passing upon an application for a Conditional Use Permit the Zoning Agency shall give notice and hold a public hearing in the manner specified by statute. (Sec. 59.97(6) - counties) (s. 62.23(7)(e)6 - cities

7.23 The Zoning Agency shall, when appropriate, seek technical review assistance available from the Department of Natural Resources, County Soil and Water Conservation District, U. S. Corps of Engineers, and other agencies having relevant expertise.

7.3 Information to be Supplied

The Zoning Agency may require the applicant to furnish the following data which it finds is pertinent and necessary for its determination:

7.31 A plat of survey prepared by a registered land surveyor, or other maps drawn to scale showing the location and dimensions of: property boundaries, the ordinary high watermark, contours of the site, required and proposed yards and setbacks, existing and proposed vegetative cover and landscaping, existing and proposed buildings, structures, driveways, parking and loading areas and streets, existing and proposed areas for the storage of equipment, machinery and materials, areas of pro-

posed grading, filling, dredging and vegetative removal, and existing and proposed methods of controlling storm-water runoff and problem groundwater conditions.

7.32 Plans of buildings and other structures, sewage disposal facilities, water supply facilities

7.33 A description of the method of operation of industrial and commercial uses

7.34 A report, prepared by a registered professional engineer, certifying that the site is or can be made suitable for the proposed development. The report shall consider, describe and analyze the following:

(1) past, current and future wave induced erosion based upon recession rates and wave energy calculations;

(2) geologic conditions including the soils and stratigraphy of the site and an analysis of the properties and stability of the materials present;

(3) ground and surface water conditions and variations including changes that will be caused by the proposed development;

(4) plans and specifications for bluff and shoreline stabilization measures and plans and specifications for measures to protect against wave erosion,

including the estimated life of such measures, their cost, the maintenance required and the effect on nearby properties and the shoreline and lake environment;

(5) where a modification of the erosion hazard setback is proposed the minimum setback required to provide a reasonable degree of safety to the proposed use for a _____ year period;

(6) methods to be used to control surface erosion and storm water runoff during and after construction;

(7) the elevation of the 100 year flood and storm surges where the site is subject to flooding.

7.35 Other pertinent data necessary to determine if the proposed use and location is consistent with the requirements of these regulations.

7.4 Standards Applicable to All Conditional Uses

In passing upon a condition use, the Zoning Agency shall evaluate the proposed use in terms of:

7.41 The erosion and flooding hazard

7.42 The need of the proposed use for a shoreland location

7.43 Compatibility with nearby land uses

7.44 Adequacy of proposed waste disposal and water supply systems

7.45 Location with respect to existing or proposed roads

7.46 The demand for public services engendered and the adequacy of existing services to meet the demand

7.47 Protection of the scenic beauty of the shoreland

7.48 Protection of public rights in navigable waters

7.5 Conditions Which May Be Attached To Conditional Uses

7.51 Upon consideration of the factors listed above, the Zoning Agency may attach such conditions, in addition to those required elsewhere in this ordinance, that it deems necessary to further the purpose and intent of these regulations. Such conditions may include, without limitation because of specific enumeration: bluff and shoreline stabilization measures; measures to protect against wave attack; control of ground water seepage; revegetation and landscaping; control of surface water runoff; the continued and regular maintenance of the above listed measures; design and construction of structures to be moveable in accordance with accepted architectural or engineering standards; the removal and relocation of uses prior to erosion damage; type of construction; construction commencement and completion dates; performance standards and operational controls; dedication of land; sureties and performance bonds; deed restrictions; and other measures designed to

ensure the satisfactory location and maintenance of uses in accord with the purpose and intent of these regulations.

7.52 When a conditional use is approved a record shall be made of the land use and structures permitted, and the conditions attached to such permission. Violation of conditions attached to a conditional use shall constitute violation of this ordinance. The Zoning Agency may, after notice and hearing and opportunity for corrective action, revoke the permit and seek a forfeiture or injunctional order as provided in Section _____ of this ordinance.

7.53 All legal existing uses which would be classified as conditional uses if they were to be established after the effective data of this ordinance or its amendment are hereby declared to be conforming conditional uses to the extent of the existing operation only. Any addition, alteration, extension, or other change in the existing operation shall be subject to the conditional use procedures as if such use were being established anew.

COMMENTARY

7.0 Conditional Uses

Conditional uses and special exceptions are the same thing. Many county ordinances use the term special exceptions. The provisions for conditional uses are set forth in detail because they are an important

feature of the regulations. They allow an appropriate degree of flexibility in light of the complexity of the erosion processes, the generalized data used to estimate erosion hazard, and legal constraints such as the taking of private property. The general legal basis for conditional uses is discussed in Part I p. 40-43. 7.1 describes the function of conditional uses, and 7.2 describes the procedures. In addition to the agencies listed in 7.23, other sources of technical assistance are University of Wisconsin-Extension, Wisconsin Coastal Zone Management Program, Wisconsin Geological and Natural History Survey, and Wisconsin Sea Grant Program.

7.3 describes the information to be supplied. Not all this information will be required for every conditional use application. As a practical matter, the Zoning Administrator usually assists in filling out the application and tells the applicant what specific information will be required in the particular case.

Some counties, e.g., Barron County, permit the Zoning Administrator to issue a modified form of a conditional use called a grading permit for minor land disturbing activities. The Zoning Administrator consults with appropriate technicians in determining the conditions which should be attached to the permit. The applicant may appeal the Administrator's determination to the Zoning Agency. This procedure is a reasonable way to expedite minor applications, but has not been tested by the Wisconsin Court. The case of State ex rel Skelly Oil Co. v. Delafield (Wis. 1973) 207 NW2d 585, suggests the court may perhaps not approve of this procedure.

7.34 applies where the applicant wishes to modify the erosion hazard setback. In that case the burden is on the landowner to provide a technical report prepared by a registered engineer certifying that the site is or can be made suitable for the proposed development.

7.4 lists standards the Zoning Agency is to use in evaluating conditional uses.

7.5 sets forth in detail the conditions which may be attached. An extended list is set forth because the case of Nodell Investment Corp. v. Glendale (Wis. 1977) 254 NW2d 310, suggests that conditions which may be attached must be authorized by the ordinance. Violation of authorized conditions constitutes a violation of the ordinance.

8.0 Nonconforming Uses

The lawful use of a building or premise existing at the effective date of this ordinance or its amendment may continue in the same manner and to the same extent subject to the following requirements:

8.1 Routine repairs and maintenance are permitted

8.2 No alterations, additions or expansions shall occur which increase the dimensional nonconformity within the erosion hazard setback unless a variance is obtained as provided in 9.0

8.3 The use of any vacant lot or parcel shown on a recorded subdivision plat, assessor's plat or a conveyance, recorded in the office of the Register of Deeds, which does not conform to the erosion hazard setback shall be permitted only upon the issuance of a variance by the Board of (Adjustment) (Appeals).

8.4 The other provisions of this ordinance relating to nonconforming uses and the provisions of Wisconsin Statutes (s. 59.97(1) - counties) (s. 62.23(7)(h) - cities) are complied with.

COMMENTARY

8.0 Nonconforming uses

Nonconforming use provisions are found in all zoning ordinances. 8.2 and 8.3 apply to uses that are nonconforming because they are located within the erosion hazard setback. 8.2 requires a variance before a non-conforming use is expanded. 8.3 requires that substandard lots also obtain a variance. The latter provision modifies typical shoreland regulations which automatically permit building on substandard lots which meet specific dimensions. There are such a variety of situations involving nonconforming use in erosion hazard areas that it is necessary to decide them on a case by case basis. The variance provides a mechanism for doing so.

9.0 Variances

A variance from the erosion hazard setback may be granted by the Board of (Adjustment) (Appeals) based upon the following standards:

9.1 No variance shall be granted which would have the effect of allowing in any district a use not permitted in that district.

9.2 No variance shall be granted which would have the effect of allowing a use of land or property which would violate state laws or administrative rules.

9.3 A variance may be granted where strict enforcement of the terms of this ordinance results in unnecessary hardship and where a variance will not be contrary to the public interest, will allow the spirit of the ordinance to be observed, and substantial justice done.

9.4 Conditions shall be attached in writing to all approved variances where such conditions will achieve compliance with the standards of this ordinance. Such conditions may include:

9.41 The proposed use is located as far landward of the erosion hazard setback as is practical.

9.42 Septic tank systems and other on-site waste disposal facilities are placed landward of the principal structure.

9.43 The proposed structure is designed, constructed and located so as to be moveable to a safe location prior to erosion damage and a deed restriction is recorded requiring removal.

9.44 Those conditions which may be attached to conditional uses as specified by 7.5.

COMMENTARY

9.0 Variances

9.0 sets out typical variance procedures. 9.4 lists special provisions that apply to variances in erosion hazard areas, i.e., setback as far as possible, location of septic tank systems landward of the principal structure, moveability of structures and attaching appropriate conditions.

SUBDIVISION REGULATION PROVISIONS FOR EROSION HAZARD AREAS

Subdivision Regulations -- In General

Subdivision regulations control the division of land into lots for sale or building in order to ensure proper and orderly development. Subdividers are required to prepare plats, i.e., detailed maps of the land proposed to be subdivided. The plats must be approved by local regulating agencies before the plat can be recorded and the lots sold. Plats are usually reviewed to ensure the suitability of the area for a subdivision; the adequacy of the street system; proper dimensions and layout of lots; sufficiency of water supply and waste disposal systems; proper stormwater management; control of erosion and sedimentation; adequate open space; and safety from physical hazards.

Wisconsin Statutory and Case Law

The authority for governmental review of subdivisions is found in Chapter 236 Wisconsin Statutes. A subdivision is defined by sec. 236.02(8) as the division of land into 5 or more parcels, each 1-1/2 acres or less in size, created within a 5 year period. These "state defined" plats are always subject to review by local approving authorities and state objecting agencies before the plat can be recorded by the County Register of Deeds. Review by state objecting agencies does not include an analysis of the erosion hazard. However, local subdivision ordinances may contain provisions which condition plat approval upon making appropriate adjustments to the erosion hazard. Local subdivision ordinances may have a more inclusive definition of what constitutes a subdivision. For example, a local subdivision ordinance may define

a subdivision as the creation of lots larger than 1-1/2 acres or divisions into fewer than 5 lots. These "locally defined" plats are subject to review in that locality and may, at the local unit's option, be subject to state agency review. More importantly, the rules set out in local ordinances may be more stringent than statewide rules governing state defined plats. Local subdivision regulations are authorized by section 236.45 Wisconsin Statutes. The purposes of local subdivision regulations are spelled out in sec. 236.45 (1) which states:

> DECLARATION OF LEGISLATIVE INTENT. The purpose of this section is to promote the public health, safety and general welfare of the community and the regulations authorized to be made are designed to lessen congestion in the streets and highways; to further the orderly layout and use of land; to secure safety from fire, panic and other dangers; to provide adequate light and air; to prevent the overcrowding of land; to avoid undue concentration of population; to facilitate adequate provision for transportation, water, sewerage, schools, parks, playgrounds and other public requirements; to facilitate the further resubdivision of larger tracts into smaller parcels of land. The regulations provided for by this section shall be made with reasonable consideration, among other things, of the character of the municipality, town or county with a view of conserving the value of the buildings placed upon land, providing the best possible environment for human habitation, and for encouraging the most appropriate use of land throughout the municipality, town or county. (underlining added)

In addition, sec. 236.45(2)(a) authorizes a municipality (city or village), town or county to ..."prohibit the division of land in areas where such prohibition will carry out the purposes of this section".

Thus erosion hazard provisions are clearly within the scope and intent of local subdivision regulations. The basis for approval of preliminary or final plats is conditional upon "Any municipal, town or county ordinance"; sec. 236.13(1)(a). Thus a plat must comply with the applicable zoning and subdivision ordinance provisions.

There may be more than one set of subdivision regulations which apply to a single tract of land. A plat in a rural area may, for example, be subject to county, town of municipal regulations if located within the extraterritorial plat approved jurisdiction of a city or village. Extraterritorial plat approval jurisdiction is defined by the statutes as "the unincorporated area within 3 miles of the corporate limits of a first, second or third class city or 1-1/2 miles of a fourth class city or village (sec. 236.02(2)). Where more than one local government has plat approval authority and their requirements conflict the plat must comply with the strictest requirements (sec. 236.13(4)). A local government, however, does not have discretion under ch. 236 to reject a plat in the absence of previously adopted standards or guidelines for approval. State ex rel. Columbia Corp. v. Pacific Town Board (Court of Appeals) (1979) 92 Wis. 2d 767.

Towns, cities and villages can impose specific conditions for approval of plats. Sec. 236.13(2)(a) states: "As a further condition of approval the governing body of the town or municipality within which the subdivision lies may require that the subdivider make and install any public improvements reasonably necessary or that he execute a surety bond to insure that he will make those improvements within a reasonable time". In Zastrow v. Brown Deer (1960) 9 Wis. 2d 100 the court stated:

> "The village could require as a condition of its approval of a plat that the subdivider make and install any public improvements reasonably necessary, including a water system, and it could require as a condition for accepting the dedication that the designated facilities previously constructed and provided be without cost to the village, and that such facilities be according to the village's specifications and under its inspection, including water mains and laterals." at p. 108.

The local government may also require dedication of land or fees-in-lieu of land dedication as a condition of plat approval. In Jordan v. Menomonee Falls (1965) 28 Wis 2d 608 the court noted:

> "The test of reasonableness is always applicable to any attempt to exercise the police power. The basis for upholding a compulsory land-dedication requirement in a platting ordinance in the nature of the instance ordinance is this: The municipality by approval of a proposed subdivision plat enables the subdivider to profit financially by selling the subdivision lots as home-building sites and thus realizing a greater price than could have been obtained if he had sold his property as unplatted lands. In return for this benefit the municipality may require him to dedicate part of his platted land to meet a demand to which the municipality would not have been put but for the influx of people into the community to occupy the subdivision lots, at p. 619-620.

Although sec. 236.13(2) does not specifically authorize counties to require public improvements or surety bonds, 236.13(1)(b) conditions plat approval upon compliance with "Any...county ordinance". Sec. 236.45(2)(a) authorizes counties along with towns, cities and villages to "adopt ordinances governing the subdivision or other division of land which are more restrictive than the provisions of this chapter". Among the purposes for which a local subdivision ordinance may be adopted is "to facilitate adequate provision for transportation, water, sewerage, schools, parks, playgrounds, and other public requirements". (236.45(1)). Thus a county can require the subdivider to make and install any improvements reasonably necessary or to provide a surety that the improvements will be installed.

There may be instances where local government decides not to require dedication of open space land or fees in lieu of such dedication. In these instances it could require: that certain lands be restricted to open space

use; that these lands be dedicated in common to purchasers of lots in the subdivision; and that an appropriate management agency be established to maintain the common open space and associated facilities. This private management agency could be either an automatic home owners association or a condominium.

An automatic home owners association is created by the developer through a declaration of covenants and restrictions. Prior to selling any lots, the developer records this document which creates a general scheme of private regulation which integrates the residential development with the community owned open space and associated facilities. Every parcel is thereby subjected to certain covenants, restrictions, easements, assessments and liens. The declaration automatically makes each lot owner a member of the association. The declaration assigns to the property owners association powers to maintain the common properties, enforce the covenants and restrictions, and collect the assessments to which each lot is subject. There is both a common law and statutory basis for the imposition of such assessments in Wisconsin. (Bartholomew v. Thieding (1937) 225 Wis. 135, Prudential Insurance Co. v. Wetzel (1933) 212 Wis. 100, and sec. 289.70 Wis. Stats.)

A condominium organized under the "Condominium Ownership Act" Chapter 703, Wisconsin Statutes provides another mechanism for creating a private management agency. In order for a subdivision ordinance to apply to a condominium the ordinance must state by its express terms that it is intended to apply to condominiums (sec. 703.27). A condominium can be a "vertical" condominium, i.e., apartment type, or a "lateral" condominium, i.e., individually owned single family structures with common open space. In either case every

unit has an undivided interest in the common elements. The common elements are maintained by the Association which is an organization of the unit owners responsible for the administration and operation of the condominium property. The Association is empowered to levy and collect assessments for common expenses from the unit owners (sec. 703.15 (3)(a)).

The local unit of government may require and enforce deed restrictions for the public benefit. Section 236.293 provides:

> RESTRICTIONS FOR PUBLIC BENEFIT. Any restriction placed on platted land by covenant, grant of easement or in any other manner, which was required by a public body or which names a public body as grantee, promisee or beneficiary, shall vest in such public body the right to enforce the restriction at law or in equity against anyone who has or acquires an interest in the land subject to the restriction. Such restriction may be released or waived in writing by the public body having the right of enforcement.

There are special provisions of the platting statutes which apply to lake and stream shore plats. Dedication of public access is required by sec. 236.16(3) which provides:

> LAKE AND STREAM SHORE PLATS. All subdivisions abutting on a navigable lake or stream shall provide public access at least 60 feet wide providing access to the low watermark so that there will be public access, which is connected to existing public roads, at not more than one-half mile intervals as measured along the lake or stream shore except where greater intervals and wider access is agreed upon by the department of natural resources and the head of the planning function, and excluding shore areas where public parks or open-space streets or roads on either side of a stream are provided. No public access established under this chapter may be vacated except by circuit court action.

In addition, subdividers may not create unplatted buffer zones between platted lands and the water's edge. Sec. 236.16(4) provides:

> LAKE AND STREAM SHORE PLATS. The lands lying between the meander line, established in accordance with s. 236.20(2)(g), and the water's edge, and any otherwise unplattable lands which lie between a proposed subdivision and the water's edge shall be included as part of lots, outlots

> or public dedications in any plat abutting a lake or stream. This subsection applies not only to lands proposed to be subdivided but also to all lands under option to the subdivider or in which he holds any interest and which are contiguous to the lands proposed to be subdivided and which abut a lake or stream.

Where a subdivider dedicates public access to the waterline public rights accrue to any newly formed land regardless of whether it results from a natural process such as accretion or reliction or from an artificial process such as reclamation. Heise v. Village of Pewaukee (1979) 92 Wis 2d 333.

Local government may require the subdivider to submit a preliminary plat. The preliminary plat must "be in sufficient detail to determine whether the final plat will meet layout requirements". (sec. 236.11(1)(a)). Other than this statement the statutes do not set specific standards for preliminary plats. However, detailed local standards for preliminary plats are authorized by sec. 236.45(2), which permits any city, village, town or county which has established a planning agency to "adopt ordinances governing the subdivision or other division of land which are more restrictive than the provisions of this chapter". These stricter standards extend, among other things, to "approving requirements for such division".

The function of a preliminary plat was noted in Lakeshore Development Corp. v. Plan Comm. (1960) 12 Wis. 2d 560:

> "It is common knowledge and a necessity that the preliminary plat show both the existing physical features of the subdivision and the proposed roads, relocation of existing roads, and proposed changes in the existing physical features of the land. A preliminary plat is not necessarily a division of land as it physically exists at the time the preliminary plat is submitted. A layout of the lots may be based upon proposed changes in topography. Layout requirements can be determined from such a preliminary plan. Approval may be given on condition such changes are made in accord-

ance with and as shown on the preliminary plan. The projection of the future in a preliminary plan does not destroy the nature of the plat as preliminary but confirms it." at p. 566-567.

The statutes contain detailed standards for the form and content of a final plat. (secs. 236.20 and 236.21)

There are specific time limits within which local government must act on plats. Preliminary plats must be approved, approved conditionally, or rejected within 90 days of submission. Failure of the approving authority to act within 90 days constitutes approval of the preliminary plat. (sec. 236.11(1)(a)). If the approving authority fails to act on a final plat within 60 days it is deemed approved. (sec. 236.11(2)). The court construes these time limits strictly for both preliminary plats (State ex rel Hozloff v. Board of Trustees (1971) 55 Wis 2d64) and for final plats (State ex rel Callan Inc. v. Barg (1958) 3 Wis 2d 488).

Subdivision Regulations For Coastal Erosion Hazard Areas.

Subdivision regulations are an important tool to reduce coast erosion damages and to protect potential purchasers of erosion prone lands. Subdivision regulations can reduce coastal erosion damages by: (1) prohibiting the subdivision of lands subject to serious erosion unless the hazards are overcome; (2) requiring the designation of erosion hazard areas on the plat and the use of deed restrictions to control lands unsuitable for buildings; (3) requiring that each lots provides a safe building site with adequate area to meet the erosion hazard setbacks and other dimensional requirements of the zoning ordinance; (4) ensuring that stormwater drainage, grading and similar activities which may accelerate erosion are undertaken in a manner compatible

with conditions on the site; (5) requiring the subdivider to install reasonably necessary public improvements, including erosion control measures, or provide a surety that the improvements will be installed; and (6) requiring that erosion protection measures are maintained by a properly constituted private management agency with assessment powers.

Sample Subdivision Provisions For Coastal Erosion Hazard Areas

The following sample subdivision regulation provisions for coastal erosion hazard areas are designed for inclusion in an existing city or village, town, or county subdivision ordinance. Local subdivision ordinances vary widely in their form and content. Some subdivision ordinances have detailed standards. Other subdivision ordinances contain only relatively general provisions which are interpreted to require specific measures when applied to the particular site in question.

These sample provisions are more detailed than those some local governments would incorporate into their subdivision ordinance. There are several reasons for setting forth relatively detailed provisions: (1) typical county subdivision provisions which apply to shoreland areas are included where they are relevant to coastal erosion hazard; (2) setting forth a full array of coastal erosion provisions gives a better picture of possible items for inclusion in a particular ordinance; and (3) the more detailed provisions and accompanying commentary suggest factors that should be considered in administering a more generally worded ordinance.

These provisions are intended primarily for use in conjunction with a zoning ordinance which delineates and regulates erosion hazard areas. In the

usual situation the governmental unit exercising subdivision controls will also be the zoning authority, e.g., a county with county shoreland zoning and a county subdivision ordinance. However, a local unit of government may exercise subdivision control in an area where it does not exercise zoning authority. Examples are a town subdivision ordinance or municipal extraterritorial plat review applied to an area subject to county shoreland zoning. In some cases the county shoreland zoning may not contain explicit standards for coastal erosion. In this instances it is up to the town or municipal subdivision ordinance to effect erosion hazard controls.

What follows is an outline of the contents of a local subdivision ordinance with explicit provisions for coastal erosion hazard areas. Rather than repeat relevant erosion hazard zoning provisions they are cited as part of the subdivision ordinance outline. Where there is no applicable zoning ordinance with special erosion hazard provisions, the cited provisions can be incorporated into the subdivision ordinance; otherwise they may be omitted.

SAMPLE SUBDIVISION PROVISIONS

1.0 Findings of Fact and Statement of Purpose

(See 1.0 Sample Zoning Provisions)

2.0 Lands to Which Erosion Hazard Provisions Apply

These erosion hazard provisions shall apply to all lands within the land division or subdivision approval authority of _____ which are:
(local unit name)

(Option #1) within _____ feet of the ordinary high watermark
(500)
of Lake _____.

(Option #2) shown as erodible on the official zoning map or otherwise mapped as being erodible.

COMMENTARY

It is necessary to designate the general area to which the special erosion hazard provisions apply. This designation should describe erodible lands other than those shown on the Official Zoning Map in instances where the area in question is not subject to erosion hazard zoning. See 2.0 Sample Zoning Provisions for further discussion.

3.0 General Provisions

(See 3.0 Sample Zoning Provisions)

4.0 Land Suitability and Erosion Hazard Setbacks

4.1 Land Suitability

No land shall be subdivided which is held unsuitable for the proposed use by the _____ for reasons of flooding,
(review agency)
inadequate drainage, soil and rock formations with severe limitations

for development, unfavorable topography, inadequate water supply or sewage disposal capabilities or any other feature likely to be harmful to the health, safety or welfare of the future residents of the proposed subdivision or of the community. The _____ in
(review agency)
applying the provisions of this section shall in writing recite the particular facts upon which it bases its conclusions that the land is not suitable for the proposed use and afford the subdivider an opportunity to present evidence regarding such suitability at a public hearing. Thereafter the _____ may affirm, modify or
(review agency)
withdraw its determination of unsuitability.

4.2 Erosion hazard setback lines shall be determined for all erodible bluffs, ravines, dunes and beaches.

(See 4.0 Sample Zoning Provisions)

4.3 The _____ may approve preliminary and final plats
(review agency)
if subdividers improve lands consistent with the standards of this and other applicable ordinances to make subdivisions, in the opinion of the _____, suitable for their intended uses. The
(review agency)
_____ may also approve prelimainary and final plats if
(review agency)
subdividers agree to make suitable improvements and place sum in escrow pursuant to 5.0 to guarantee performance.

4.4 In applying the provisions of 4.1 and 4.3 the review agency may require subdividers to submit a report, prepared by a registered professional engineer, certifying that the site is or can be made suitable

for the proposed development. The report shall consider, describe and analyze the following:

4.41 past, current and future wave induced erosion based upon recession rates and wave energy calculations;

4.42 geologic conditions including the soils and stratigraphy of the site and an analysis of the properties and stability of the materials present;

4.43 ground and surface water conditions and variations including changes that will be caused by the proposed development;

4.44 plans and specifications for bluff and shoreline stabilization measures and for measures to protect against wave erosion, including the estimated life of such measures, their cost, the maintenance required and its cost, and the effect on nearby properties and the shoreland and lake environment;

4.45 where a modification of the erosion hazard setback is proposed the minimum setback required to provide a reasonable degree of safety to the proposed use for a _____ year period;

4.46 methods to be used to control surface erosion and stormwater runoff during and after construction;

4.47 the elevation of the 100 year flood and storm surge where the site is subject to flooding;

4.48 other pertinent data necessary to determine if the proposed use and location is consistent with the requirements of applicable regulations.

COMMENTARY

The general land suitability requirements stated in 4.1 are similar to those found in most county shoreland subdivision regulations. 4.2 incorporates erosion hazard setbacks as a specific requirement for land proposed to be subdivided. 4.3 permits subdivisions within the erosion hazard setback if proper protective measures, e.g., shoreline protection or bluff stabilization, are installed. The land may be subdivided prior to installation of these measures if the developer places a sufficient sum to construct them in escrow. 4.4 applies where the subdivider challenges the required erosion hazard setback or proposes to install protective measures. This provision repeats 7.34 of the sample zoning provisions which apply to conditional uses. The design period of 50 years which is the minimum recommended for zoning provisions could arguably be made longer for subdivisions, e.g., 75 years. Several factors may be relevant. (1) Subdivisions typically involve a larger tract of land and there is likelihood that a greater setback can be reasonably required. (2) Innovative subdivision development in the form of common open space and shared recreational facilities along the shoreline is an acceptable design alternative which can be both environmentally sound and economically remunerative. (3) There may be a time lag of some years before the land is platted and lots of sold or structures built. (4) A subdivision may involve a more substantial investment in terms of streets, sewer and water and other facilities.

5.0 Performance Bonds

No final plat shall be approved by the _____ until
(review agency)
the improvements required by this ordinance are constructed in a satisfactory manner and approved by the _____. In lieu of such construction, the _____ may grant final approval prior to completion
(review agency) (review agency)
providing the subdivider:

5.1 Enters into an agreement with the _____ guaranteeing
(local unit)
that the improvements will be installed in accordance with the plans, specifications, and schedules approved by the _____ prior
(review agency)
to plat approval.

5.2 Offers, simultaneous with the execution of the agreement specified in 5.1, a fiscal surety to guarantee performance of this agreement and installation of improvements by the subdivider/owners at their own expense in accordance with the approved plans, specifications, and schedules. The surety bond shall be in the full amount of the estimated costs. The surety agreement shall be conditioned upon final approval of the plat. The land shall be offered by the subdivider, his agent or an authorized bonding firm. The bond shall consist of a certified check, escrow account, or irrevocable letter of credit in favor of _____.
(the governing body)

5.3 Agrees that the deposit in escrow may be applied by the governing body for the completion of improvements as agreed and may be held for a period of _____ months after completion of such improvement to ensure correction of any defect in material or workmanship latent in

character and not discernible at the time of final inspection or acceptance by the governing body. Such agreement shall also provide that the bond may be applied by the _____ for any
(governing body)
amounts incurred correcting such defects. The balance of such deposit, if any, held at the end of such _____ month period shall be returned by the governing body to the depositor, or paid to the order of the depositor without payment of interest by the governing body.

5.4 Furnishes, prior to offering any improvement to the governing body, a written guarantee that all indebtedness incurred for supplies, material, labor furnished, or engineering and professional services in the construction of improvements shall have been paid in full and that there are no claims or suits against the contractor involving such improvements.

COMMENTARY 5.0

Local government has the authority to require the installation of various improvements before a plat is finally approved and recorded. Requiring improvements to be completed before plat approvals can cause long delay and expense to the developer. Performance bonds in lieu of actual completion and as assurance for work to be carried out in accordance with an approved plat provides the developer some flexibility in staging the development. These performance bond requirements are more detailed than what a local government may choose to include in its ordinance, but serve as an example of items to be considered in preparing performance bond agreements. A related provision

concerns the maintenance by lot owners of shore protective measures and common open spaces. This is covered in _____.

6.0 Dedication

6.1 All subdivision layouts shall be developed in proper relation to existing and proposed streets, the topography, surface water, vegetative cover, other natural features, and the most advantageous development of adjoining areas. The _____ (review agency) may require that suitable sites not to exceed _____ percent of the total area of the subdivision be dedicated or reserved for future public use such as parks, playgrounds, public access and open spaces as needed by the subdivision shall be offered for public dedication subject to acceptance thereof by the appropriate governing body.

6.2 Any part of a street, other public way or drainageway required by the _____ (review agency) shall be offered for public dedication subject to acceptance thereof by the appropriate governing body.

6.3 In lieu of public dedication the _____ (review agency) may require dedication to a private organization representing landowners in the subdivision such as an automatic property owners association or condominium association which is authorized to enforce maintenance liens for the commonly owned property.

6.4 All subdivisions abutting on a navigable lake or stream shall provide public access at least 60 feet wide providing access to the low watermark so that there will be public access, which is connected to existing public roads, at not more than one-half mile intervals as

measured along the lake or stream shore except where greater intervals and wider access is agreed upon by the department of natural resources and the head of the planning function, and excluding shore areas where public parks or open-space streets or roads on either side of a stream are provided as required by sec. 236.16(3). The _____ may require dedication of access points
(review agency)
of greater width or more frequent interval at points designated by them.

6.5 The lands lying between the meander line, established in accordance with sec. 236.20(2)(g) and the water's edge, and any otherwise unplattable lands which lie between a proposed subdivision and the water's edge shall be included as part of lots, outlots or public dedications in any plat abutting a lake or stream. This requirement applies not only to lands proposed to be subdivided but also to all lands under option to the subdivider or in which he holds any interest and which are contiguous to the lands proposed to be subdivided and which abut a lake or stream as required by sec. 236.16(4).

6.6 If the review agency determines that only a part of a proposed plat can be safely developed, it shall limit development to that part and may require that the unplattable lands be designated on the plat be restricted to open-space uses be offered for public dedication; or be dedicated to an approved private organization which is

authorized to enforce maintenance liens for the commonly owned property.

COMMENTARY 6.0

The Wisconsin court has upheld the validity of dedication of land or fees in lieu of land dedication. 6.1 requires dedication of land for public open space use subject to acceptance by the governing body. The local governing body may delegate its plat review authority to the plan commission or committee (cities and villages), county planning agency or town planning agency. However, final plats dedicating streets or other lands must be accepted by the governing body (sec. 236.10(4)). When the final plat is approved by the governing body and all other approvals are obtained and the plat is recorded, the approval constitutes acceptance of all lands shown on the plat designated as dedicated to the public (sec. 236.29(3)). 6.3 allows the review agency to require dedication of lands to a private management agency of the lot owners. 6.4 is a provision that repeats the requirements of sec. 236.16(3) but provides that additional access may be required by the local government under the authority granted by sec. 236.45 to impose more restrictive requirements. 6.5 reiterates the requirements of sec. 236.16(4) which among other things applies to "unplattable lands which lie between a proposed subdivision and the water's edge". These unplattable lands may be required to: (1) be designated on the plat, (2) be restricted to open space use, and (3) be offered for public dedication or dedication to the lot owners by terms of 6.6.

7.0 Restrictions for Public Benefit

Any restriction placed on platted land by covenant, grant of easement or in any other manner, which was required by the _____ (review agency), or which names the _____ (governing body) as grantee, promissee or beneficiary, shall vest in the _____ (governing body) the right to enforce the restriction at law or in equity against anyone who has or acquires an interest in land subject to the restriction. Such restrictions shall include obligations to pay maintenance assessments for commonly held open-space property or shore protection works and other erosion control measures.

COMMENTARY 7.0

This section repeats the provisions of sec. 236.293. It would permit a local unit to enforce restrictions, such as setbacks, where it does not have zoning authority. It also adds the provision that the governing body may enforce deed restrictions which require the lot owners to maintain shore protection works and other erosion control measures to ensure they continue to function effectively.

8.0 Improvements

8.1 Before final plat approval the subdivider shall install required improvements including erosion control measures or if such improvements are not installed the subdivider shall have entered into a performance bond agreement as specified in 5.0. One week prior to the time each improvement is to be installed and upon its completion the subdivider shall notify the _____ (review agency) so that adequate inspection can be made.

8.2 Streets

8.3 Water Supply Facilities

8.4 Sanitary Sewer Facilities

8.5 Storm Drainage

Storm drainage shall be designed to permit the unimpeded flow of natural water courses; insure the drainage of all points along the line of streets; and provide positive drainage away from on-site sewage disposal facilities. In designing storm drainage facilities, special consideration shall be given to protection against shoreland erosion and siltation of surface waters and preventing excess runoff on adjacent property. The _____ (review agency) may require that easements or drainage ways of width sufficient to accomodate storm water runoff be provided.

8.6 Erosion and Sediment Control Measures

8.61 The _____ (review agency) may require the subdivider to utilize grading techniques, subdivision design, landscaping, special vegetative cover, berms, sediment basins and other measures to reduce surface water runoff and erosion.

8.62 The _____ (review agency) may require the subdivider to install shoreline protection measures such as breakwaters, groins, revetments, seawalls, bulkheads, groundwater dewatering and other bluff stabilization measures.

8.63 Plans for storm drainage, surface water runoff control, and shoreline protection and bluff stabilization measures,

shall be submitted to the _____ which shall
(review agency)
transmit them where appropriate to the County Soil and Water Conservation District, Department of Natural Resources, U. S. Corps of Engineers and other agencies for review and comment. These comments shall be available to the _____
(review agency)
for review two weeks prior to submittal of the final plat and before any land surfaces are disturbed. Guidelines, standards, and specifications contained in the publications: (1) "Minimizing Erosion in Urbanizing Areas", Soil Conservation Service; (2) "Help Yourself", Corps of Engineers; (3) "Great Lakes Shore Protection: Structural Design Examples", Wisconsin Coastal Management Program; and (4)"Harmony With The Lake: Guide to Bluff Stabilization", Illinois Department of Transportation, shall provide a framework for the development, review and implementation of erosion control, shoreline protection and bluff stabilization measures.

COMMENTARY 8.0

Before final plat approval, required improvements must be installed, or there must be a performance bond agreement guaranteeing that the improvements will be installed in accordance with plans, specifications and schedules required by the review agency. There are explicit provisions dealing with storm drainage, surface erosion, wave erosion and bluff stabilization. 8.63 authorizes the planning agency to require submission of plans dealing with

these items and to request technical review. The planning agency can conditionally approve the preliminary plat subject to favorable technical review. The review agency must act (i.e., approve, approve conditionally, or reject) the plat within 90 days of submission or the plat is deemed approved. (Sec. 236.11(1)(a) and Lozloff v. Board of Trustees (1971), 55 Wis 2d 64 which held that merely tabling consideration of the plat is not sufficient.)

9.0 Preliminary Plat

(Add the following to existing ordinance requirements for information to be submitted with, or shown on the preliminary plat.)

9.1 The ordinary high watermark and erosion hazard setback line.

9.2 Draft of proposed restrictive covenants and designation of areas subject to special restrictions.

9.3 Plans and specifications for improvements required in 8.0.

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APPENDIX A

Data Available

An investigation of shore erosion was undertaken by the Coastal Management Program to develop a more complete coastal data base, analyze various methods to reduce damages and identify erosion hazard areas. This four year study generated inventories of shore protection structures, vertical and oblique aerial photography, geological and geotechnical data and shoreline recession rates. [Wisconsin's Shore Erosion Plan p 1-2]

Critical erosion areas were identified on the basis of (1) public perception, (2) shore recession rates, (3) shore damages (1972-1976), (4) protective structures, (5) bluff height and (6) shore development. Before a mapping of critical areas was undertaken, erosion rates were measured. Both long-term and short-term erosion rates were used. The long-term rates were catalogued from a variety of sources including the U. S. Army Corps of Engineers and other research studies. Short-term recession rates (1966-1975) were measured from vertical aerial photography at scales of 1:12,000 to 1:20,000 on recent air photos. The measurements were made by plotting shoreline positions from the older photograph onto the most recent photograph and measuring the rate of recession with a Bausch and Lomb Microline Supergauge. These were then converted to distance on the ground by determining photo scale in comparison with U. S. Geological Survey topographic maps. The amounts of recession were then divided by the number of years of record to produce a recession rate in feet per year.

After critical erosion areas were determined, field work by geologists was done on a section-(one mile) by-section basis. In each section where a bluff was present 2-6 profiles were measured. Significant slope breaks, materials in the bluffs, the type of slope failure and the amount of vegetation on the bluff were noted. Samples were collected and analyzed in the laboratory. [Shore Erosion Study: Technical Report p 3-10]

This information is shown in a series of 9 Technical Appendices. Each appendix provides detailed information on shoreline conditions for erodible areas. For each township evaluated there is a map (1:12,000) which shows short-term and long-term recession rates, bluff height, shore protection structures and other information. The text describes the characteristics of shoreline conditions. Another map shows locations of measured profiles along the shoreline. A description of bluff characteristics, materials making up the toe of the slope, beach characteristics and engineering data is also given.

DATE DUE

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