

**Baird.**

Innovation Engineered.

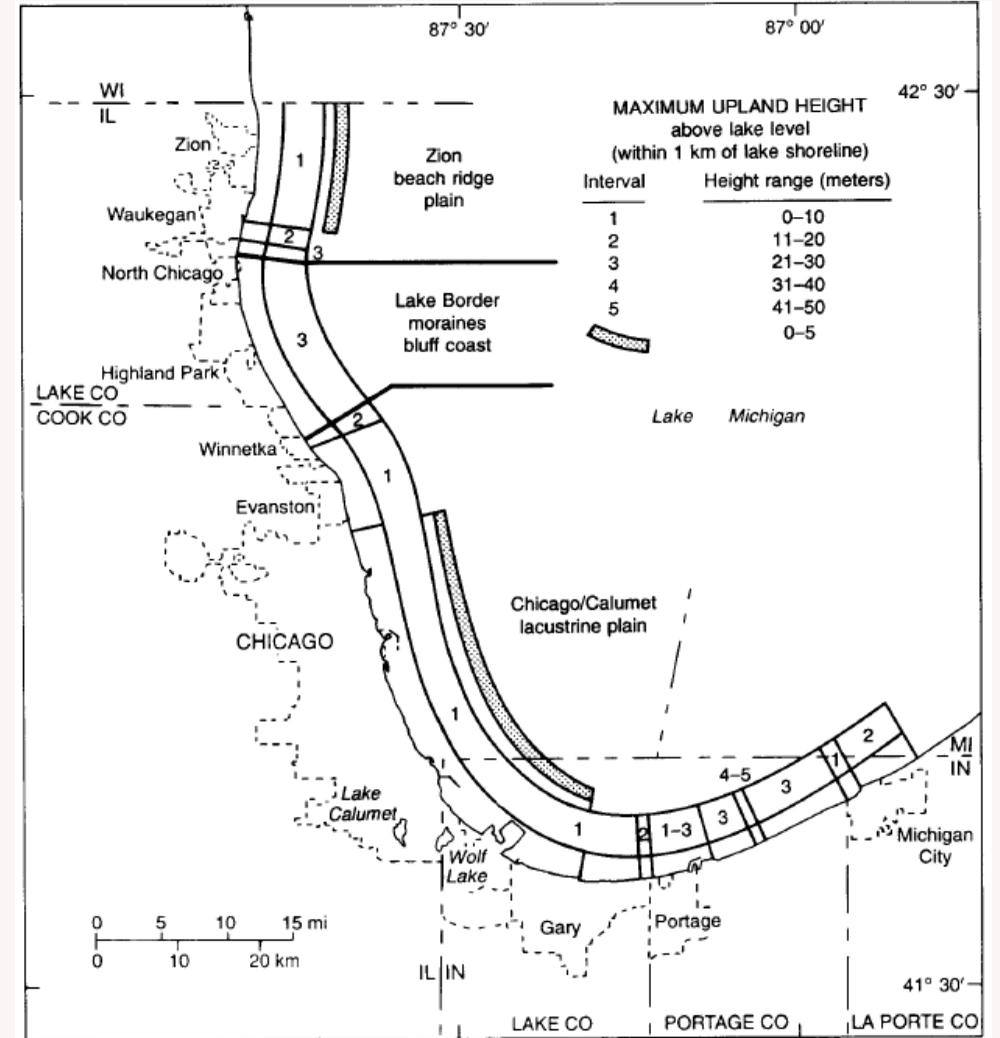
# Description of Winnetka's Bluff & Their Role in Lakefront Ecosystem

Village of Winnetka – Village Council Study Session

September 12, 2023

# Roll of Bluffs Along the Lakefront Ecosystem

- Winnetka bluffs created by glacier retreat
- Three regional coastal geomorphic areas:
  - Zion beach ridge plain
  - Lake Border moraine bluff coast
  - Chicago/Calumet lacustrine plain
- Landward erosion of bluffs is/was natural
- Human development significantly slowed erosion

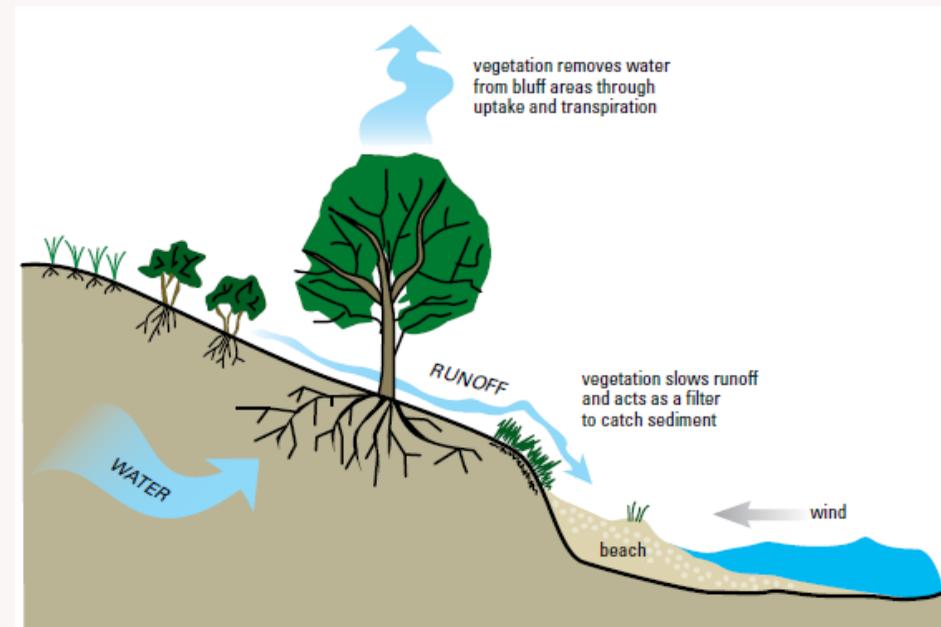


(Chrzastowski, 1994)

# Bluff Ecosystem in Built and Developed Environment

- Healthy bluff ecosystem consists of a mix of:
  - large trees,
  - a middle layer of small trees and shrubs and
  - native (deep-rooted) undergrowth.
- Highly variable.
- Habitat – migratory birds, “urban” wildlife

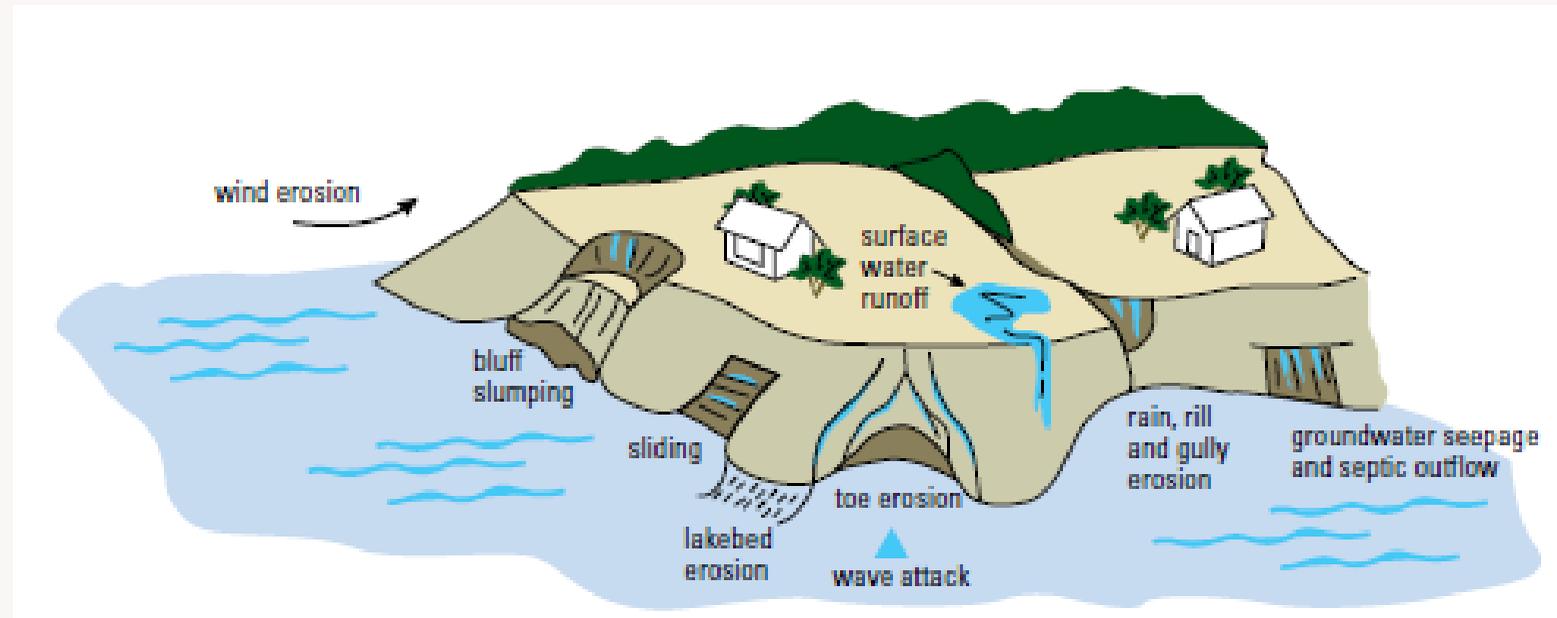
- Human-induced disturbances:
  - Fire-suppression practices
  - Altered hydrology and hydraulics
  - Increased colonization of invasive species
  - Urban fragmentation



(UW Sea Grant)

# Impacts from Development on Erosion, the Lake, etc.

- Bluff Erosion Impacts
  - Development has slowed bluff erosion from waves
  - Bluff erosion continues due to poor planning/differed maintenance: surface water runoff, excess groundwater, vegetation, etc.
- Sediment Transport Impacts -> Lakebed Downcutting -> More Wave Energy Reaches the Shore



(UW Sea Grant)

# Comparing Steep Slope Regulations in the Villages of Glencoe and Kenilworth and Their Application in the Village of Winnetka

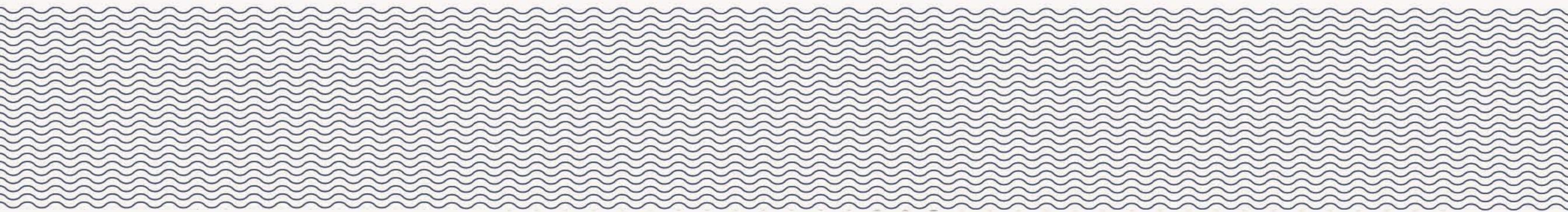
Village of Winnetka – Village Council Study Session

September 12, 2023

# Presentation Outline

- Steep Slope Regulations in Adjacent Communities
- Village of Winnetka Steep Slope Zone Description
- Adjacent Communities Steep Slope Regulations Application in the Village of Winnetka

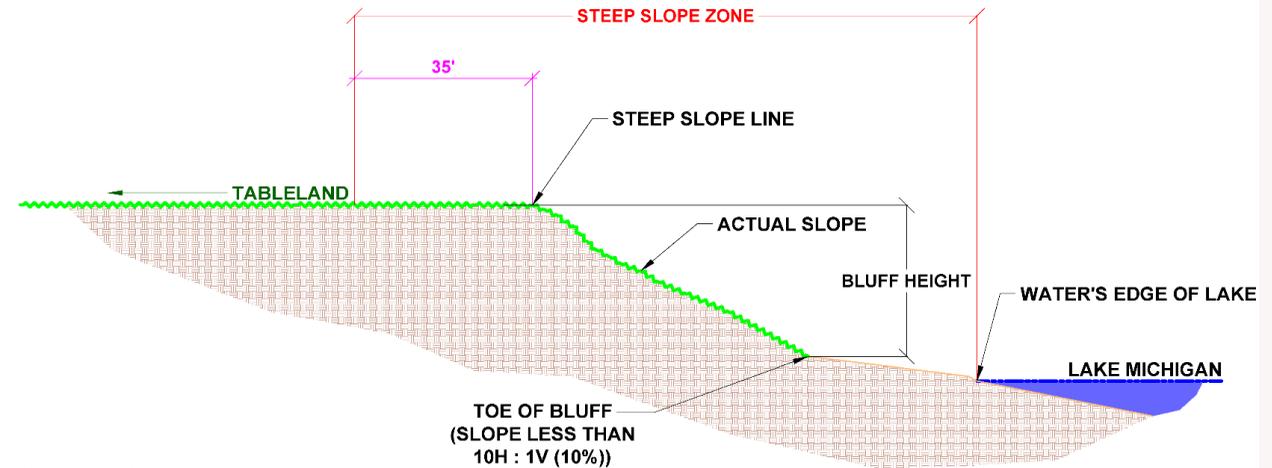
# **Steep Slope Regulations in Adjacent Communities**



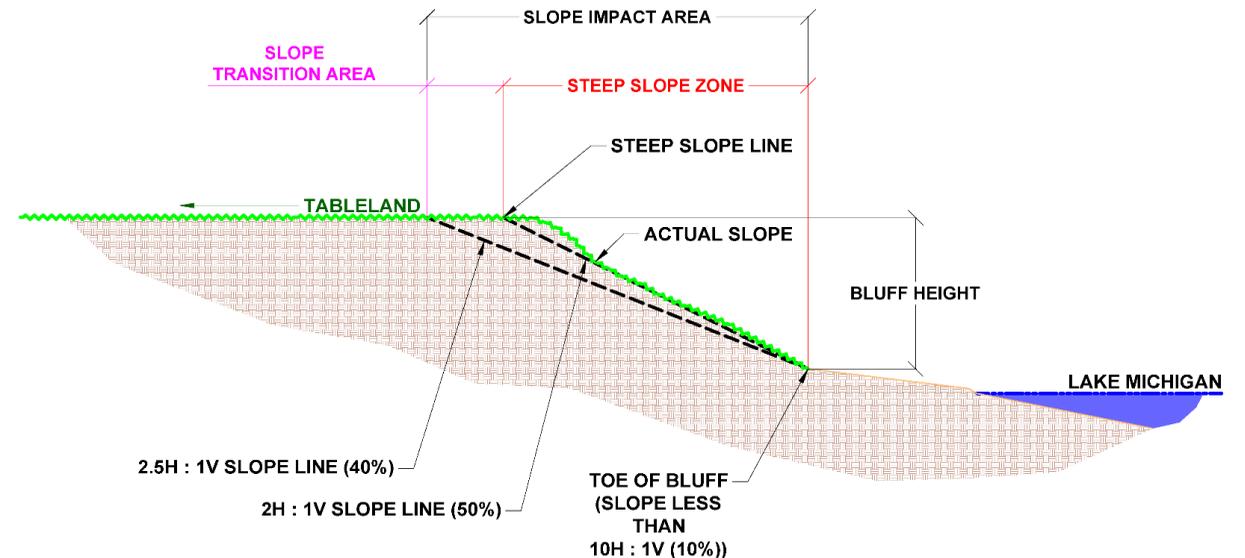
# Key Steep Slope Regulation Definitions

- Bluff
- Table Land
- Toe of Bluff
- Steep Slope Line
- Steep Slope Zone
- Slope Transition Area
- Slope Impact Area

KENILWORTH REGULATION



GLENCOE REGULATION



# Permitted Development in Kenilworth and Glencoe's **Steep Slope Zone** (Subject to Approval):

## Decks\*

- Unless exceptional engineering is provided, no more than
  - 100 sqft (Kenilworth)
  - 50 sqft (Glencoe)

## Retaining Walls

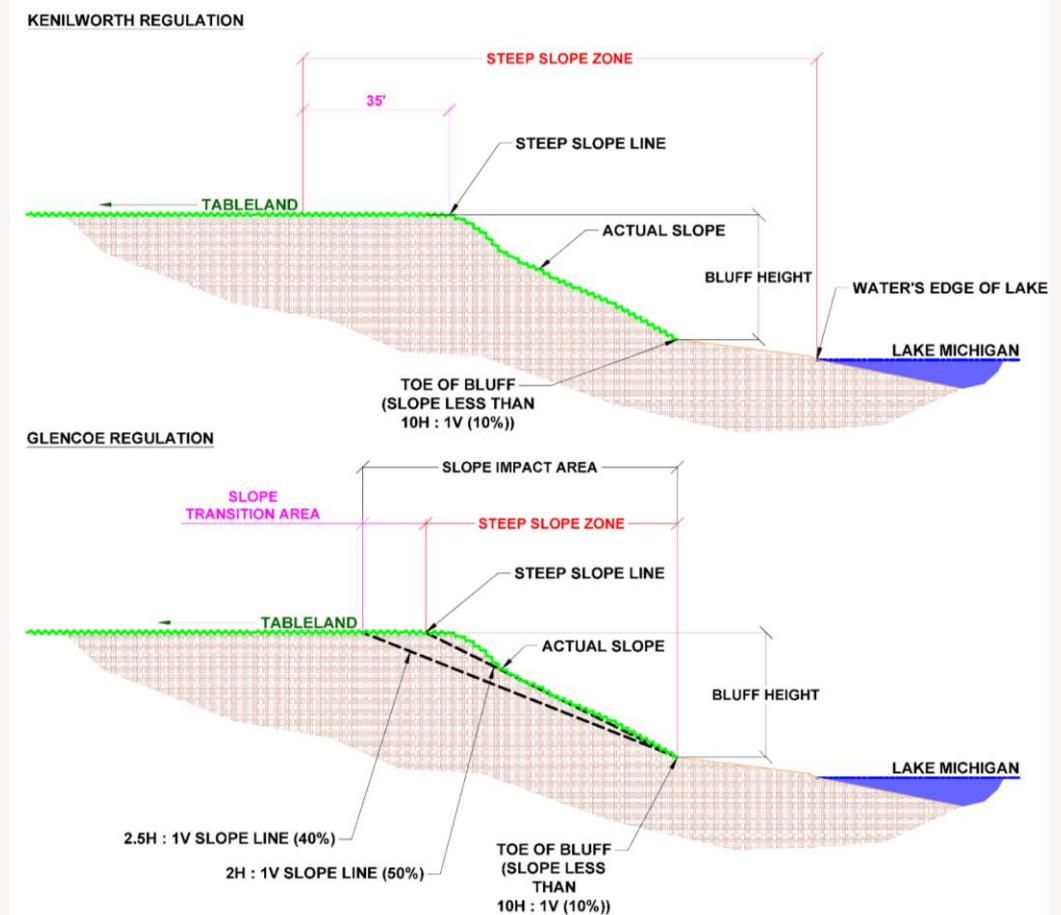
- When necessary for stabilization
- Can't increase or create tableland
- Backfilling allowed only for stabilization

## Rebuilt/Remodeled Structures

- Only on a suitable existing foundation
- Plans prepared by Architect or Engineer
- Can't increase footprint
- Can't increase height (Kenilworth)

## Stairs/Steps\*

- No more than 5' wide
- Landings no more than 50 sqft



## Mechanical or Electrical Lift, Bridge, and/or Walkway\*

## Fences\*

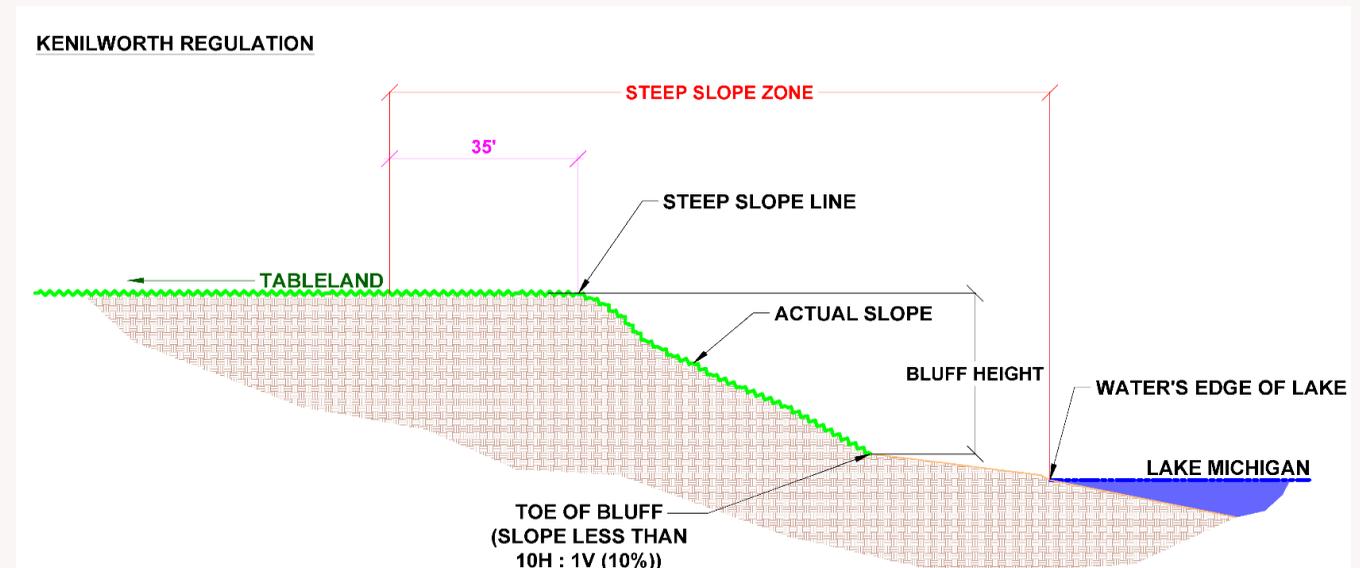
- Must Comply with all other Village Codes

\*Can't obstruct flow of light and air, or interfere with utility lines

# Additional Permitted Development in Kenilworth's **Steep Slope Zone** (Subject to Approval):

## One Accessory Structure

- No larger than 150 sqft or taller than 11'
- Can't impact slope stability of the property or adjacent properties
- Can't be visible from adjacent tableland



# Additional Permitted Development in Glencoe's:

- Slope Transition Area

Any development otherwise authorized under codes, ordinances, and regulations of the village, pending the Director's review

- Steep Slope Zone  
(Subject to Approval)

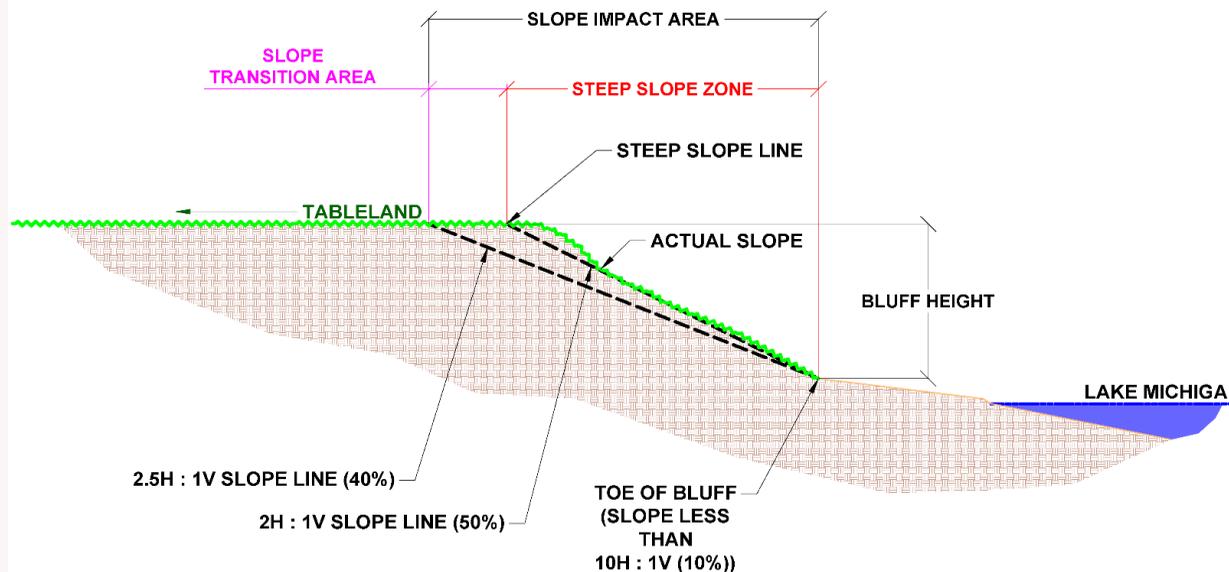
Boat Houses

- Director must determine the structure won't impact slope stability

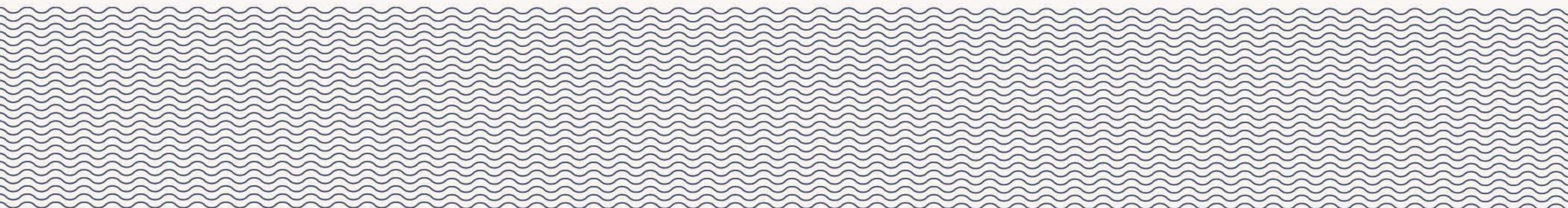
Cantilevering of Structures

- No more than 4' extension over the Zone unless otherwise limited by Code
- Can't block natural sunlight or alter natural stormwater drainage in a way that jeopardizes slope stability

GLENCOE REGULATION



# **Village of Winnetka Steep Slope Zone Description**



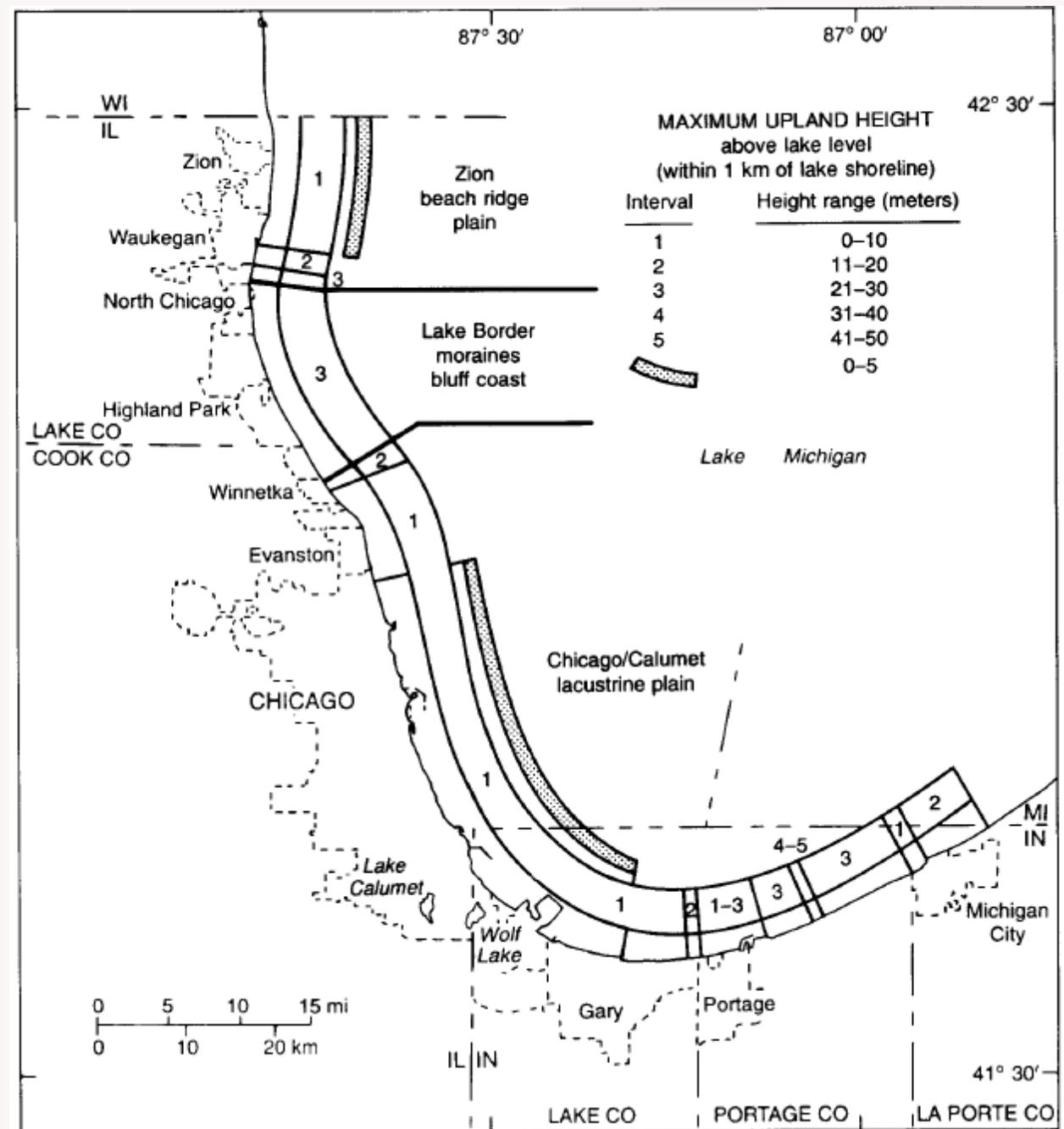
# Winnetka Shoreline Characterization

- Bluff height varies significantly from North to South
- Slope (or factor of safety / bluff stability) varies significantly as well



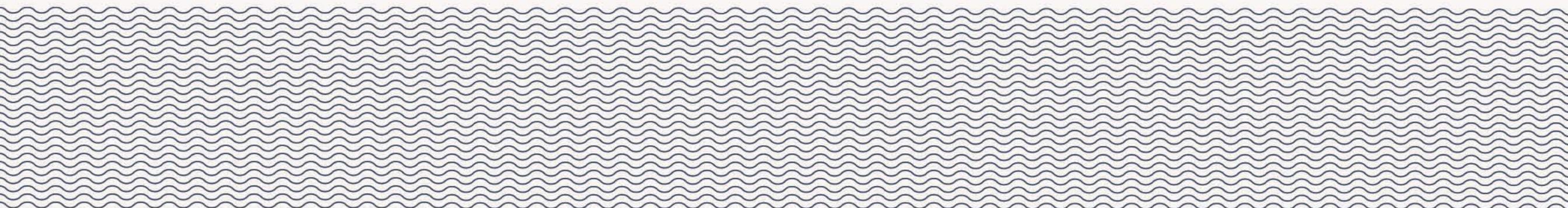
# Winnetka Geomorphic Area

- Winnetka - located within the transition from the Lake Border moraine bluff coast and the Chicago/Calumet lacustrine plain which contributes to a variable bluff height.
- Glencoe - Lake Border moraine bluff coast.
- Kenilworth - Chicago/Calumet lacustrine plain.



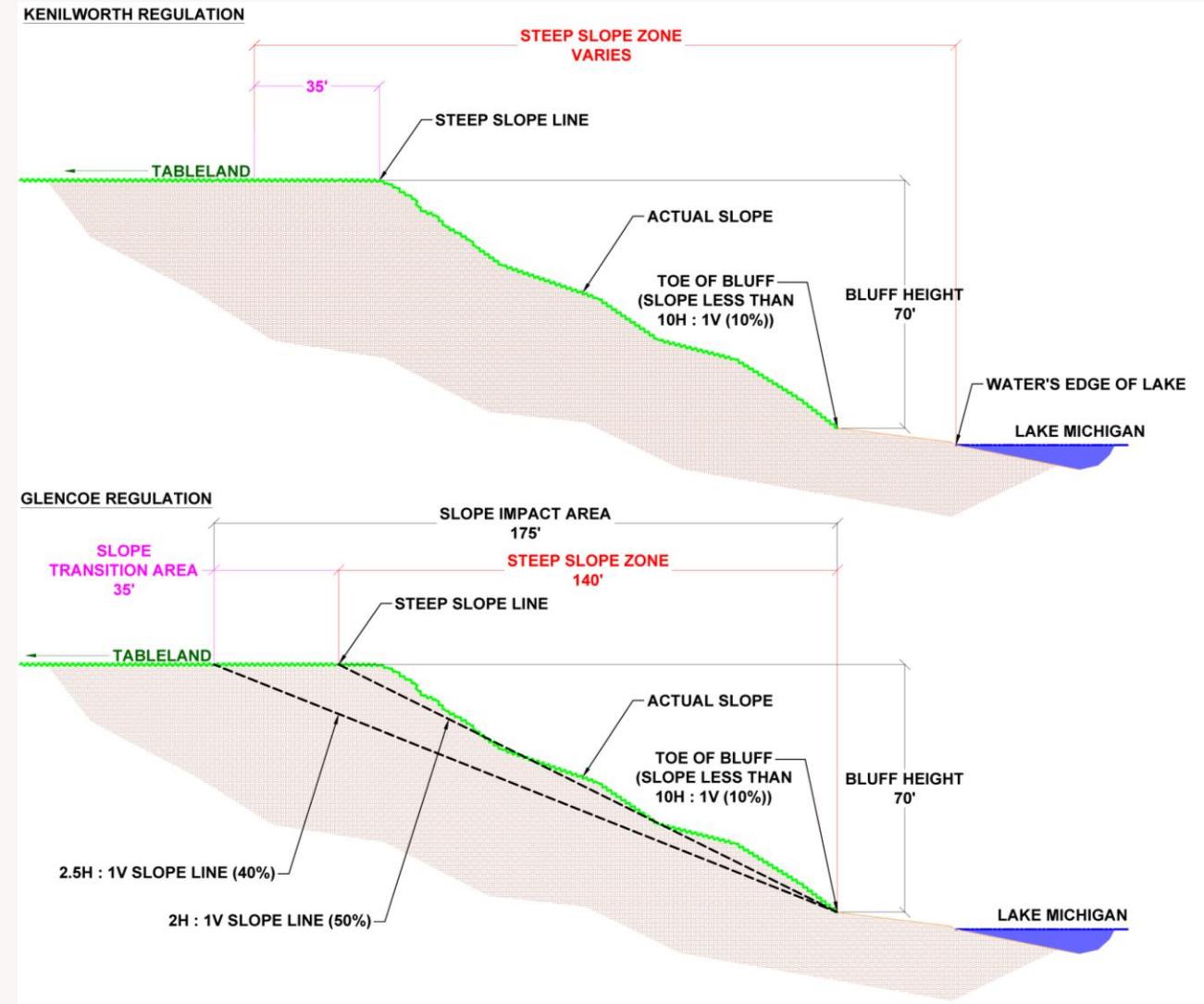
(Chrzastowski, 1994)

# **Application of Adjacent Communities Steep Slope Regulations in the Village of Winnetka**



# 70-Foot Bluff Height 2H : 1V Slope Line (50%) Regulated Area Example

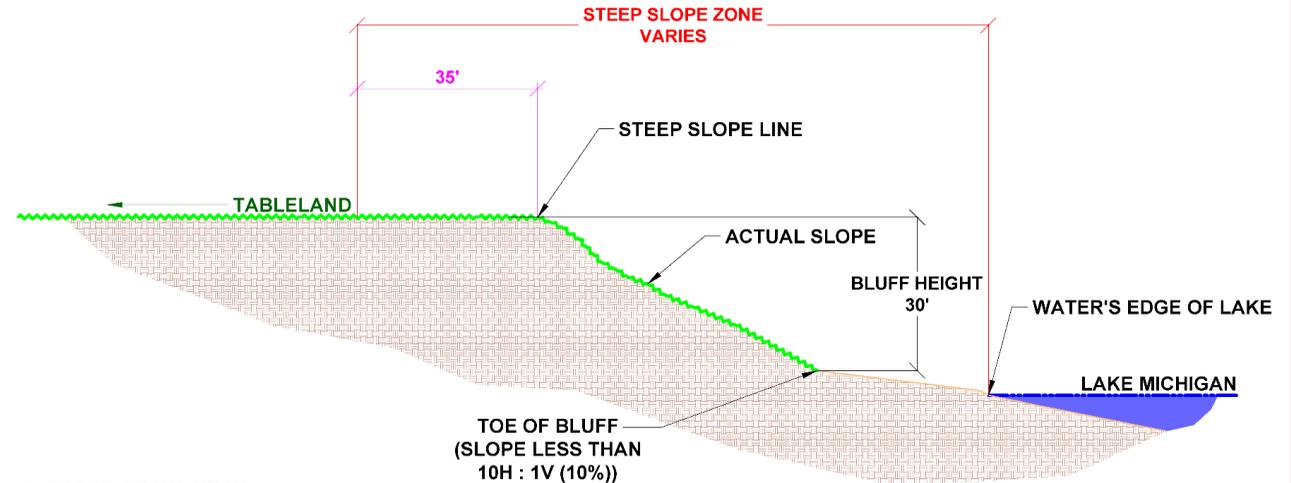
- Results:
  - The Steep Slope Zone regulations in Kenilworth are applied farther upland on the Table Land than Steep Slope Zone regulation in Glencoe.
  - The Slope Impact Zone (Steep Slope Zone + Slope Transition Area) regulations in Glencoe are applied farther upland on the Table Land than Steep Slope Zone regulations in Kenilworth.



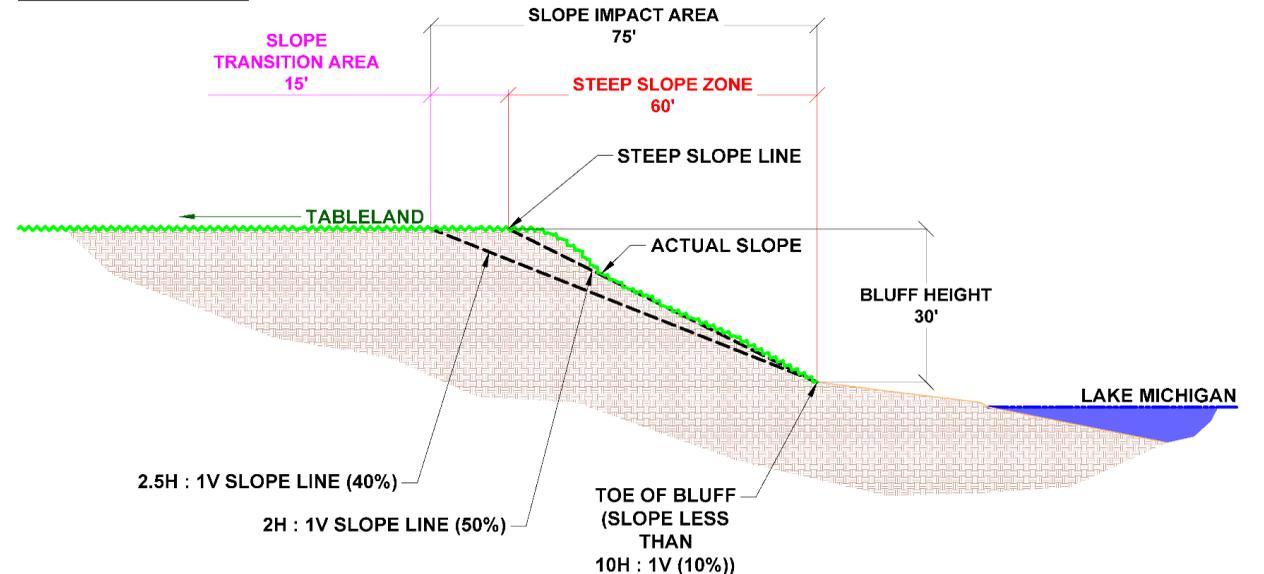
# 30-Foot Bluff Height 2H : 1V Slope Line (50%) Regulated Area Example

- Result: Steep Slope Zone regulations in Kenilworth are applied farther upland on the Table Land than the Steep Slope Zone and Slope Impact Zone regulations in Glencoe.

**KENILWORTH REGULATION**

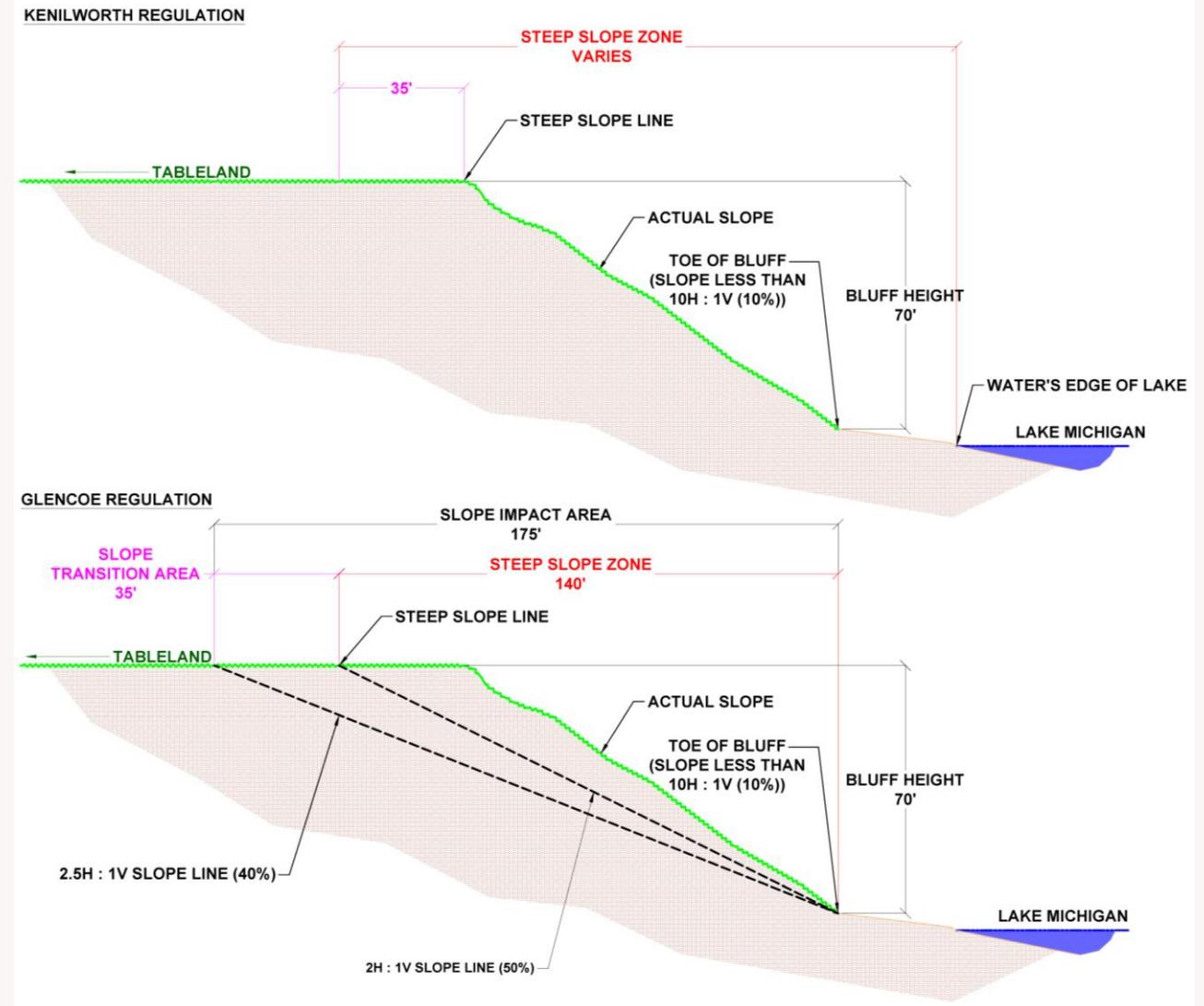


**GLENCOE REGULATION**



# 70-Foot Bluff Height 1.5H : 1V Slope Line (67%) Regulated Area Example

- Over-steepened slope example
- Results:
  - The Steep Slope Zone regulations in Kenilworth and Glencoe are applied across an equivalent area on the Table Land.
  - The Slope Transition Area regulations in Glencoe are applied farther upland on the Table Land than the Steep Slope Zone regulations in Kenilworth.



# Design Minimum Factors of Safety for Coastal Slopes in the Great Lakes (OMNR, 2001)

Land Use	Design Minimum Factor of Safety <sup>1</sup>
<b>Passive.</b> Fields, woods, forest, etc. No buildings near slope.	1.1
<b>Light.</b> Recreational parks, golf courses, barns, garages, swimming pools, sheds, buried small utilities, gazebos, satellite dishes, dog houses, etc. No habitable structures near slope.	1.2-1.3
<b>Active.</b> Habitable or occupied structures near slope; residential, commercial, industrial buildings, retaining walls, etc.	1.3-1.5
<b>Public Use.</b> Structures and services for public use; hospitals, schools, etc.	1.4-1.5

Approximate Equivalent Slope for Typical Regional Bluff<sup>2</sup>

2 H : 1 V  
(50%)



2.5 H : 1 V  
(40%)

<sup>1</sup>Factor of Safety is the ratio of the forces promoting failure to the forces resisting failure. A Factor of Safety less than one means the bluff is susceptible to failure under the design conditions.

<sup>2</sup>Values provided are for information only. The actual factor of safety on a bluff slope depends on a variety of site-specific factors including subsurface conditions, surface water management, groundwater management, vegetation, bluff toe protection, etc. and will vary significantly. Consult with a licensed geotechnical engineer.

# Questions?

## References

- Village of Glencoe Ordinance No. 2013-13-3343
- Village of Kenilworth Ordinance No. 1163
- Kenilworth Village Code, Chapter 154
- Ontario Ministry of Natural Resources. (2001) “Stable slopes—geotechnical principles.” *In Great Lakes-St. Lawrence River System and Large Inland Lakes.*
- Chrzastowski, Michael J., et al. “Coastal Geomorphology and littoral cell divisions along the Illinois-indiana coast of Lake Michigan.” *Journal of Great Lakes Research*, vol. 20, no. 1, 1994, pp. 27–43.

**Baird.**

Innovation Engineered.