V Zones: Coming Soon to a Great Lake Near You Introduction to Coastal High Hazard Areas for Illinois Stakeholders

March 2019







So you're getting new maps...

...and they have new zones (VE zones) on them.

Now what?



Erie County PA, effective 6/7/17



Frank Shockey

You need to know about:

What makes coastal flooding different from riverine flooding;

 Finding relevant data for floodplain management in coastal areas;

 Floodplain management standards for coastal high-hazard areas.



NFIP participating communities:

 Will need to adopt floodplain management regulations that meet NFIP standards for coastal high-hazard areas. 44 C.F.R. § 60.3(e)

 In Illinois, FEMA and Illinois DNR will work with Lake County SMC and affected Cook County communities to revise floodplain management regulations to meet these standards.





Basics of coastal flooding I. COASTAL FLOODING



How is coastal flooding different from riverine and lacustrine flooding?

- A river floods when the discharge exceeds the capacity of the channel and it overflows its banks into areas that are "normally" dry.
- A pond or small lake floods when the water level rises above the ordinary high water mark and overflows onto normally dry land areas.

 In both cases, the usual primary hazards to property (i.e. buildings and their contents) are the hydrostatic and buoyant forces from the rising water, and the fact that stuff gets wet.



Coastal flooding:



- Currents
- Waves
- Wind



Coasts flood when storm surge (rising water) combines with wave effects (runup, overtopping, and/or overland wave propagation) to inundate normally dry land areas.



Coastal flooding in the Great Lakes

- Tidal variation in Great Lakes is negligible
- Water levels do vary over long periods (years and decades) and seasonally (month to month)
- Storm events, varying atmospheric pressure, and wind-driven wave setup can produce storm surge over short periods (hours)
- Presence of ice cover may reduce the effects of storm events on water levels
- Great Lakes studies account for all of these probabilities



Rising water + waves

- In addition to rising water (surge plus wave setup), coastal flood hazards include some component of onshore wave effects.
- Generally, where the coastal topography is inundated by the rising water, the onshore wave component will include <u>wave</u> <u>heights</u> and may include <u>overland wave propagation</u>.
- Generally, where the slope is steeper or where there is a bluff face or vertical wall close to the shoreline, the onshore wave component will include <u>wave runup</u> where runup height is 3 feet or more.
- If runup exceeds the barrier crest height by 3 feet or more, landward of the barrier is an <u>overtopping splash zone</u>.





Wave runup





Wave runup/overtopping:

 Click on link for video of wave runup and overtopping example (Aberystwyth, Wales UK, 2014)

 Second link is Minnesota's Lake Superior coast in October 2018

https://www.youtube.com/watch?v=v0OKbJaLsk4

https://www.duluthnewstribune.com/video/X6NH4aZy



What does this look like on a map?



Additional forces acting on buildings in coastal areas

Hydrodynamic forces

- Velocity flow
- Breaking waves
- Wave uplift

High winds

- Lateral
- Uplift

Debris

- Windborne
- Waterborne

Erosion and scour







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Not in the SFHA = No flood risk





Not just rising water





Waves and debris impacts







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No flood risk in any of these places...











Additional, different damaging forces

- Several additional forces can act on buildings in a coastal flood hazard area, including hydrodynamic forces, waves, and winds.
 - Also debris impacts, generalized erosion and localized scour.

Additional, different regulations to protect buildings.

 Don't plan for the best case of the worst case: plan for the worst case of the worst case.



	407850	ZONE AE			TABLE 5	- SUMMARY OF COAS	TAL STILLWATE	R ELEVATIONS	- continued	
	AD7850	(EL 11)						ELEVATION	(feet NAVD#)	
	STREET		FLOO	DDING SOU	JRCE AND LO	OCATION	10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
LAGO LAGO SECONDS										
STREET THIRD	$\land //$	ÅD1372	SAN	CARLOS B	AY	h Daaah	5.2	10.0	11.5	14.0
OLD SAN		ZONE AE	Betw	veen Funda r	Beach and Bod	witch Point	5.4	9.8	11.3	14.0
BOULEVARD	st III	(EL 10)								
$X \setminus X \setminus (Y \setminus Y)$	38	000	GULI	F OF MEXI	CO	··				
		TABLE 7 - TRANSECT D	ESCRIPTIONS	- continued		ge Avenue on	4.9	9.7	11.3	14.3
			STILLWA	TER ELEVATIO	N IN FEET	Island and Big				
(EL 16)	TRANSECT	LOCATION	10-PERCENT	(NAVD 88) 1-PERCENT	WAVE CREST	Dass	4.9	9.6	11.2	14.3
Town of	8	At the intersection of Sand Drift Road.				y Pass	5.2	8.8	11.5	14.3
Fort Myors Pageh ZONE VE	9	and South Seas Plantation Road At the intersection of Sea Turtle Court	4.52	10.52*	16.17	nty boundary	4.8	8.9	11.3	13.2
120672	10	and South Seas Plantation Road About 1 mile from intersection of	4.52	10.522	16.17	section of Bonita				
120073	- 11	Captiva Road and Murmond Lane Extends through DEP monument number	4.52	10.522	16.17	nd along the	4.8	8.9	11.3	13.2
(EL 17)	12	R-104 About 4,000 feet south of the	4.52	10.522	16.17	ntersection of				
		Intersection of Wulfert Road and Troon Court, through Clam Bayou	4.12	10.62 ³	16.32	soulevard along the	4.8	8.9	11.3	13.2
CRESCENT STR	E	About 2,700 feet southwest of the intersection of Buckthorn Lane and				ntersection of				
	14	At the intersection of White Ibis Road	4.12	9.82	15.10	Boulevard along the	4.9	8.0	0.0	NIA
	15	At the intersection of Sawgrass Place	4.12	9.82	15.10		4.8	8.9	9.9	IN/A
	16	About 300 feet east from the intersection	4.12	11.22	17.24					
	17	About 150 feet east from the intersection	4.12	11.22	17.24					
	18	Gulf Drive	4.52	12.72 ²	19.53					
	10	and Lindgren Boulevard	4.72	12.82 ²	19.68					
	20	of Spoon Bill Court and East Gulf Drive	4.92	13.22 ²	20.29					
	20	Sanibel Island	4.92	13.22 ²	20.29					
	21	and Matanzas Court	4.92	12.82 ³	19.68					

NFIP Coastal FIRM and FIS Data

21.5

100 ft east of the intersection of Estero

Boulevard and Fishermans Wharf Drive

II. FLOODPLAIN MANAGEMENT USING COASTAL DATA



12.82³

19.68

Riverine BFE: Cross Sections and Profiles





FLOODING SOU	RCE	FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)					
CROSS SECTION	DISTANCE ¹	WIDTH AREA (FEET) (SQUARE FEET)		MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE		
Rock River (continued)										
113.14	113.14	1,330	16,477	3.6	679.4	679.4	679.4	0.0		
114.17	114.17	1,027	14,595	4.1	680.3	680.3	680.3	0.0		
115.75	115.75	1,170	13,736	4.4	681.0	681.0	681.0	0.0		
116.94	116.94	903	14,961	4.0	681.7	681.7	681.8	0.1		
118.34	118.34	1,127	14,560	4.1	682.6	682.6	682.6	0.0		
119.17	119.17	681	12,023	5.0	683.1	683.1	683.2	0.1		
120.87	120.87	1,141	12,768	4.7	684.1	684.1	684.1	0.0		
121.34	121.34	1,177	19,189	3.1	684.8	684.8	684.9	0.1		
121.73	121.73	962	13,850	4.3	684.9	684.9	685.0	0.1		
122.19	122.19	1,110	13,441	4.5	685.3	685.3	685.4	0.1		
123.62	123.62	1,075	11,645	5.2	686.4	686.4	686.4	0.0		
124.23	124.23	730	11,275	5.3	686.9	686.9	686.9	0.0		
124.96	124.96	575	10,393	5.8	687.4	687.4	687.5	0.1		
125.94	125.94	555	9,444	6.4	688.2	688.2	688.2	0.0		
126.50	126.50	866	14,045	4.3	688.9	688.9	689.0	0.1		
127.22	127.22	814	11,513	5.2	689.9	689.9	689.9	0.0		
127.81	127.81	680	10,505	5.7	690.4	690.4	690.5	0.1		
128.87	128.87	945	13,010	4.6	691.7	691.7	691.7	0.0		

Miles above confluence with Mississippi River

1	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	OGLE COUNTY, IL AND INCORPORATED AREAS	ROCK RIVER
	Turada	March 10, 2010



Coastal BFE: Where's the Base Flood Elevation?



TABLE 7 - TRANSECT DESCRIPTIONS - continued

		STILLWATER ELEVATION IN FEET (NAVD 88)					
RANSECT	LOCATION	10-PERCENT	1-PERCENT	WAVE CREST			
8	At the intersection of Sand Drift Road.						
	and South Seas Plantation Road	4.52	10.522	16.17			
9	At the intersection of Sea Turtle Court		and the second				
	and South Seas Plantation Road	4.52	10.522	16.17			
10	About 1 mile from intersection of						
	Captiva Road and Murmond Lane	4.52	10.522	16.17			
11	Extends through DEP monument number		100000				
	R-104	4.52	10.522	16.17			
12	About 4,000 feet south of the						
	intersection of Wulfert Road and Troon		1923				
	Court, through Clam Bayou	4.12	10.623	16.32			
13	About 2,700 feet southwest of the						
	intersection of Buckthorn Lane and						
	Sanibel Captiva Road	4.12	9.82	15.10			
14	At the intersection of White Ibis Road						
	and Watersedge Lane	4.12	9.823	15.10			
15	At the intersection of Sawgrass Place						
	and West Gulf Drive	4.12	11.22	17.24			
16	About 300 feet east from the intersection		10000000000				
	of Daniels Drive and West Gulf Drive	4.12	11.22*	17.24			
17	About 150 feet east from the intersection						
	of Olde Middle Gulf Drive and Middle						
	Gulf Drive	4.52	12.722	19.53			
18	At the intersection of Sand Dollar Drive		10000				
	and Lindgren Boulevard	4.72	12.822	19.68			
19	About 70 feet east from the intersection		2.222.03471				
	of Spoon Bill Court and East Gulf Drive	4.92	13.222	20.29			
20	About 300 feet west of the end of						
1210	Sanibel Island	4.92	13.222	20.29			
21	At the intersection of Matanzas Street						
337313	and Matanzas Court	4.92	12.823	19.68			
21.5	100 ft east of the intersection of Estero						
	Boulevard and Fishermans Wharf Drive	4.92	12.82 ³	19.68			



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TABLE 5 - SUMMARY OF COASTAL STILLWATER ELEVATIONS - continued

	ELEVATION (feet NAVD*)							
FLOODING SOURCE AND LOCATION	10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT				
SAN CARLOS BAY								
Between Punta Rassa and Bunch Beach	5.2	10.0	11.5	14.0				
Between Bunch Beach and Bodwitch Point	5.4	9.8	11.3	14.1				
GULF OF MEXICO								
Between Bodwitch Point and Cottage Avenue on								
Estero Island	4.9	9.7	11.3	14.3				
Between Cottage Avenue on Estero Island and Big								
Carlos Pass	4.9	9.6	11.2	14.3				
Between Big Carlos Pass and New Pass	4.1	9.8	11.7	14.8				
Between New Pass and Big Hickory Pass	5.2	8.8	11.5	14.3				
Between Big Hickory Pass and county boundary	4.8	8.9	11.3	13.2				
About 1 mile northwest of the intersection of Bonita								
Beach Road and Hickory Boulevard along the								
shoreline	4.8	8.9	11.3	13.2				
About 2,400 feet northwest of the intersection of								
Bonita Beach Road and Hickory Boulevard along the								
shoreline	4.8	8.9	11.3	13.2				
About 1,950 feet southeast of the intersection of								
Bonita Beach Road and Hickory Boulevard along the								
shoreline	4.8	8.9	9.9	N/A				

TABLE 8 - TRANSECT DATA - continued

FLOODING	TRANSECT	STILL 10-PERCENT	WATER ELEV	ATION (feet -PERCENT	NAVD*) 0.2-PERCENT	ZONE	BASE FLOOD ELEVATION (feet NAVD*)
Gulf of Mexico	17	4.5	N/A	12.8 ²	N/A	VE	14-20
						AE	11-14
Pine Island Soun	d	3.1	N/A	6.5	N/A	VE	9-11
						AE	7-9
Matlacha Pass		3.5	N/A	7.3	9.3	VE	9-11
						AE	7-9
Gulf of Mexico	18	47	N/A	13.2 ²	N/A	VE	15-20
oun of mexico	10		14/1	1012	16/4	AE	12-15
Pine Island Soun	d	3.1	N/A	65	N/A	VE	10-11
The Island South		211	1.011	0.2	1011	AE	8-10
Matlacha Pass		3.5	N/A	7.3	9.3	VE	9-11
						AE	7-9
Gulf of Mexico	19	4.9	N/A	13.2^{2}	N/A	VE	15-20
						AE	12-15
Matlacha Pass		3.5	N/A	7.3	9.3	VE	9-11
						AE	7-9
Gulf of Mexico	20	4.9	N/A	13.24	N/A	VE	15-20
						AE	12-15
Matlacha Pass		3.5	N/A	7.3	9.3	VE	9-11
						AE	7-9
Cult of Manian	21	4.0	0.7	10.02	14.2	VE	14.20
Out of Mexico	21	4.9	9.7	12.0	14.5	AE	14-20
Estars Barr		2.6	NI/A	0.4	12.2	NE	13-14
Estero Bay		2.5	19/74	9.4	13.2	AE	0.10
						AL	9-10
Gulf of Mexico	21.5	49	97	12.8^{2}	14.3	VE	13.20
oun of Mexico	21.0	4.9	2.7	12.0	14.5	AE	10-13
Fatero Bay		2.5	N/A	94	13.2	AE	10-13
Estero Day		2.0	14/75	2.4	1.0.2	AD	10-11

The BFE is the number ON THE MAP for the area bounded by the gutter lines





What if the site crosses over the gutter lines?

And therefore has multiple BFEs?

Or multiple flood zones (VE, AE, AO...)?

 Always use the more hazardous zone for the area encompassed by the development.

Always use the highest BFE for the area encompassed by the development.

 If the development is a building, the whole building needs to meet the requirements for the most hazardous zone and highest BFE that applies to any part of the building.



Where's the floodway? How do I show there's no rise?

In locations where the 1%-annual-chance flood is solely the result of coastal flooding effects, there is no floodway.

The floodway concept applies to areas where there is flow in a channel.



Designing and building a compliant building in a coastal high-hazard area

Coastal high-hazard means Zone VE

Not a simple matter of "raising it up high enough."

- A qualified design professional will need to be involved.
- Relies on data from the FIRM and FIS, and on that design professional's calculations and judgments.

 Much guidance on this topic is in FEMA's Coastal Construction Manual (FEMA 55), and companion publications.



Zone AO with depth number





Lorain County, OH Prelim FIRM

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AO zone regulations (review)

- Elevate lowest floor, including basement, of new construction and substantial improvements to or above the <u>depth number</u> specified on the FIRM (or 2 feet if not specified), measured from the <u>highest adjacent natural grade</u>.
- Community needs to keep a record of the natural grade prior to construction in order to document that construction in Zone AO was compliant.
- KEEP A RECORD OF THE NATURAL GRADE PRIOR TO CONSTRUCTION!





Minimum NFIP Provisions, Building Codes, and Consensus Engineering Standards

III. FLOODPLAIN MANAGEMENT STANDARDS IN COASTAL ZONES



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NFIP Floodplain Management Standards for Coastal High Hazard Areas (highlights)

44 CFR §60.3(e):

"When the Federal Insurance Administrator [...] has identified on the community's FIRM coastal high hazard areas by designating Zones V1-30, VE, and/or V, the community shall: [...]"



Remember the staircase from E273?



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60.3(e)(4)(i)

 "Provide that all new construction and substantial improvements in Zone[...] VE [...] on the community's FIRM are elevated on pilings and columns so that (i) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level[...]"





Where's the bottom of the lowest horizontal structural member?













60.3(e)(4)(ii)

 "[...] and (ii) the pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of <u>wind and water loads</u> <u>acting simultaneously on all building components</u>. Water loading values shall be those associated with the base flood. Wind loading values shall be those required by applicable State or local building standards." (emphasis added)

104.2.1; 1612.1; 1612.4 (through reference to ASCE 24); R322.3; R322.3.2; R322.3.3





"A registered professional engineer shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of paragraphs (e)(4)(i) and (ii) of this section."

"accepted standards of practice":

ASCE/SEI 7-16 Minimum Design Loads for Buildings and Other Structures

ASCE/SEI 24-14 Flood Resistant Design and Construction



1612.5(2.2); R322.3.3; R322.3.6

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Continuous load path:



"Superstorm" Sandy November 2012



60.3(e)(5)

"Provide that all new construction and substantial improvements within Zone[...] VE [...] on the community's FIRM have the space below the lowest floor <u>either free of obstruction</u> or constructed with <u>non-supporting breakaway walls</u>, <u>open wood</u> <u>lattice-work</u>, or <u>insect screening</u> intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system."





Wood lattice-work:

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Breakaway wall enclosures

"Such enclosed space shall be useable solely for parking of vehicles, building access, or storage."

Separate rooms?

"Roughed in" plumbing and electrical?

Windows and French doubledoors in "breakaway" walls?

What's that blue glow coming from the windows after dark?

Community must be diligent in ongoing enforcement.



FEMA



60.3(e)(6)

"Prohibit the use of fill for structural support of buildings within Zones V1-30, VE, and V on the community's FIRM." (emphasis









1612.4(through reference to ASCE 24; G401.2; R322.3.2(3)

Frank Shockey

Tuesday, March 19, 2019

No fill?

How am I going to get my LOMR-F so I can get out of paying for flood insurance?!

NO LOMR-F in Zone VE. End of discussion. NO BASEMENT in Zone VE. End of discussion.



Things to remember about floodplain management regulations in Zone VE:

- Elevate lowest horizontal supporting member to or above BFE on piling or column foundation, with space below open to present no obstruction, or enclosed only with breakaway walls/latticework
- NO FILL FOR STRUCTURAL SUPPORT
- NO DRY-FLOODPROOFING (see above)
- NO LOMR-F (see above)
- ENGINEERING is not optional
- NO, NO, NO, NO, NO BASEMENTS. <u>NO BASEMENTS</u>!



Residual risk \neq No risk

- Site is shown outside SFHA.
- Pre- and post-construction grade is below BFE.
 - Is there truly *no* risk of flooding during the base flood?
- How clearly is the site outside the SFHA? Is there no chance that a Flood Hazard Determination Vendor is going to call the building "in" the SFHA?

If you apply for a LOMA or LOMR-F and the lowest adjacent grade is below BFE, the result is a non-removal.



Amend-In and Deny

"non-removal"



Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP AMENDMENT DETERMINATION DOCUMENT (NON-REMOVAL)

		and the second second second								
	- Seele		ND MAP PANEL	INFORMATION	LEGAL PROPERTY DESCRIPTION					
		CITY OF SANDUSKY, ERIE COUNTY, OHIO		Units 385 through 388, Building 2 (North Building), Harbour Island Boathouse Condominium No. 1, as described in the Declaration of Condominium Ownership recorded as Document No. 0345596, in Volume 513, Pages 892 through 933, in the Office of the Recorder, Erie County, Ohio						
	TIME TAX	22-1	UNITY NO.: 390	156						
		NE-IU	BER: 39043C008	3D						
			: 8/28/2008							
	and the second	-	LAKE ERIE		APPROXIMATE LATI SOURCE OF LAT & L	TUDE & LONGIT ONG: GOOGLE	UDE OF PROPERT EARTH PRO	Y: 41.443, -82.673 C	DATUM: NAD 83	
					DETERMINATIO	N				
		SECTION	SUBDIVISION	STREET	OUTCOME WHAT IS NOT REMOVED FROM THE SFHA	FLOOD ZONE	1% ANNUAL CHANCE FLOOD ELEVATION (NAVD 88)	LOWEST ADJACENT GRADE ELEVATION (NAVD 88)	LOWEST LOT ELEVATION (NAVD 88)	
'supersedes		-	Harbour Island Boathouse Condominium	Portside Drive (Units 385-388)	Structure (Building 2)	AE	577.2 feet	565.3 feet	-	
previous	Spec equa	cial Flood Haz aled or exceede	ard Area (SFHA) d in any given yea) - The SFHA is an a r (base flood).	area that would be	inundated by	the flood havin	g a 1-percent c	hance of being	

ADDITIONAL CONSIDERATIONS (Please refer to the appropriate section on Attachment 1 for the additional considerations listed below.)

GREAT LAKES

SUPERSEDES PREVIOUS DETERMINATION



determination"

Coastal areas challenge conventional assumptions:

- There is not necessarily a viable engineering solution to every site-related factor.
- Wise subdivision practices, and wise siting decisions, can minimize the cost of building design and construction to resist anticipated coastal hazards.
- Following *only* the NFIP-minimum floodplain management regulations could allow design practices that could result in reduced coverage or very costly flood insurance premiums.
- Plan for the future events, not the past events:

http://www.geol.ucsb.edu/faculty/sylvester/UCSB_Beaches/IVCLIFFS/pillarhus.html



Resources:

- FEMA P-55 Coastal Construction Manual
 - https://www.fema.gov/media-library/assets/documents/3293
- FEMA P-499 Home Builder's Guide to Coastal Construction
 - https://www.fema.gov/media-library/assets/documents/6131
- FEMA P-762 Local Officials Guide for Coastal Construction
 - https://www.fema.gov/media-library/assets/documents/16036
- IS-386 Introduction to Residential Coastal Construction
 - https://training.fema.gov/is/coursematerials.aspx?code=IS-386
- https://www.fema.gov/coastal-flood-risk-resources



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> More training opportunities and outreach will be coming to NE Illinois and NW Indiana in the coming months.

QUESTIONS?





FEMA