

Assumptions, Misconceptions & Clarifications About Living Shorelines

2016 Delaware Living Shoreline Workshop

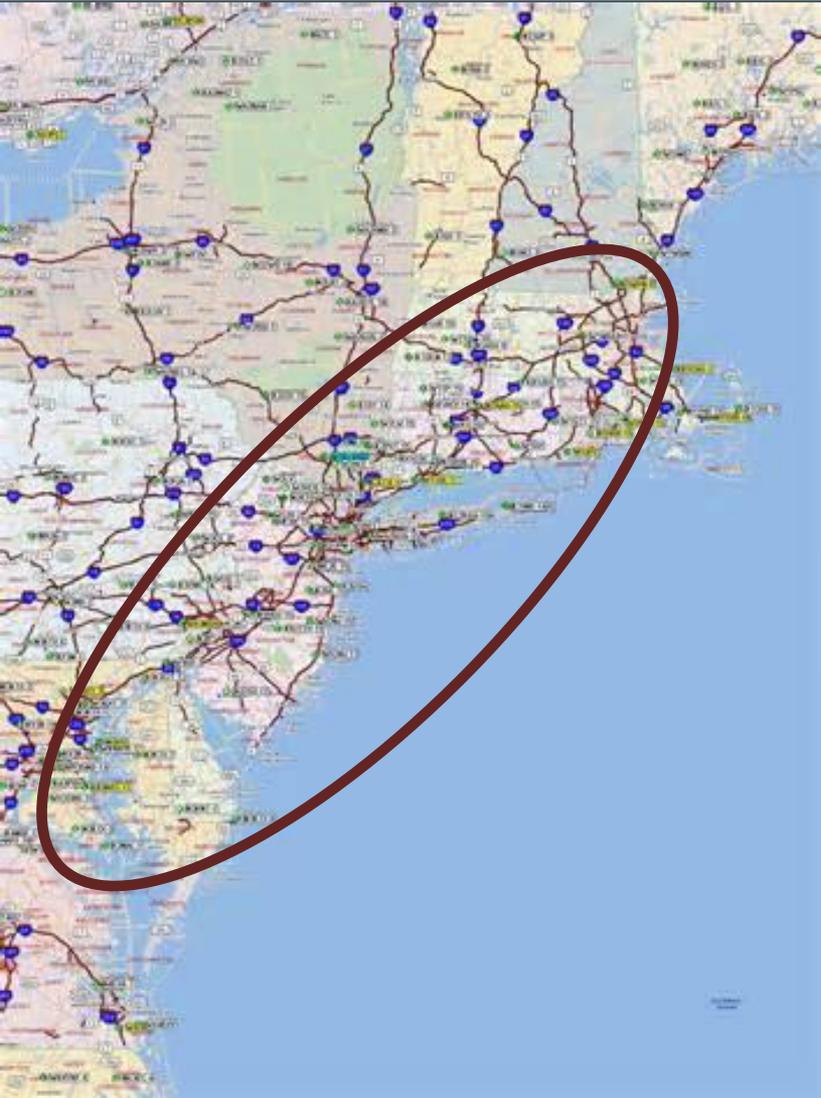
Douglas Janiec

Natural Resources Program Manager

& Senior Restoration Ecologist

Sovereign Consulting Inc.

Represented Living Shoreline & Energy Attenuation Throughout The Northeast (2014 -2015)



- D. Janiec. 2015. Natural Resilience and Living Shorelines: What are they and how do they work? 2015 Emergency Preparedness and Hazmat Response Conference, King of Prussia, **PA**. Workshop. October 23, 2015.
- D. Janiec. 2015. Shoreline Restoration and Natural Shoreline Resilience Using Standard and Hybrid Energy Attenuating Living Shorelines. Maryland-District of Columbia Utilities Association, 2015 Environmental Conference, Cambridge, **MD**. October 22, 2015.
- D. Janiec. 2015. Lessons Learned with Energy Attenuating Hybrid Living Shorelines. **New Jersey** Living Shoreline Workshop. June 10, 2015.
- D. Janiec. 2015. Restoration Project Management, Pit-falls and Lessons Learned. Presented to the Joint Base McGuire- Dix-Lakehurst (MDL), **NJ**. March 18, 2015.
- D. Janiec. 2015. Introduction to Sovereign & Technical Talk on Natural Shoreline Restoration and Resilience. Presented to the USFWS, Chesapeake Marshlands NWR Complex, **MD**. March 4, 2015.
- D. Janiec. 2015. A Talk on Waves, Wave Attenuation & Hybrid Living Shorelines. The State of **Delaware** Living Shoreline Training Workshop. February 26, 2015.
- D. Janiec. 2015. Energy Attenuation & Hybrid Living Shorelines: A Viable Tool for Coastal Resilience. Hot Topic Session, Delaware Estuary Science & Environmental Summit "Balancing Progress & Protection – 10 Years of Science in Action." January 28, 2015.
- D. Janiec. 2015. Panel Discussion. Monitoring Standards for Tidal Wetland Enhancement Projects. Special Session, Delaware Estuary Science & Environmental Summit "Balancing Progress & Protection – 10 Years of Science in Action." January 28, 2015.
- D. Janiec. 2015. Living Shoreline Treatments, Tactics, & Techniques in the Delaware Region. Restoration I Session, Delaware Estuary Science & Environmental Summit "Balancing Progress & Protection – 10 Years of Science in Action." January 27, 2015.
- D. Janiec. 2014. Inland Bays, Highlighted Topic No. 1: Management of Sediments for Improved Estuary Water Quality. Speaker on behalf of the Delaware Center for the Inland Bays, A Tale of Three Estuaries Conference, 4th Annual DEAWRA Symposium & 53 Annual WRA-DRB Conference, **DE**. November 12, 2014.
- D. Janiec. 2014. Wave Energy Attenuation. Guest Speaker at: Water Resources Association of the Delaware River Basin, Annual Board Meeting and Award Dinner. **PA** April 16, 2014.
- D. Janiec. 2014. Wave Attenuation Devices: A Linchpin to Maximized Coastal Resiliency and Ecological Function. Keynote Speaker at: Hampton Beach Coastal Erosion Control Workshop, **NH**. Know H2OW. April 10, 2014.
- D. Janiec. 2014. Wave Attenuation Devices: A Linchpin to Maximized Coastal Resiliency and Ecological Function. Keynote Speaker at: Cape Cod Coastal Erosion Control Workshop, **MA**. Know H2OW. April 9, 2014.
- D. Janiec. 2014. Wave Attenuation Devices: A Linchpin to Maximized Coastal Resiliency and Ecological Function. Keynote Speaker at: **Rhode Island** Coastal Erosion Control Workshop, Know H2OW. April 8, 2014.
- D. Janiec and W. Young. 2014. Hybrid Living Shorelines: A Systematic Approach to Maximized Coastal Resiliency and Ecology. Plenary Speaker at: Society of Ecological Restoration (SER) Mid-Atlantic Conference. March 21, 2014, **PA**.

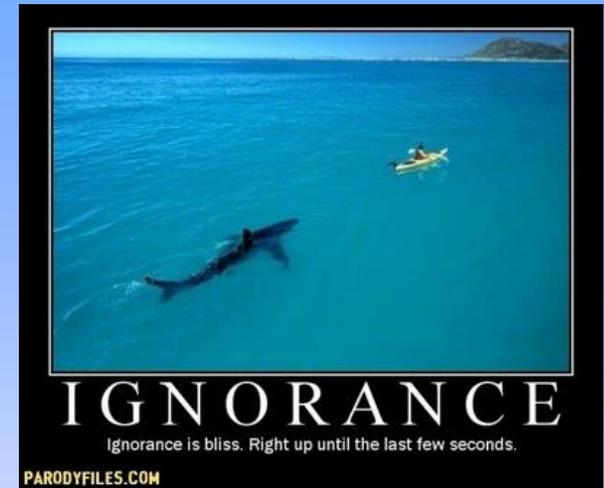


Let's do some sleuthing
Assumptions, Misconceptions & Clarifications
About Living Shorelines

Reoccurring Assumptions & Misconceptions About Living Shorelines = *Myths Or Fact*

How/why do these occur?

- Ignorance
- Competition
- Perspective
- Monkey See Monkey Do



Overdressed Scientists

Engineers (casual Friday)



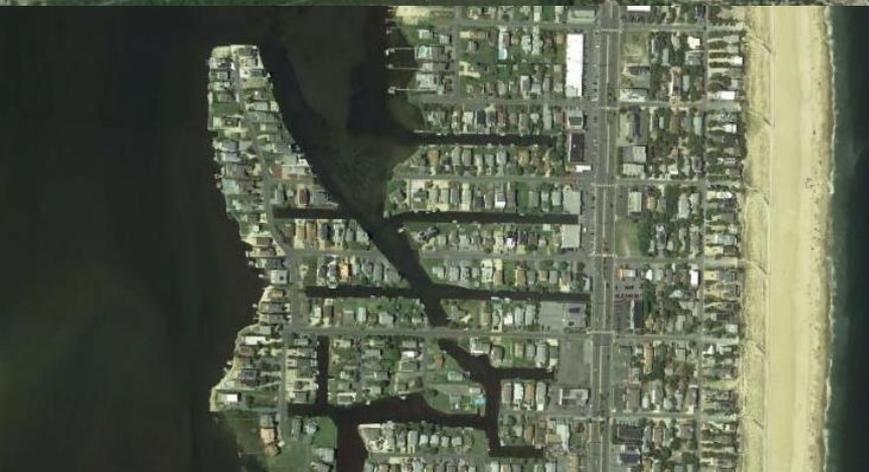
If I see it on the internet, it must be true.



QUICK POINT Energy Attenuation and Living Shorelines Come In Many Shapes and Sizes



Traditional **Stone/Walled** Tactics Have Specific Applications; Living Shorelines is Another Tool in the Toolbox



To Start With:

Wave Energy Attenuation and/or Attenuating Hybrid Living Shorelines ARE NOT Breakwaters (Stone/Walled Tactic)

- **It's a Monster misconception**
- **We need to look at how structures functionally interact with wave energy.**



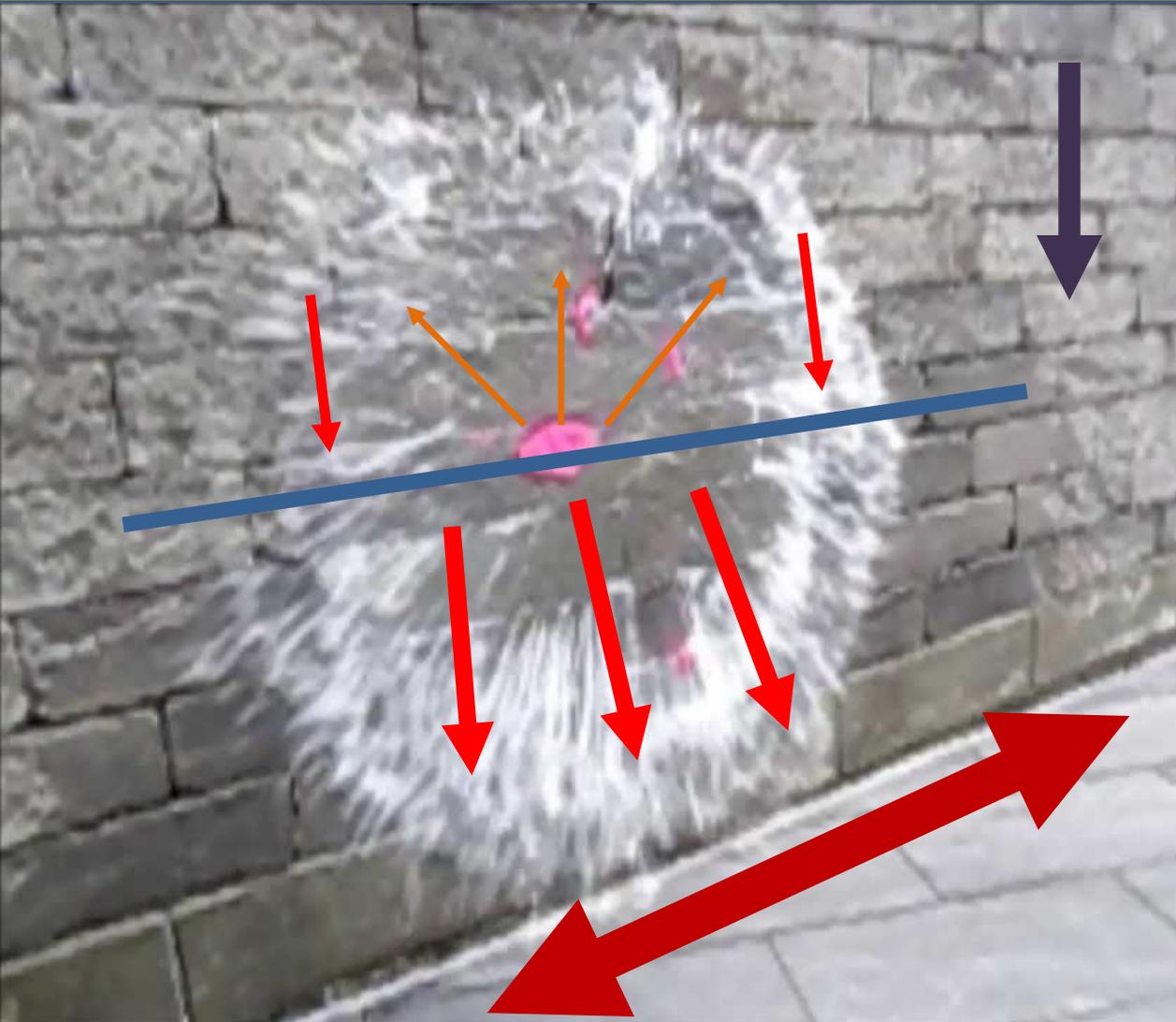
Breakwaters vs. Attenuation Structures

- Breakwaters provide a linear barrier to *redirect (manipulate) concentrated wave energy*.
- New attenuating technology *allows the wave to pass through the structure(s) as it attenuates (breaks up) the wave energies and creates an out of phase wave environment*.



When Water Hits A Wall

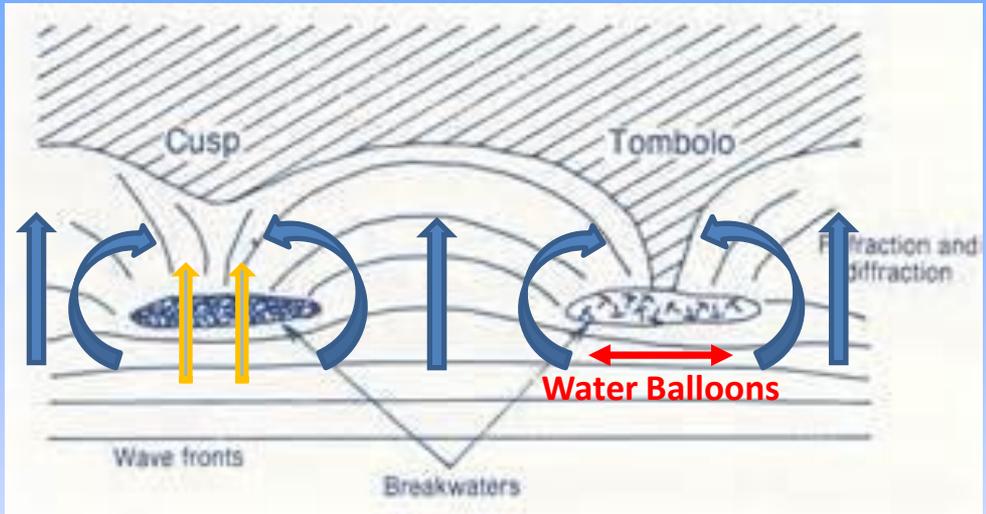
(A gross simplification of a wave hitting a stone/walled feature)



- Approximate displacement boundary
- Vertical displacement (splits water in balloon)
- Gravity forces water down
- Water starts concentrating at the base of the wall
- Concentrated water moves along the lower portion of wall (scour)



How Breakwaters Work



- Erosion Patterns (not accretion patterns).
- Much of the energy is concentrated.



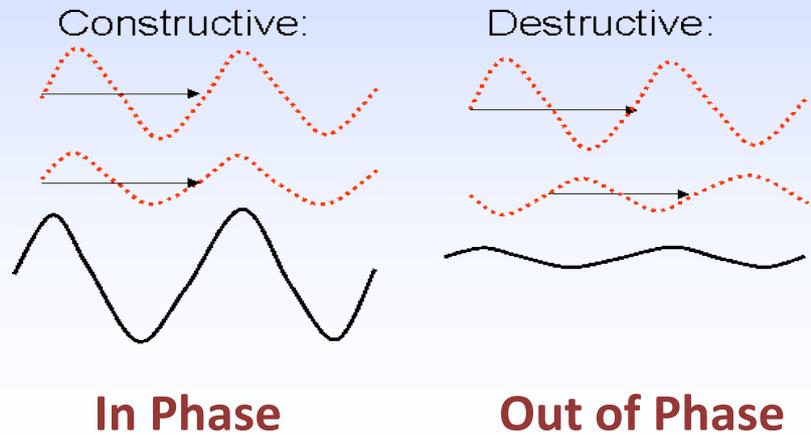
How Wave Attenuation Works



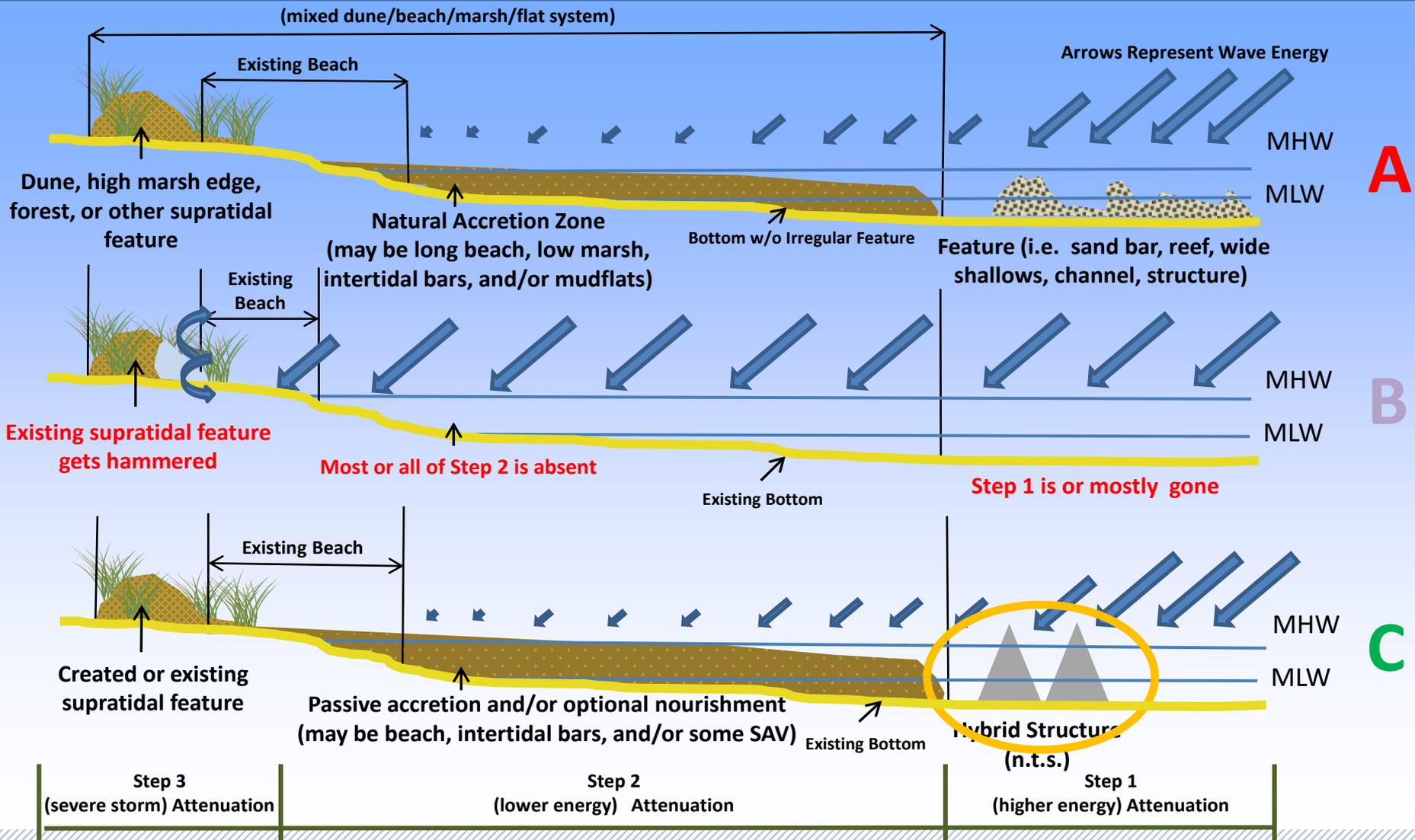
In simplest terms, a wave energy attenuation design:

- 1) Takes focused energy (waves) and breaks it up into many smaller units
- 2) Creates a destructive wave environment so that wave energies become out of phase.

The net result is vastly reduced wave energy impacts and typically the creation of accretion zones.



Energy Attenuation is a Natural System (Conceptual Cross Sections)

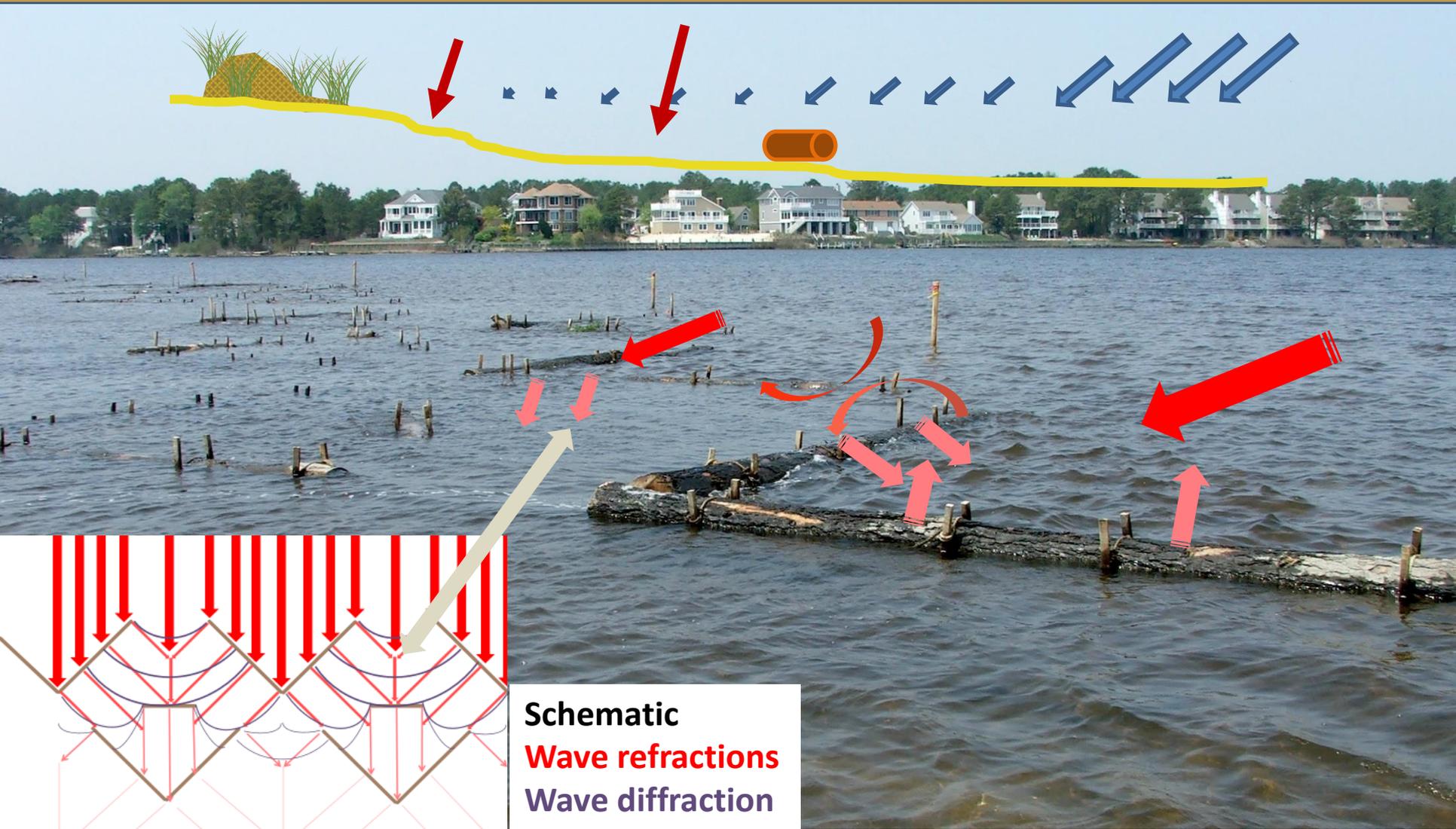


A – Ideal natural attenuation system; B - Commonly occurring condition; C – Hybrid system mimicking nature

DELSI – Conventional Living Shoreline – Low Energy



Cupped Wave Spreader – Moderate Energy Hybrid



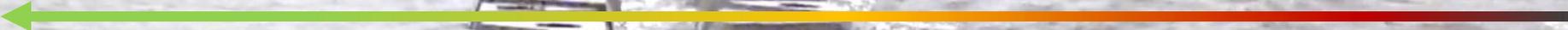
Schematic
Wave refractions
Wave diffraction

Thank you, Delaware Center for the Inland Bays for sharing

Energy Attenuation Using WADs – High Energy Hybrid

*Non-destructive
Dispersed Wave Energy*

*Destructive Focused
Wave Energy*

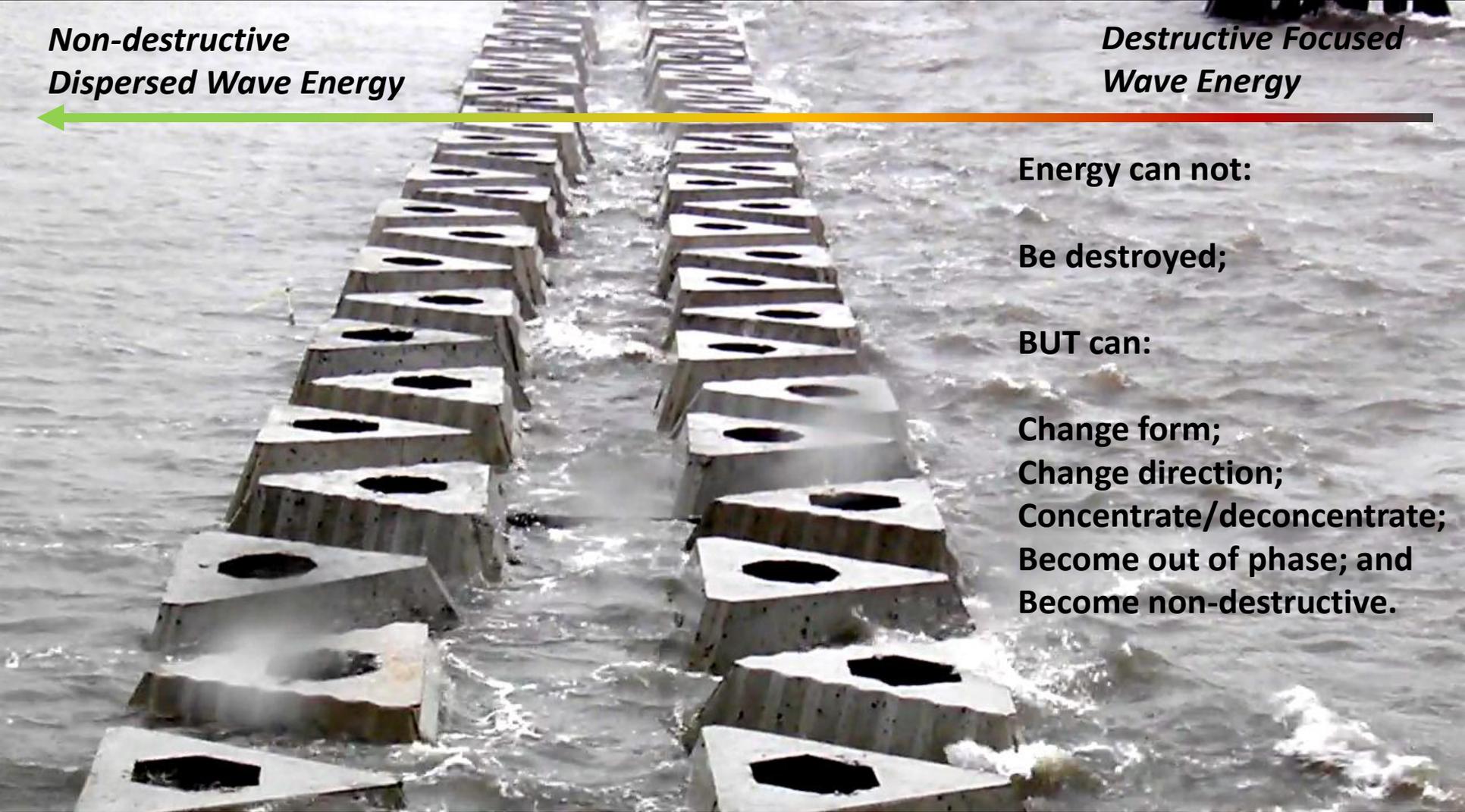


Energy can not:

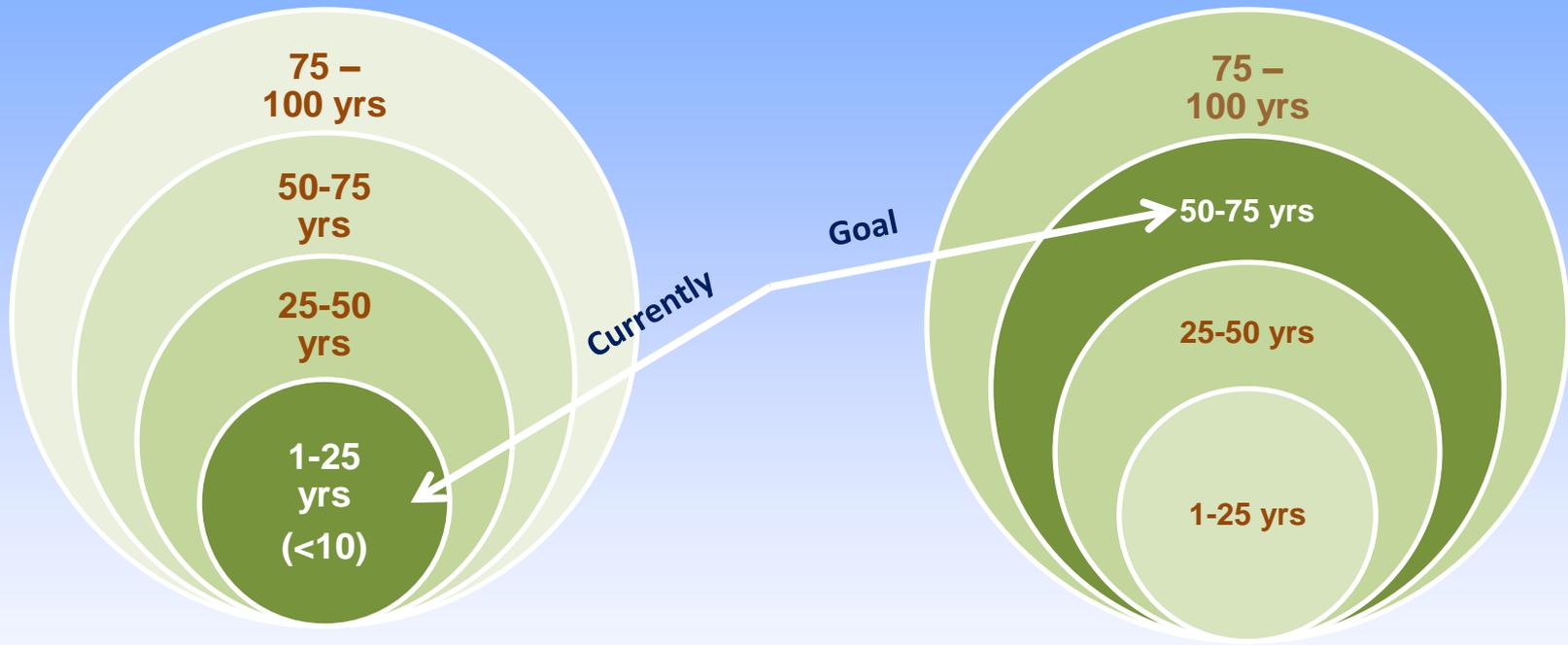
Be destroyed;

BUT can:

- Change form;
- Change direction;
- Concentrate/deconcentrate;
- Become out of phase; and
- Become non-destructive.



QUICK POINT How Long Does A Project Have To Last To Be Resilient? *Redefining the Project Life Paradigm*



- Short Project Life Tough on Wildlife
- Often High & Unfunded O&M Costs
- No Longer Economical

- Acute Toughness/Chronic Endurance
- Multiple Time-Driven Eco-Endpoints
- Low to No O&M Costs

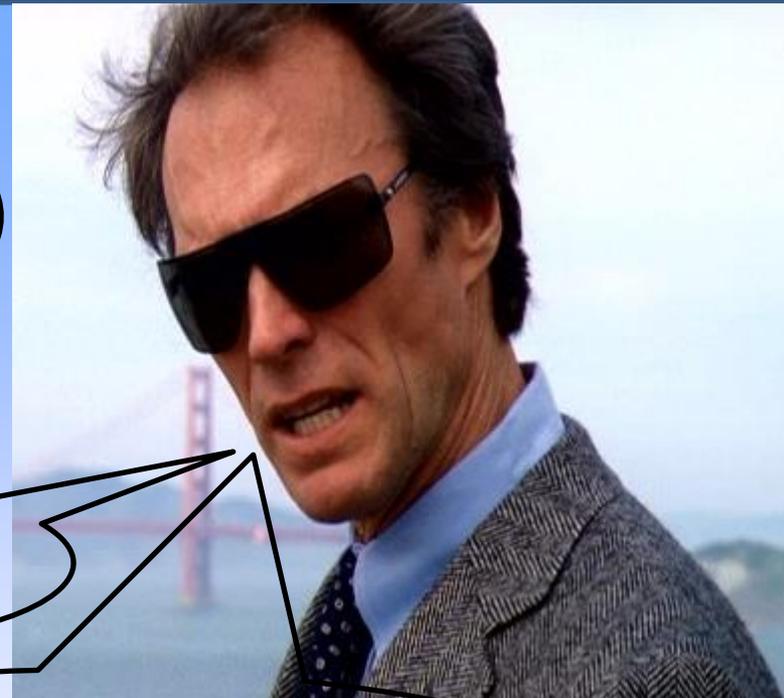
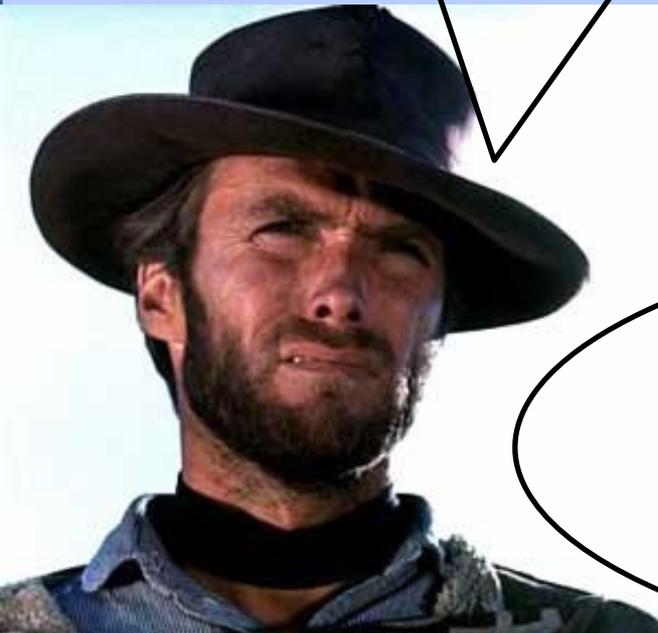
Tall Orders!

- *Acute Toughness/Chronic Endurance?*
- *Multiple Time-Driven Eco-Endpoints?*
- *Low to No O&M Costs?*

How do you figure we do that?

Punk!

- *First, we characterize the causes (wave energy and volume);*
- *Then, we work with nature to:*
 - *Take advantage of the energy, not fight it;*
 - *We provide the framework and let nature do the fine touches.*



Living Shorelines Work In High Energy Systems?

- **Conventional Living Shorelines cannot handle high energy systems.**
- **But when we talk about hybrids, ...well let's see.**



Living Shorelines Work In High Energy Systems



Dauphin Island, AL



Sunken Island, FL

Living Shorelines Work In High Energy Systems

December 2015

This is passive accretion; self-healing and resilient!

How much would it cost to mechanically bring this amount of material in, maintain it, and replace it?

*Thank you LSS, Inc., Dade City, FL & Mid Atlantic Environmental LLC, Virginia Beach, VA for sharing photos
monitoring photography*



Costs Efficiencies of Hybrid Living Shorelines vs. Traditional Stone/Walled Tactics

	Conventional LSs	Hybrids LSs (structural)
• Center for Coastal Resources Management - VIMS	\$ 50 - \$100	\$150 - \$ 500
• Chesapeake Bay Foundation	\$ 50 - \$100	\$150 - \$1,200
• Partnership for the DE Est. (Brochure)	\$100 - \$225	\$250 - \$1,000
<i>PDE Brochure</i>	<i>Breakwaters/Bulkheads</i>	<i>\$450 - \$1,500</i>

Wave Energy Based Ranges	Low	Moderate	High
	\$50 - \$250	\$175 - \$600	\$350 - \$1,000

Costs Efficiencies of Hybrid Living Shorelines vs. Traditional Stone/Walled Tactics

Example Comparison (*high energy; structural components*)

(Per 500 linear feet, 5 feet high)

WAD Array

Units 10 ft W x 5 ft H,
1.5 ft spacing, 2x row

Cost per linear foot, installed*: \$450 - \$600 (**\$500**)

Breakwater

5 ft H, 5 ft Crest, 2.5:1
slope F, 2.5:1 slope B

\$550 to \$800 (**\$670**)

Costs Efficiencies of Hybrid Living Shorelines vs. Traditional Stone/Walled Tactics

Other considerations:

Hybrids LS

Stone/Walled

- Maintenance Costs
- Access
- Geographic Location
- Equipment
- Local Contractors
- Nourishment/Accretion



The Ecological Uplift Of A Hybrid Living Shoreline Incorporating WADS Can be Significant

- Supports LS Projects in Moderate to High Energy Systems
- **Sediment Conservation**
- **Cost Saving for Dune and Nourishment Projects**
- **Infrastructure Protection**
- Resilience – General and Related to Climate change
- **Reef Habitat**
- **Oyster Habitat**
- **Beach Stabilization for Horseshoe Crab**
- **Migratory Birds Habitat**
- **EFH Uplift**
- **Sea grass/SAV Restoration**
- **Improved Ecosystem Services**



QUICK POINT About Money And Restoration



Examples:

- **Sediment Retention**
- **Carbon & Nutrients Retention**
- **Fisheries**
- **Recreation**
- **Other Ecosystem Services**

Impacts of Hybrid Structures is Different than Stone/Walled Tactics

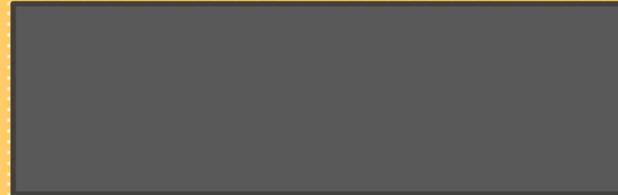
Structural Ecological Metrics:

- SBC - Soft Bottom Coverage (ft²)
- NHS - New Hard Surface Area (ft²)
- SHS Index (SBC/NHS) (lower is better)
- DDC - Dimensional Depth & Morphologic Character



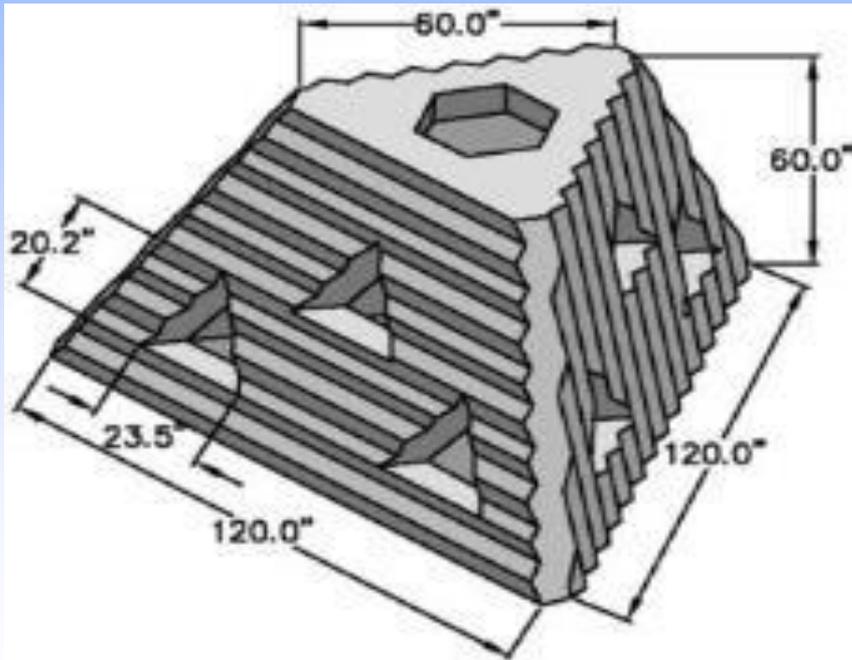
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Impacts of Hybrid Structures is Different than Stone/Walled Tactics

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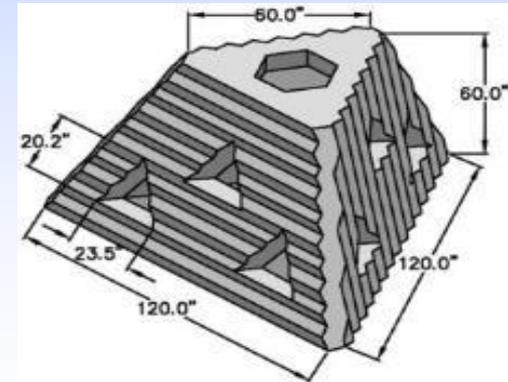
DDC - Dimensional Depth & Morphologic Character

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Planar



3-D



Example

(Per 500 linear feet)

WAD Array

Breakwater

Units 10 ft W x 5 ft H,
1.5 ft spacing, 2x row

5 ft H, 5 ft Crest, 2.5:1
slope F, 2.5:1 slope B

General Description

Wave Mechanism

Attenuation

**Diffraction/Refraction/
Reflection**

SBC - Soft Bottom Coverage (ft²)

2,435

13,750

NHS - New Hard Surface Area (ft²)

49,098

14,850

SHS Index (SBC/NHS) (lower is better)

5.0%

92.6%

**DDC - Dimensional Depth &
Morphologic Character**

5 feet, 3-D

0.75 feet, Planar

A black and white, high-contrast image of a person wearing a trench coat and a wide-brimmed hat. The person's face is mostly obscured by deep shadows, but their eyes are glowing with a bright, cyan-blue light. The background is a soft, out-of-focus grey. The overall mood is mysterious and noir.

**Thank you for
sleuthing with me**