

# Living Shoreline Workshop

## Some Engineering Considerations

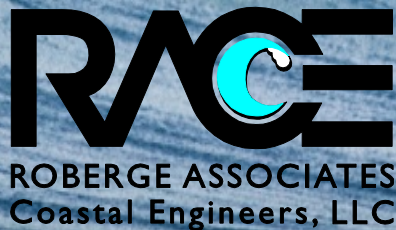
Sponsored by:

UConn ... NOAA ... CLEAR ...  
CT Sea Grant ... DEEP ... GEI  
Consultants

January 9, 2015

Thoughts by:


John C. Roberge, P.E.





# Engineering Responsibilities

- Site Assessment
  - Identify cause and extent of shoreline damage
  - Characterize the site conditions
- Design of Shoreline Repairs
  - Slope stability
  - Required vegetation
  - Structural elements, if required
- Regulatory Coordination
  - Pre-application meeting
  - Prepare permit applications
- Construction Oversight



# What is important to the Engineering Design to Maximize Success

- Wave Climate
- Soil Characteristics
- Design Slope Constraints
- Rely on Past Experience
- Selection of Proper Vegetation – We typically need **HELP !**
- Other Site Constraints - ICE



# Historical Perspective: Industry Experience with Living

## Shorelines

- Chesapeake Bay Foundation
- Maryland DNR
- US Army Corps of Engineers
  - Bio-solutions / Vegetated Shoreline Successful at Sites with < 2 mile fetch exposure – 2' height, 2.5 sec wave
  - Hybrid Solutions – Include Structural Toe protection at Sites with 2mile fetch
  - Structural Solutions required at sites with > 2 fetch
  - No experience at sites experiencing ice flows

# Recent RACE Design Experience in LIS

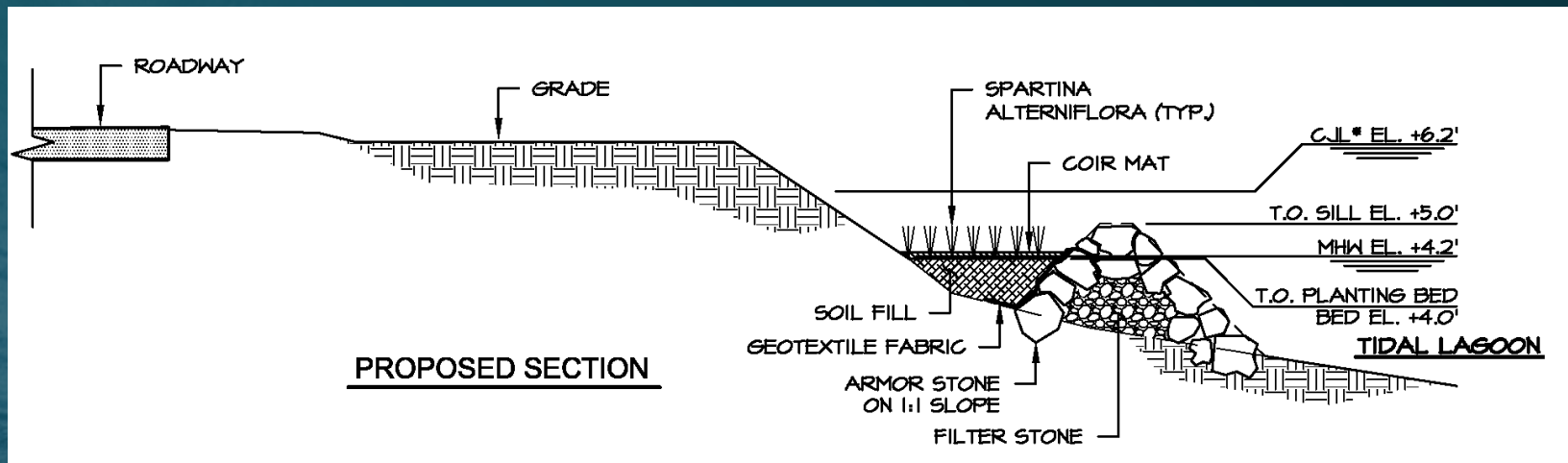
- Lagoon System :  
Southport, CT

- Post –Sandy Damage
- Historical Ice Cover
- Naturally Vegetated
- Historical Eroded Shoreline Fringe
- Tide Gate Controlled



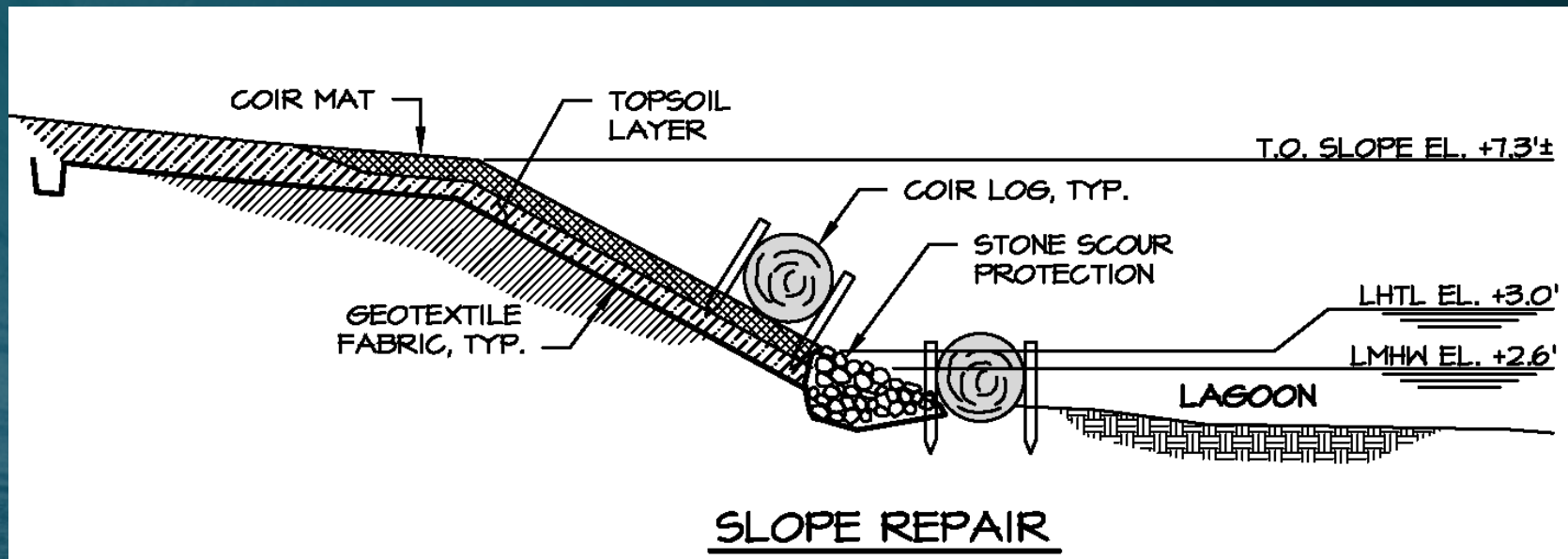
# Developmental Phase : Proposed Living Shoreline Site Improvements

- Limited Fetch – Minimum Wave Energy
- Site Highly Impacted by Winter Ice
- Concept Supported By DEEP
- Cost - \$600 / lf



# Actual Design and Construction Phase: Reality Sets In !

- Modified Design – Costs Too High
  - Design Modifications – Accommodates Ice Flows
  - DEEP Follow-up and Approval
- Decreased Costs - \$250 / If



# Post – Construction Success

- Construction



- Current





# Recent Experience of DOCKO, Inc.

- CT River Sites - Need to Accommodate Ice Conditions



# ALTERNATIVE COASTAL STABILIZATION

- Structures can impact habitat, erosion conditions, wave reflections, etc.

- Examples:
  - Seawalls
  - Bulkheads
  - Revetments
  - Dunes
  - Vegetated Slopes



# EROSION



Pre-Storm



Post-Storm

# UTILIZING A SHORELINE FLOOD & EROSION CONTROL STRUCTURE TO PROTECT PROPERTY AND REMAP FLOOD ZONES

Highly regulated....

- State of Connecticut Department of Energy and Environmental Protection (DEEP)
- US Army Corps of Engineers
- Local P&Z





# Shoreline Flood & Erosion Control “Structures”

- Repairs to existing structures can be authorized – bulkheads, seawalls, revetments
- New structures will only be considered if necessary, unavoidable, and there is no feasible less environmentally damaging solution for protection of:
  - Infrastructure (roads, utilities)
  - Water-dependent uses (marinas, terminals)
  - Inhabited structures constructed prior to 1995
  - Cemeteries



# Shoreline Flood & Erosion Control Measures

- What are “feasible, less environmentally damaging alternatives”?
  - Structure relocation – Not Always Possible
  - Structure elevation - Not Always Necessary
  - Dune creation – Sometimes Attractive
  - Living shoreline –Low Energy Sites
    - This is a work in progress and clear direction and guidance on what the DEEP will accept as a “living shoreline” does not exist.

# BULKHEADS – High Energy Site

RIGHT WAY TO  
ANCHOR....

WRONG WAY TO  
ANCHOR....



GOOD  
REASON TO  
HIRE A P.E.!!

# SEAWALLS – Total Structural Alternative





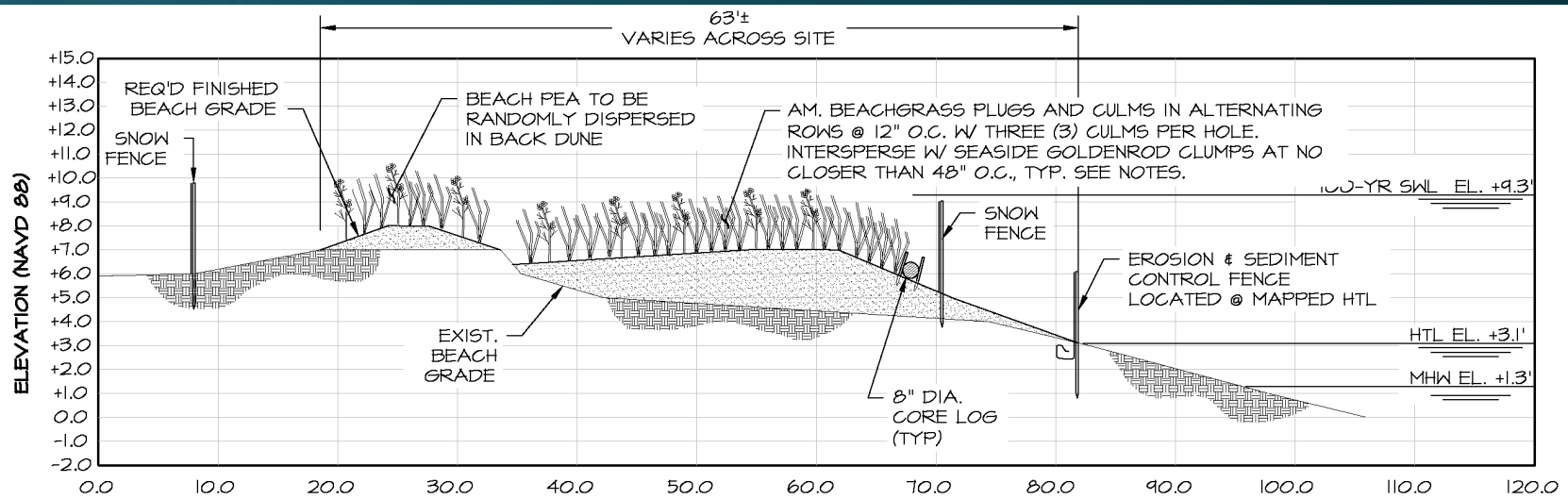
# REVETMENT



# DUNE STABILIZATION



# COASTAL STRUCTURES – VEGETATED SLOPES



# LIVING SHORELINE



# Questions?



ROBERGE ASSOCIATES  
Coastal Engineers, LLC

John C. Roberge, P.E.  
[jcr@racellc.com](mailto:jcr@racellc.com)  
203-377-0663