



Effects of Bulkheads on Estuarine Beach Swash Zone Processes and Characteristics

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Background: Bulkheads

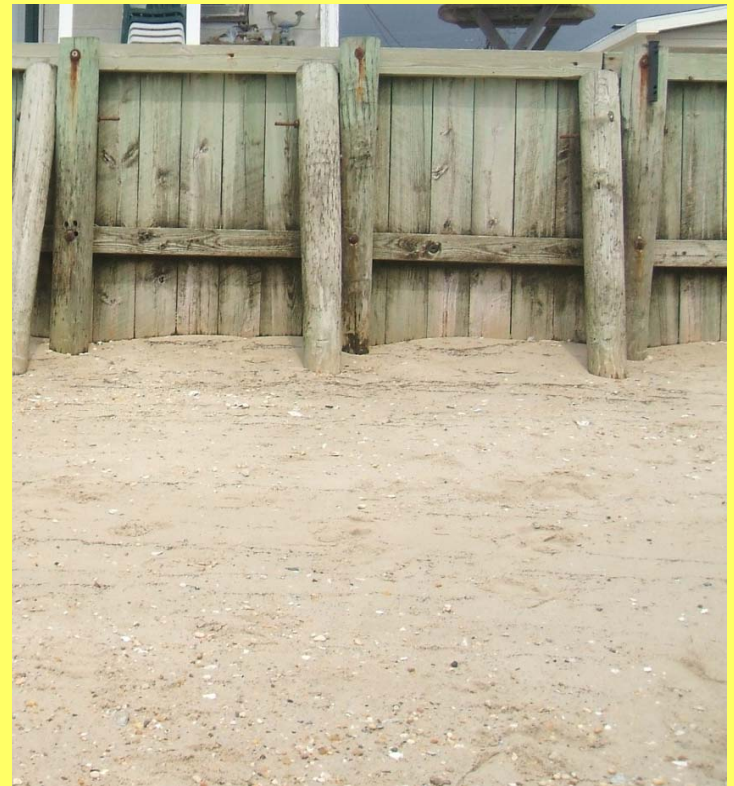


Bulkheads protect infrastructure from erosion

Bulkhead Effects on Estuarine Beaches

- Higher frequency of erosion/accretion
- Smaller overall net surface change
- Increased depth of sediment activation

- Bulkhead design matters
- Enclaves altered



Process Alterations

Interrupts longshore transport

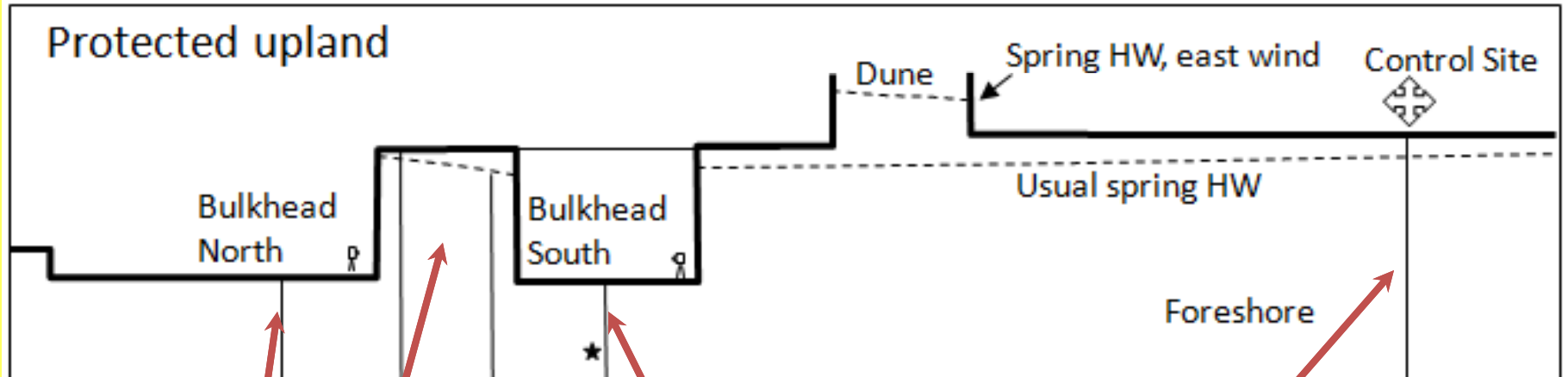
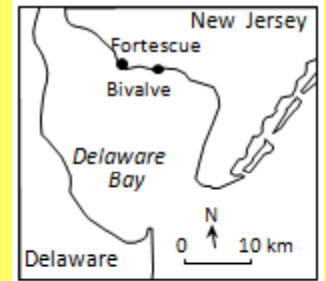
Prevents migration of swash/waves

Creates reflected wave and swash energy

Increases turbulence



Field Design



Average Conditions: 8-22 June 2007

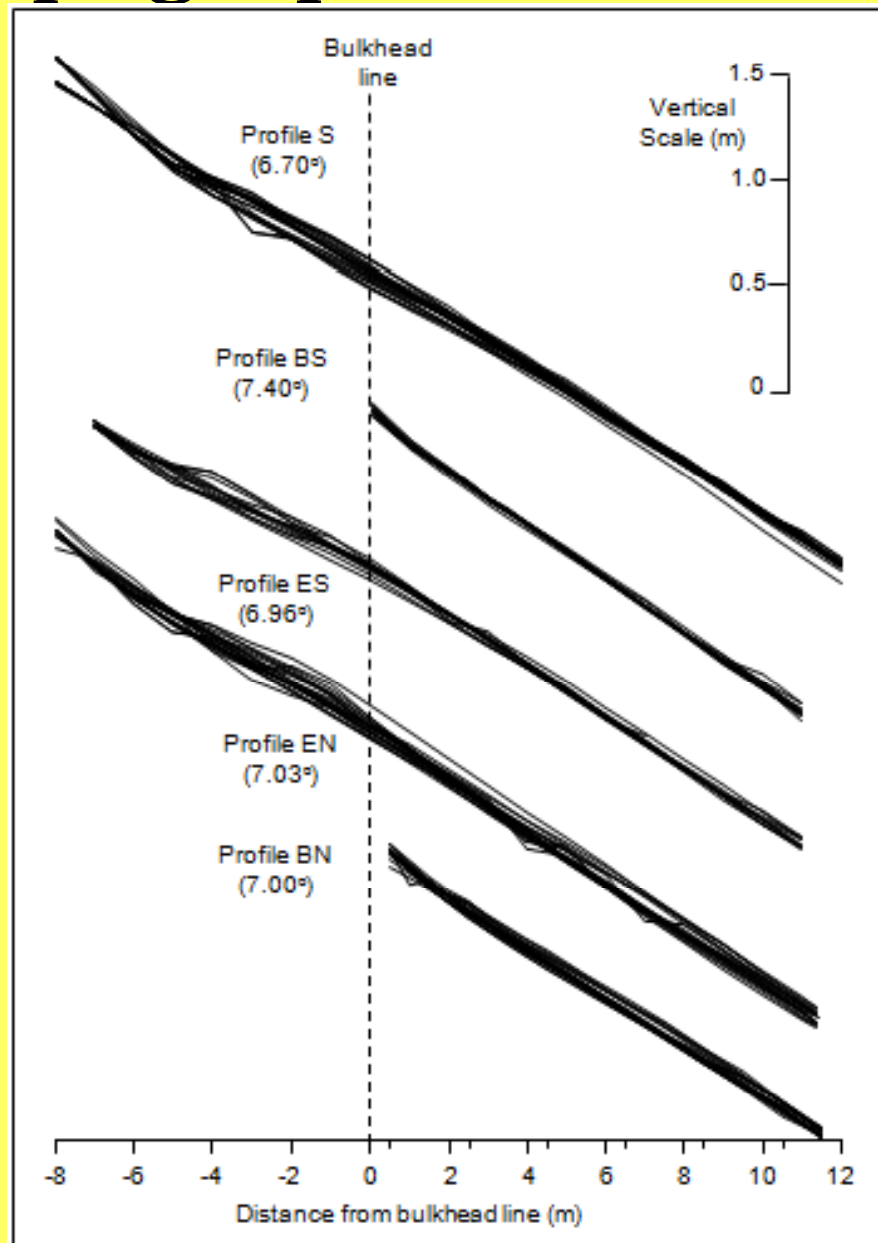


Wind Speed: 2.0 ms^{-1}

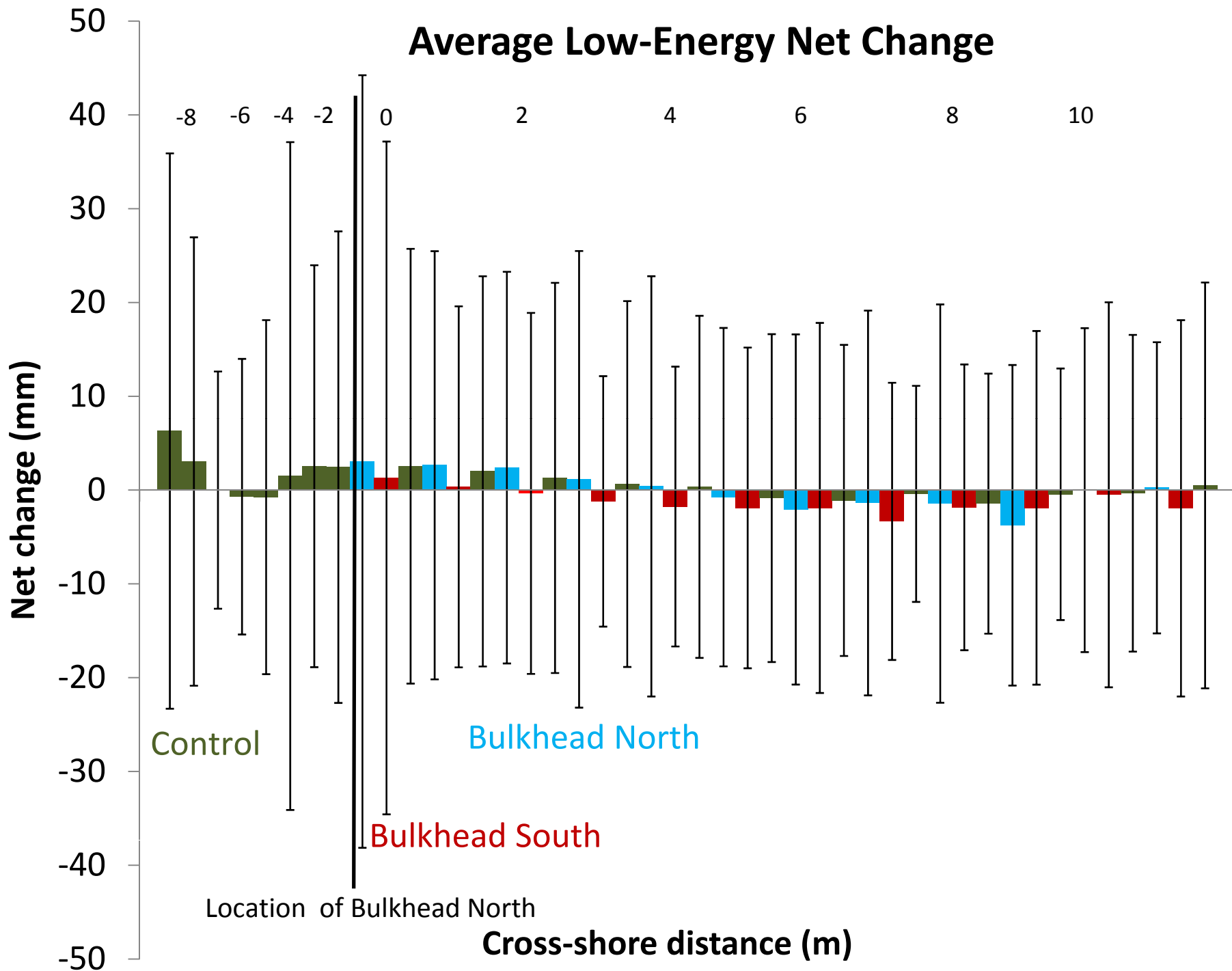
Wind Direction: SSE

Significant Wave Height: 0.18 m

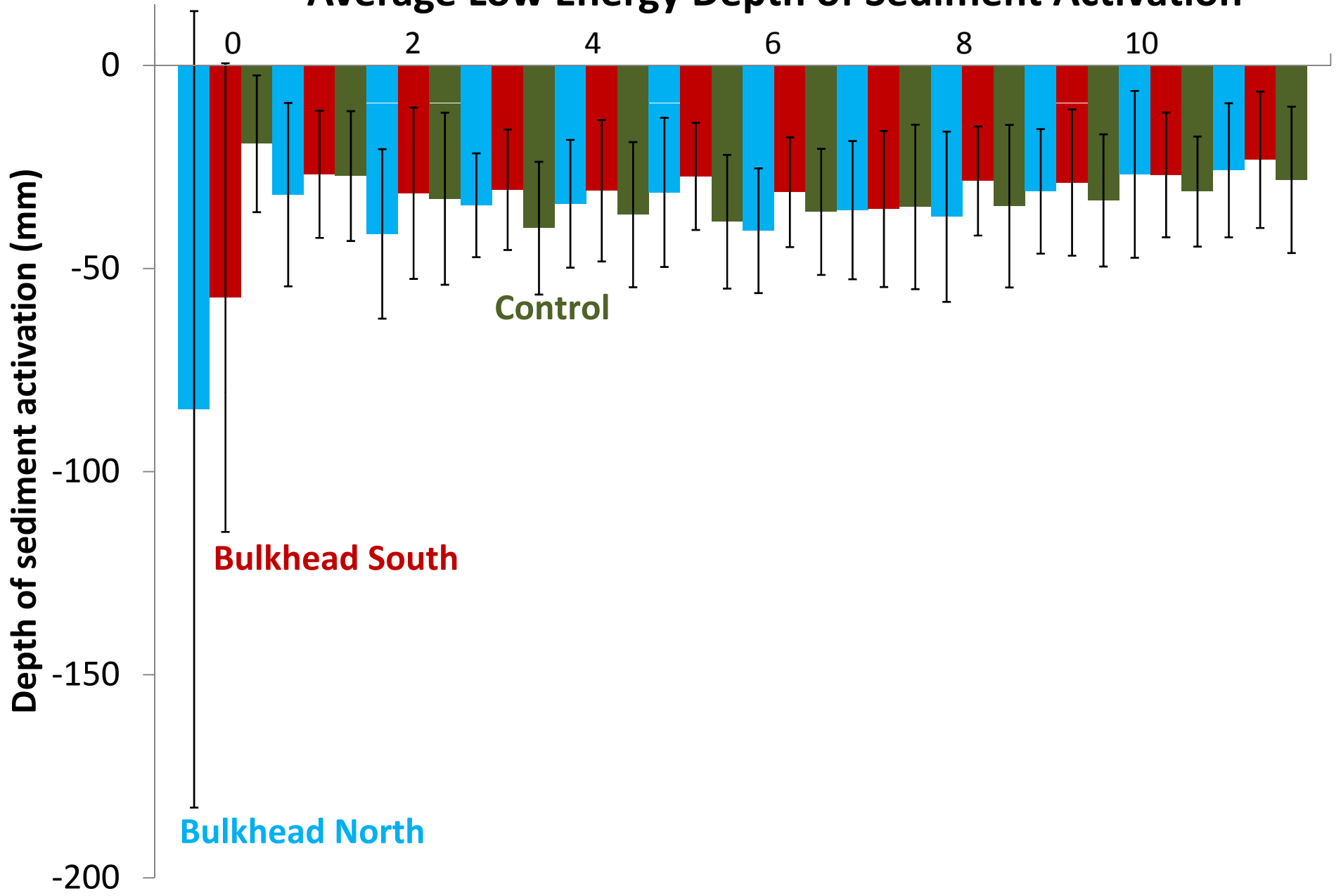
Topographic Variability



Average Low-Energy Net Change



Average Low Energy Depth of Sediment Activation



Increased depth of sediment activation at bulkheads

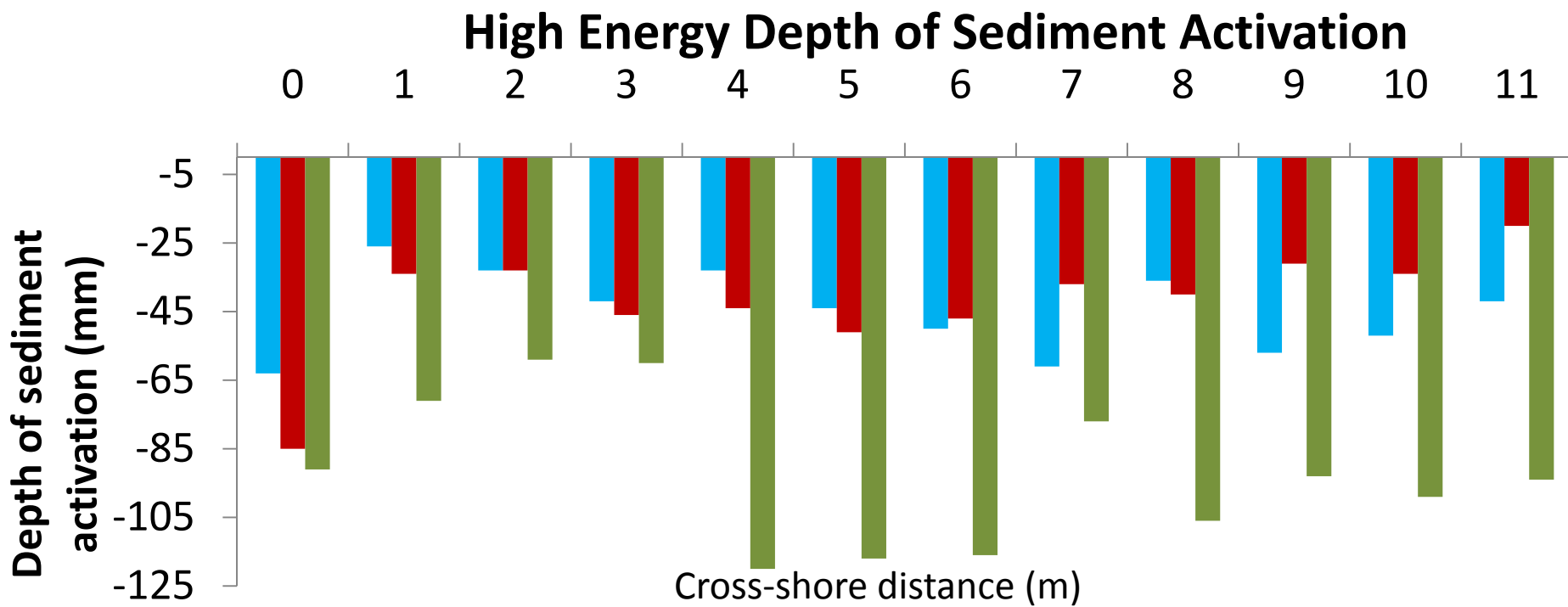
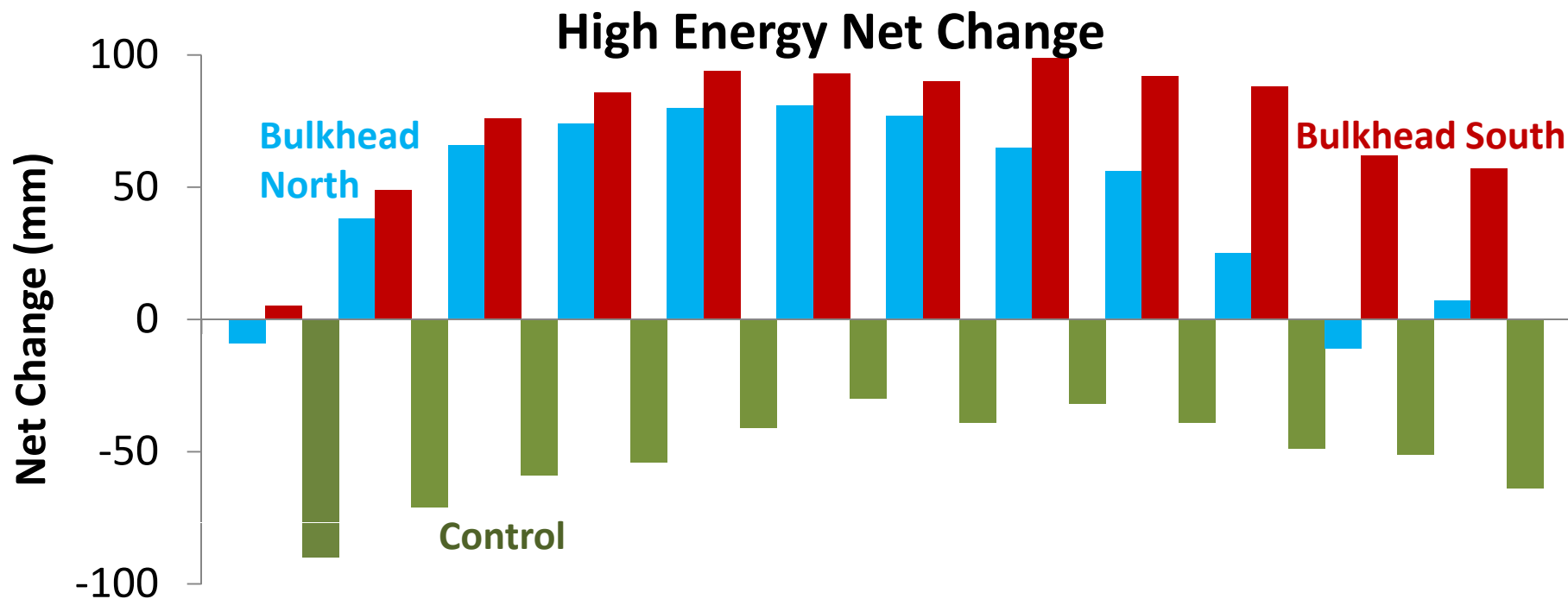
High Energy Event: 22 June



Wind Speed: 7.7 ms^{-1}

Wind Direction: NW

Significant Wave Height: 0.28 m

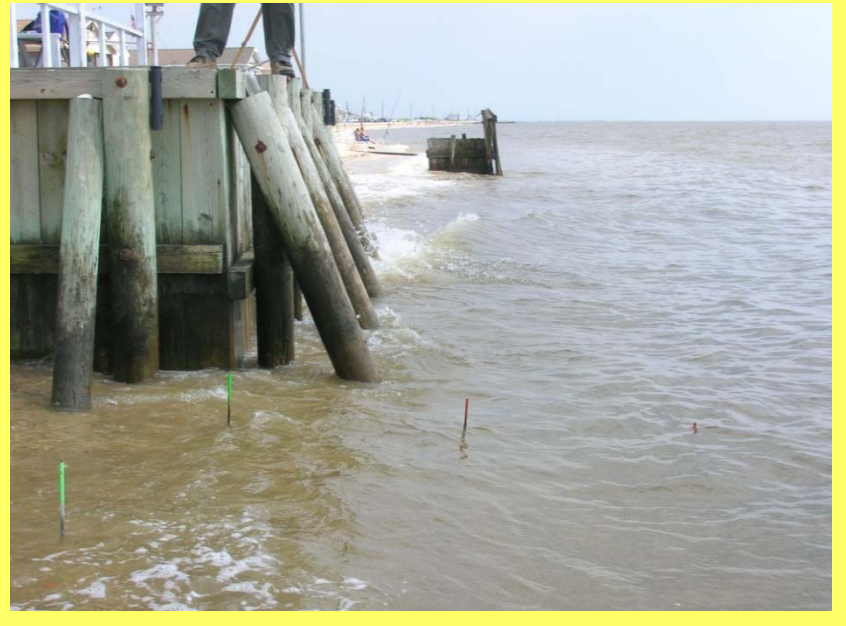
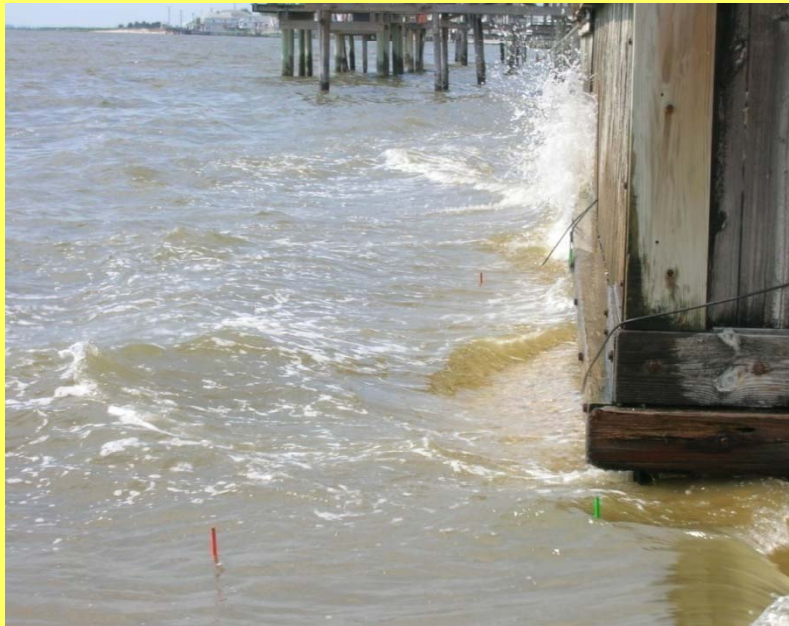


Process Alterations

Incident
Wave



Reflected
Wave



Planar vs Buttressed Bulkheads



Enclave



Locally increased
sediment activation



Increased surface
change and
sediment mobility

Conclusion

Bulkheads create zones of swash reflection and wave interaction

Increasing:

Frequency of erosion/accretion reversals

Depth of sediment activation

Design makes a difference

Enclaves experience alterations



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