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CONCEPTUAL DESCRIPTION OF A SOFT-SHORE ALTERNATIVE TO MARINE BULKHEADS AND REVETMENTS: THE "ROOT WALL"©

Introduction: The root wall concept is proposed to provide a bio-structural alternative to conventional bulkheading. The root wall represents an innovative, environmentally acceptable form of shore protection that minimizes adverse impacts common to conventional shore armoring measures. It will also significantly improve nearshore habitat features and provide for complex shore form creation. A root wall will mimic naturally occurring accumulations of marine driftwood, which protect shorelines and prograde beaches.

The root wall concept has been developed by **Elliott Menashe, of Greenbelt Consulting,** in collaboration with **Jim Johannessen, of Coastal Geologic Services**.

Root Wall Conceptual Description - The root wall employs large tree root masses, trunk and root masses, and other large woody debris (LWD) as primary structural components to provide immediate toe protection and bluff stabilization. LWD to be used as structural components exposed to wave attack would be of durable tree species resistant to rot and abrasion.

The planting, establishment, and development of trees and shrubs behind the structure are integral to the root wall system's design. Incorporating planned vegetation elements in the engineering design provides short term and long term erosion control, as well as long term structural and environmental benefits as detailed below.

The strength of the root wall would be achieved by interlocking component pieces to allow flexure without loss of structural integrity. Major components would be partially buried in beach substrate and further secured by backfill to resist movement caused by wave action. The composite structure would be anchored into the underlying substrate as necessary.

Backfill materials will include sandy loam topsoil in the upper portion to provide an optimal rooting medium for establishment of the vegetation that will be an integral component of this bio-structural design. Incorporation of vegetation in the design provides long term structural reinforcement of components through root matrix development. Vegetative components become more effective, adaptable, and self-perpetuating over time. Conventional bulkheads are strongest when built but become progressively weaker and more prone to failure over time. When mature, trees planted as project components will be gradually recruited as additional shore protection and shrub and ground covers will reduce surface erosion and filter sediments. This approach mimics well-documented naturally occurring processes.

A high quality geotextile which is permeable to water, would be installed landward of the backfill to retain fine grain bluff sediments as is common in conventional revetment design. Geotextile will be installed so as to allow root penetration and reinforcement of structural components.

Sources of suitable LWD could include material from local upland clearing and grading projects, logging operations, and collection of floating riverine and marine LWD which constitute a hazard to navigation.

The root wall concept can be used in conjunction with other soft-shore protection measures, such as beach nourishment. Potential sites for the Root Wall include low-to-moderate energy beaches and areas sporadically subject to wave attack. The root wall approach would be ideal where restoration of marine uplands is a critical objective.

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Benefits of the Root Wall Over Conventional Hard-Structures:

Physical – Reduces reflection and refraction of wave energy. Reduces beachface sediment suspension and transport. Minimizes scouring of beach materials fronting structure. Reduces "end wall" effects. "Meters" natural erosion – allowing upland sediments to reach marine beaches at a slow rate. "Captures" additional floating LWD during high-water storm events. Dissipates wave energy. Maintains ground water regimes/hydrologic and hydraulic continuity. Creates complex shore forms and microhabitat features.

Biological – Provides primary habitat features as integral structural components. LWD supports a large number of biological functions. Encourages rapid naturalization of backshore and lower bluff. Contributes to biological linkages between marine and upland areas. Improves nearshore habitat for wildlife. Provides diverse overhanging vegetation and shades upper foreshore. Promotes introduction of organic matter into marine system. Improves fisheries habitat by providing food, refuge from predation, migratory corridors, and shade.

Additional Benefits – Improves nearshore and distant-view aesthetics. Employs "free" material that would otherwise be "waste". Reduces air pollution by reducing burnpile volumes. Root wall and integral-to-design vegetative components comprise a self-perpetuating system for long term shore protection and naturalization.

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