

Living Breakwaters

Staten Island, New York, U.S.A.

Staten Island, New York, which sits at the mouth of the New York Bight, was hit hard by Hurricane Sandy in 2012 and is vulnerable to future wave action and erosion. A winning project in the U.S. Department of Housing and Urban Development (HUD)-sponsored Rebuild by Design competition, Living Breakwaters, is a project by landscape architecture firm SCAPE that integrates risk reduction with ecological restoration while also providing environmental education and recreation opportunities on the shore. Proposed in 2014, the first phase of this \$60 million-project began in April 2015.

Rather than propose a single levee that disconnects people physically and visually from the water (and could also catastrophically fail), the project embraces the water and increases the awareness of risk with a necklace of breakwaters, which are rocky-sloped walls placed within the water column that provide a buffer against flooding and erosion. These breakwaters absorb wave energy and create slow moving water, reducing flooding. Calm water, in turn, encourages sedimentation, which replenishes beaches and creates habitat for a diverse array of aquatic wildlife.

Certain subtidal breakwaters are coupled with “reef streets” that can ecologically benefit from calmer waters. Mimicking the historic reef habitat of the bay, they are designed to host oysters, lobsters, and juvenile fish, encouraging ecological restoration and creating opportunities to sit and watch the sea life. Other species, such as muddy bottom-loving eelgrass and hard clams, thrive in the lightly-sedimented zone adjacent to the breakwaters, while seals and birds can bask or perch on the exposed portion of the breakwater.

These reef streets have been specifically designed around the life cycles of fish. Econcrete, a low pH concrete mix for maritime construction, is formed into

units that line the reef streets and are proven to entice sea creatures to live there. Small holes and crevices in the econcrete provide habitat for juvenile fish that need to be protected from larger species. In addition to creating new habitat, these constructed reefs create recreational fishing opportunities.

Drawing on the Raritan Bay’s history as an oyster-producing habitat, Living Breakwaters will incorporate oyster restoration. Using multiple techniques, the project will restore oysters to the bay in a highly-monitored way. In addition to filtering water, oysters increase the strength of the breakwater system by biogenically building up on its face. Econcrete units will be set with oyster spat (juveniles) and placed in the breakwater reef. Oyster gabions will be tested as part of the living shoreline and breakwater strategy. Tankless setting, an experimental method that releases spat into the water column, may be tested along the reef streets.

Connecting residents back to the water is a high priority for the project team. A series of land-based “Water Hubs,” which will be designed through community design charrettes, will serve as information, storage, and gathering spaces. Each community will get a different kind of Water Hub based on its needs – either embedded, floating, cantilevered, or elevated. These spaces, which will also have bathrooms and water fountains, act as a “lighthouse,” providing orientation within the new coastal landscape.

The project will involve Staten Island schools in waterfront education, restoration, and reef building. Through partnerships with Billion Oyster Project, which plans to restore one-billion live oysters to New York Harbor over the next 20 years, local schools will be empowered to learn more about coastal sciences.

The Living Breakwaters approach is specifically suited

DESIGNING OUR FUTURE: SUSTAINABLE LANDSCAPES

Living Breakwaters

to Staten Island, but is replicable for many coastal communities all over the world faced with both risks and opportunities.

Project Resources

TEAM LEAD / LANDSCAPE ARCHITECT

SCAPE / Landscape Architecture

ENGINEERING / PLANNING

Parsons Brinckerhoff

MARINE SCIENCE / OCEAN MODELING

Dr. Phillip Orton / Stevens Institute of Technology

COASTAL ENGINEERING

Ocean and Coastal Consultants

MARINE BIOLOGY

SeArc Ecological Marine Consulting

EDUCATION / OYSTER RESTORATION

The New York Harbor School

ARCHITECTURE

LOT-EK

GRAPHIC DESIGN

MTWTF

ADVISOR

Paul Greenberg