LIVING BREAKWATERS

https://stormrecovery.ny.gov/living-breakwaters-tottenville

Brad Howe, Senior Associate, SCAPE Landscape Architecture

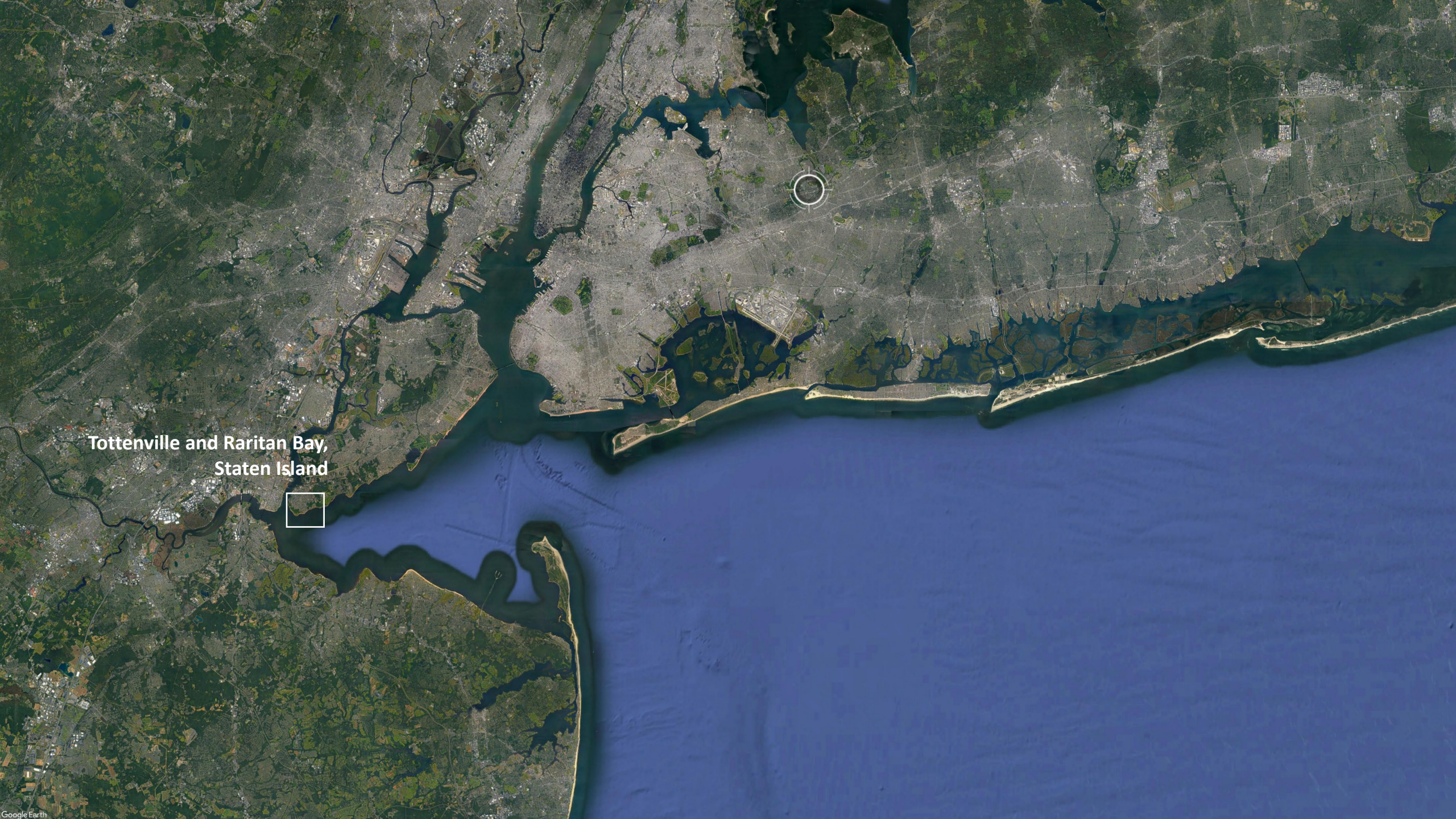

SCAPE

LANDSCAPE ARCHITECTS

ARCHITECTS

URBAN DESIGNERS

PLANNERS


Tottenville and Raritan Bay,
Staten Island
Google Earth

Designing the Process

The Task Force, with a core group of advisors and staff, created a unique structure for the competition. A successive and connected set of stages was established to orient the design process around in-depth research, cross-sector, cross-professional collaboration, and iterative design development. The design process incorporated a variety of inputs to ensure that each stage's deliverables were based on the best knowledge and talent, and that the final proposals would be replicable, regional, and implementable.

Making room for a collaborative and innovative approach was a side step away from the institutional world. A detour around negotiations, the process aimed to build understanding and trust.

1 TALENT

Objective Gather the talent of the world to work with the talent of the Sandy-affected region.

Process Task Force issues a Request for Qualifications and Approaches calling for teams to assemble themselves in interdisciplinary partnerships to tackle the region's physical and social vulnerabilities.

To incentivize participation, the Federal Government pledges funding to implement the winning designs while private philanthropy pledges prize money for competitors.

Result Ten finalist design teams are selected comprising a diverse set of complementary skills and approaches.

2 RESEARCH

Objective Establish the broadest possible understanding of the region's vulnerabilities to future risks and uncertainties, to enhance resilience.

Process Rebuild by Design's local partner organizations create an intensive, three-month program of field research to introduce teams to a variety of local stakeholders, providing a comprehensive view of the storm's effects – the damage it created as well as the long-standing problems it uncovered or exacerbated.

A Research Advisory Board leads the teams through the region to learn from a variety of perspectives, and teams conduct additional research to supplement this on-the-ground work. Research is collaborative across teams and focuses on typologies as well as locations.

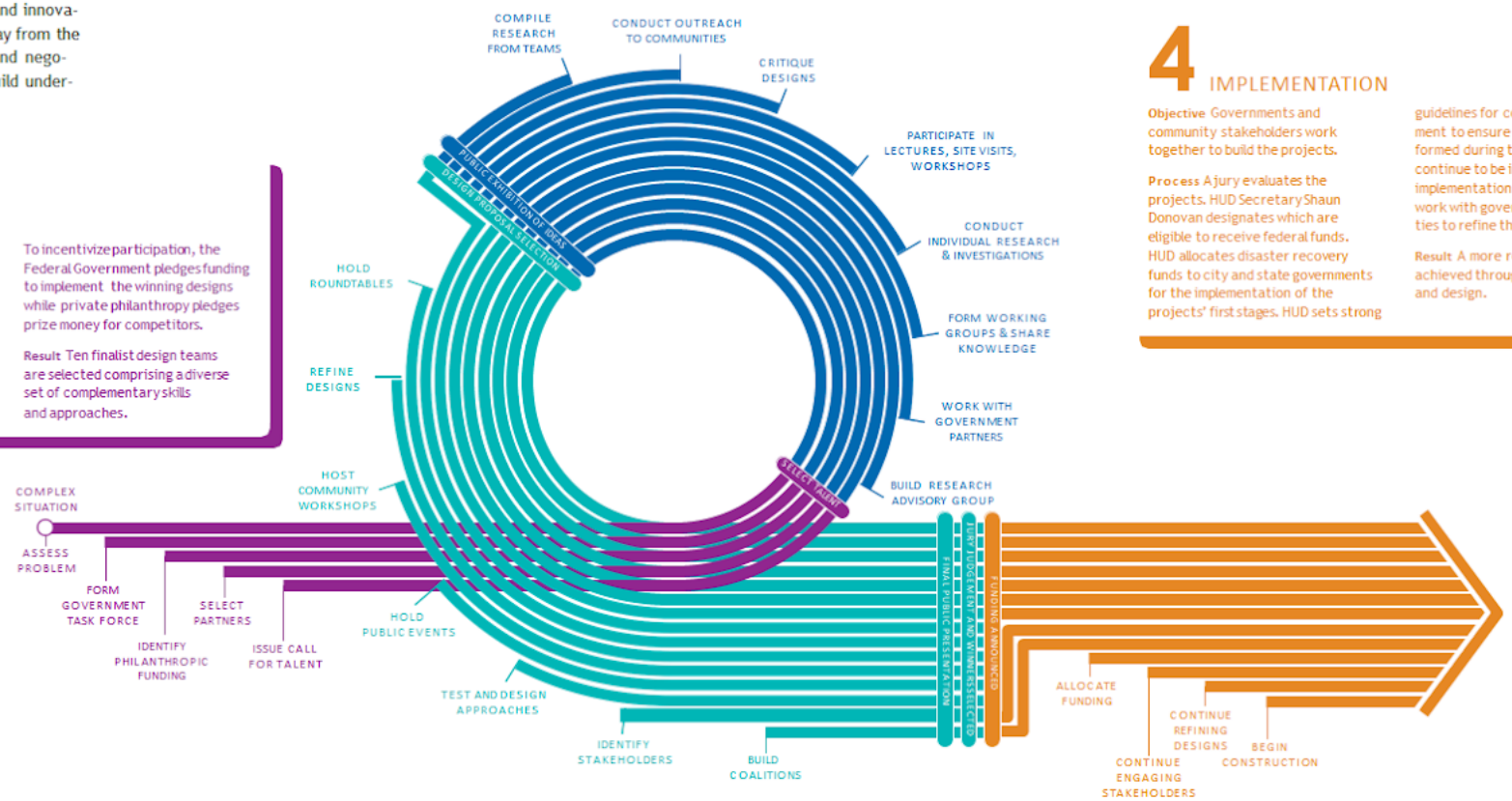
Result A public presentation from each team that includes three to five "design opportunities" describing conceptual approaches for interventions and an overall compilation of research submitted by all teams.

3 DESIGN

Objective Develop implementable solutions that have support from local communities and governments.

Process HUD Secretary Shaun Donovan selects, on average, one design opportunity for each team to develop. Teams then gather diverse local stakeholders into community coalitions, with whom they begin a four-month process of co-designing the final interventions. Using meetings, colloquia, charrettes, and non-traditional events to gain the broadest perspectives, they create solutions that not only address disaster scenarios, but also enrich the daily life of community members.

Result Ten fully developed, implementable resilience proposals champion communities' visions for future development and have support from the local governments.



4 IMPLEMENTATION

Objective Governments and community stakeholders work together to build the projects.

Process A jury evaluates the projects. HUD Secretary Shaun Donovan designates which are eligible to receive federal funds. HUD allocates disaster recovery funds to city and state governments for the implementation of the projects' first stages. HUD sets strong guidelines for community involvement to ensure that the coalitions formed during the competition continue to be involved through implementation. Teams are poised to work with government and communities to refine the interventions.

Result A more resilient region achieved through collaboration and design.

APRIL 30, 2015 | Albany, NY

Governor Cuomo Announces $60 Million Living Breakwaters Barrier to Protect Staten Island Shoreline and Habitat

STORM RECOVERY

Governor's Office of Storm Recovery

NYC Parks

NEW YORK STATE OF OPPORTUNITY. DASNY

LIVING BREAKWATERS + WATER HUB DESIGN

SCAPE

COWI, COASTAL ENGINEERS

ARCADIS, COASTAL MODELING

SEARC, MARINE ECOLOGISTS

WSP / PARSONS BRINKERHOFF, GEOTECHNICAL ENGINEERING

MRS ENGINEERS, SURVEYS AND COST ESTIMATING

PRUDENT ENGINEERING, IN-WATER SURVEYING

LO-TEK, ARCHITECTS

NY / NJ BAYKEEPER, DATA COLLECTION

SILMAN, STRUCTURAL ENGINEERING

OYSTER RESTORATION

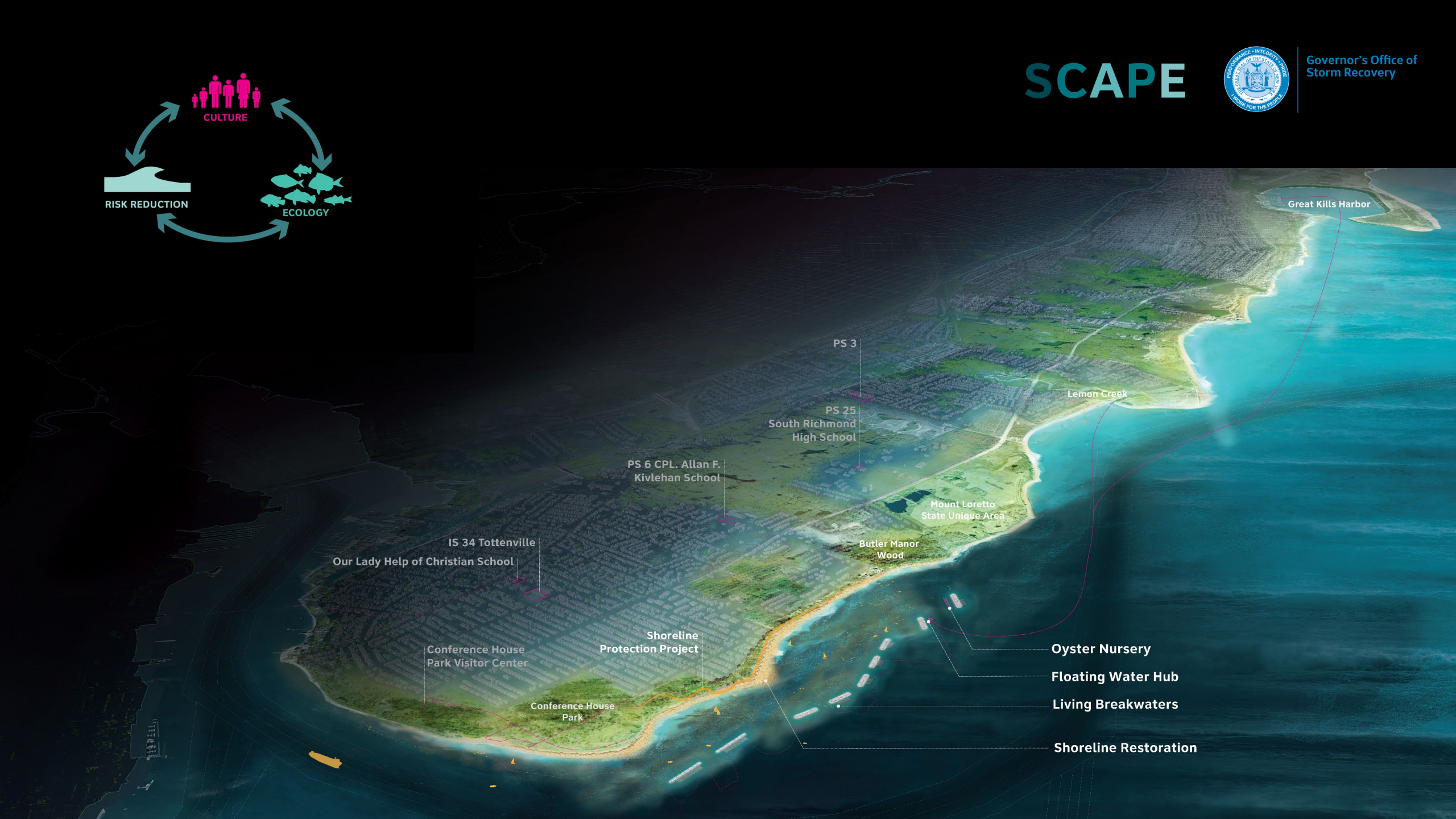
BILLION OYSTER PROJECT

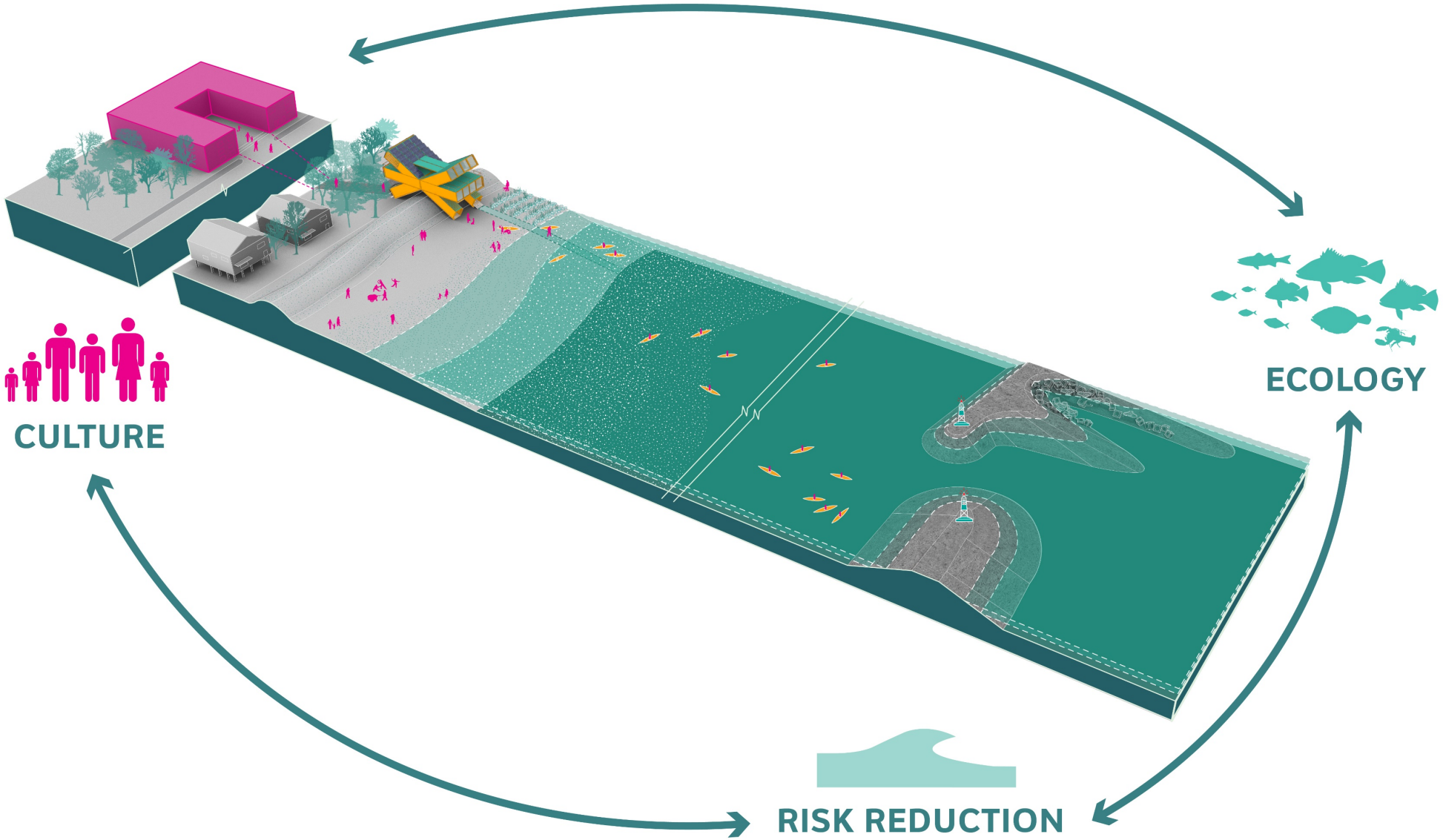
ENVIRONMENTAL REVIEW

AKRF

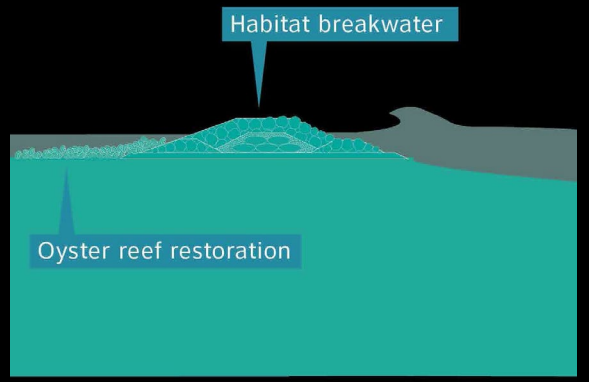
HILL

Hill International

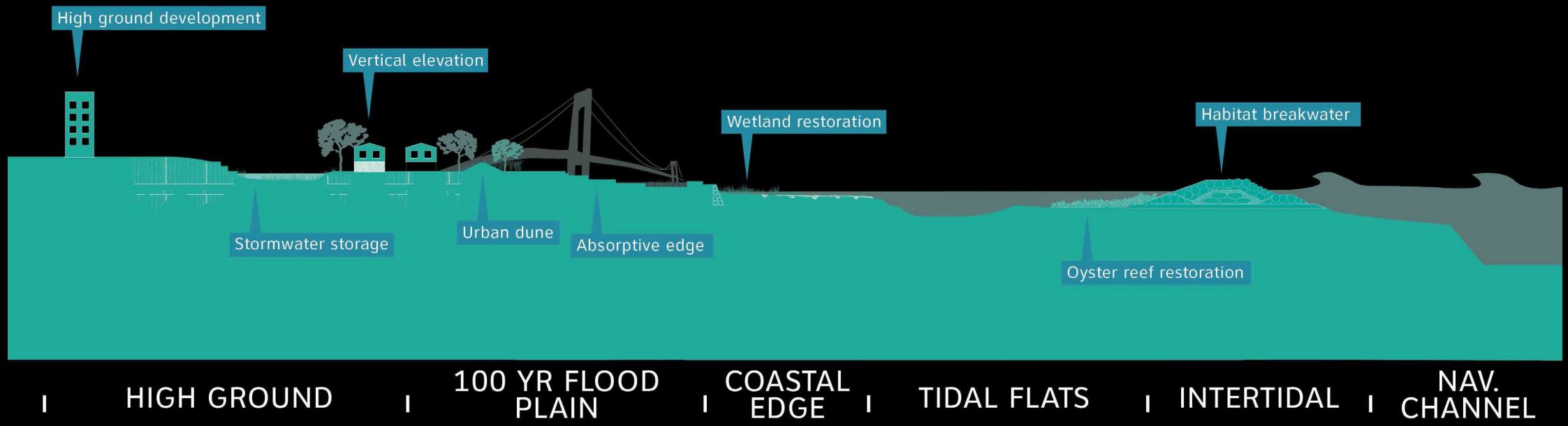

CULTURE
RISK REDUCTION
ECOLOGY
SCAPE
Governor's Office of Storm Recovery
Great Kills Harbor
PS 3
Lemon Creek
PS 25
South Richmond
High School
PS 6 CPL. Allan F.
Kivlehan School
Mount Loretto
State Unique Area
Butler Manor
Wood
IS 34 Tottenville
Our Lady Help of Christian School
Shoreline
Protection Project
Conference House
Park Visitor Center
Conference House
Park
Oyster Nursery
Floating Water Hub
Living Breakwaters
Shoreline Restoration


CULTURE
ECOLOGY
RISK REDUCTION

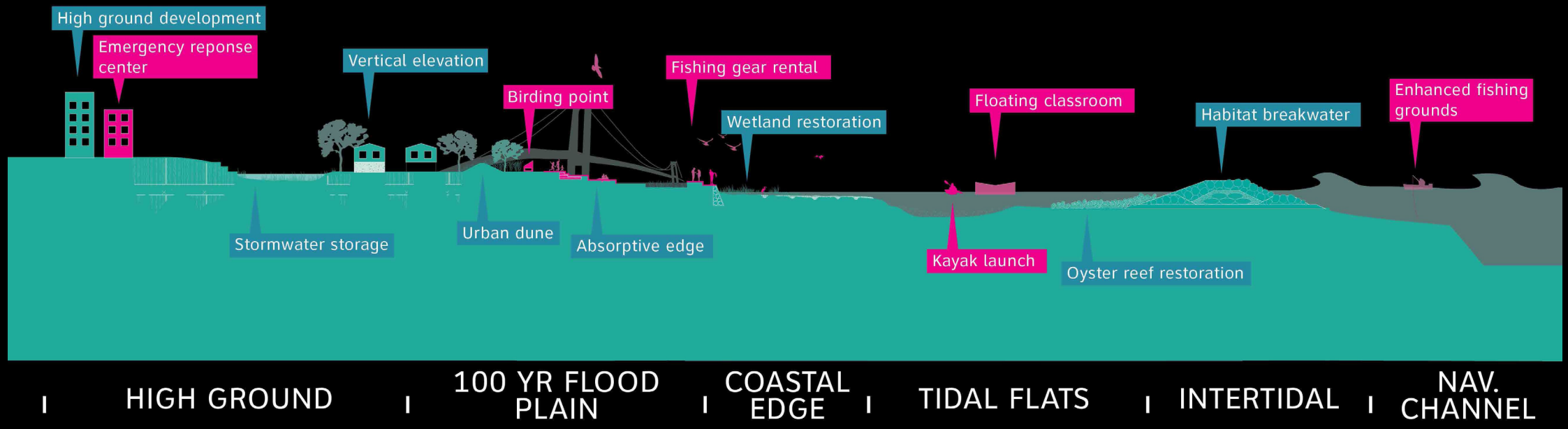
IT’S NOT ONLY A LIVING BREAKWATER



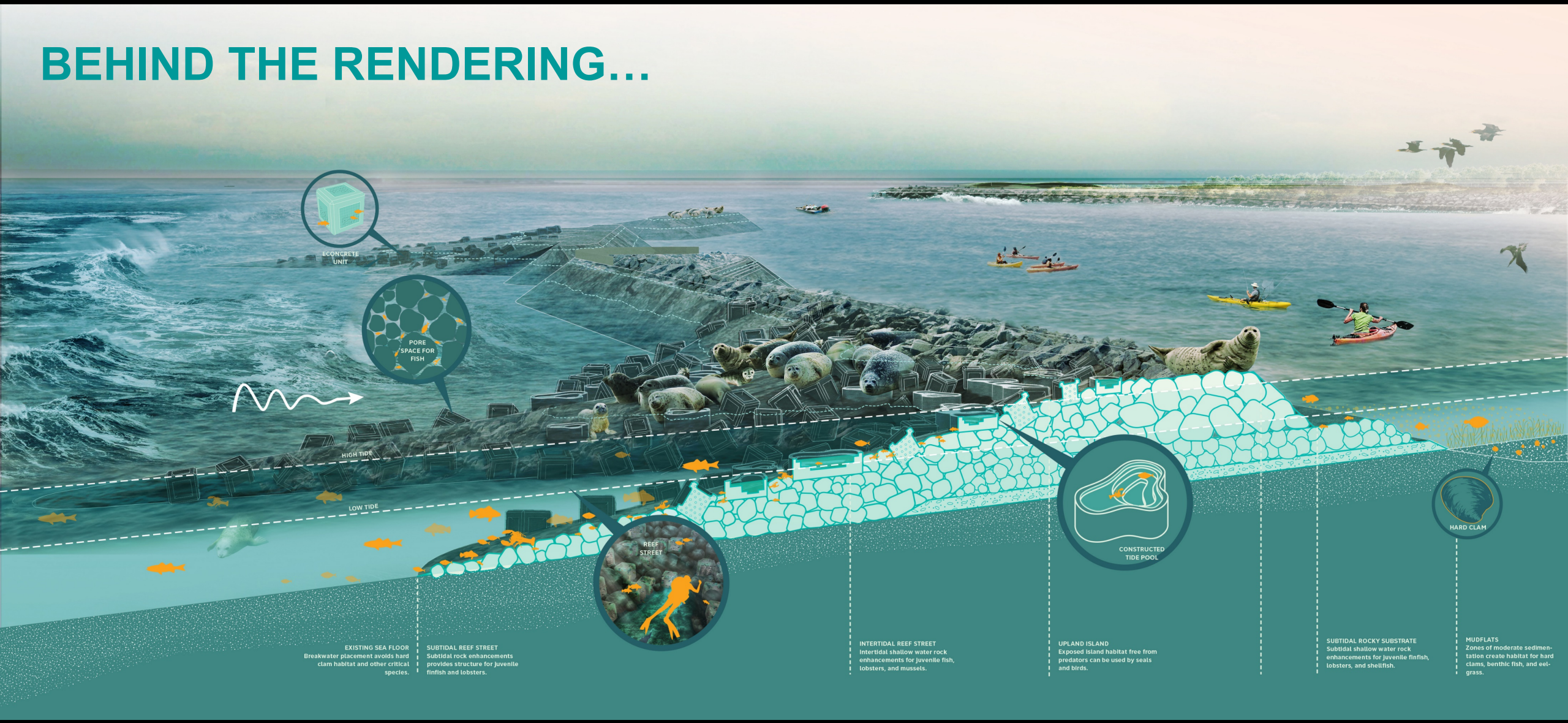
IT'S NOT ONLY A LIVING BREAKWATER
IT IS A LAYERED APPROACH



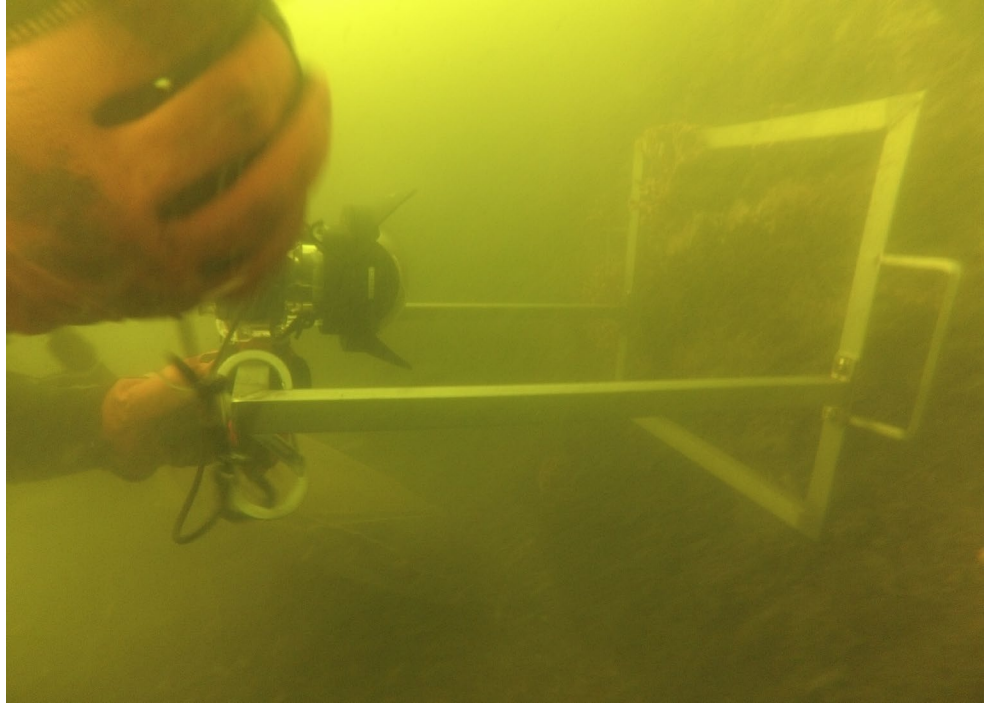
IT'S NOT ONLY A LIVING BREAKWATER
IT IS A LAYERED APPROACH
THAT CREATES A CULTURE OF RESILIENCE



BEHIND THE RENDERING…




50







MES
Engineering & Surveying


SECO

ITERATE AND MODEL

x

TOMBOLO

Very little wave energy reaches the shore, sediment builds up behind the breakwater, connecting it to the shoreline, and the beach is stable with little transport along the shore.

?

PERIODIC TOMBOLO

One or more of the breakwater segments is periodically backed by tombolos with a periodic trapping of littoral material followed by a release of a “slug” of sediment to the downdrift shoreline.

√

STRONG SALIENT

Somewhat higher wave energy reaches the lee of the structures; characterized by a balanced sediment budget. Longshore moving material enters and leaves at approximately the same rate.

√√

SUBDUED SALIENT

Yet higher wave energy reaches the shoreline; the shoreline response is not as pronounced and the amplitude of the salient is of lower relief.

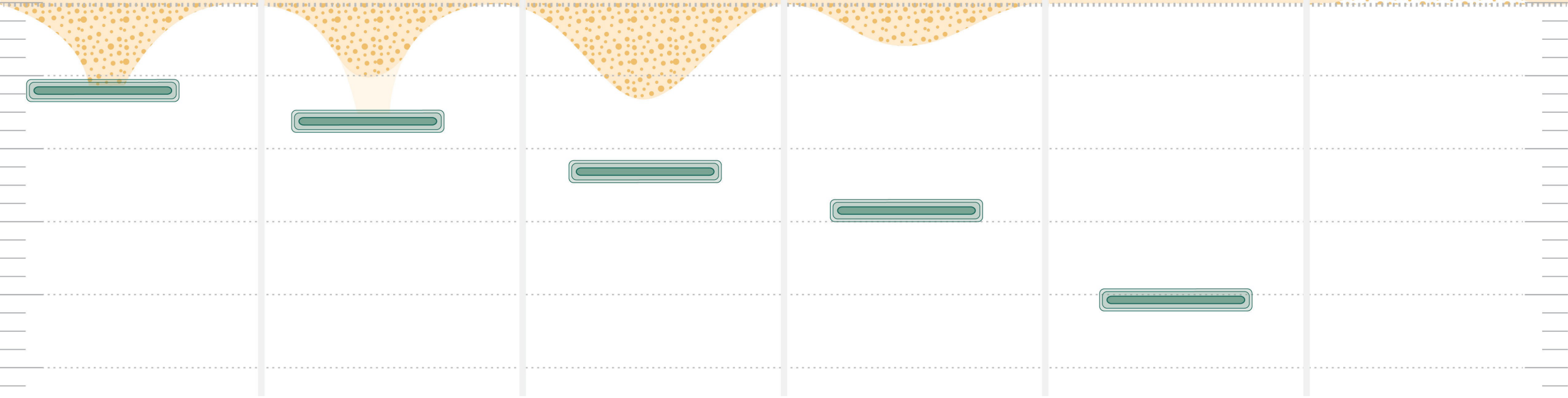
√

NO SINUOSITY / MINIMAL IMPACT

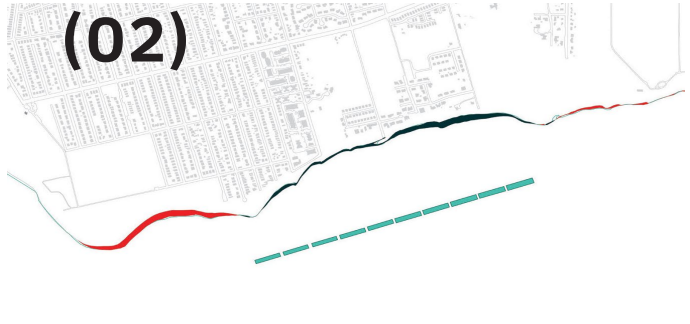
High wave energy reaches the beach, resulting in little, if any shoreline response.

x

ERODED




(01)


(02)

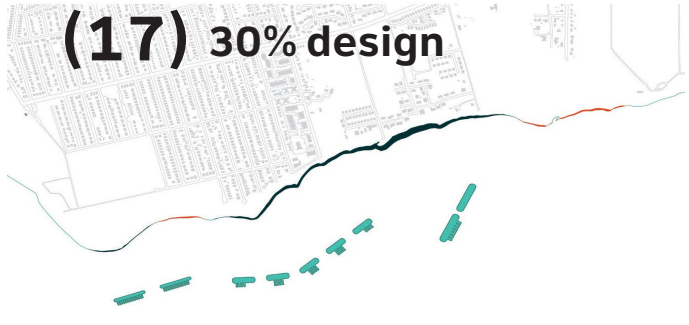

(03)

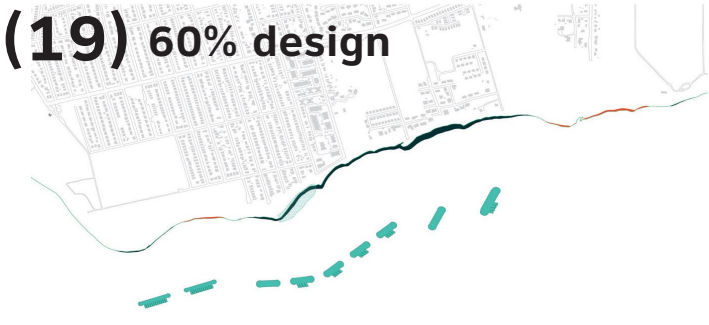

(05)


(07)

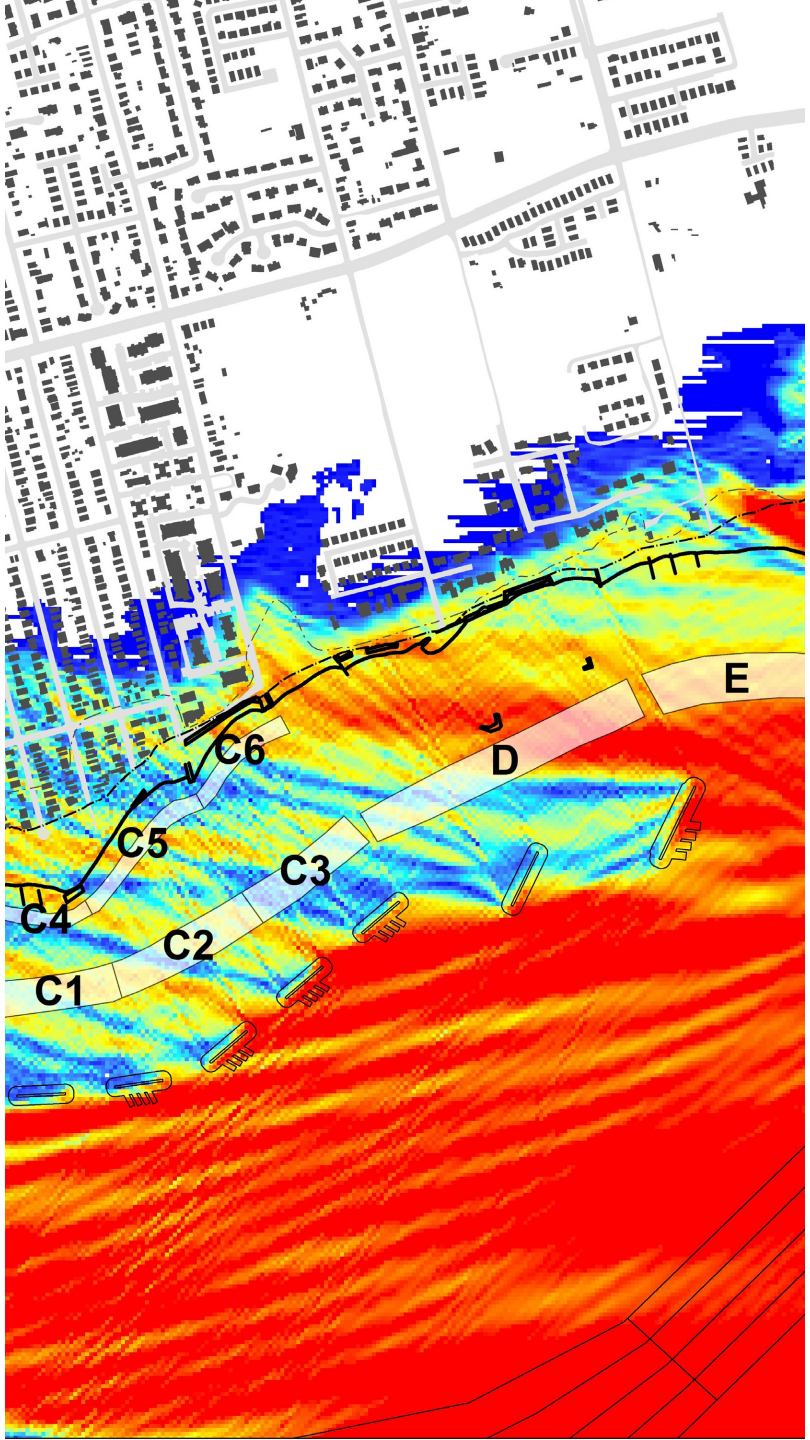

(10)

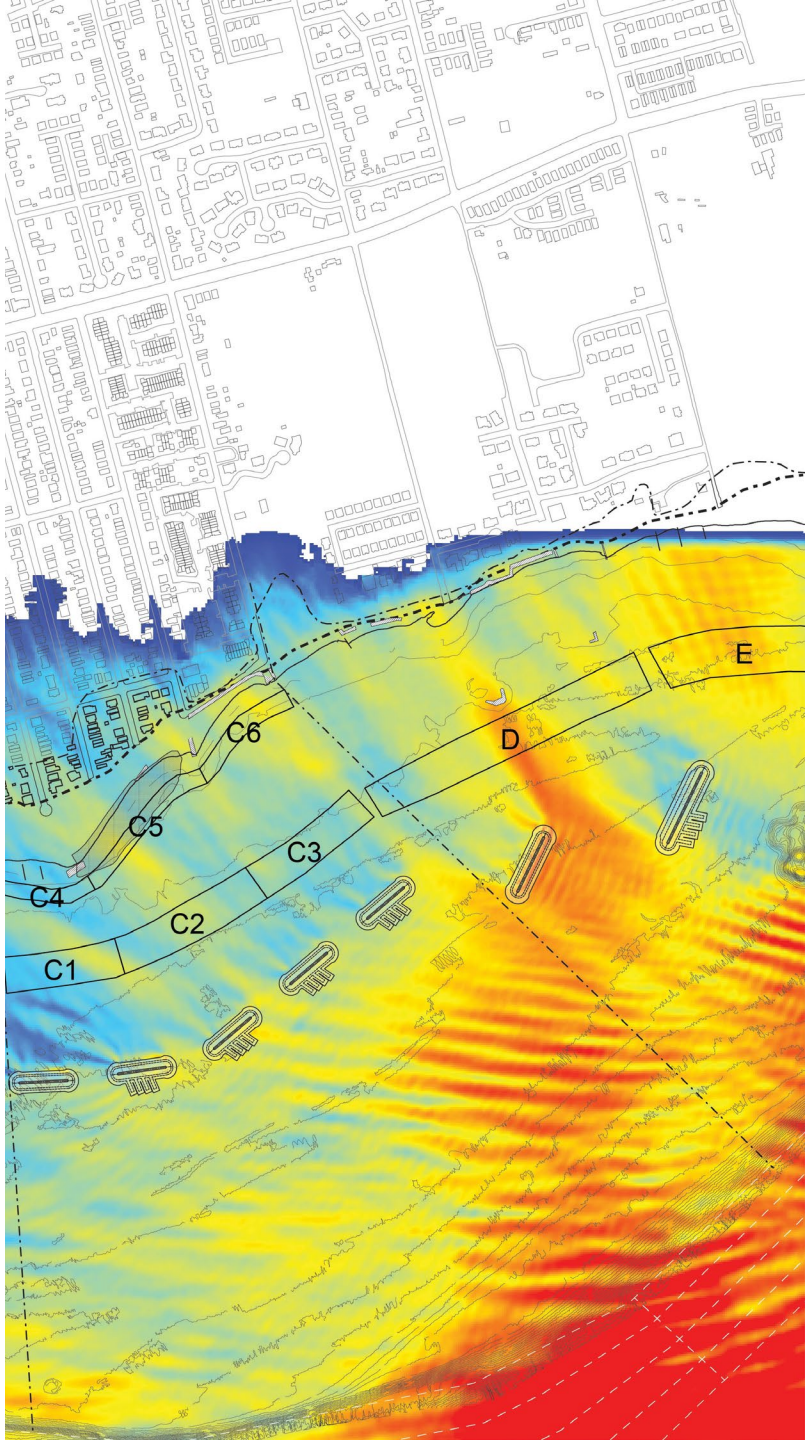

(13)


(17) 30% design


(19) 60% design


SPRAGUE AVE
JOLINE AVE
PAGE AVE


C1
C2
C3
C4
C5
C6
D
E


C1
C2
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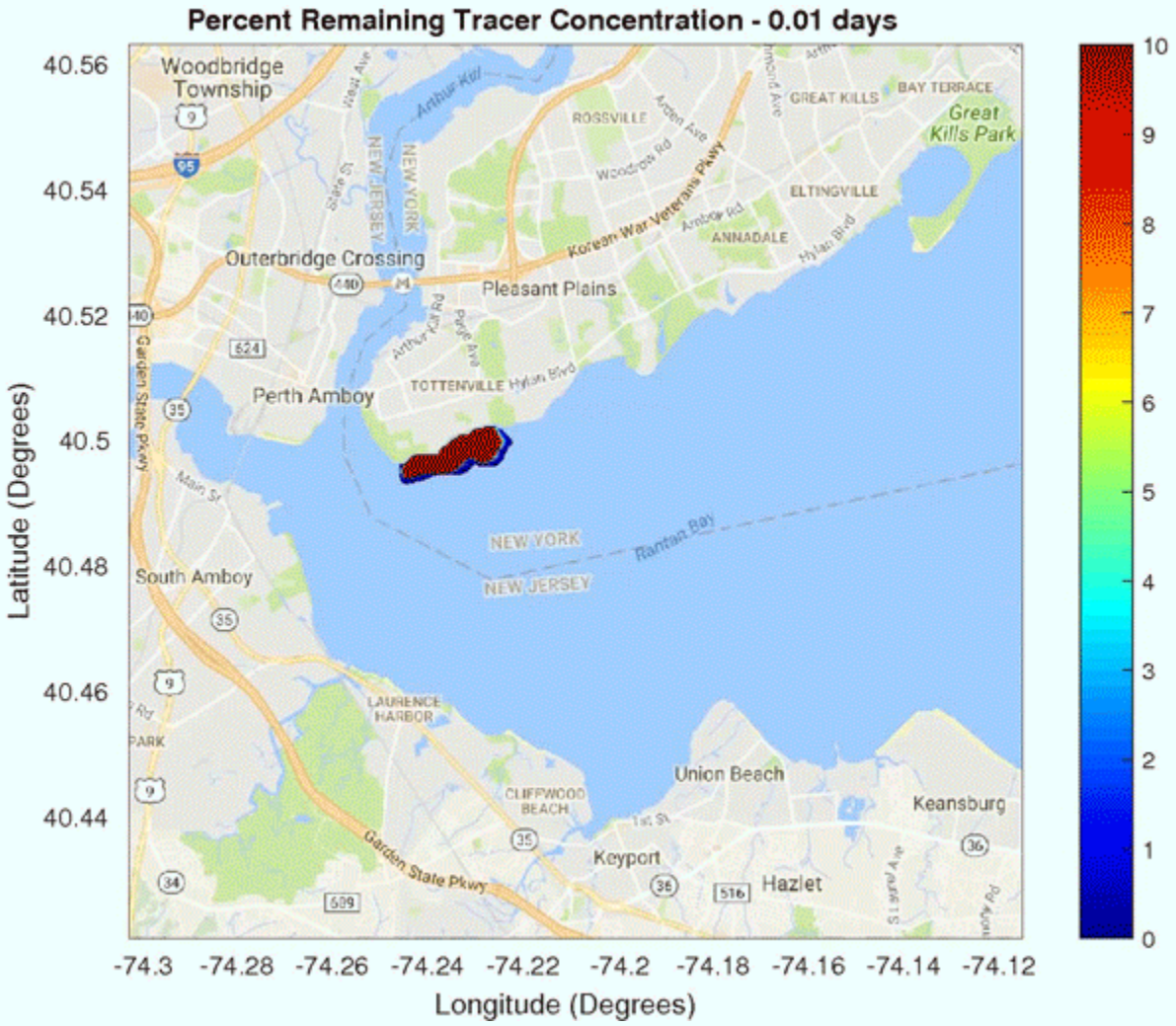
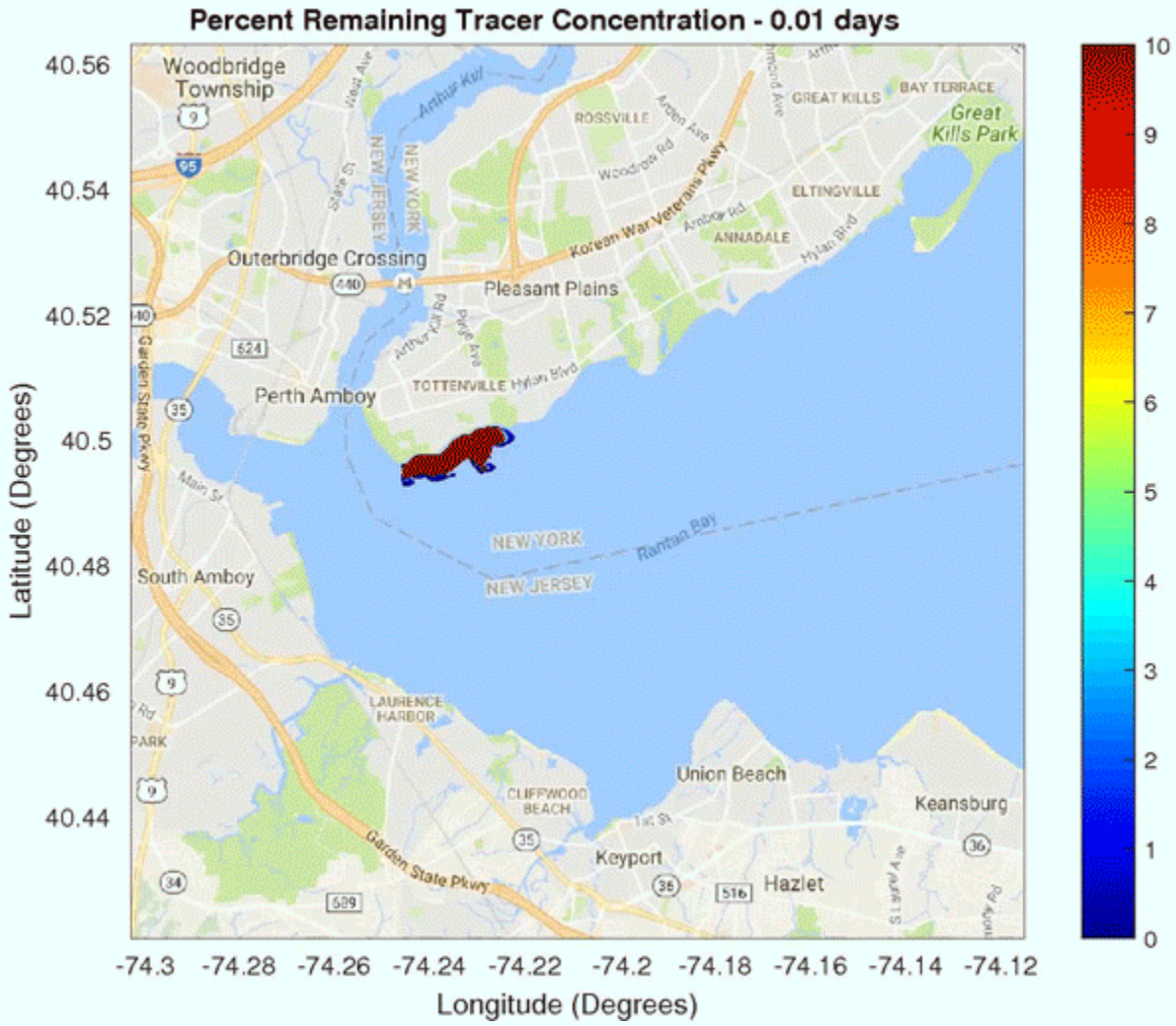
C5
C6
D
E


Percent Remaining Tracer Concentration - 0.01 days
Latitude (Degrees)
Longitude (Degrees)
40.56
40.54
40.52
40.5
40.48
40.46
40.44
-74.3
-74.28
-74.26
-74.24
-74.22
-74.2
-74.18
-74.16
-74.14
-74.12
10
9
8
7
6
5
4
3
2
1
0
Woodbridge Township
Outerbridge Crossing
Perth Amboy
Pleasant Plains
TOTTENVILLE
ELTINGVILLE
ANNADALE
ROSSVILLE
GREAT KILLS
BAY TERRACE
Great Kills Park
South Amboy
NEW YORK
NEW JERSEY
Raritan Bay
LAURENCE HARBOR
CLIFFWOOD BEACH
Union Beach
Keansburg
Keyport
Hazlet
Garden State Pkwy
Korean War Veterans Pkwy
Arthur Kill
NEW JERSEY
NEW YORK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40.56
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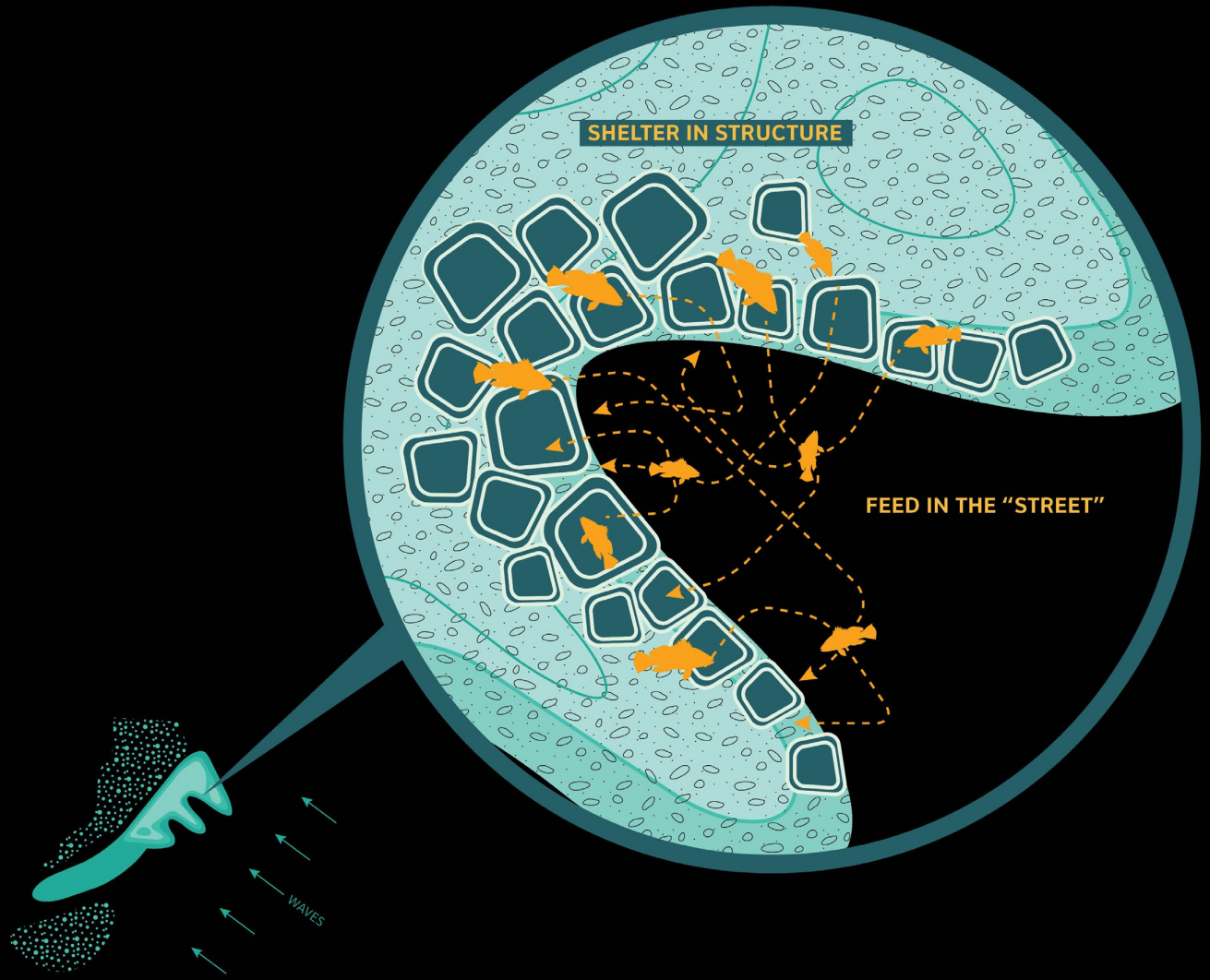
NEW YORK

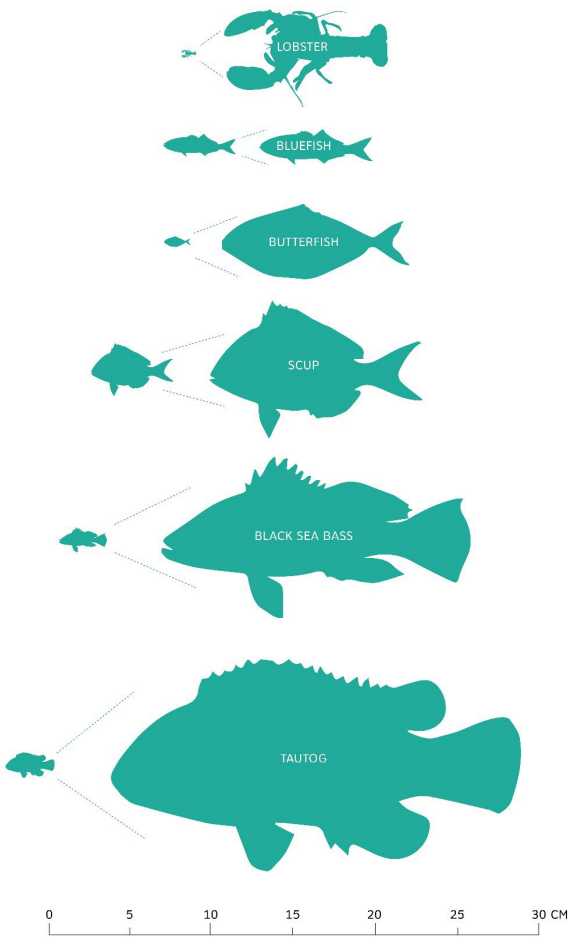
DESIGN HABITAT

“REEF STREETS”



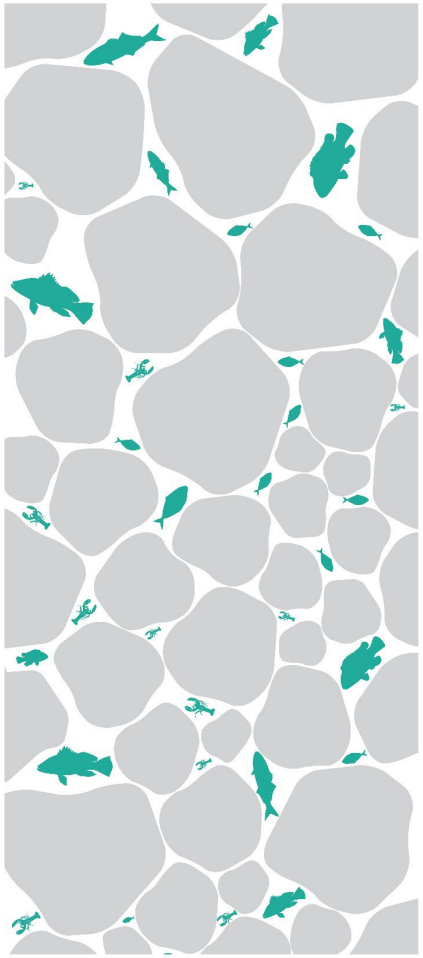
JUVENILE SIZE

FISH AND SHELLFISH SPECIES OF RARITAN BAY WITH PREFERENCE FOR STRUCTURED HABITAT



3 CM - 10 CM ROCK

SMALLER ROCK PROVIDES HABITAT FOR YOUNGER AND SMALLER JUVENILE SPECIES MOST PRONE TO PREDATION.

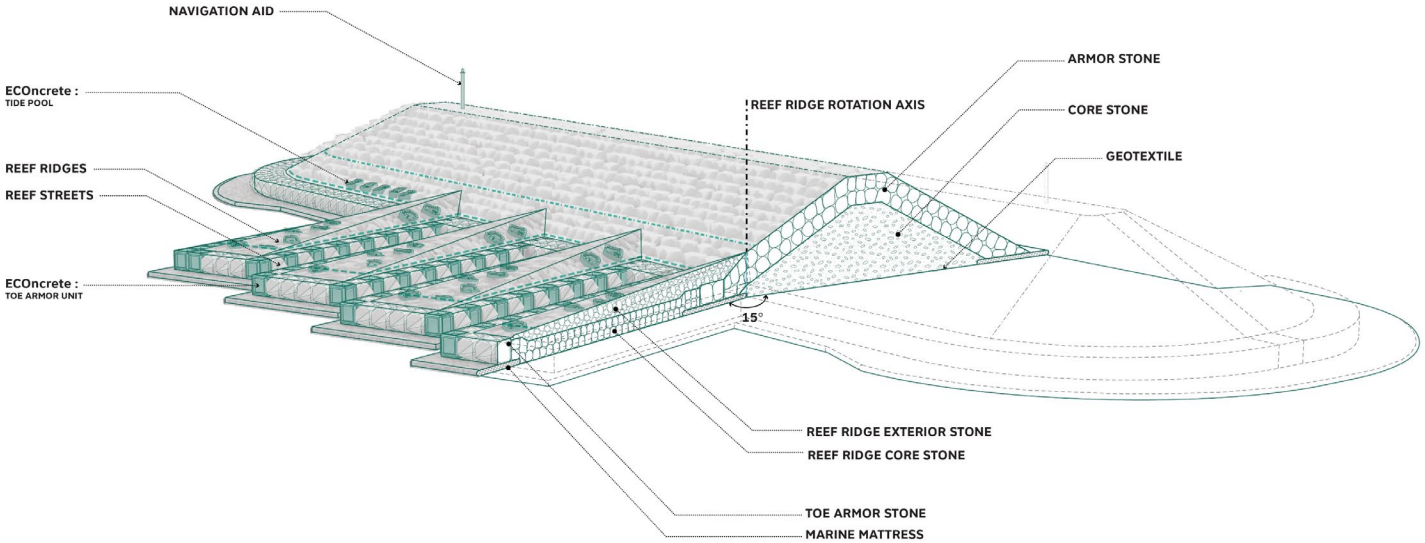


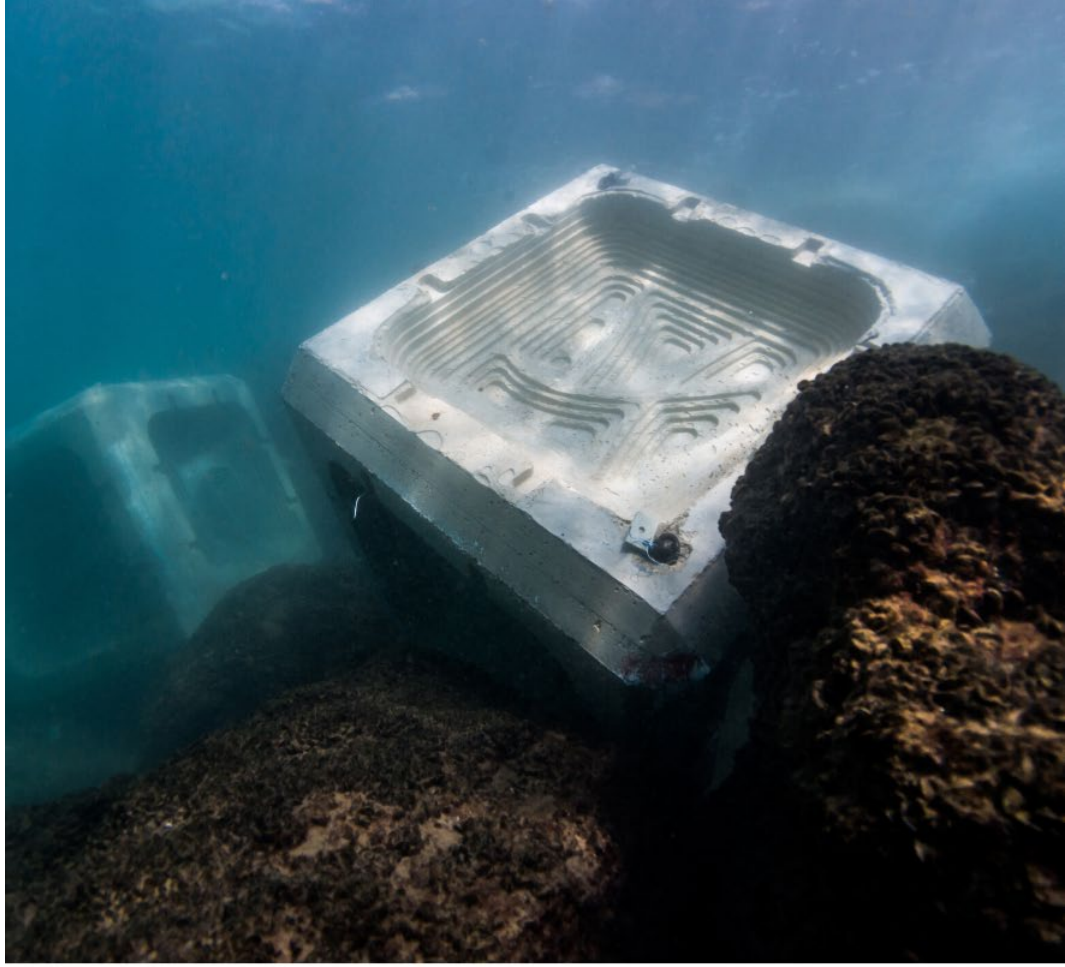
20 CM - 40 CM ROCK

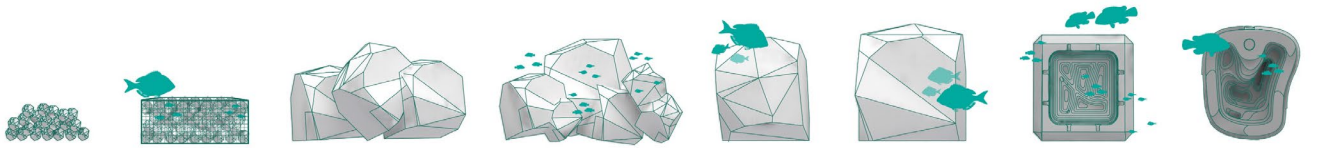
LARGER HOLE SPACES PROVIDE HABITAT FOR JUVENILES AS THEY GROW AND EXAPND THEIR FORAGING RANGE.

OYSTER REEF

BIOLOGICAL STRUCTURES PROVIDE COMPLEX GEOMETRIES ACCOMMODATING A RANGE OF SPECIES AND AGES.







INTERNAL CORE STONE
D_{50}= 16″

MARINE MATTRESS
HT= 12″

REEF RIDGE CORE STONE
Dmin= 24″ D_{50}= 30″
Dmax=36″

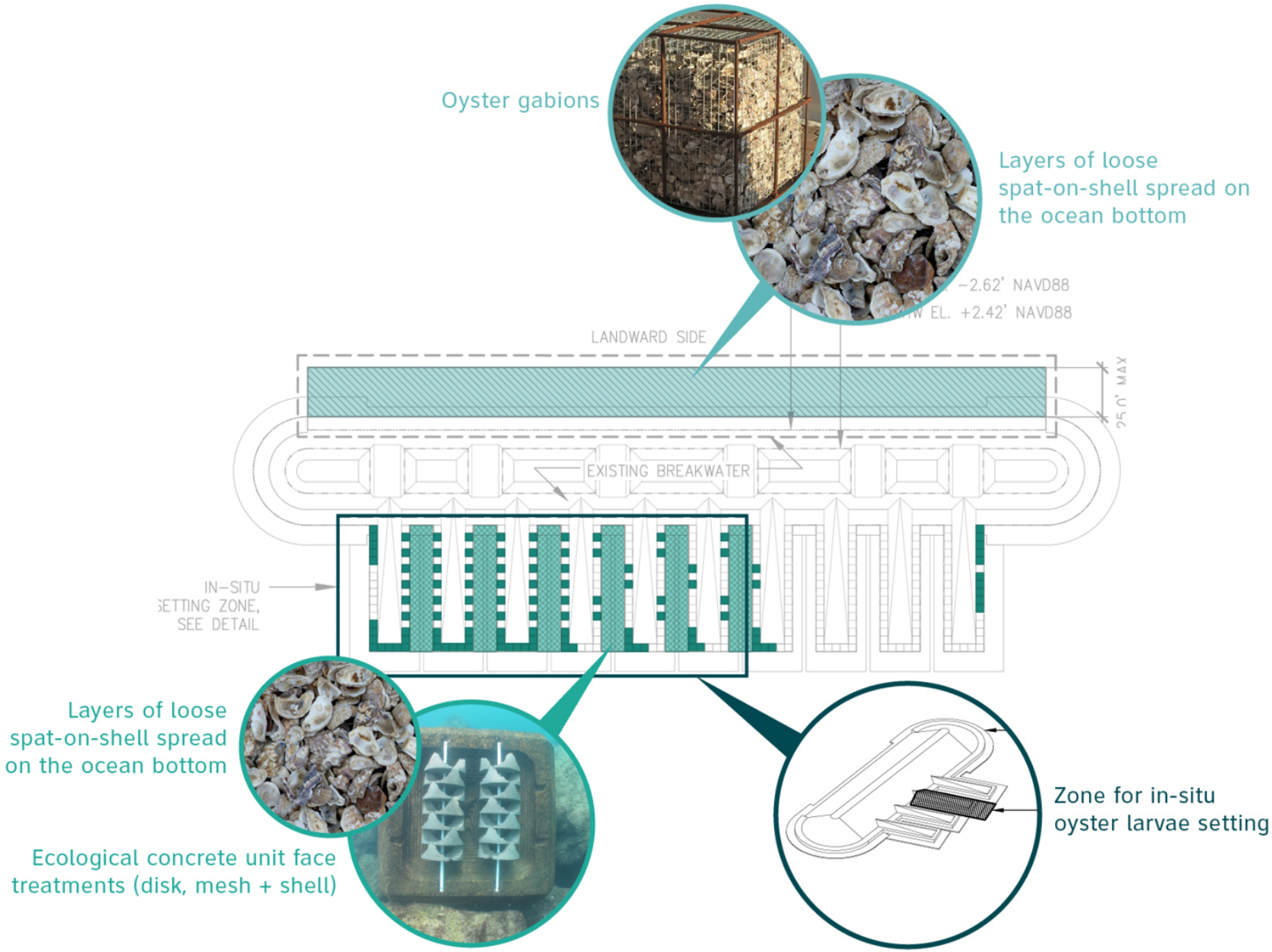
REEF RIDGE EXTERIOR STONE
D_{15}= 15″ D_{50}= 24″
D_{100}=36″

STONE ARMOR UNIT
D_{50}= 40″

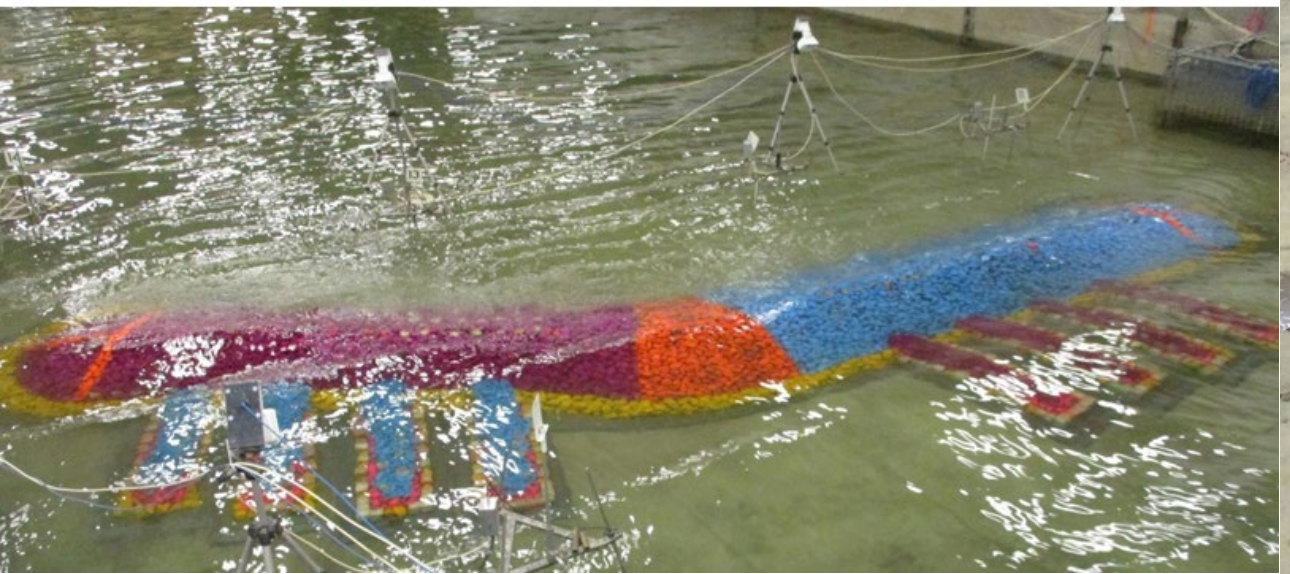
STONE TOE ARMOR UNIT
D_{50}: 48″

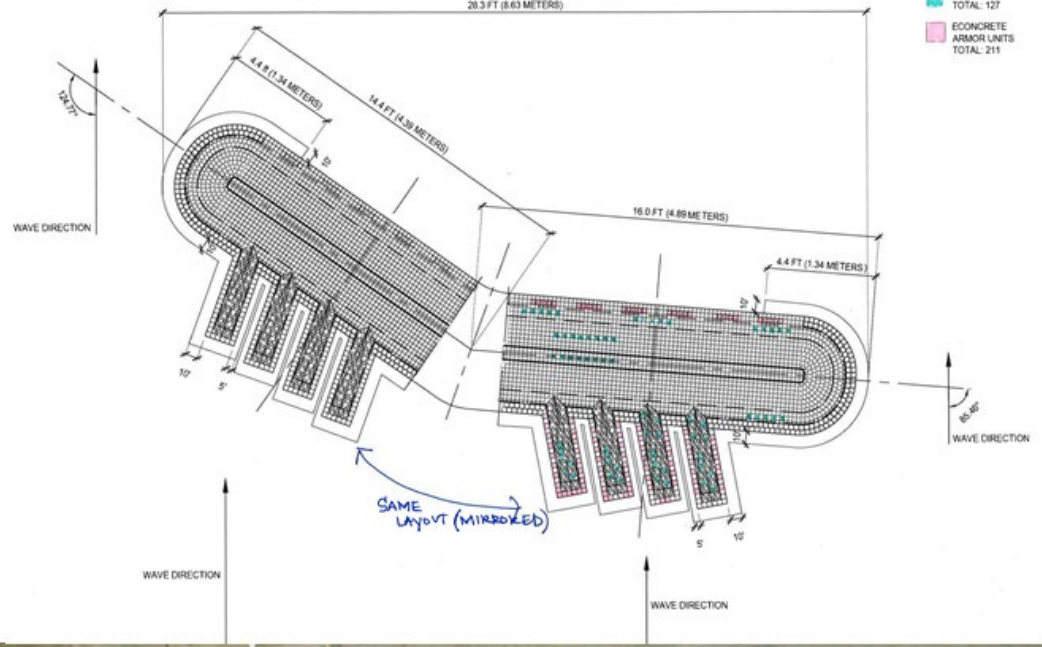
ECOncrete® TOE ARMOR UNIT
Dimension: 48″x 48″x 48″

ECOncrete® TIDE POOLS
Dimension: 44″X 48″X27


Oyster gabions
Layers of loose spat-on-shell spread on the ocean bottom
−2.62' NAVD88
EL. +2.42' NAVD88
LANDWARD SIDE
25.0' MAX
EXISTING BREAKWATER
IN-SITU SETTING ZONE, SEE DETAIL
Layers of loose spat-on-shell spread on the ocean bottom
Ecological concrete unit face treatments (disk, mesh + shell)
Zone for in-situ oyster larvae setting

PILOT, TEST, EXPERIMENT, MONITOR




28.3 FT (8.63 METERS)
TOTAL: 127
ECONCRETE ARMOR UNITS
TOTAL: 211
4.4 FT (1.34 METERS)
14.4 FT (4.39 METERS)
WAVE DIRECTION
16.0 FT (4.89 METERS)
4.4 FT (1.34 METERS)
SAME LAYOUT (MIRRORED)
WAVE DIRECTION
WAVE DIRECTION


BOSTON UNIVERSITY
GLOBAL DAYS OF SERVICE
APRIL


Cabela's


Cabela's

THANK YOU!

Brad Howe, SCAPE
brad@scapestudio.com