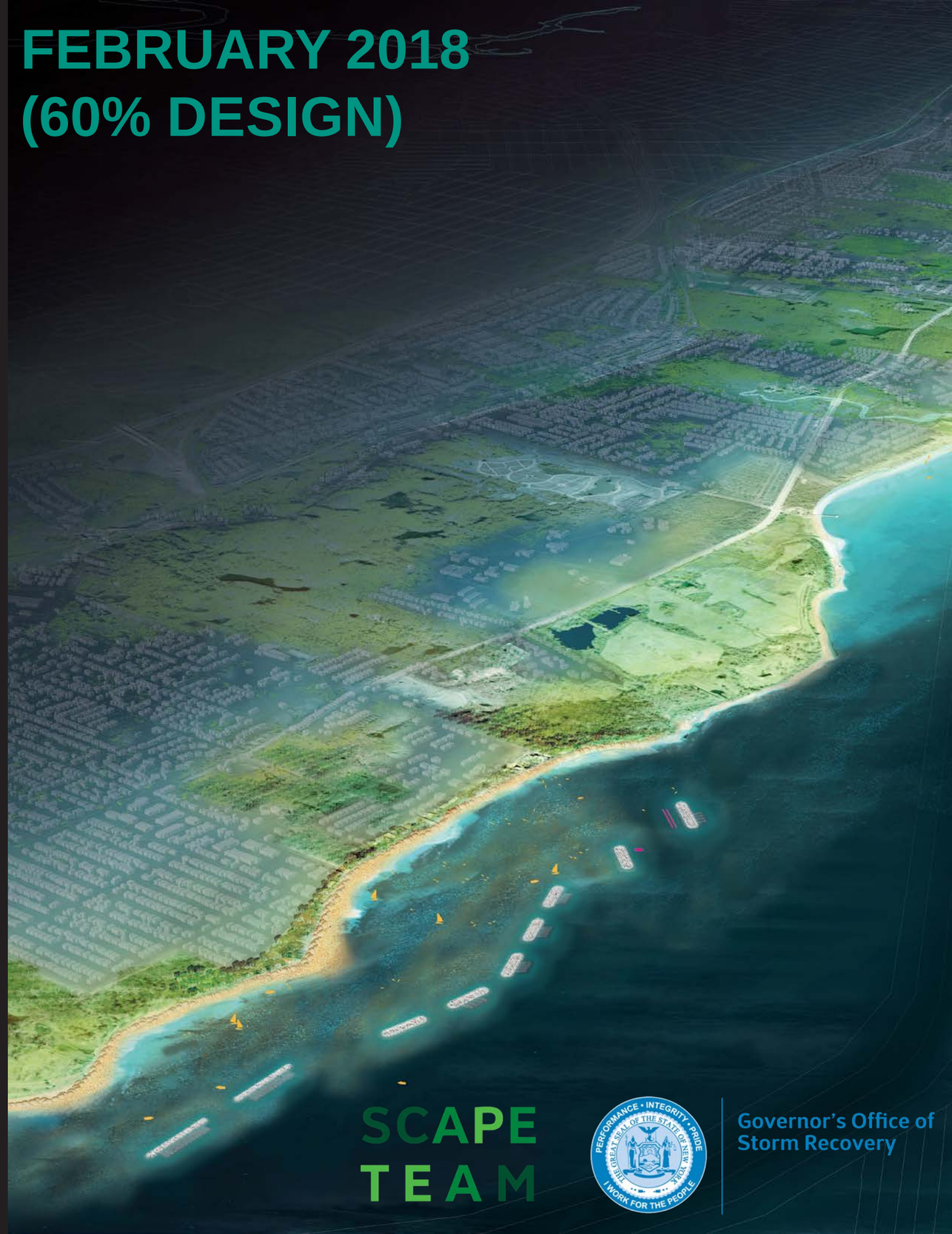
but we knew what we came up with had to be something that could actually be accomplished inside the complexpolitical ecosystem in which we operated.

- Henk Ovink, TOO BIG, 2018

JUNE 2014 (COMPETITION PROPOSAL)

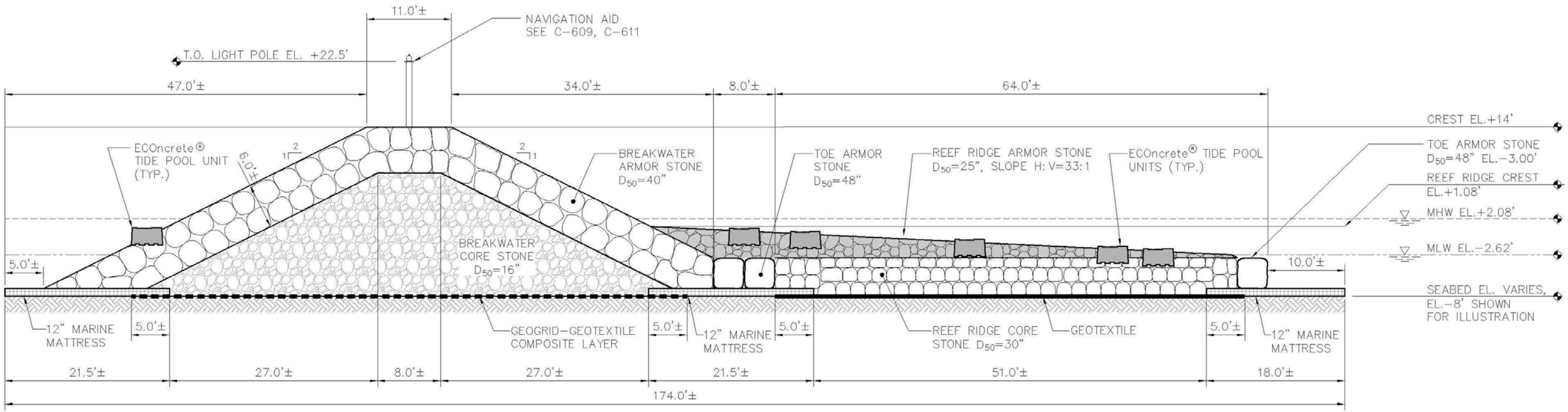
SCAPE TEAM

FEBRUARY 2018 (60% DESIGN)



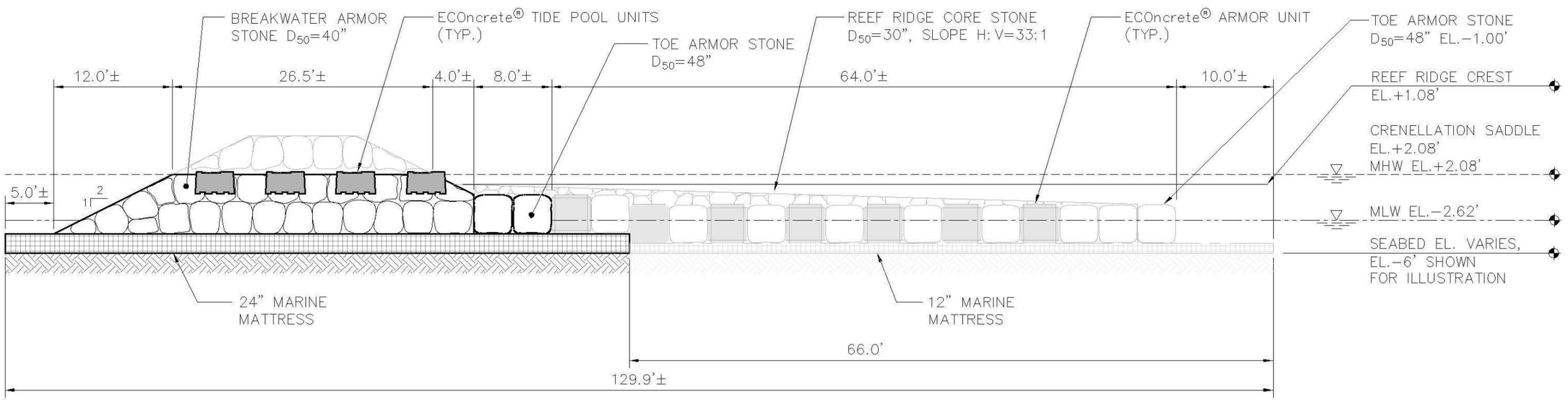
SCAPE TEAM

Governor's Office of Storm Recovery



A C-504 BREAKWATER B2, B4 – SECTION A

SCALE: 1"=8'



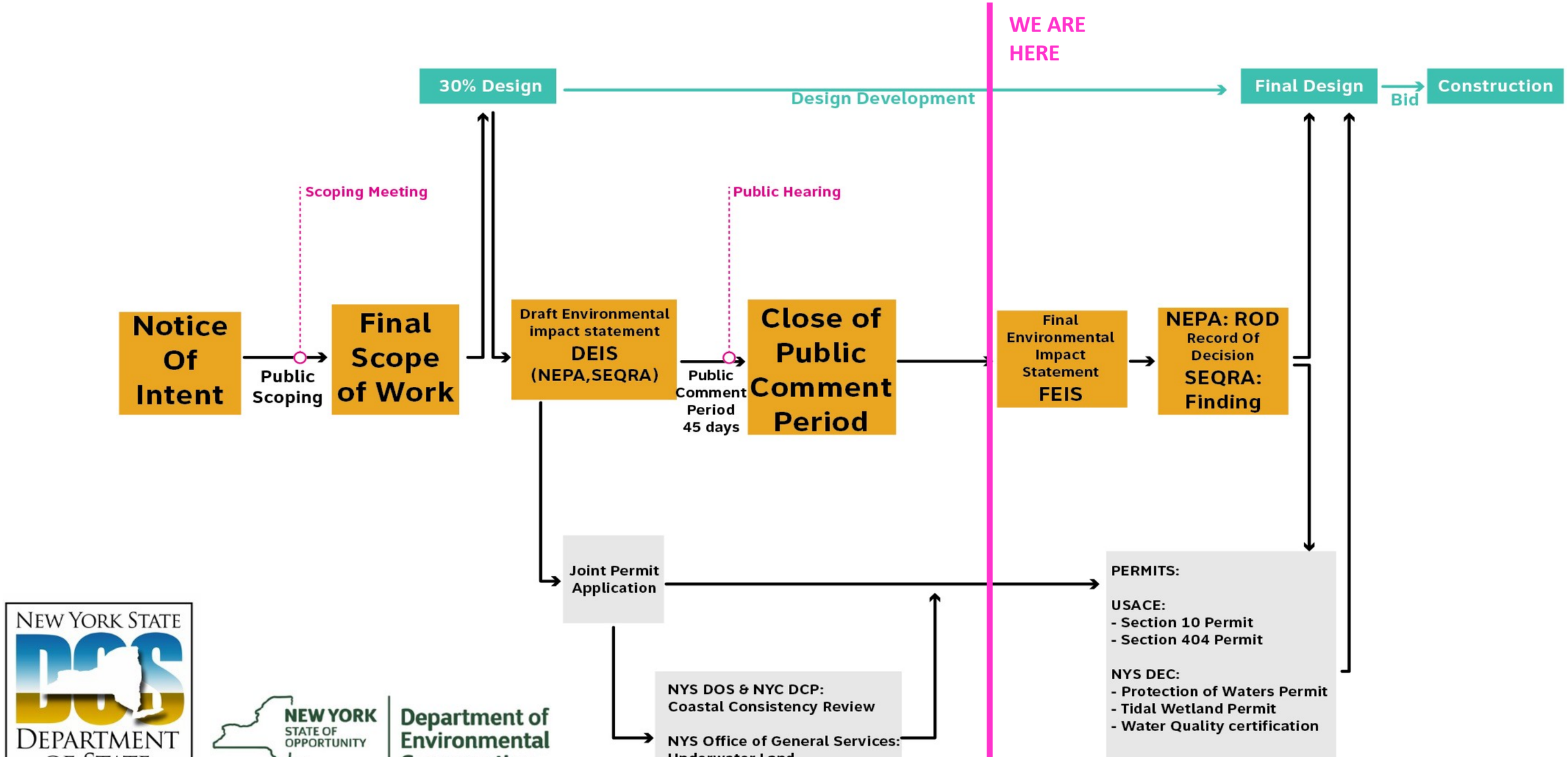
B C-501 BREAKWATER A1 – SECTION B

SCALE: 1"=8'

SUMMARY OF PERMITS & APPROVALS

Type	Name of permit or approval	Permitting / Regulatory agency	Other agencies involved	likelihood	hurdle?	Description of permit	Requirements / Prerequisites^	Deliverables / submissions	Approx timeframe (min, typ, max)	strategy and timeframe considerations
Permits required										
Permit	Section 10	USACE	NYSDOS, NYCDCP, NMFS, USFWS, USEPA, USCG, SHPO	DEFINITELY REQUIRED	*see component approvals / reviews*	Section 10 of the Rivers and Harbors Act requires authorization from the USACE for the construction of structures in or over any navigable water of the United States, excavation/dredging or deposition of material in these waters or any obstruction or alteration in a "navigable water" (all tidal waters are navigable waters of the US). Issue in conjunction w/ Section 404.	CZM Consistency, NEPA Compliance, EFH Assessment, ESA, FWCA, NHPA	Modeling for sedimentation & erosion to determine impact to navigation channels and shoreline; Navigation study to avoid navigational conflicts and ensure navigation safety Response to public comments EFH Assesment	6 mo – 1yr – 3 yrs	Timeframes begin when application is found to be complete by USACE. Pre-application consult important for reducing incomplete application phase. Max. time assumes NEPA EIS is required Min. time assumes no public hearing is required
Permit	Section 404	USACE	Same as above, plus NYSDEC	DEFINITELY REQUIRED	*see component approvals / reviews*	Section 404 of the Clean Water Act, as amended, requires authorization from the USACE to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Issue in conjunction w/ Section 10.	CZM Consistency, NEPA Compliance, EFH Assessment, ESA, FWCA, NEPA, WQC	Demonstrate lack of practicable alternatives to accomplish project purpose Document that project benefits offset detrimental impacts	Same as above for Section 10	Same as above for Section 10
Permit	Protection of Waters	NYSDEC	State or local SEQRA lead agency	DEFINITELY REQUIRED	*see component approvals / reviews*	Under Article 15 of the Environmental Conservation Law a permit is required from the NYSDEC for: Disturbance of the bed or banks of a "protected stream" or other watercourse; Construction, reconstruction or repair of dams and other impoundment structures; Construction, reconstruction or expansion of docking and mooring facilities; and Excavation or placement of fill in "navigable waters" and their adjacent and contiguous wetlands. The Protection of Waters Program regulates waterways based on the designation given to the specific body of water.	SEQRA, CZMP/LWRP for activities in State coastal zone		6 mo – 1yr – 3 yrs	Timeframes begin when application is found to be complete by NYSDEC Pre-application consult important for reducing incomplete application phase Max. time assumes SEQRA EIS is required Min. time assumes no public hearing is required
Permit	Tidal Wetlands	NYSDEC	State or local SEQRA lead agency NYSOGS NYSDOS NYCDCP	**DEFINITELY REQUIRED** (given how DEC defines tidal wetlands)	*see component approvals / reviews*	Under Article 25 of the Environmental Conservation Law a permit is required from NYSDEC for almost any activity that will alter wetlands or the adjacent areas. In general, tidal wetlands consist of all the salt marshes, non-vegetated as well as vegetated flats and shorelines subject to tides. Adjacent areas extend up to 300 feet inland from the wetland boundary (up to 150 feet inland within NYC). Official tidal wetlands maps showing the exact locations of NY's regulated wetlands are on file at NYSDEC regional offices and in the County Clerks' Offices.	Same as above for Protection of Waters permit, plus underwater land approval or easement,	Same as for Protection of Waters permit, plus underwater land approval or easement	Same as above for Protection of Waters permit	Same as above for Protection of Waters permit
Permit	Freshwater Wetlands	NYSDEC	None	**UNLIKELY** only for on-shore components	*see component approvals / reviews*	This permit allows an applicant to perform an activity or erect a structure that will impact a NYSDEC-regulated freshwater wetland or an adjacent area. Generally, the permit applies to freshwater wetlands that are 12.4 acres or larger in area or smaller wetlands deemed to be of unusual local importance, and which appear on the Freshwater Wetlands regulatory maps.	None	Delineate freshwater wetland boundary and show on project plans	Same as above for Protection of Waters permit	

^ approvals, reviews, etc. required prior to issuing of permit



NEW YORK STATE DEPARTMENT OF STATE

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

US Army Corps of Engineers®

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

NOAA — NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION — U.S. DEPARTMENT OF COMMERCE

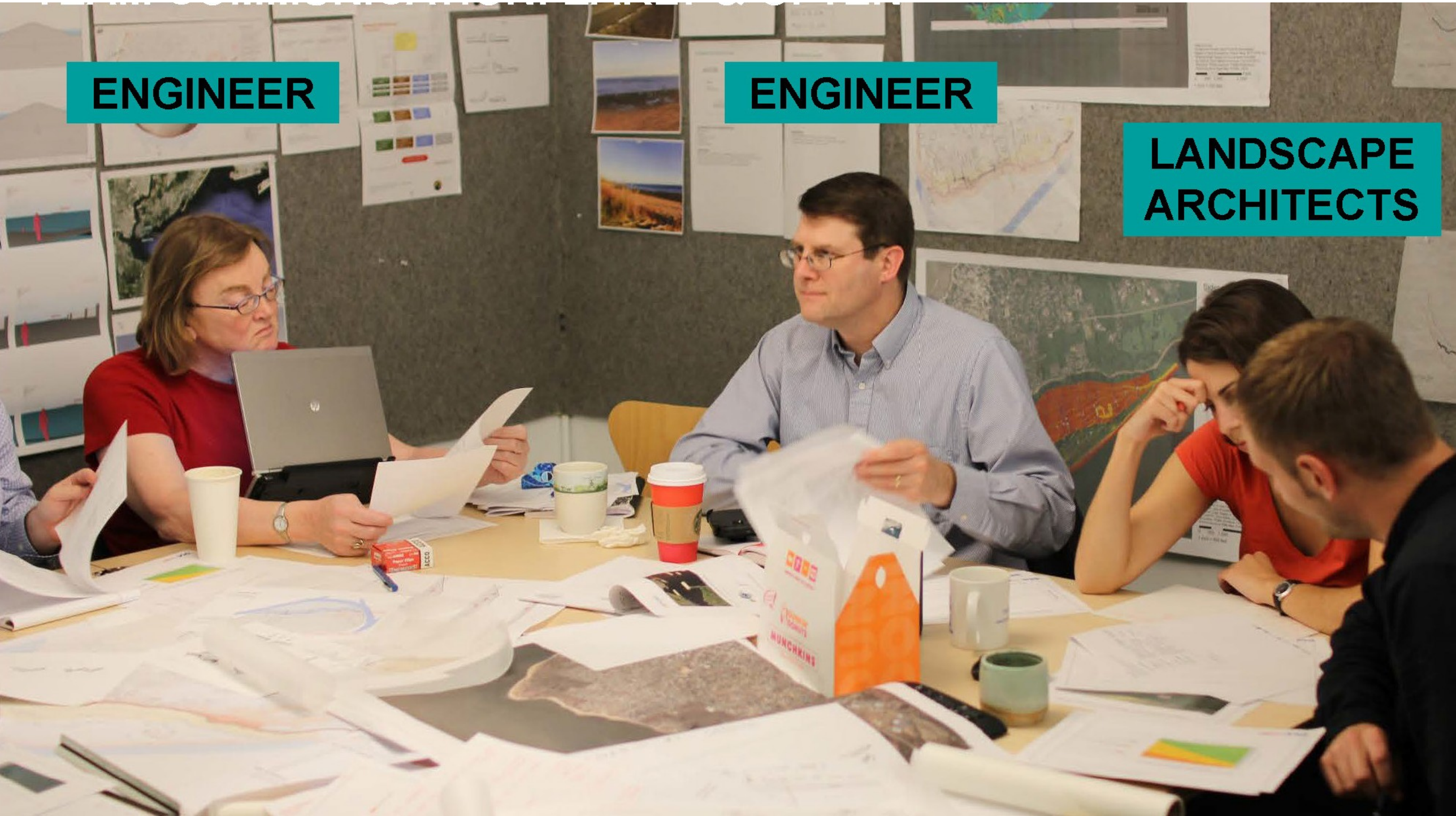
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

U.S. DEPARTMENT OF THE INTERIOR — MARCH 3, 1849

NYC PLANNING — DEPARTMENT OF CITY PLANNING CITY OF NEW YORK

COMMUNICATE & COLLABORATE

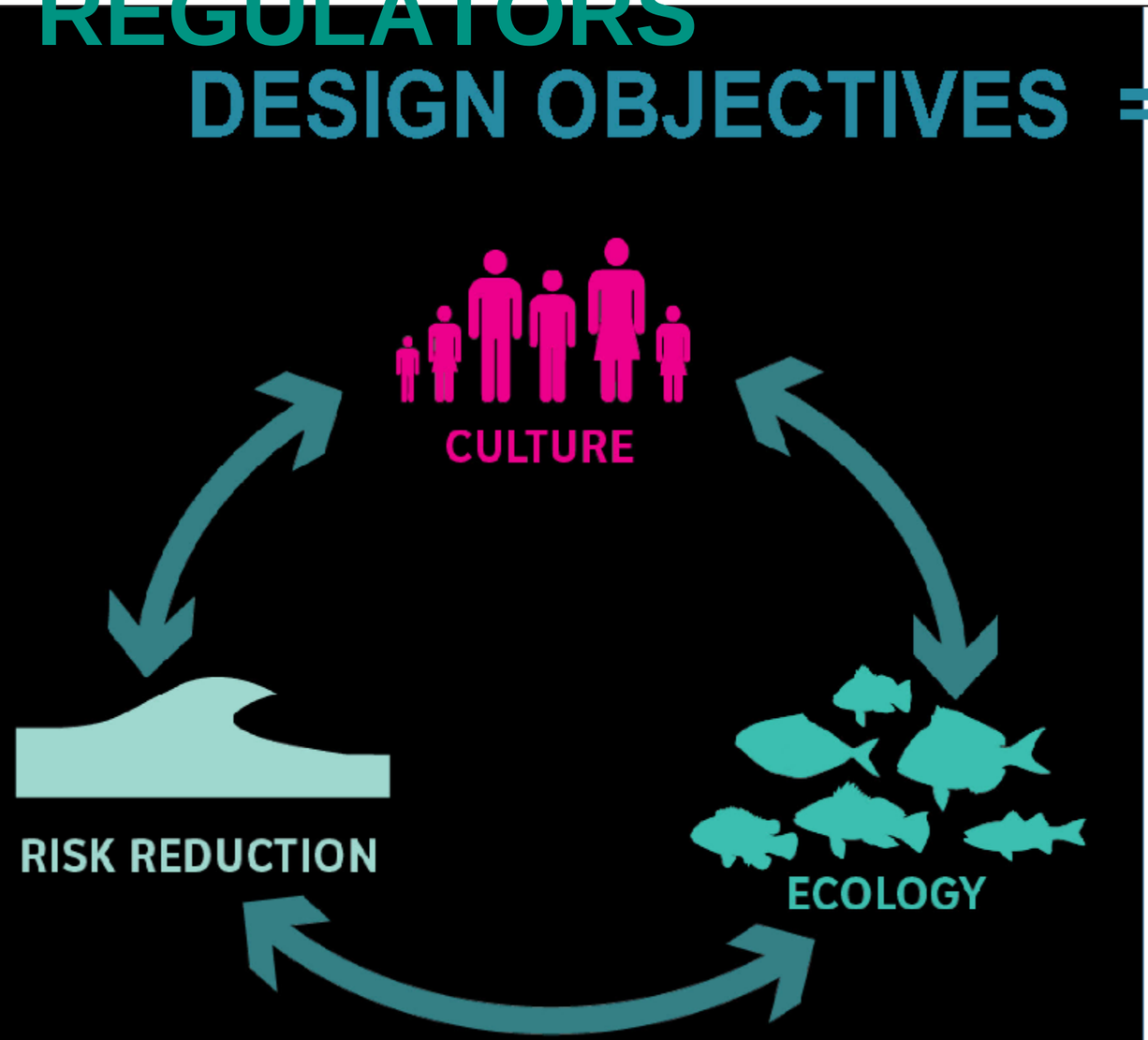
COMMUNICATE WITH EACH OTHER



COMMUNICATE WITH THE PUBLIC(S)

COMMUNICATE WITH THE REGULATORS

DESIGN OBJECTIVES = PURPOSE & NEED



PURPOSE AND NEED

The project design objectives are directly related to the project purpose and need as documented in the Final EIS scoping document. It should be noted that a single EIS is being prepared for the combined Living Breakwaters and Tottenville Shoreline Protection projects. The purpose and need is laid out in the Coastal and Social Resiliency Initiatives for Tottenville Shoreline, Staten Island, NY - Environmental Impact Statement Final Scope of Work, released on April 1, 2016, and states:

Specifically, the goals and objectives related to the Proposed Actions' purpose and need are listed below:

Risk Reduction

- Attenuate wave energy;
- Address both event-based and long-term shoreline erosion / preserve beach width; and
- Address the impacts of coastal flooding [note: refers to TSPP only].

Ecological Enhancement

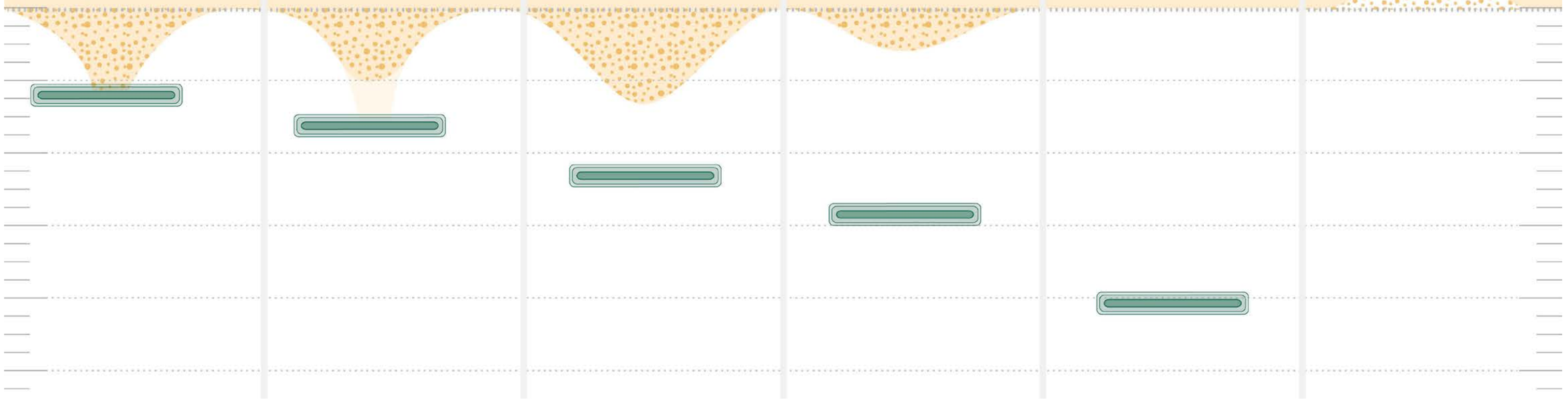
- Increase diversity of aquatic habitats consistent with the Hudson-Raritan Estuary plan priorities (e.g., oyster reefs and fish and shellfish habitat).

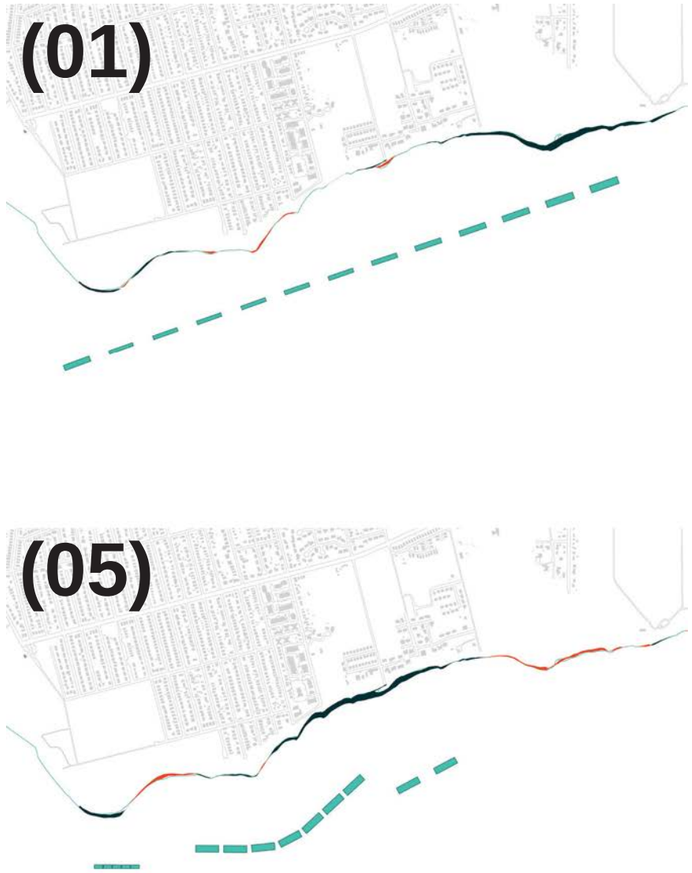
Social Resiliency

- Foster community education on coastal resiliency directly tied to and building off the structural components of this resiliency initiative;
- Increase physical and visual access to the water's edge;
- Enhance community stewardship of on-shore and in-water ecosystems; and
- Increase access to recreational opportunities.

EXPLORE & ITERATE

x	?	√	√ √	√	x
TOMBOLO	**PERIODIC TOMBOLO**	**STRONG SALIENT**	**SUBDUED SALIENT**	**NO SINUOSITY / MINIMAL IMPACT**	**ERODED**
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.	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.	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.	Yet higher wave energy reaches the shoreline; the shoreline response is not as pronounced and the amplitude of the salient is of lower relief.	High wave energy reaches the beach, resulting in little, if any shoreline response.	

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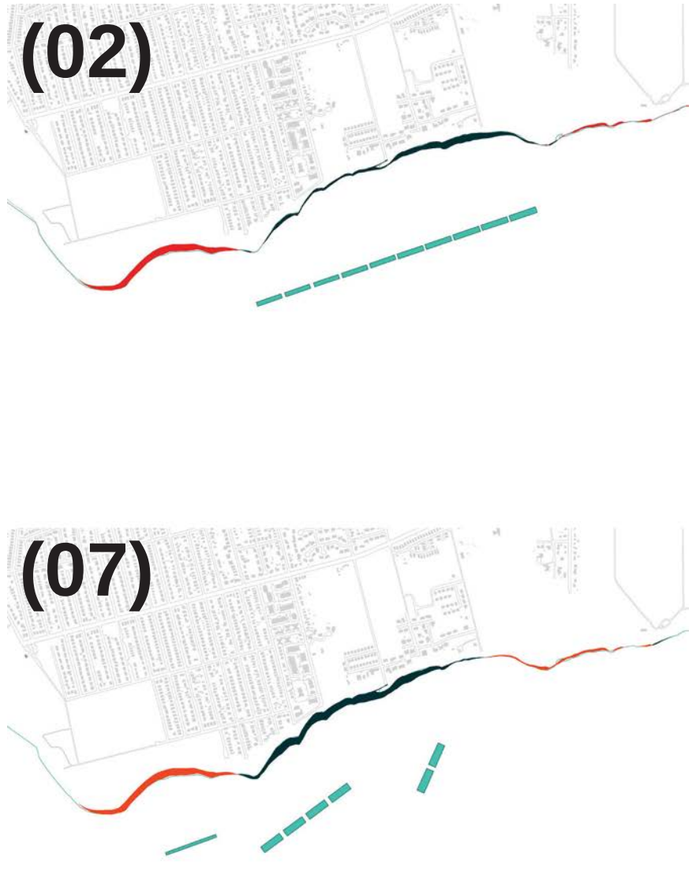
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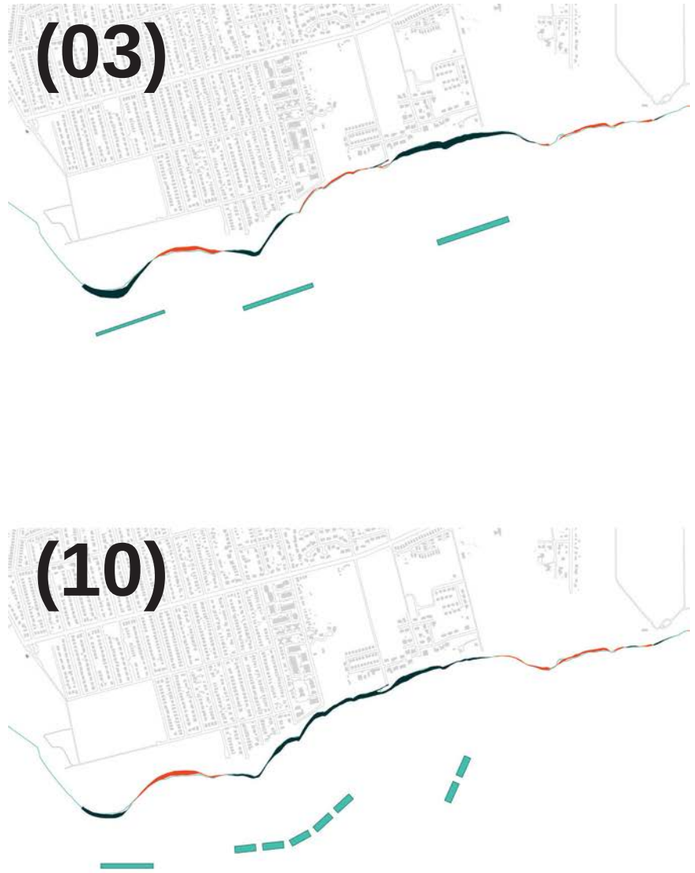
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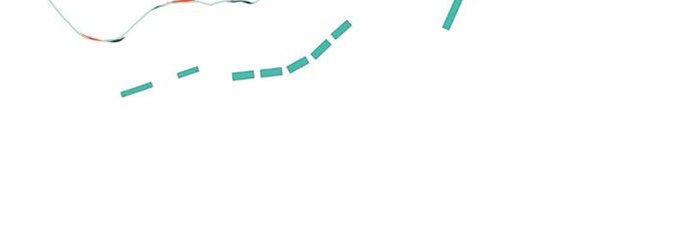
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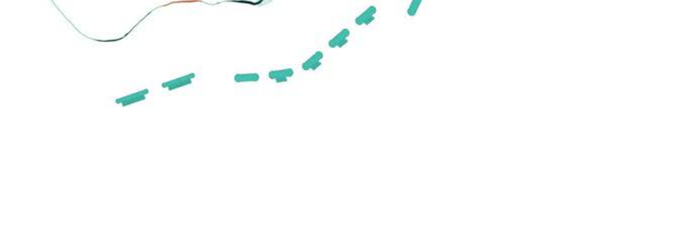
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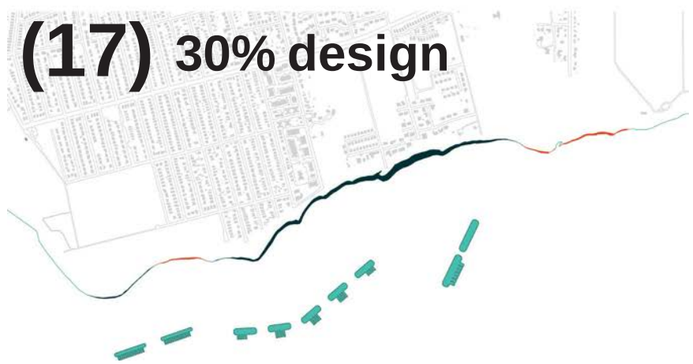
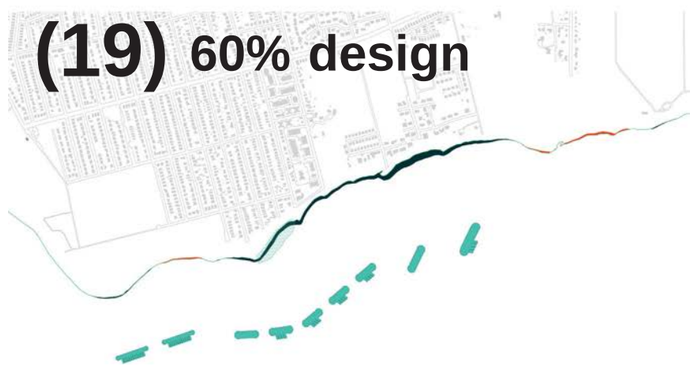
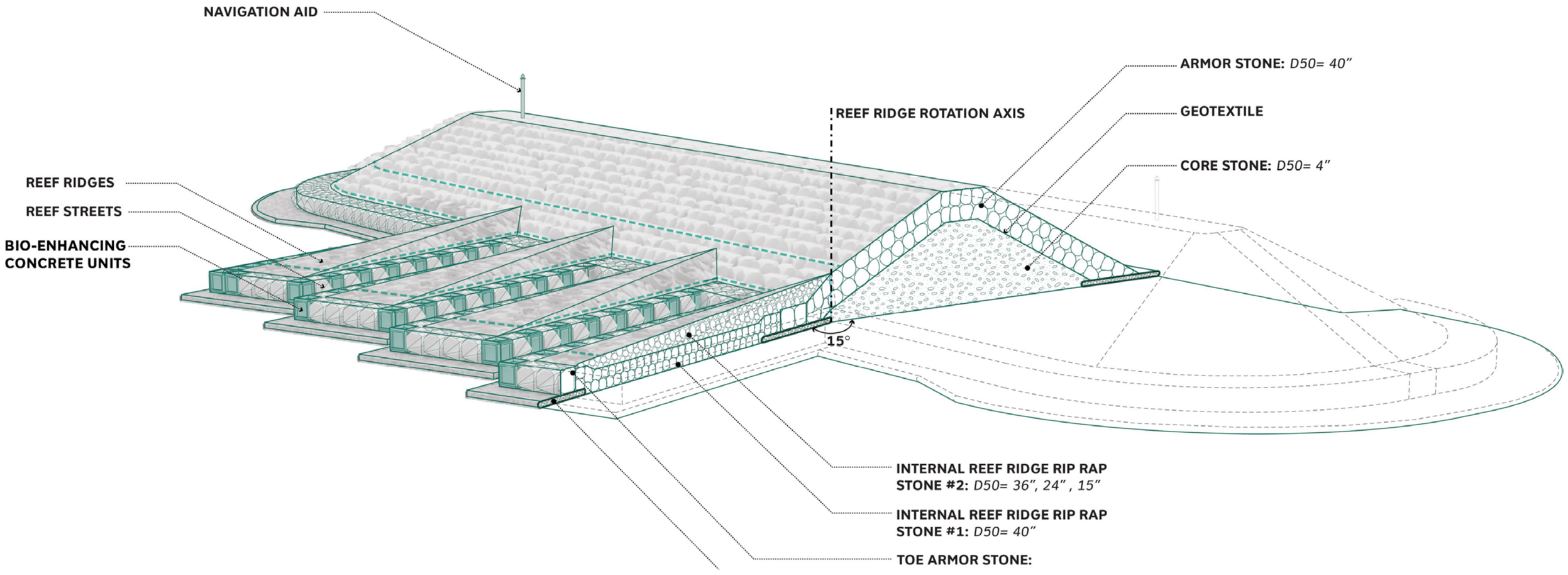
(13)


(17) 30% design

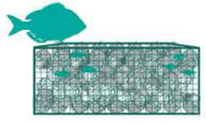

(19) 60% design

EXPERIMENT & VALIDATE

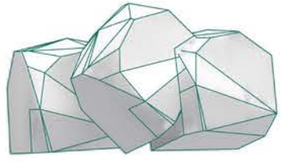
MATERIAL S



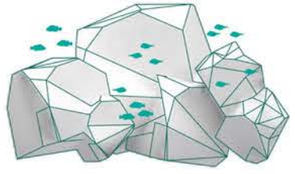
INTERNAL CORE STONE
D_{50}= 16”



MARINE MATTRESS
HT= 12”

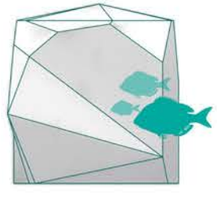


REEF RIDGE CORE STONE
Dmin= 24” D_{50}= 30”
Dmax=36”



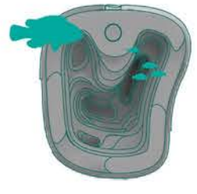
REEF RIDGE EXTERIOR STONE
D_{15}= 15” D_{50}= 24”
D_{100}=36”

STONE ARMOR UNIT
D_{50}= 40”



STONE TOE ARMOR UNIT
D_{50}: 48”

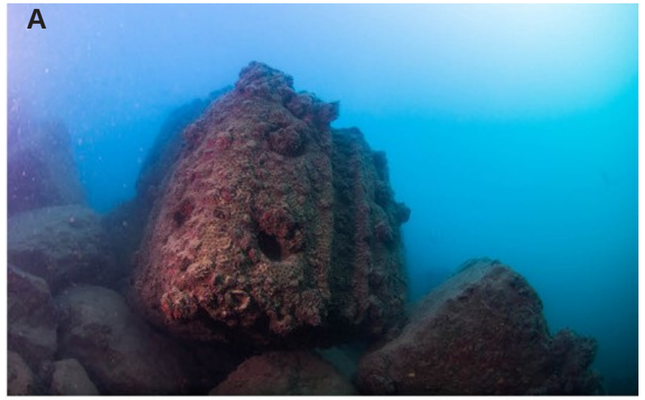
ECOncrete® TOE ARMOR UNIT
Dimension: 48”x 48”x 48”

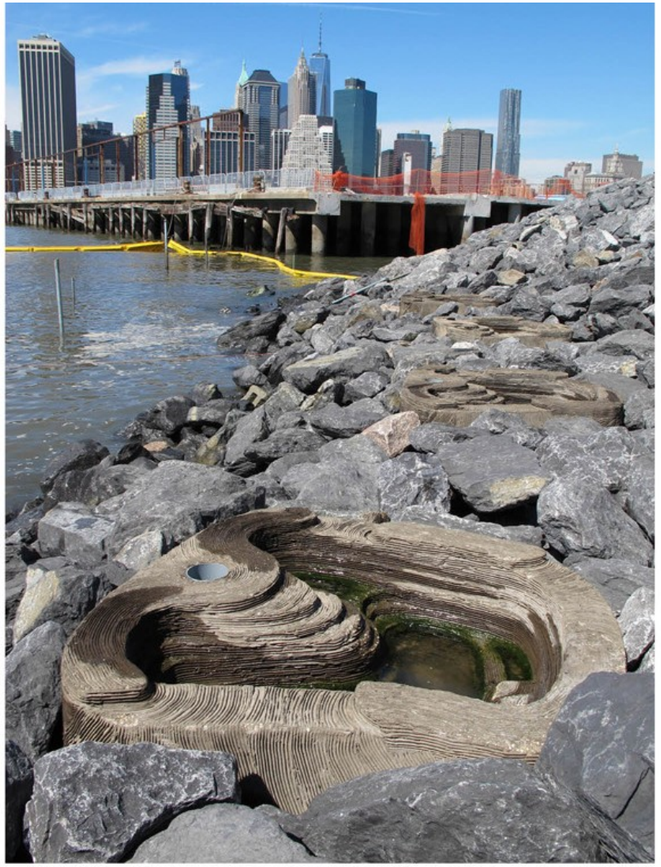


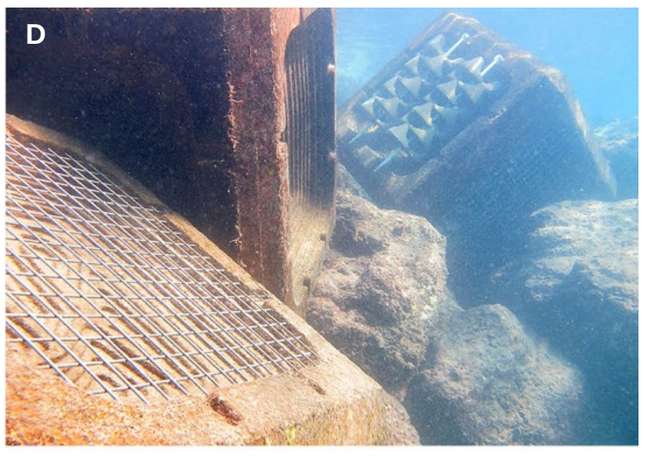
ECOncrete® TIDE POOLS
Dimension: 44”X 48”X27

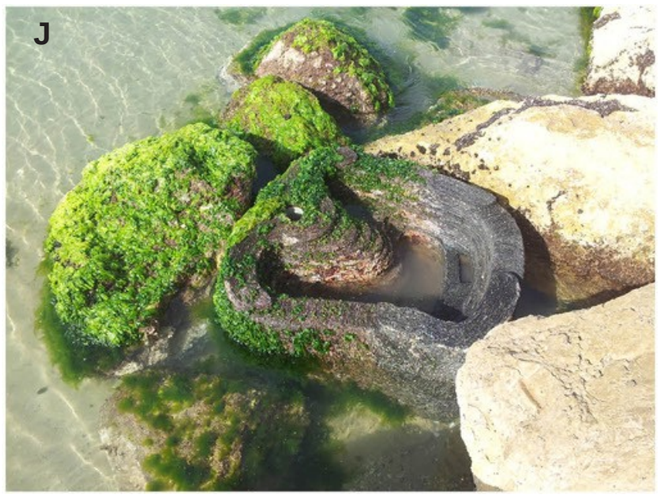
ECOconcrete

®

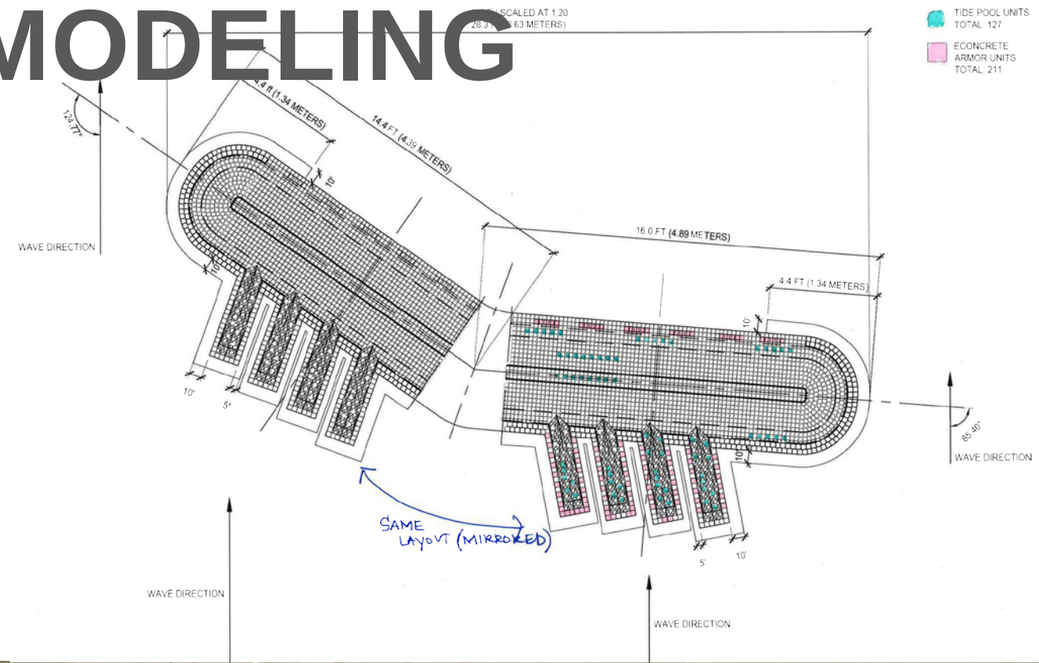


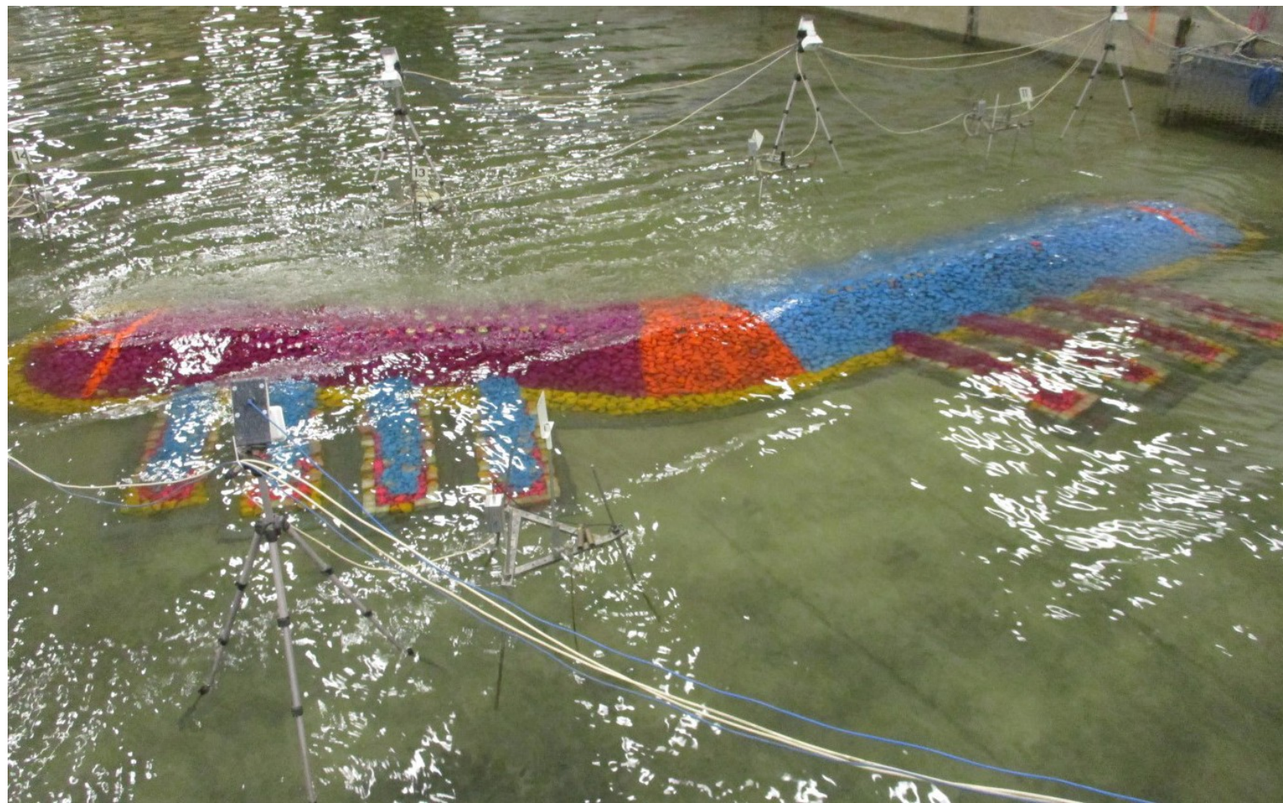






PHYSICAL MODELING





MONITOR
MANAGE
ADAPT
REPLICATE

HORIZONTAL INTERTIDAL SURFACES

WATER RETAINING TIDE POOLS

STONE SIZE DIVERSITY

HW +2.08 NAVD88

MLW -2.62 NAVD88

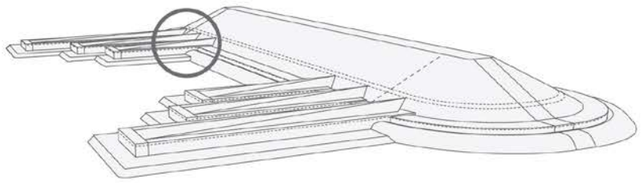
+ TAUTOG

+ SCUP

+ BLUE FISH

+ STRIPED BASS

+ AMERICAN LOBSTER



STEEP SUBTIDAL SURFACES

POROSITY

SURFACE COMPLEXITY

HARD SUBSTRATE LIVING BREAKWATER HABITAT