LIVING BREAKWATERS & TOTTENVILLE SHORELINE PROTECTION PROJECT

CAC MEETING #5

PS6 Corporal Allan F. Kivlehan School

9/29/2016

NYC Parks

NY RISING

SCAPE TEAM

SCAPE / LANDSCAPE ARCHITECTURE
OCEAN AND COASTAL CONSULTANTS
PARSONS BRINCKERHOFF
ARCADIS
SEARC ECOLOGICAL MARINE CONSULTING
NEW YORK HARBOR FOUNDATION
LOT-EK ARCHITECTURE
MFS CONSULTING ENGINEERS
PRUDENT ENGINEERING

Stantec

RACE

NEW YORK STATE OF OPPORTUNITY. | DASNY

AGENDA

1. WELCOME & INTRODUCTION
2. PROGRESS UPDATES
3. RECAP
4. Q & A / INFO SESSION

WELCOME & INTRODUCTION

COMMUNITY ADVISORY COMMITTEE

- James Pistilli (Co-Chair)
- Victoria Cerullo (Co-Chair)
- Debra Amoroso
- Phyllis Broughton
- Catherine Cramer
- Kerry Halvorsen
- Albert Klingele
- Michael Kress
- Gloria Maldonado
- John Malizia
- Nicole Nigro
- Pamela Pettyjohn
- Anthony Reinhart
- Frank Santarpia
- Bill Shadel
- Diane Silverman
- Veronica Petersen
- Michele Moore
- Lauren Cosgrove

PROJECT TEAMS & PARTNERS

Government Partners

NY RISING
NYC Parks
U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
NEW YORK STATE OF OPPORTUNITY. | DASNY

Environmental Review

AKRF
Hill International

Design Team

SCAPE / LANDSCAPE ARCHITECTURE PLLC
COWI
ARCADIS
LOT-EK
PARSONS BRINCKERHOFF
SeArc
PRUDENT ENGINEERING
MES
BILLION OYSTER PROJECT
New York HARBOR FOUNDATION

Peer Review

TETRA TECH

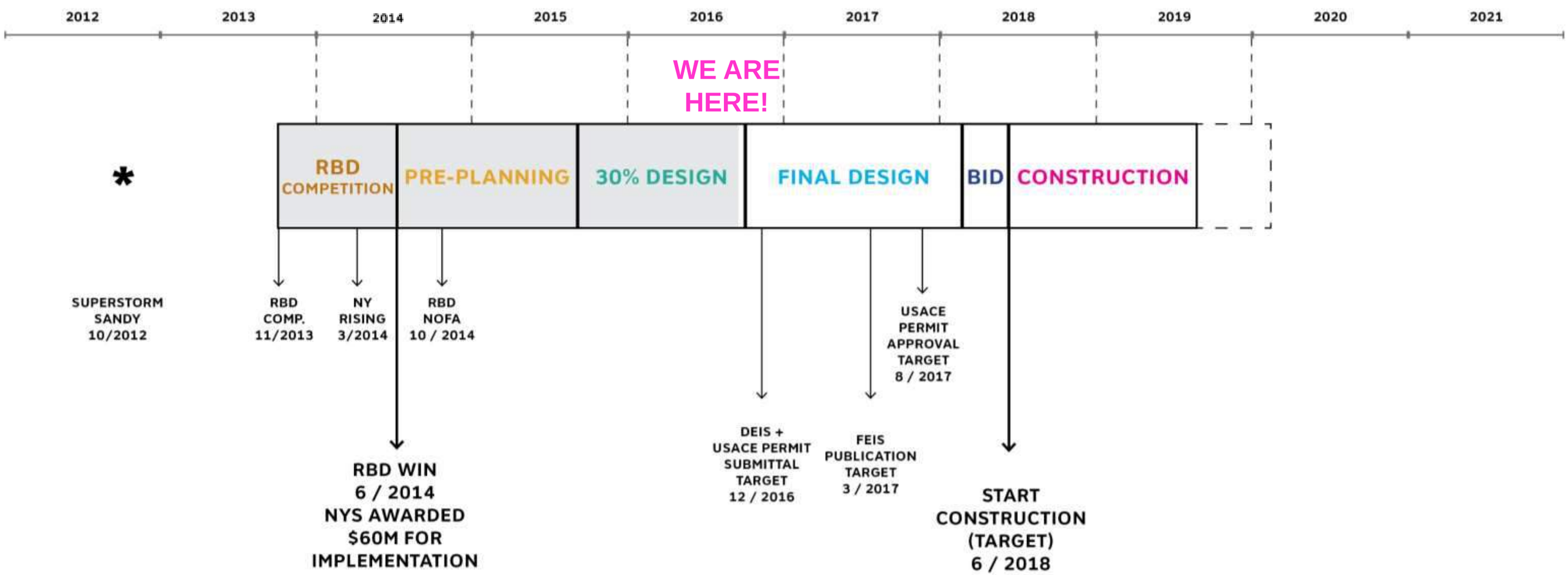
Shoreline Protection Design Team

Stantec
RAGE
Naik GROUP

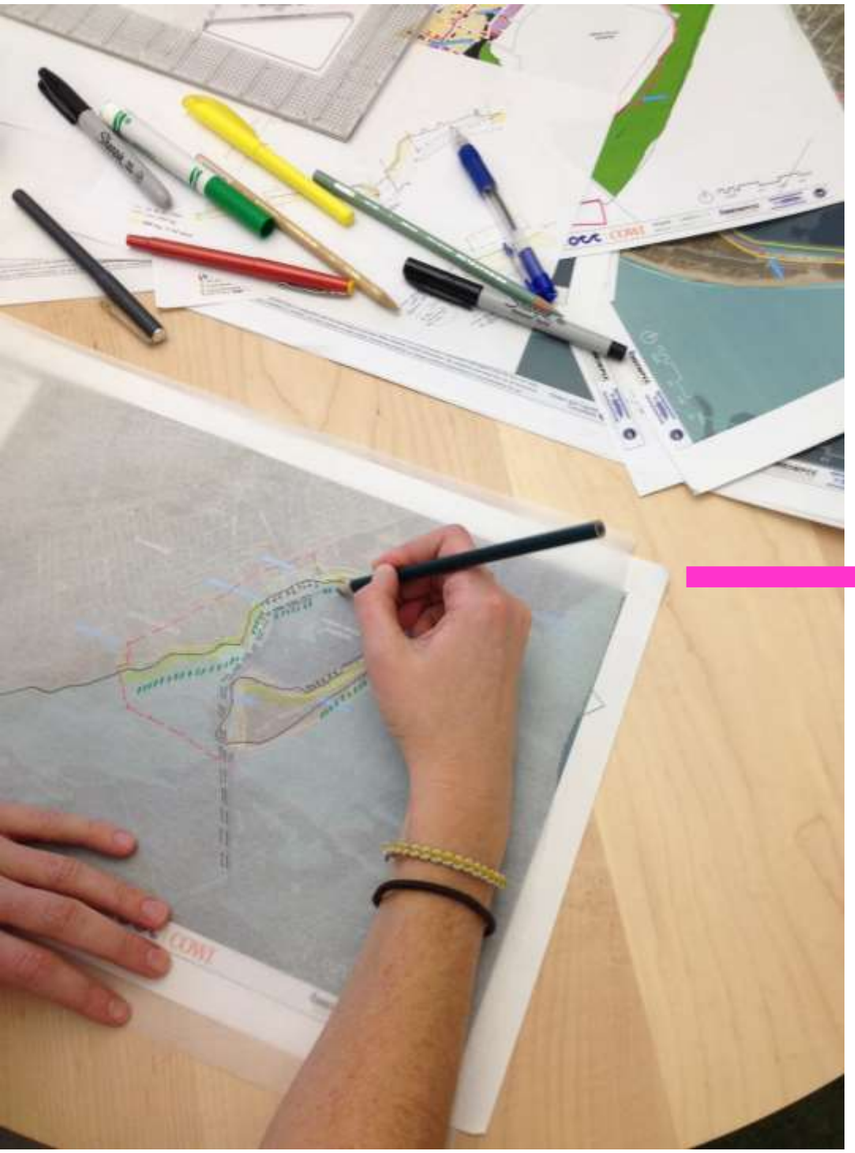
In Partnership with

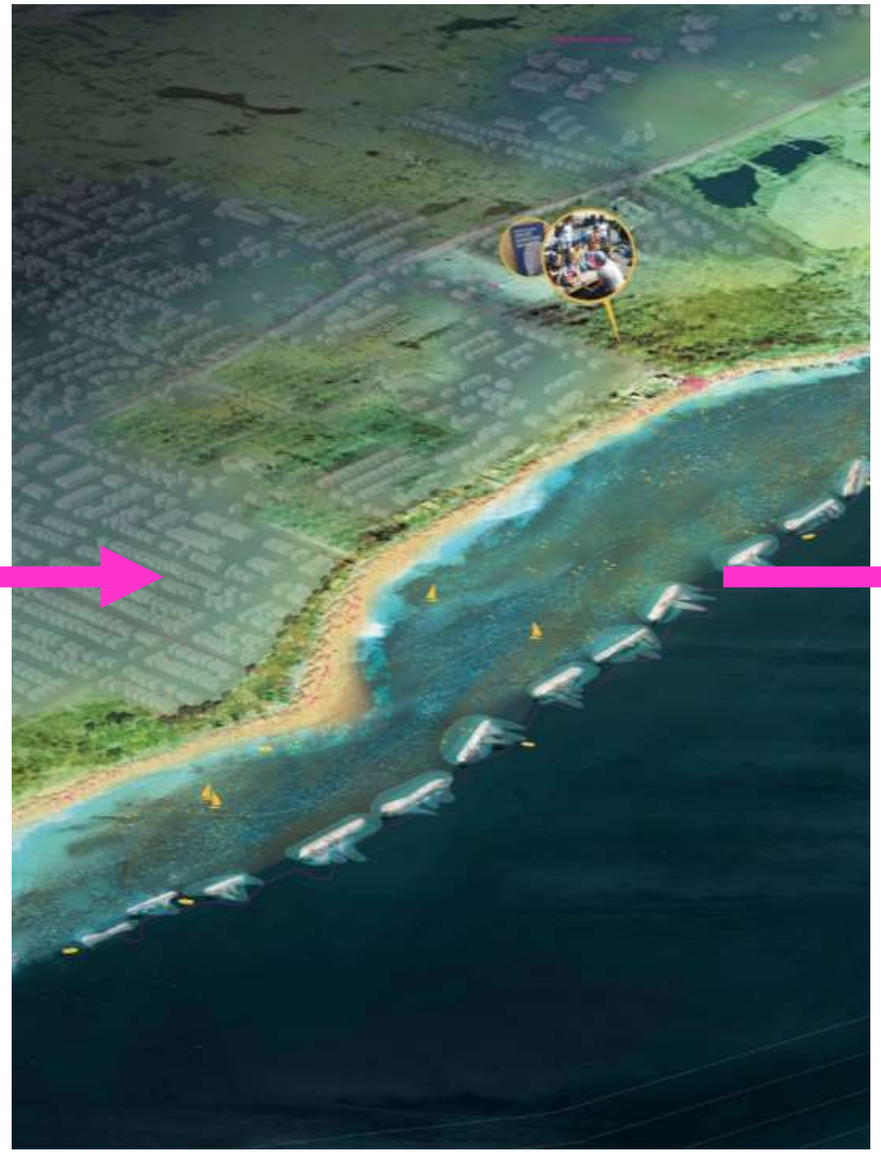
REBUILD BY DESIGN
NY RISING

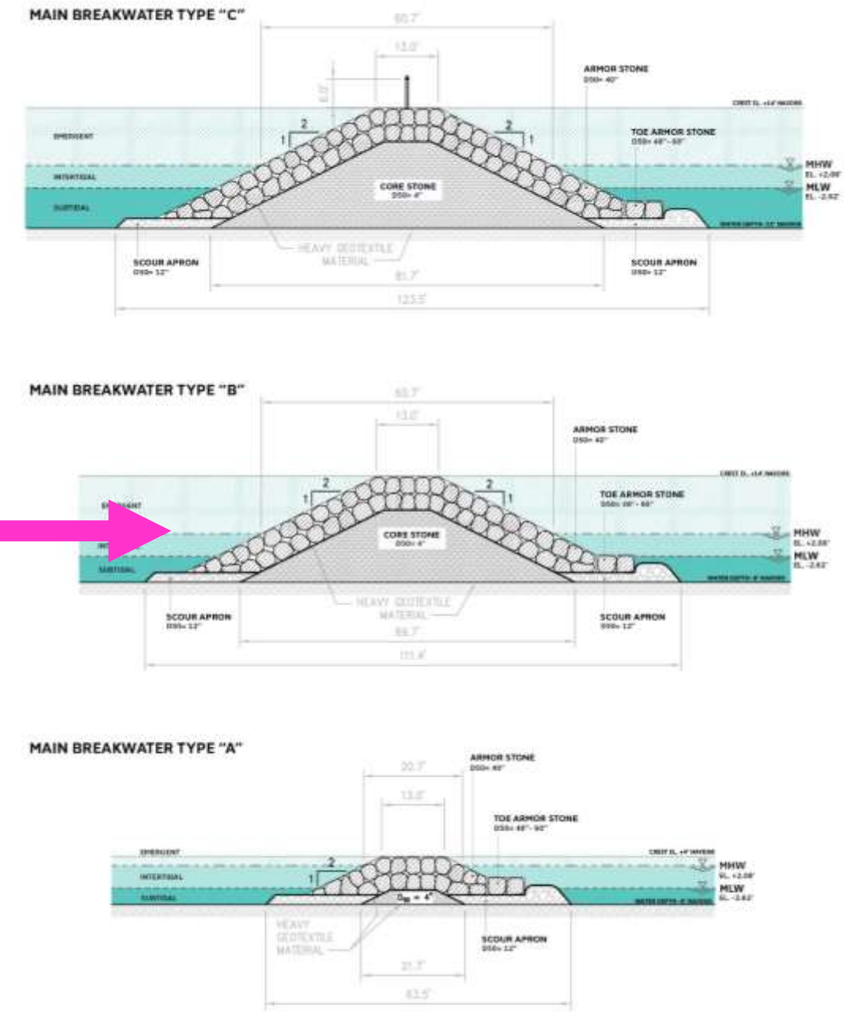
LIVING BREAKWATERS ESTIMATED PROJECT TIMELINE



FROM CONCEPT TO 30% DESIGN!







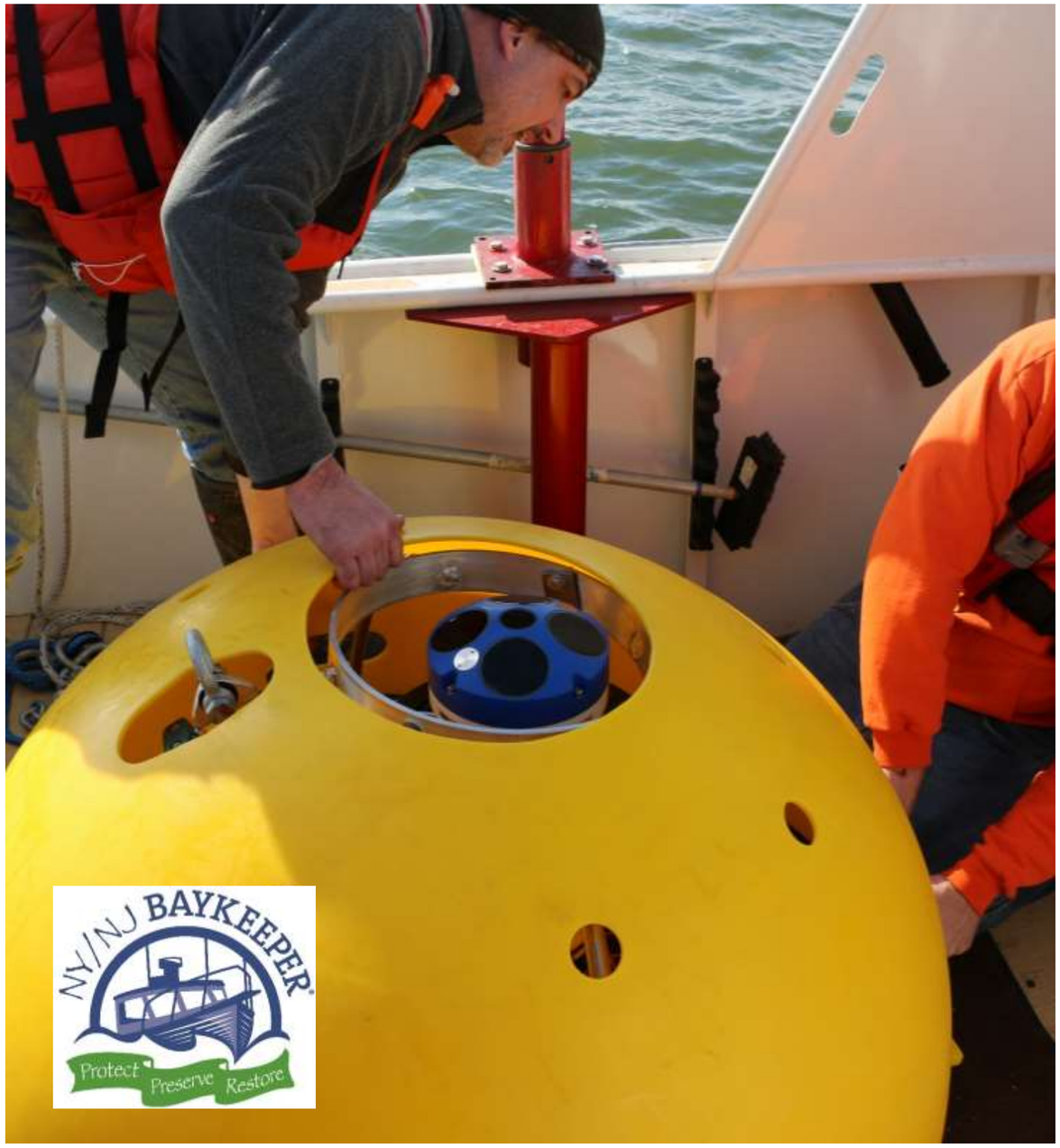
LIVING BREAKWATERS & TOTTENVILLE SHORELINE PROTECTION

PROGRESS UPDATES

SURVEYS / FIELD WORK

SHORELINE WALK BROCHURES & INFORMATION DISPLAY CASE

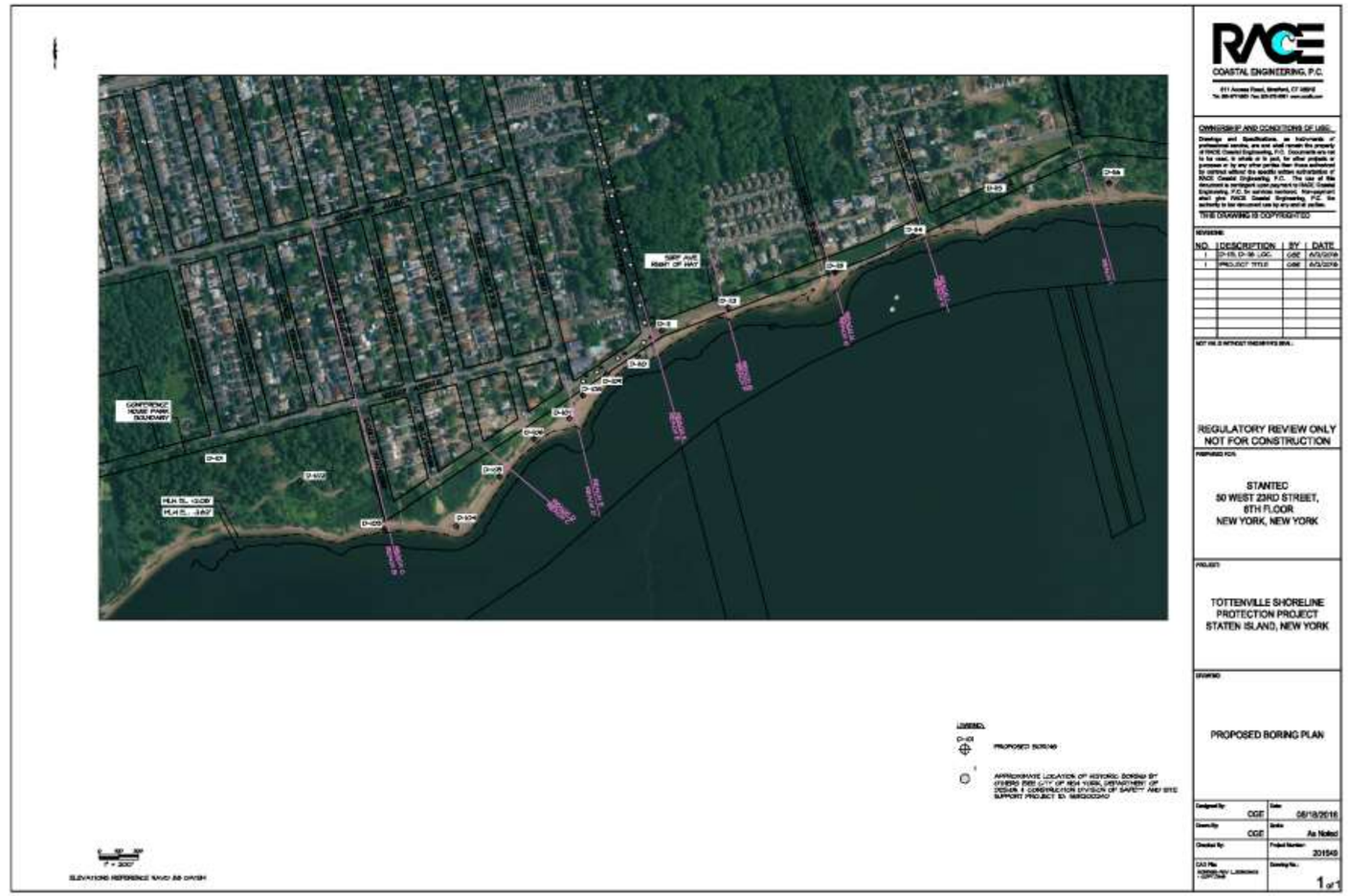
ONGOING: BEACH PROFILES SURVEYS + ADCP DATA COLLECTION



COMPLETED: WETLAND DELINEATION

COMPLETED: BERM LOCATION IN FIELD

COMPLETED: GEOTECHNICAL BORINGS-FIELD WORK

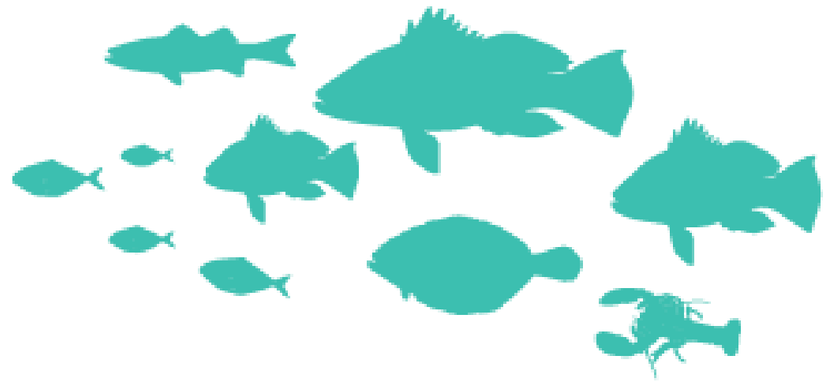


PROJECT OBJECTIVES

PROJECT DESIGN OBJECTIVES:
LIVING BREAKWATERS + TOTTENVILLE SHORELINE PROTECTION

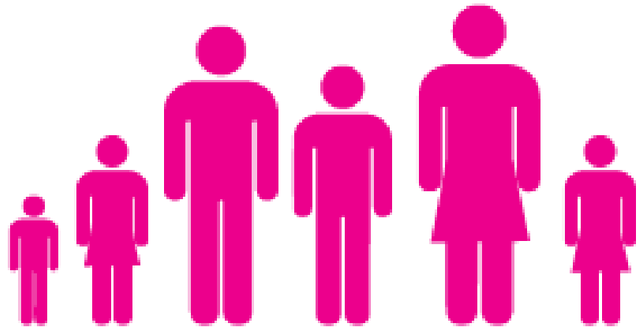
REDUCE RISK

- Attenuate wave energy
- Address both event-based and long-term shoreline erosion / preserve beach width
- Address the impacts of coastal flooding



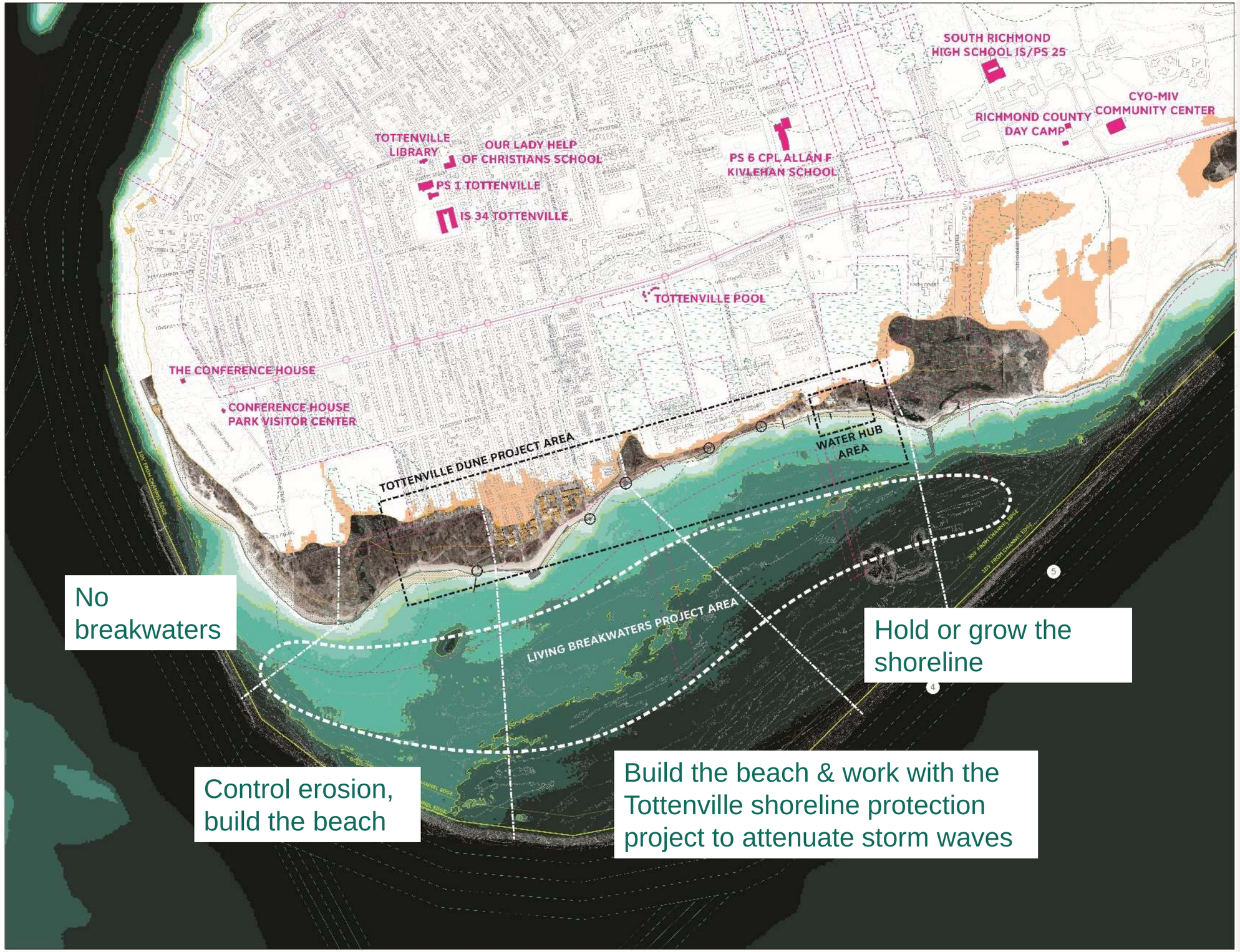
ENHANCE ECOLOGY

- Increase diversity of aquatic habitats consistent with the Hudson-Raritan Estuary plan priorities



FOSTER SOCIAL RESILIENCE

- Foster community education on coastal resiliency directly tied to and building off of 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
- Increase access to recreational opportunities



LIVING BREAKWATERS

EDGE OF FEDERAL CHANNEL (USACE COORDS)
FEDERAL NAVIGATION CHANNEL (NOAA)
NYC PARCEL BOUNDARIES (NYC DCP)
SI PARCELS (MapPLUTO 15v1)
STATEN ISLAND BUILDING FOOTPRINTS
OUTFALL LOCATIONS (NYC DEP)
SHORELINE STRUCTURES

ELEVATION (NAVD 88)

> MHW (2.08)
MHW TO MLW (-2.62)
MLW TO -6 MHW (-3.92)
-6 MHW TO -2 MLW (-4.62)
-2 MLW TO -4 MLW (-6.62)
-4 MLW TO -6 MLW (-8.62)
-6 MLW TO -8 MLW (-10.62)
-8 MLW TO -20 MLW (-22.62)
< -20 MLW

RISK

WAVE HAZARD ZONES

LIMIT OF V ZONE (WAVE HEIGHT > 3FT) (pFIRM 2013)
LIMIT OF MODERATE WAVE ACTION (LiMWA) (WAVE HEIGHT > 18")(pFIRM 2013)
POTENTIAL FUTURE 2;3 FT WAVE ZONE (100 YR STORM) WITH 30" SLR

HISTORIC SHORELINE CHANGE 1978-2012

MHW 2012
MHW 1978
ACCRETION
EROSION

ECOLOGY

FRESH WATER WETLAND
WETLAND CHECK ZONE

CULTURE

SCHOOLS & PUBLIC FACILITY
BUS STOP
BUS ROUTE
PARK OR OPEN SPACE

PROJECT AREA / STUDY AREA ZONES

1. CONFERENCE HOUSE PARK WEST
2. CONFERENCE HOUSE PARK EAST
3. NEIGHBORHOOD SOUTH
4. NEIGHBORHOOD NORTH
5. MOUNT LORETTO

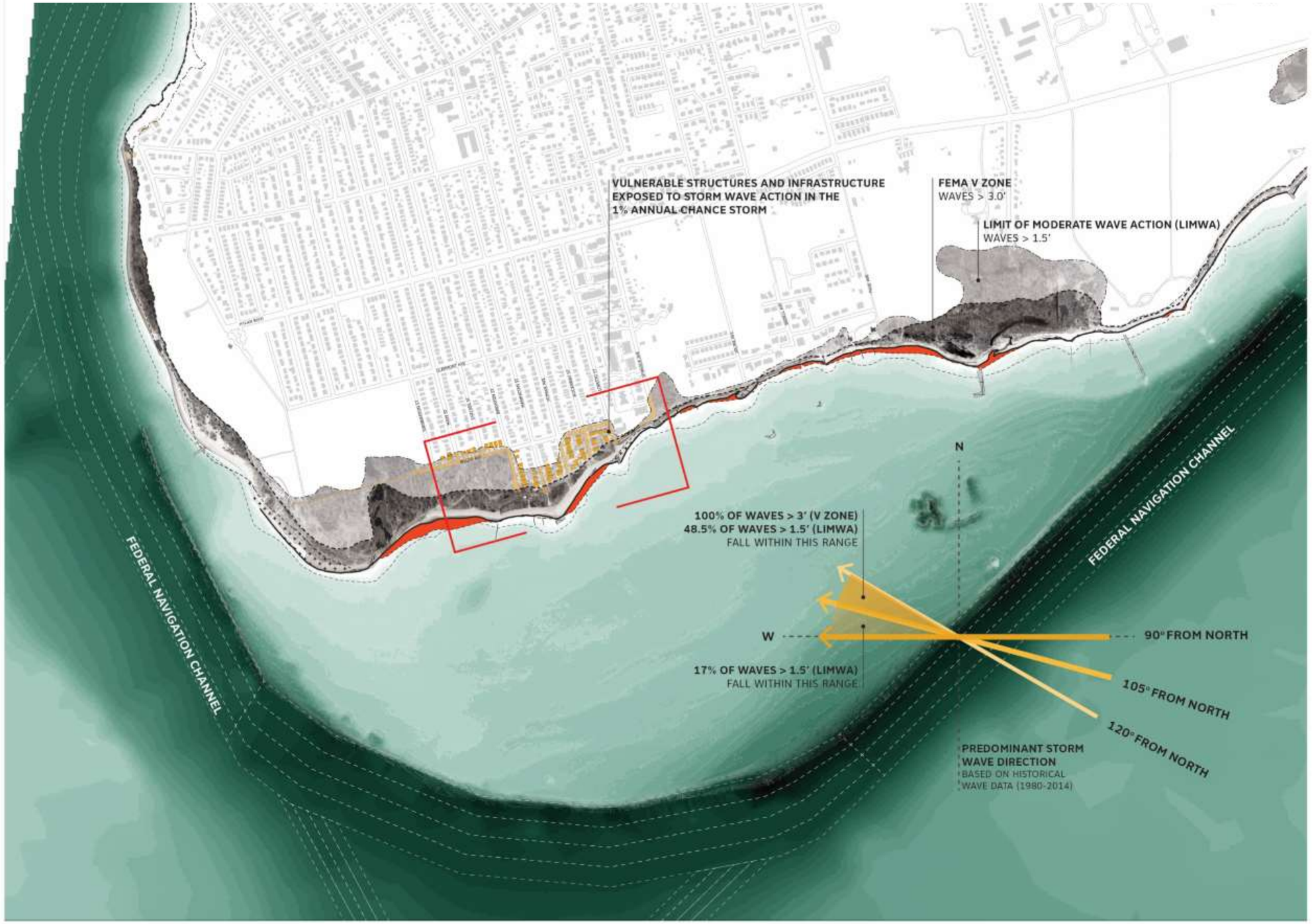
ZONE BOUNDARY

DATA SOURCES:
LOCATIONS:
BASED ON DATA PROVIDED BY GRACE TANG, NYC DPR 4/27/2015
COORDINATES:
BASED ON COORDINATES PROVIDED BY USACE (JOHN BELOIN, DUNIONES) 2/25/2015
ELEVATIONS:
FEMA SHORELINE & FLOOD ZONES, FEMA PRELIMINARY FLOOD INSURANCE RATE MAP (FIRM) 2013
DIGITAL STRUCTURES:
BASED ON SHORELINE & BUILDINGS
SURVEY BY HILL INTERNATIONAL, LLC 2015
BUILDING CLASSIFICATIONS:
BASED ON ELEVATION SURVEY CONDUCTED BY AKRF ENGINEERING
POTENTIAL FUTURE 2' ZONES:
APPROXIMATED BY IDENTIFYING WATER DEPTHS 4" IN THE STILL WATER ELEVATIONS FOR STORM RETURN PERIODS
BATHYMETRY:
BASED ON SURVEY BY HILL INTERNATIONAL PERFORMED IN JUNE 2015
STILL WATER ELEVATIONS:
FOR FUTURE STORMS ESTIMATED STILL WATER ELEVATIONS FROM FEMA 2015 DFIRM TRANSECT KB
HURRICANE KATRINA AND SANDY ELEVATIONS:
BASED ON ANALYSIS OF AERIAL IMAGERY PROVIDED BY NYC DOF DIGITAL ORTHO IMAGERY PROGRAM AND NYC DOITT

0' 500' 1000' 2000'

WHAT ARE THE RISKS?

WHAT ARE THE RISKS?



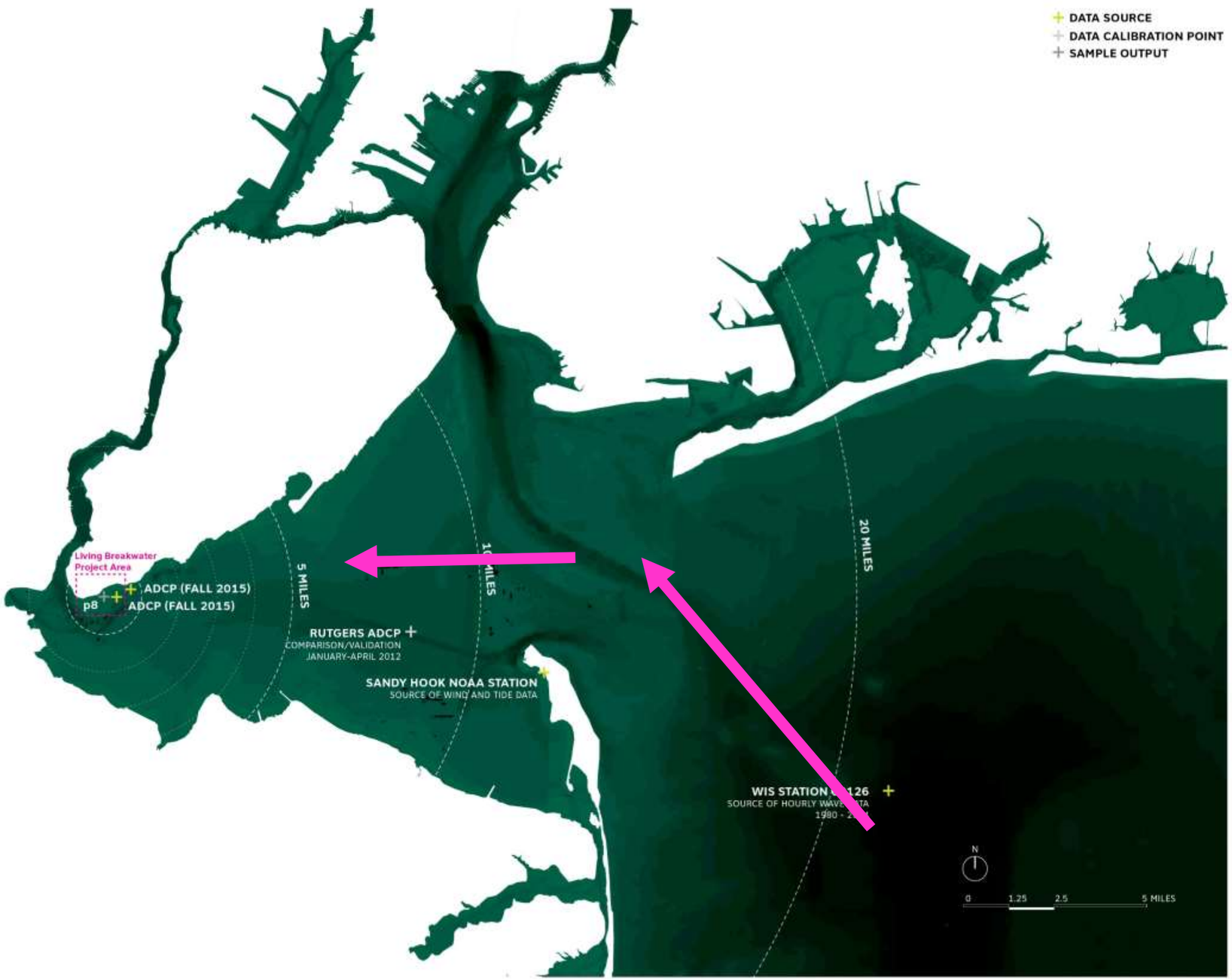
- **STORM WAVES**
- **EROSION (LONG-TERM & EVENT-BASED)**

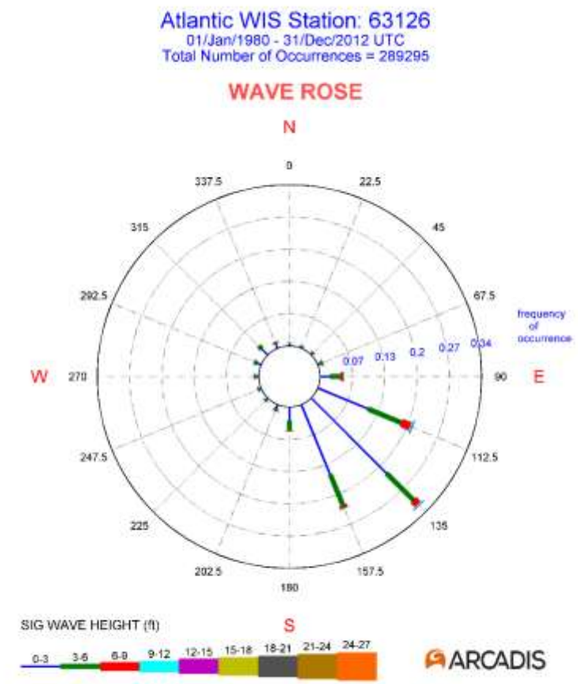
1978 MHW LINE
2015 MHW LINE
CURRENT MLW LINE
HISTORIC SHORELINE EROSION
HISTORIC SHORELINE ACCRETION
VE ZONE LINE
LiMWA LINE
SHORELINE STRUCTURES
STRUCTURES WITHIN RISK ZONES

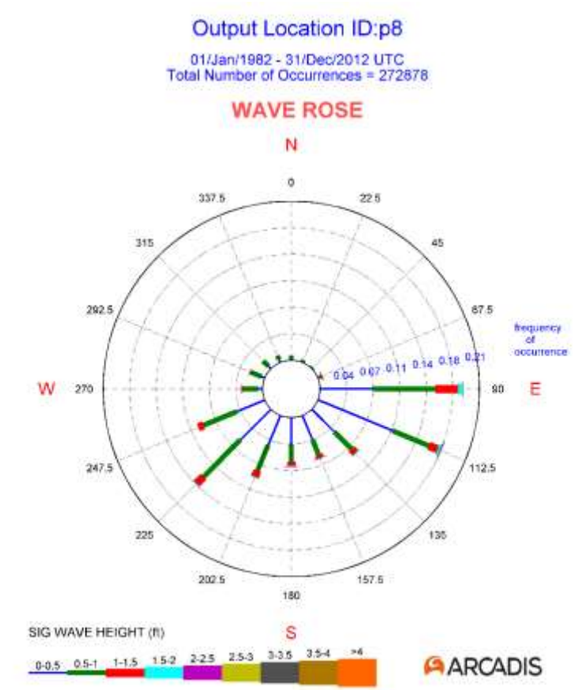
DATA SOURCES:
PREDOMINANT WAVE DIRECTIO
USING WAVE TRANSFORMATION
WIS STATION
2015 MHW LINE AND SHORELIN
BY NYACK, SUPPLEMENTED WIT
HISTORIC AERIAL IMAGERY
CHANNEL EDGE: BASED ON CO
BY USACE (JOHN BELDIN-QUIN
CONTOUR BATHYMETRY GENER

0' 500' 1000

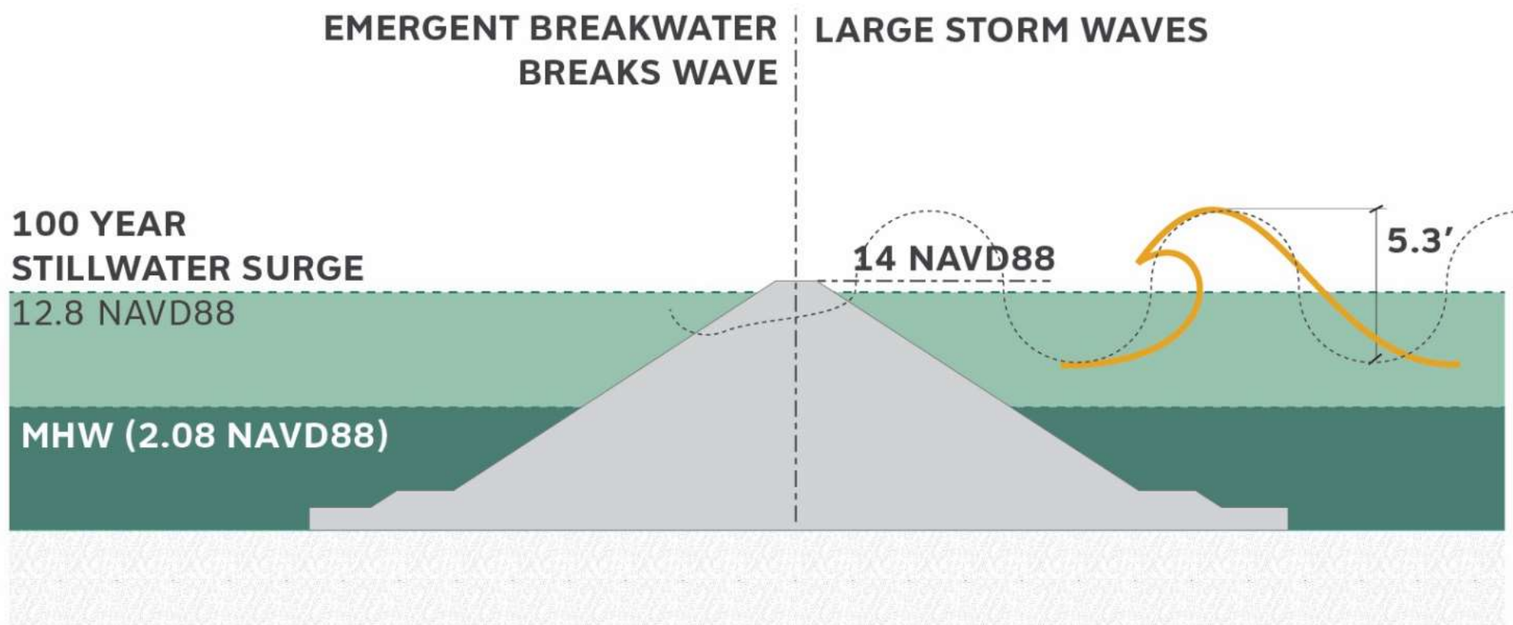
STORM WAVES: WHERE ARE THEY COMING FROM?

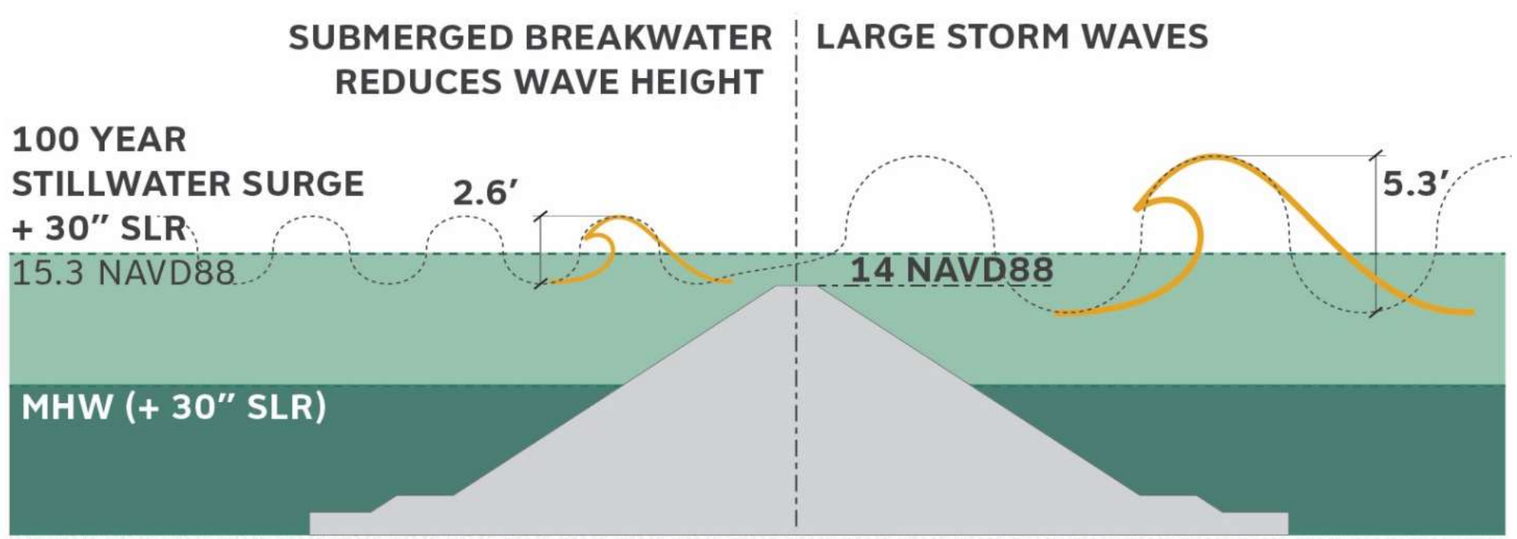






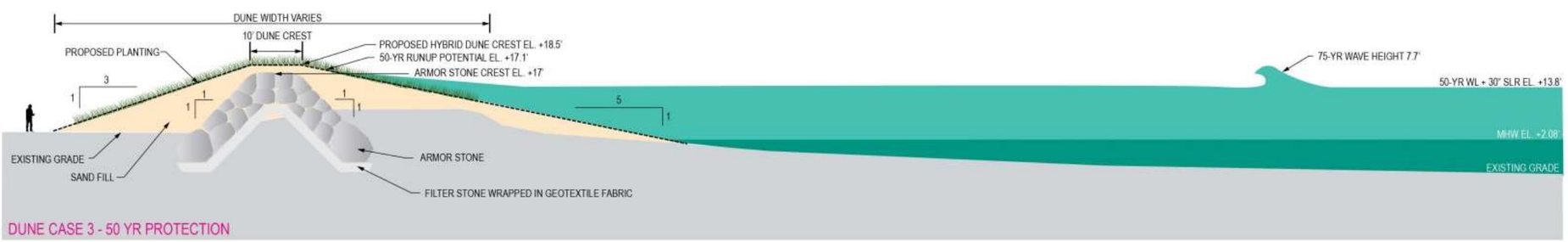
STORM WAVES: HOW BIG ARE THEY?

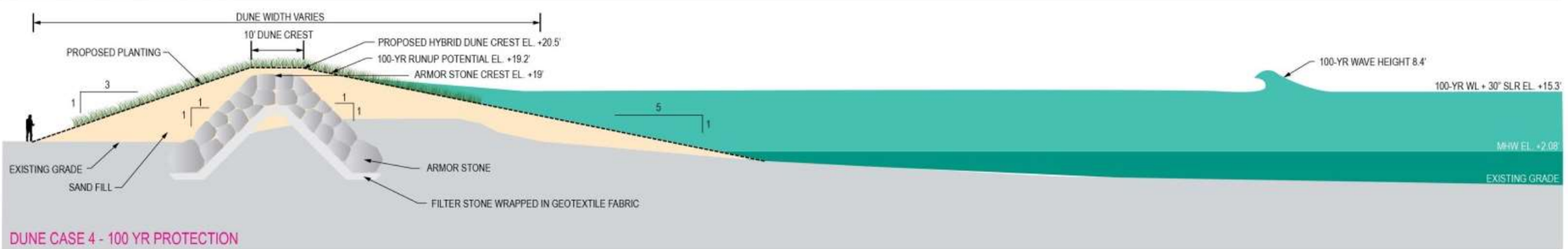




HOW DID WE GET HERE?

EXISTING DUNE ELEVATION: +9.4'
PROPOSED DUNE ELEVATION: +15'



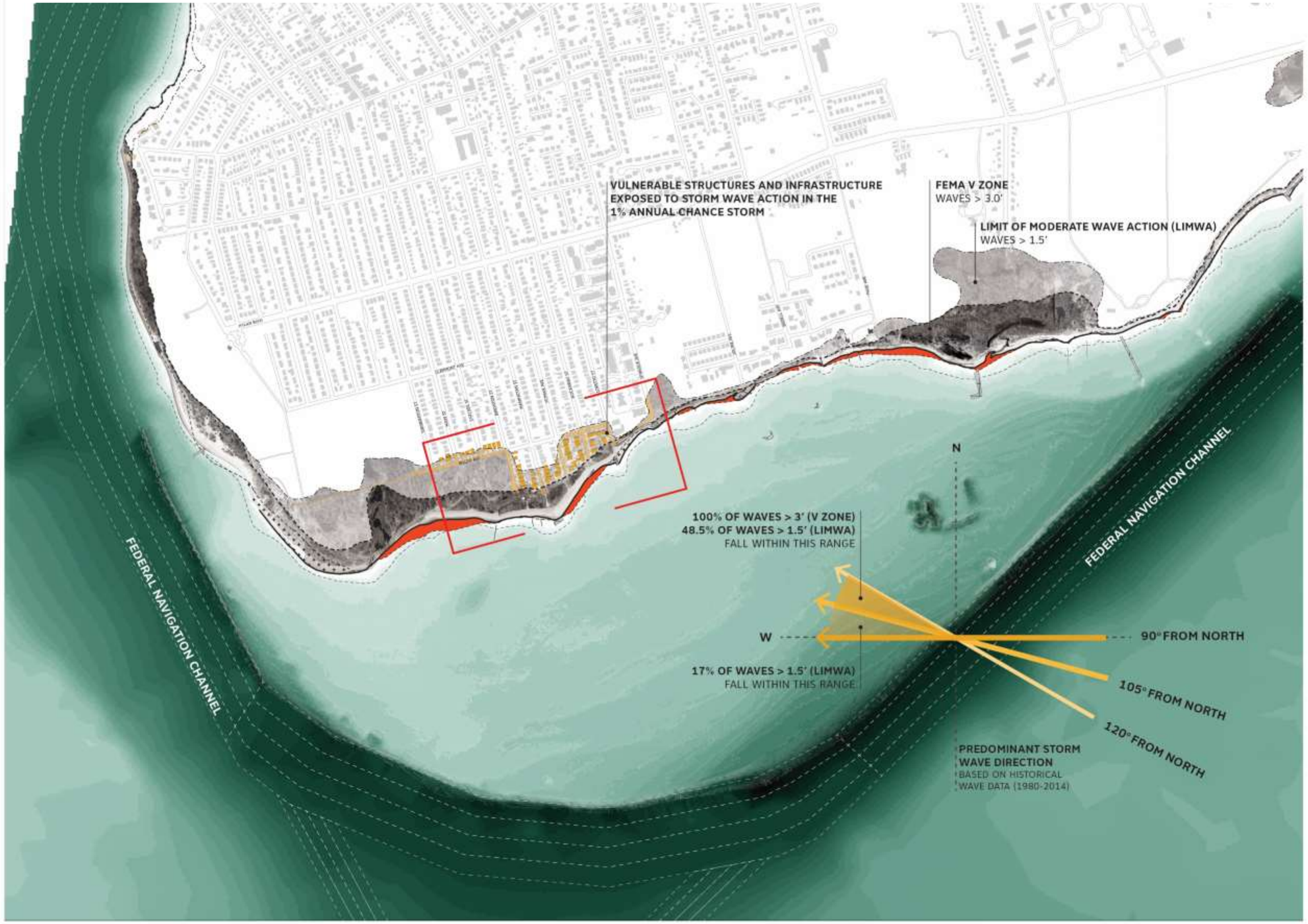


PRELIMINARY PREFERED DUNE ELEVATION:

+/- 15 Dune Crest Elevation
+/- 12.5 Stone Core Crest Elevation

+/- 25 YEAR PROTECTION

WHAT ARE THE RISKS?



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PREDOMINANT WAVE DIRECTION DEVELOPED BY ARCADIS USING WAVE TRANSFORMATION MODELING FROM NEARBY WIS STATION
2015 MHW LINE AND SHORELINE STRUCTURES SURVEYED BY NYACK, SUPPLEMENTED WITH 2014 LIDAR AND HISTORIC AERIAL IMAGERY
CHANNEL EDGE: BASED ON COORDINATES PROVIDED BY USACE (JOHN BELDIN-QUINONES) ON 2/25/2015
CONTOUR BATHYMETRY GENERATED BY HILL

0' 500' 1000' 2000'

RISK REDUCTION:
LIVING BREAKWATER MODELING PROCESS

BREAKWATERS DESIGNED FOR STORM WAVE ATTENUATION

SHORELINE STRUCTURES

ABOVE MLW (-2.62' NAVD88)

BETWEEN MLW AND -4' MLW (-6.62' NAVD88)

BETWEEN -4' MLW AND -6' MLW (-8.62' NAVD88)

BETWEEN -6' MLW AND -20' NAVD88

BELOW -20' NAVD88

PROPOSED BEACH FILL

STRUCTURES WITHIN RISK ZONES

CURRENT MLW LINE

2015 MHW LINE

VE ZONE LINE

LIMWA LINE

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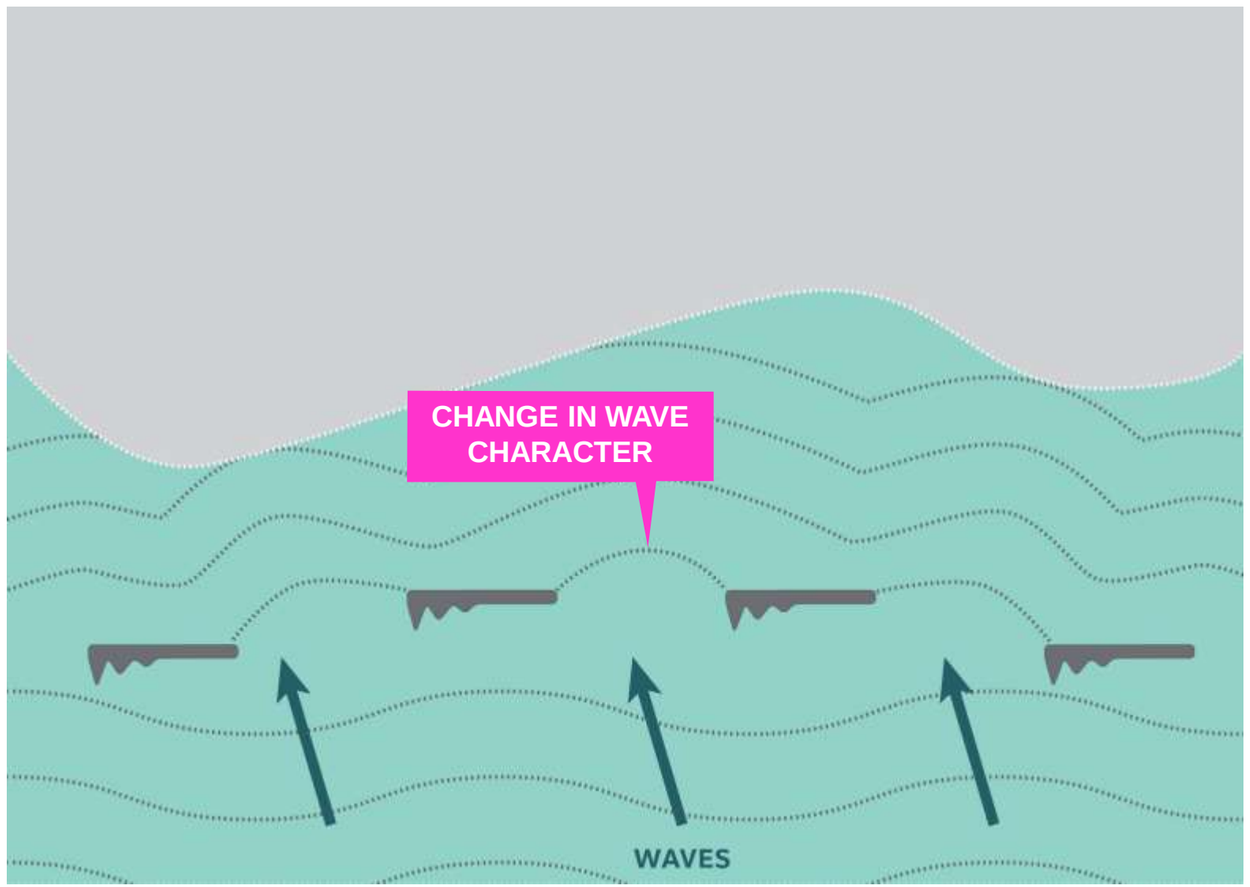
CONTOUR BATHYMETRY GENERATED BY HILL

0' 500' 1000' 2000'

MODELING TO UNDERSTAND STORM WAVE BEHAVIORS

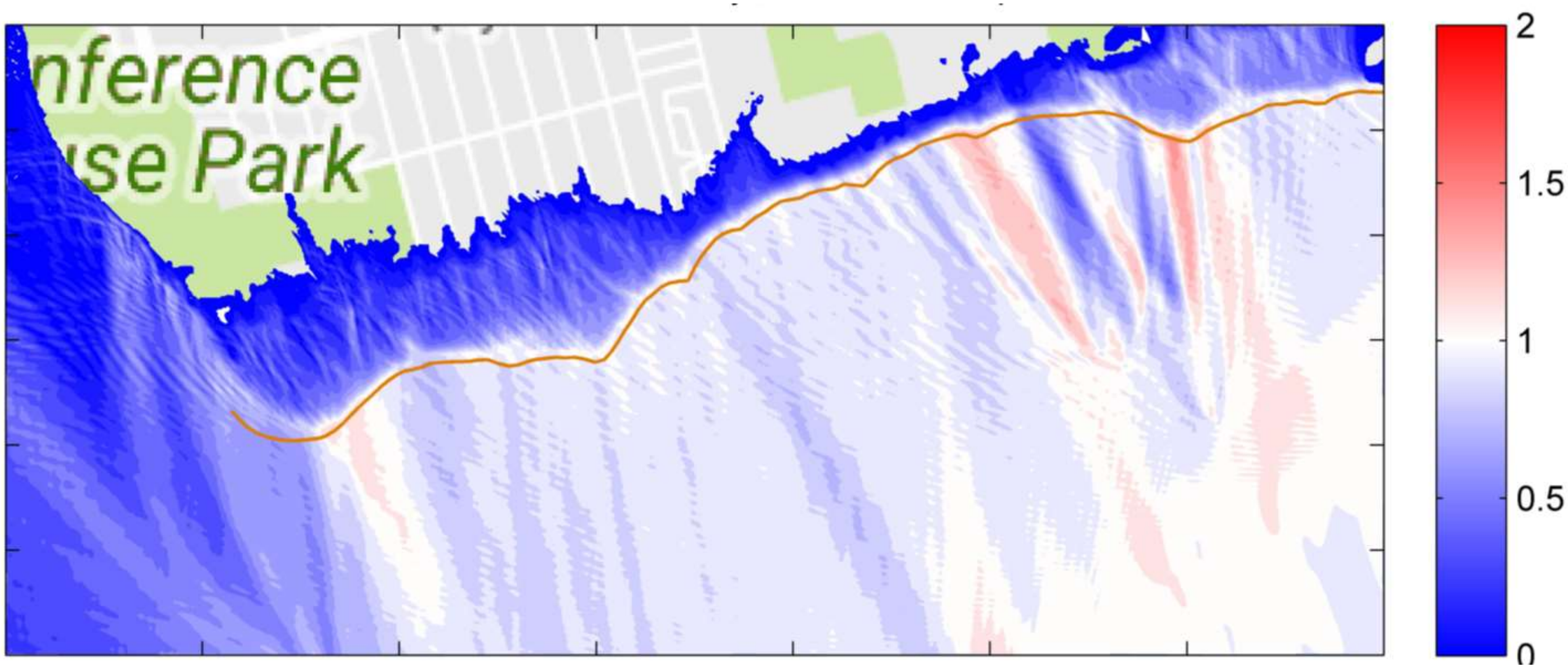
WAVE DIFFRACTION & REFRACTION MODELING:
REF DIF



- ASSESS WAVE TRANSFORMATION AS WAVES PROPAGATE INSHORE AND AROUND BREAKWATERS
- SIMULATES CHANGES IN WAVE CHARACTERISTICS DUE TO BATHYMETRY

NO ACTION
REF-DIF RESULTS

100 Year | Input Wave Height of 5.3 feet | Waves Perpendicular to Shore (South-Southeast)



Wave heights shown are relative wave heights (modeled wave height/incoming offshore wave height).

SCAPE / LANDSCAPE
ARCHITECTURE PLLC

BREAKWATER 30% DESIGN SCENARIO

REF-DIF RESULTS

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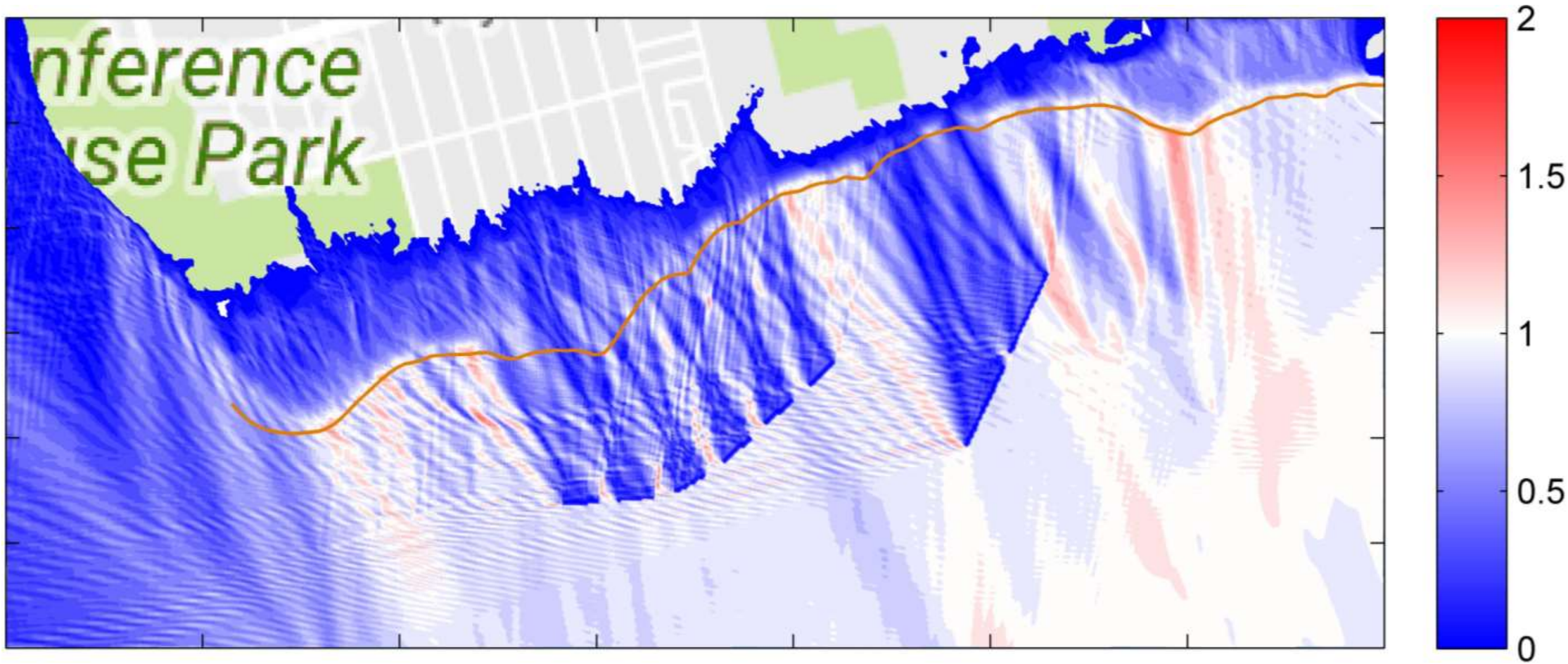
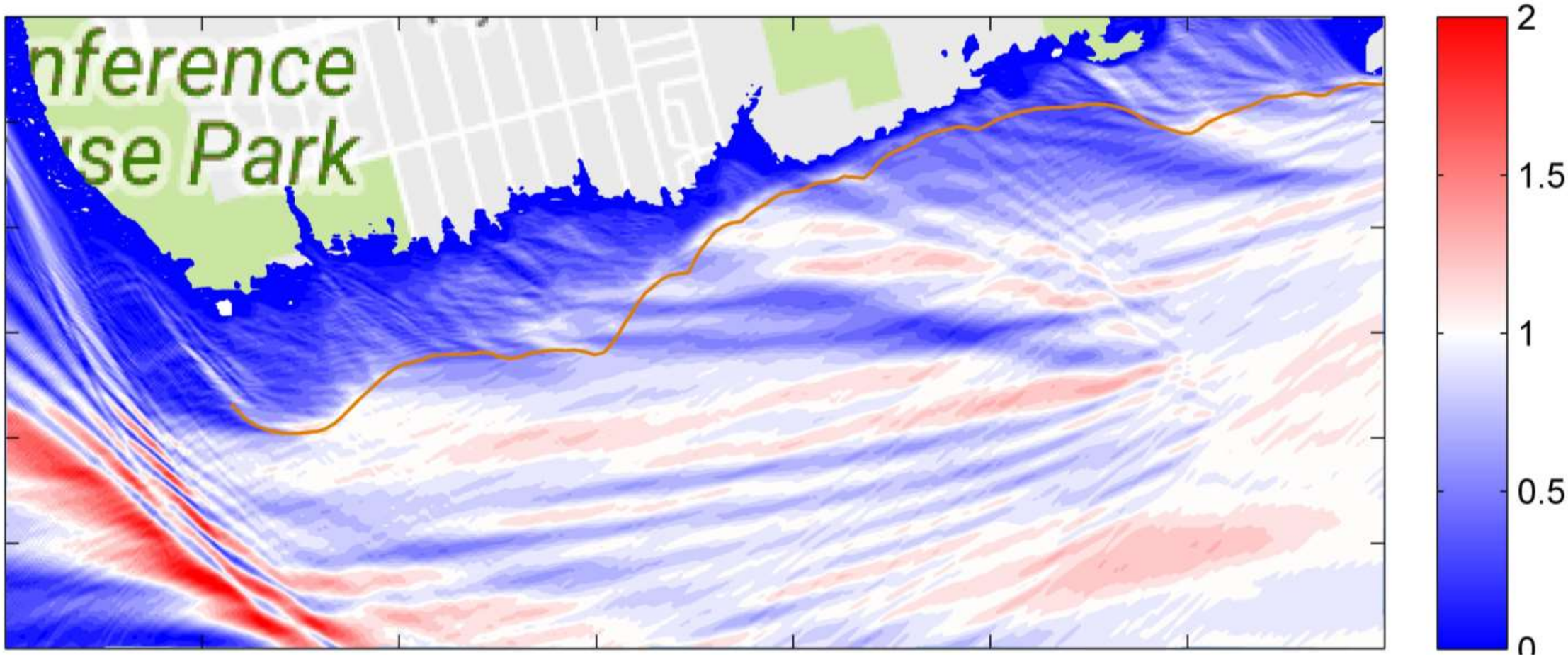


Wave heights shown are relative wave heights (modeled wave height/incoming offshore wave height).

SCAPE / LANDSCAPE
ARCHITECTURE PLLC

NO ACTION
REF-DIF RESULTS

100 Year | Input Wave Height of 5.3 feet | Waves from East



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SCAPE / LANDSCAPE
ARCHITECTURE PLLC

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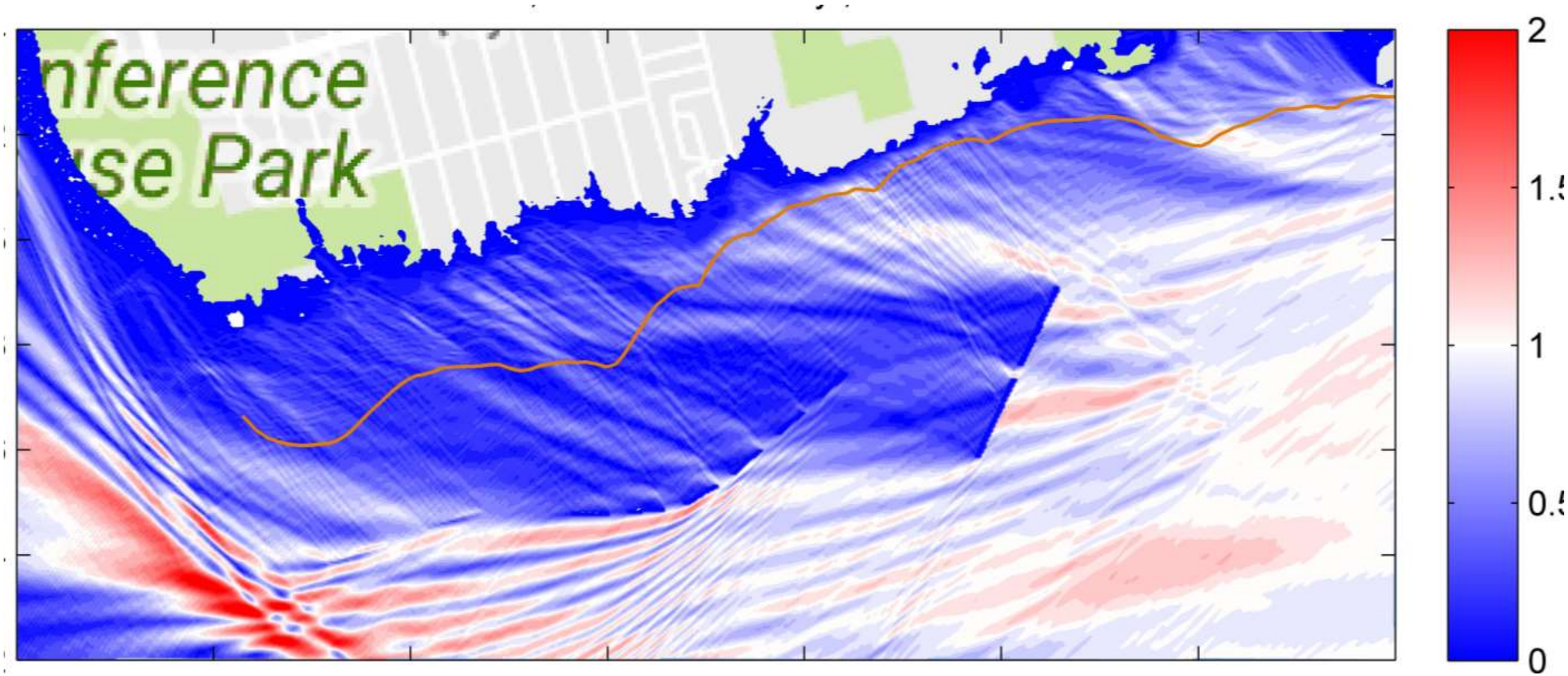

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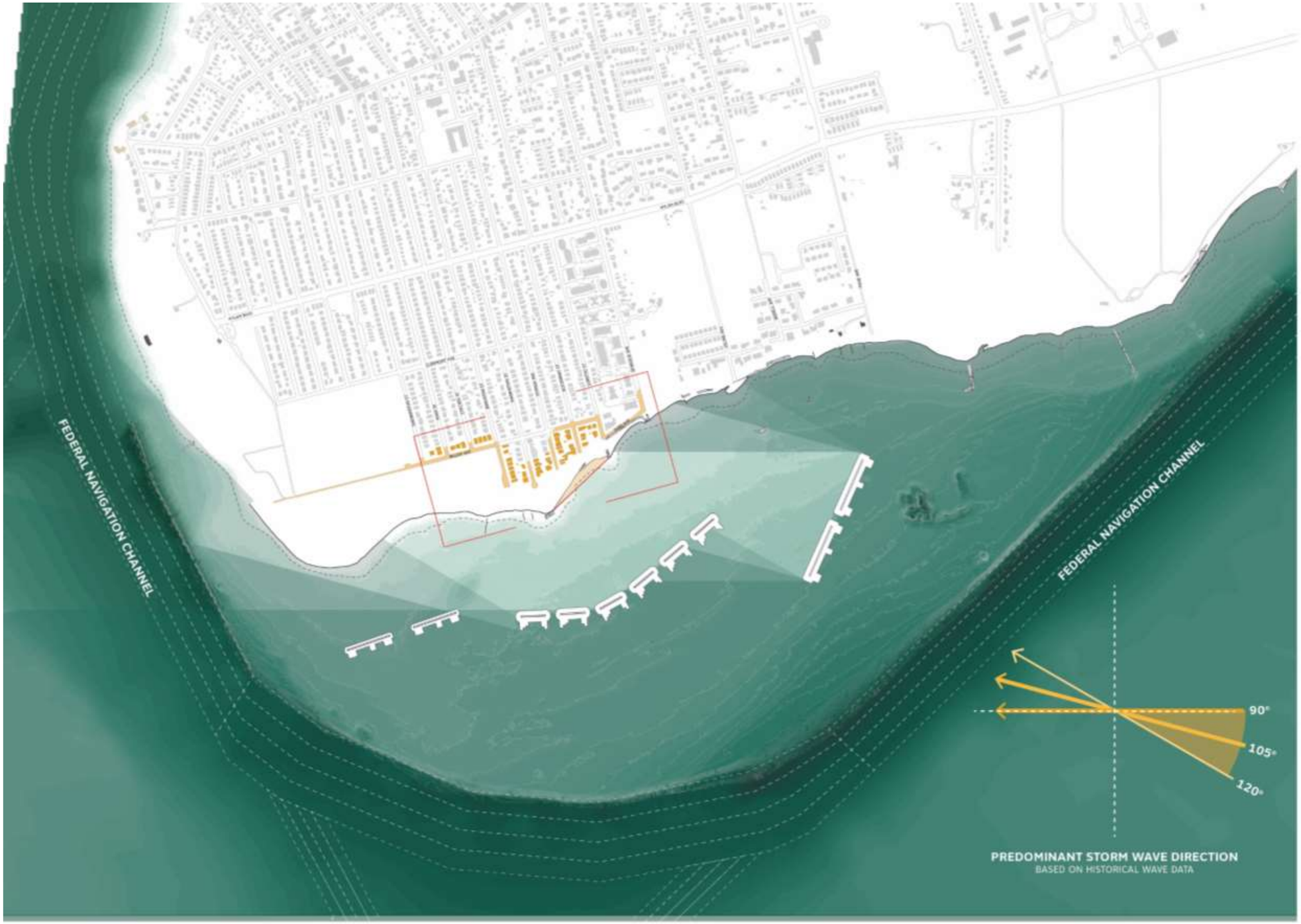
SCAPE / LANDSCAPE
ARCHITECTURE PLLC

BREAKWATERS DESIGNED FOR STORM WAVE ATTENUATION



SHORELINE STRUCTURES

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BETWEEN -6' MLW AND -20' NAVD88

BELOW -20' NAVD88

PROPOSED BEACH FILL

STRUCTURES WITHIN RISK ZONES

CURRENT MLW LINE

2015 MHW LINE

VE ZONE LINE

LIMWA LINE

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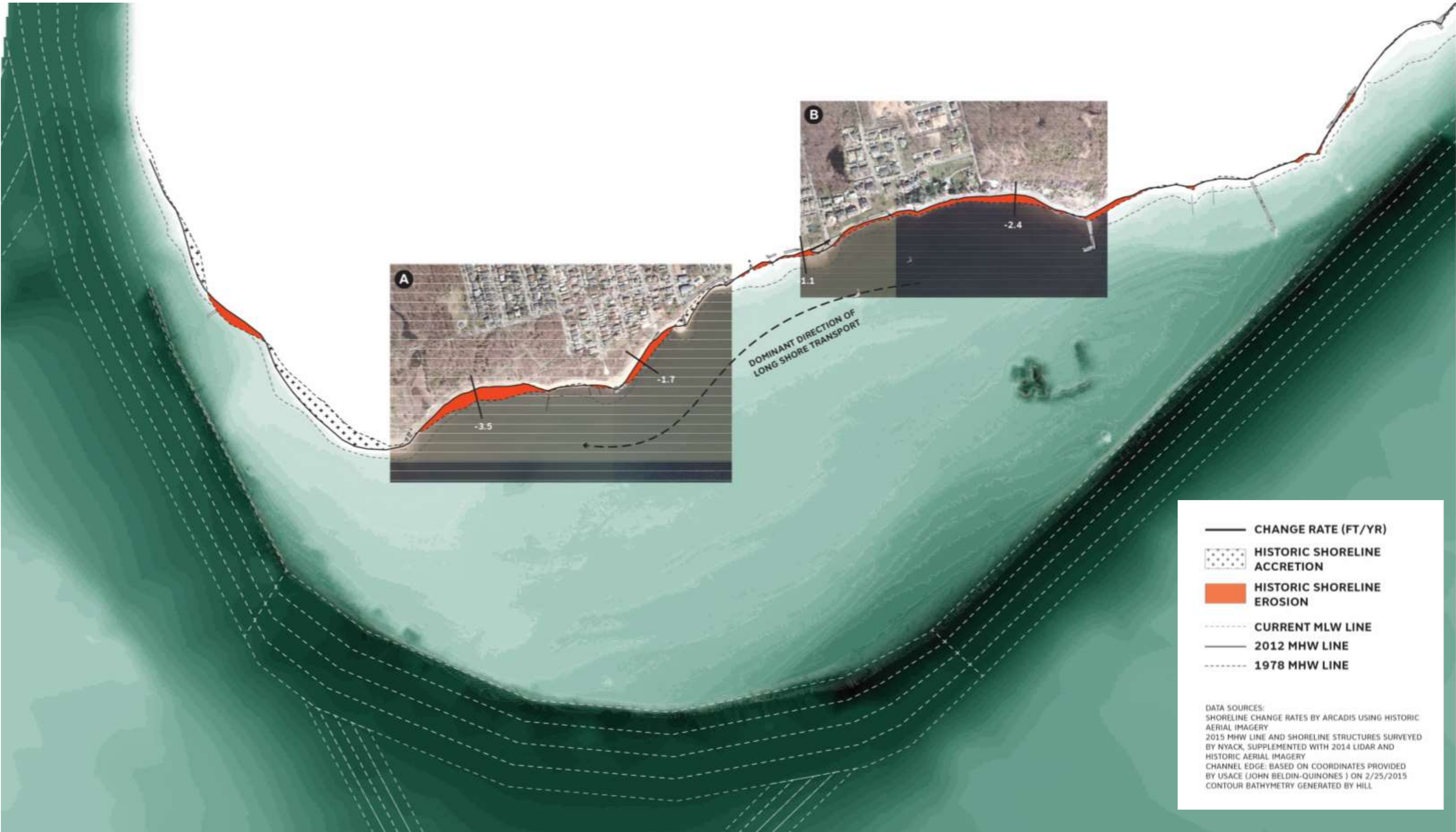
0' 500' 1000' 2000'

LONG-TERM HISTORIC EROSION: 1978 - 2012

LONG-TERM HISTORIC EROSION: 1978 - 2012



LONG-TERM EROSION

CHANGE RATE (FT/YR)

HISTORIC SHORELINE ACCRETION

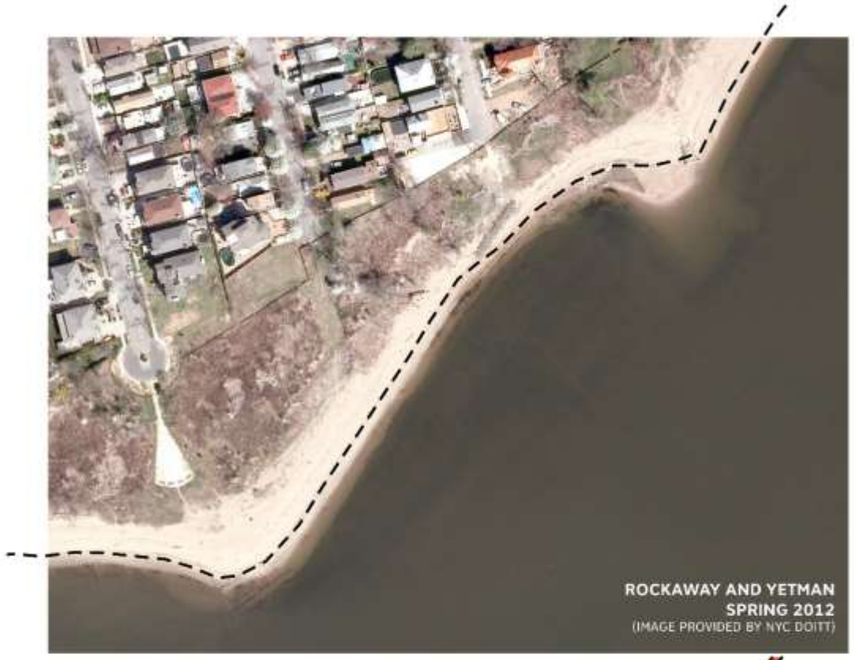
HISTORIC SHORELINE EROSION

2012 MHW LINE

1978 MHW LINE

SCAPE / LANDSCAPE ARCHITECTURE PLLC

EVENT-BASED EROSION: SHORELINE CHANGE DURING SANDY

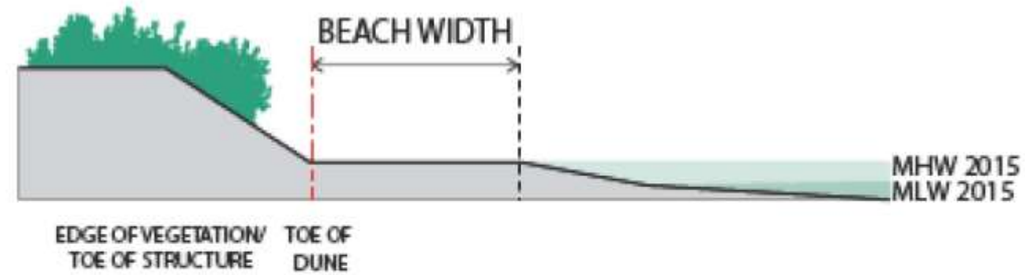


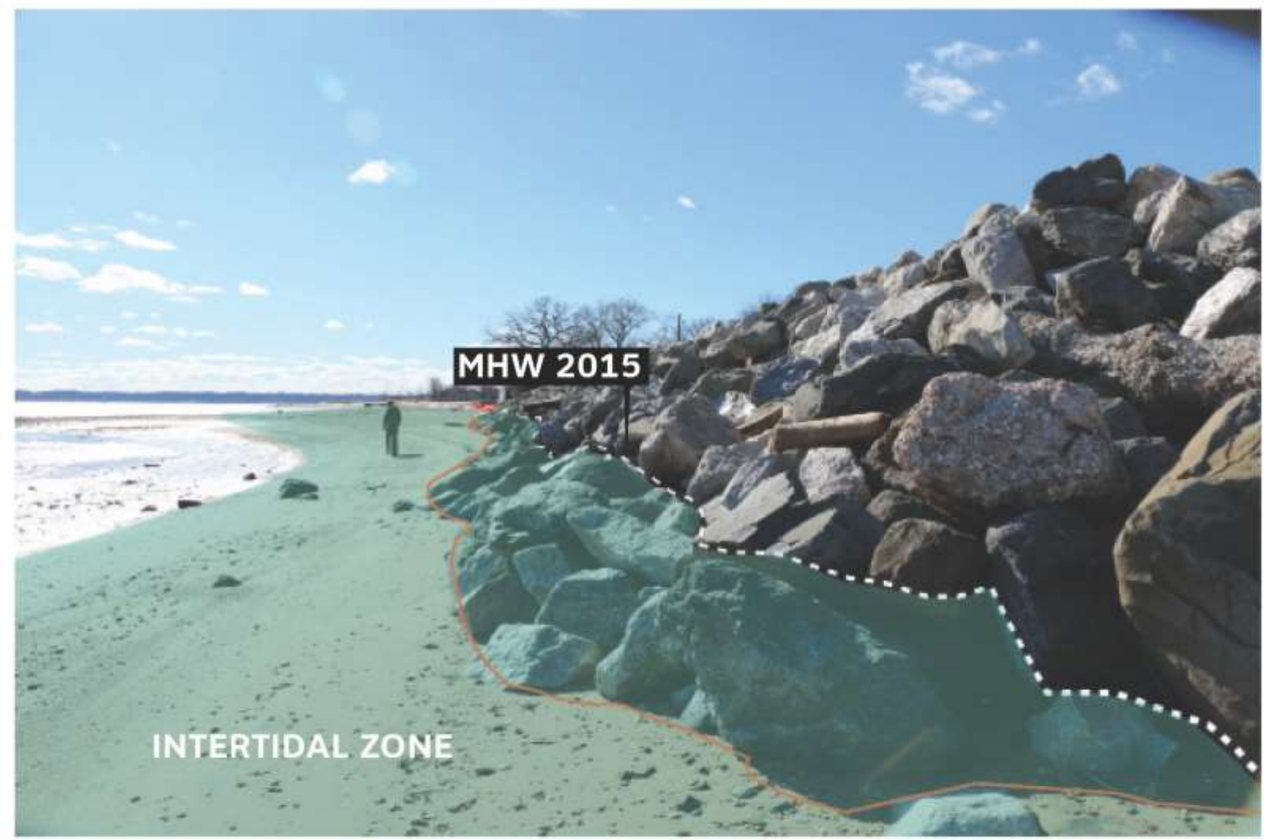
HISTORIC SHORELINE EROSION

MHW (SPRING 2012)

MHW (FALL 2012)

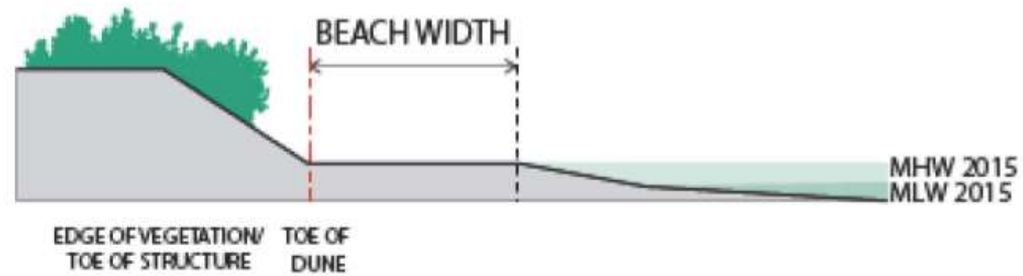
WHERE WE ARE NOW: THE SHORELINE TODAY & BEACH WIDTH

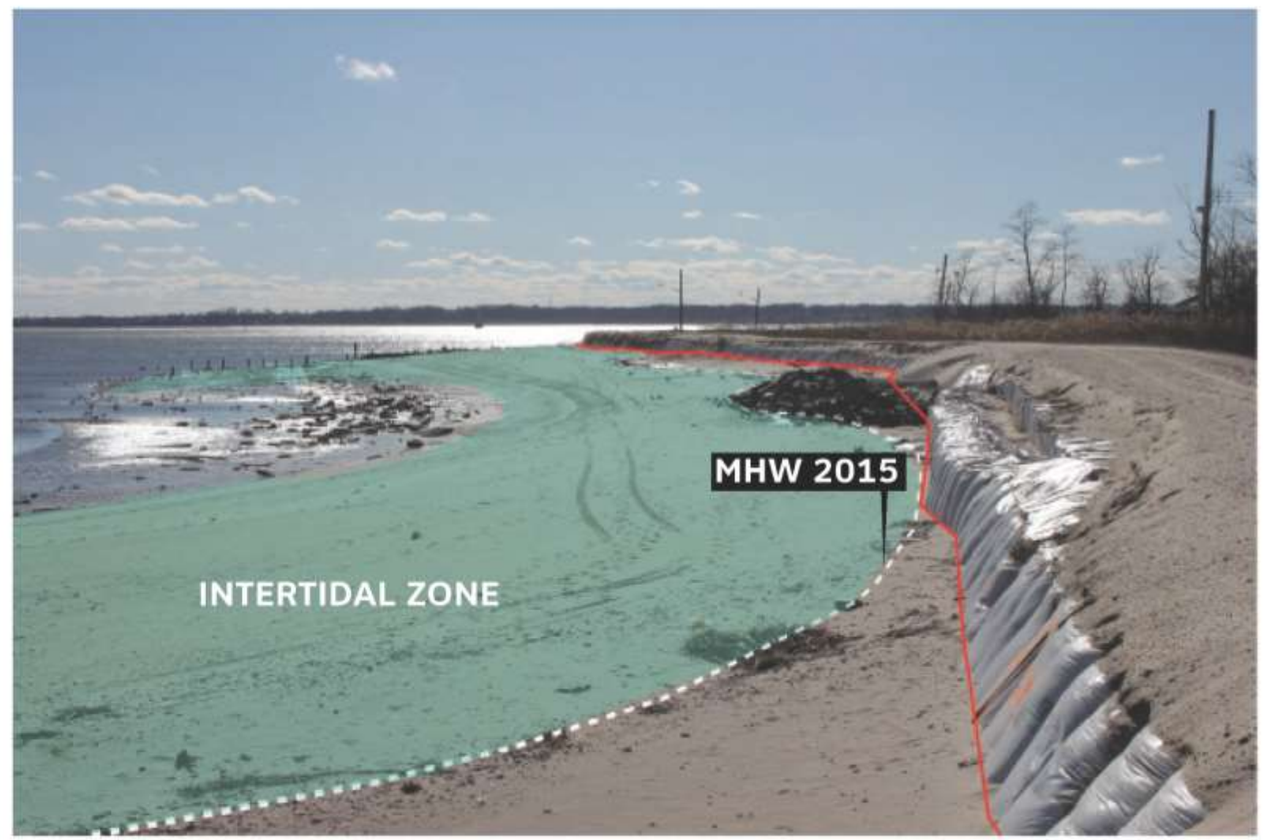




VERY NARROW BEACH

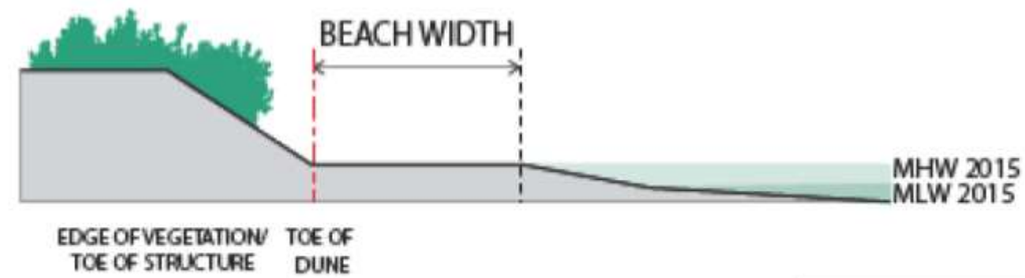
WHERE WE ARE NOW: THE SHORELINE TODAY & BEACH WIDTH

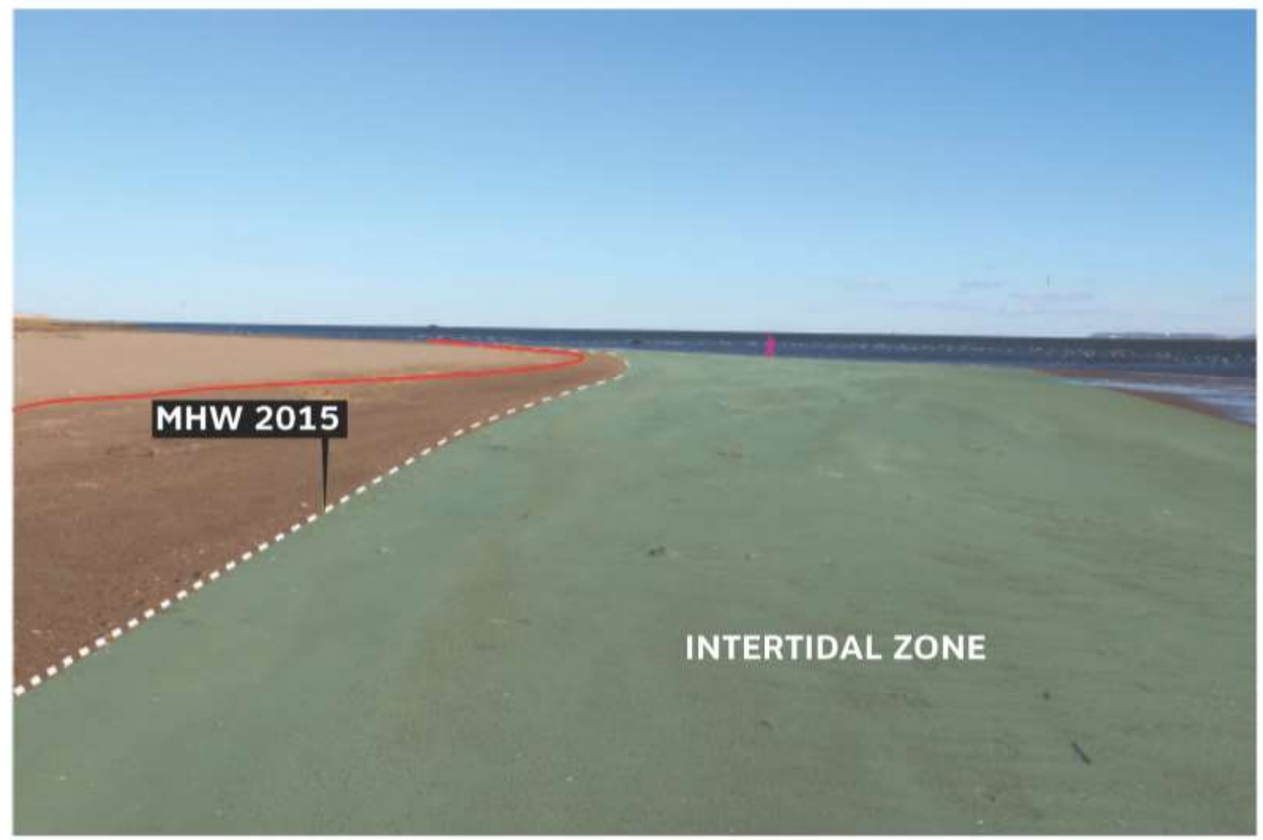




NARROW BEACH

WHERE WE ARE NOW: THE SHORELINE TODAY & BEACH WIDTH

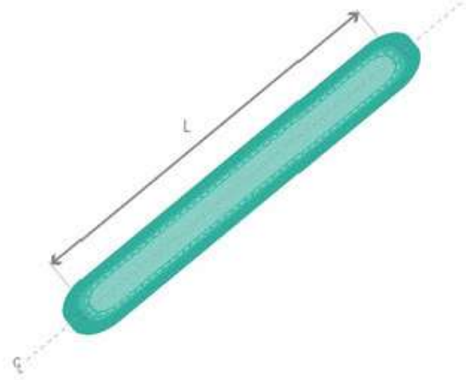


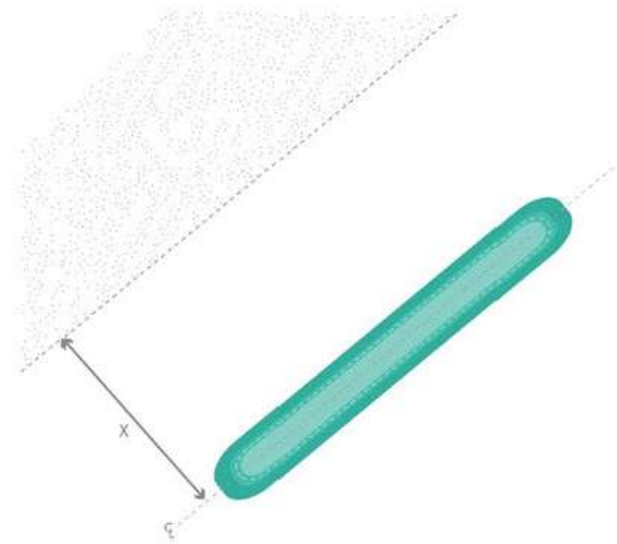


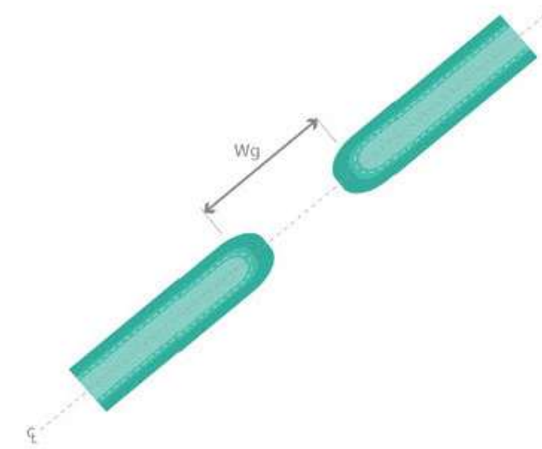
WIDE BEACH

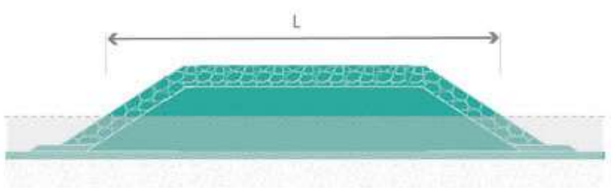
HOW DO BREAKWATERS IMPACT SHORELINE CHANGE?

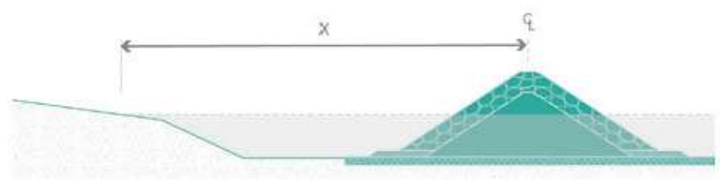
BREAKWATER PARAMETERS







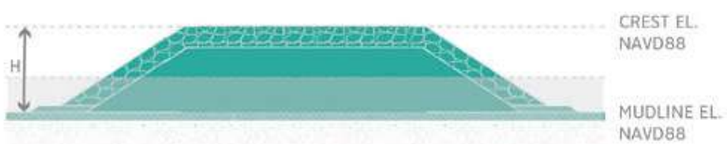




BREAKWATER LENGTH (L)
MEASURED FROM INTERSECTION POINT
BETWEEN 0 NAVD88 AND BREAKWATER CENTERLINE

DISTANCE FROM SHORE (X)
DISTANCE FROM FEMA pFIRM 2013 SHORELINE
PERPENDICULAR TO THE BREAKWATER CENTERLINE

GAP WIDTH (Wg)
MEASURED FROM INTERSECTION POINT AT 0 NAVD88
BETWEEN BREAKWATERS ALONG CENTERLINE

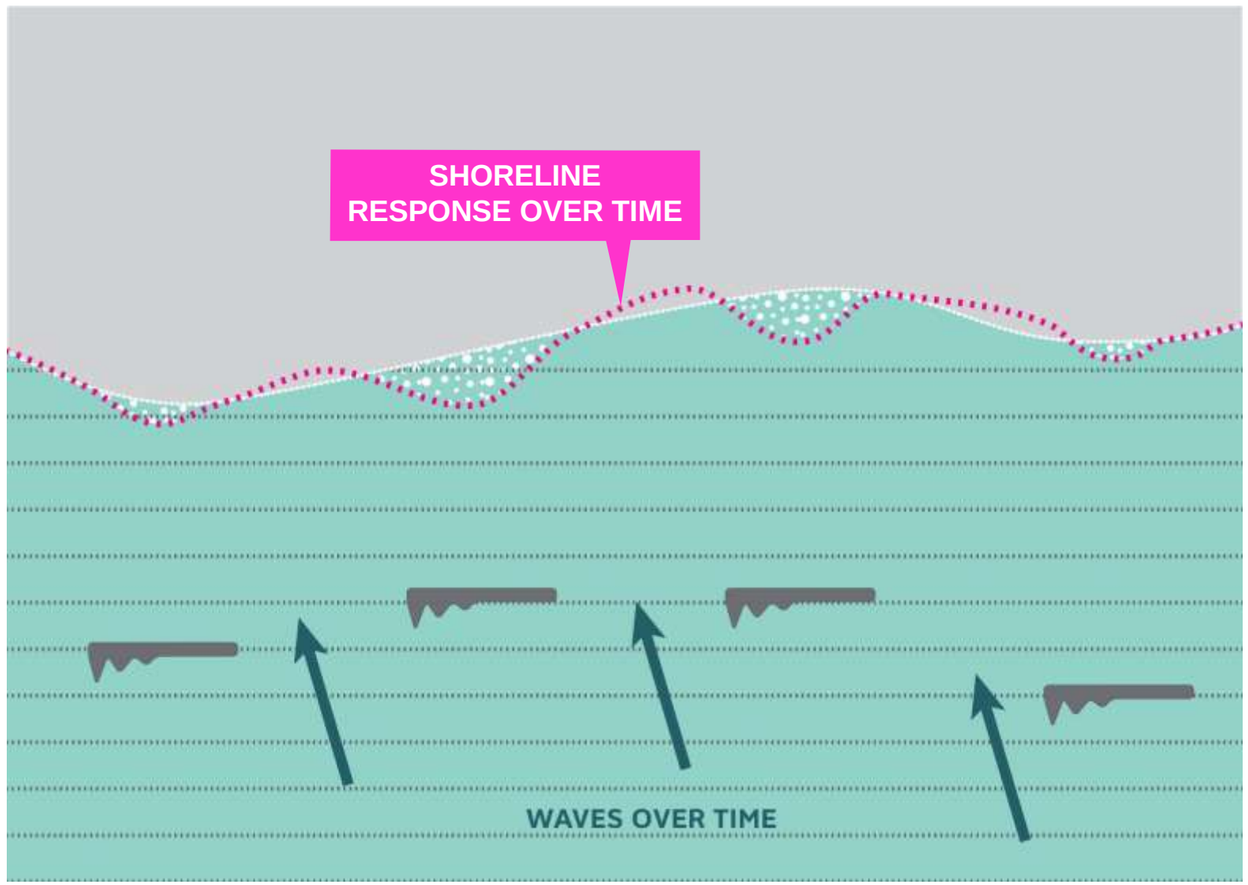


BREAKWATER HEIGHT (H)
MEASURED FROM THE CREST ELEVATION (NAVD88)
TO THE MUDLINE ELEVATION AT (NAVD88)

SCAPE / LANDSCAPE
ARCHITECTURE PLLC

Modeling to understand long term shoreline change

SHORELINE CHANGE MODELING:
GENESIS



- ASSESS SHORELINE CHANGE
- SIMULATES LONG-TERM SHORELINE EVOLUTION IN RESPONSE TO WAVE CONDITIONS AND COASTAL STRUCTURES

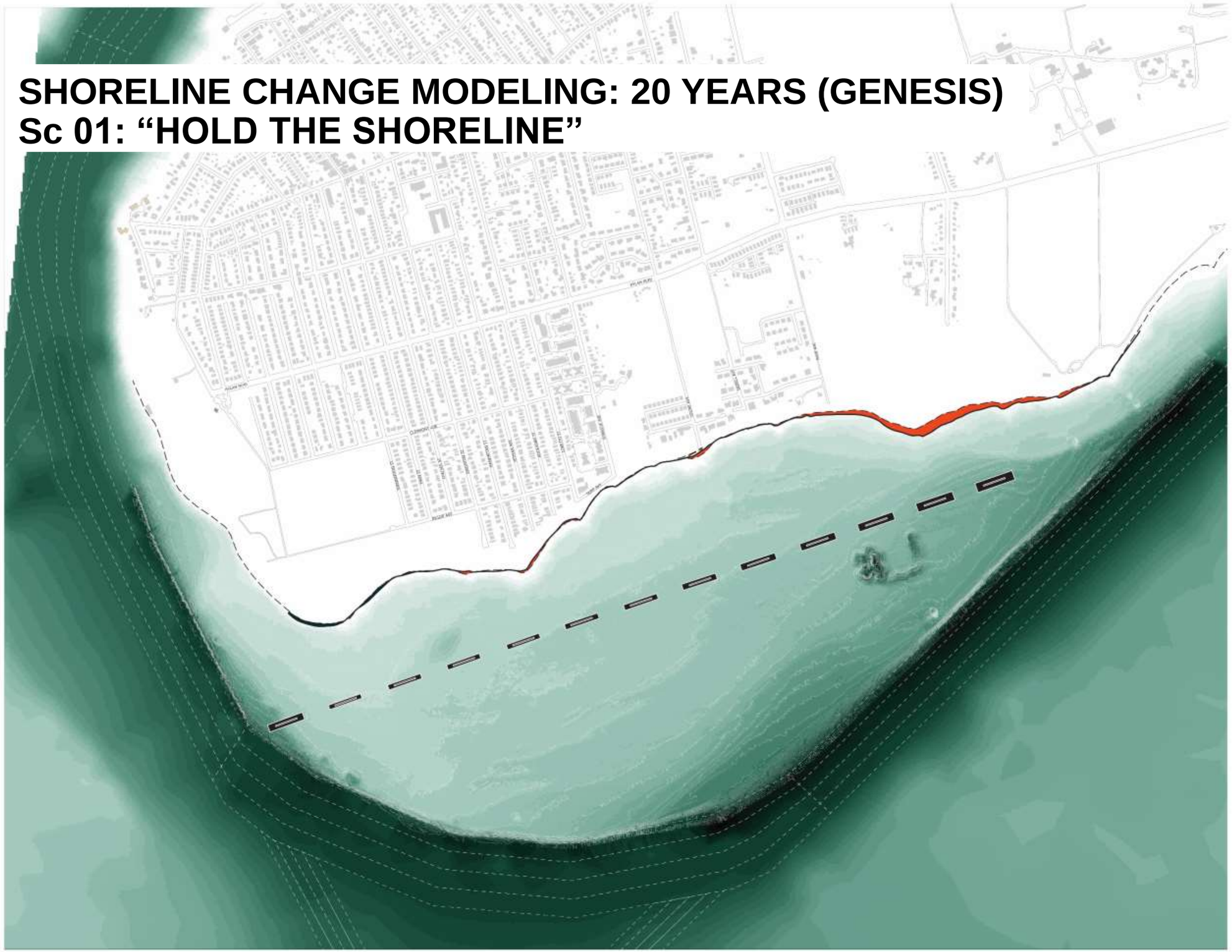
SCAPE / LANDSCAPE
ARCHITECTURE PLLC

LIVING BREAKWATERS

SCAPE TEAM

SCAPE / LANDSCAPE ARCHITECTURE
OCEAN AND COASTAL CONSULTANTS
PARSONS BRINCKERHOFF
ARCADIS
SEARC ECOLOGICAL MARINE CONSULTING
LOT-EK ARCHITECTURE
MFS CONSULTING ENGINEERS
PRUDENT ENGINEERING

SHORELINE CHANGE MODELING: 20 YEARS (GENESIS)
Sc 01: "HOLD THE SHORELINE"



MODELED 2032 MHW

MHW SPRING 2012

ANTICIPATED BEACH GROWTH

ANTICIPATED EROSION

SHORELINE STRUCTURES

BREAKWATER FOOTPRINT

DATA SOURCES:
2035 MHW MODELED BY ARCADIS USING GENESIS
2015 MHW LINE AND SHORELINE STRUCTURES SURVEYED BY NYACK, SUPPLEMENTED WITH 2014 LIDAR AND HISTORIC AERIAL IMAGERY
CHANNEL EDGE: BASED ON COORDINATES PROVIDED BY USACE (JOHN BELOIN-QUINONES) ON 2/25/2015
CONTOUR BATHYMETRY GENERATED BY HILL

0' 500' 1000' 2000'

LIVING BREAKWATERS

SCAPE TEAM

SCAPE / LANDSCAPE ARCHITECTURE
OCEAN AND COASTAL CONSULTANTS
PARSONS BRINCKERHOFF
ARCADIS
SEARC ECOLOGICAL MARINE CONSULTING
LOT-EK ARCHITECTURE
MFS CONSULTING ENGINEERS
PRUDENT ENGINEERING

SHORELINE CHANGE MODELING: 20 YEARS (GENESIS)
Sc 02: "BLOCK THE STORM"

MODELED 2032 MHW

MHW SPRING 2012

ANTICIPATED BEACH GROWTH

ANTICIPATED EROSION

SHORELINE STRUCTURES

BREAKWATER FOOTPRINT

DATA SOURCES:
2035 MHW MODELED BY ARCADIS USING GENESIS
2015 MHW LINE AND SHORELINE STRUCTURES SURVEYED BY NYACK, SUPPLEMENTED WITH 2014 LIDAR AND HISTORIC AERIAL IMAGERY
CHANNEL EDGE: BASED ON COORDINATES PROVIDED BY USACE (JOHN BELOIN-QUINONES) ON 2/25/2015
CONTOUR BATHYMETRY GENERATED BY HILL

0' 500' 1000' 2000'

LIVING BREAKWATERS

SCAPE TEAM

SCAPE / LANDSCAPE ARCHITECTURE
OCEAN AND COASTAL CONSULTANTS
PARSONS BRINCKERHOFF
ARCADIS
SEARC ECOLOGICAL MARINE CONSULTING
LOT-EK ARCHITECTURE
MFS CONSULTING ENGINEERS
PRUDENT ENGINEERING

SHORELINE CHANGE MODELING: 20 YEARS (GENESIS)
Sc 03: “TOMBOLO?”

MODELED 2032 MHW

MHW SPRING 2012

ANTICIPATED BEACH GROWTH

ANTICIPATED EROSION

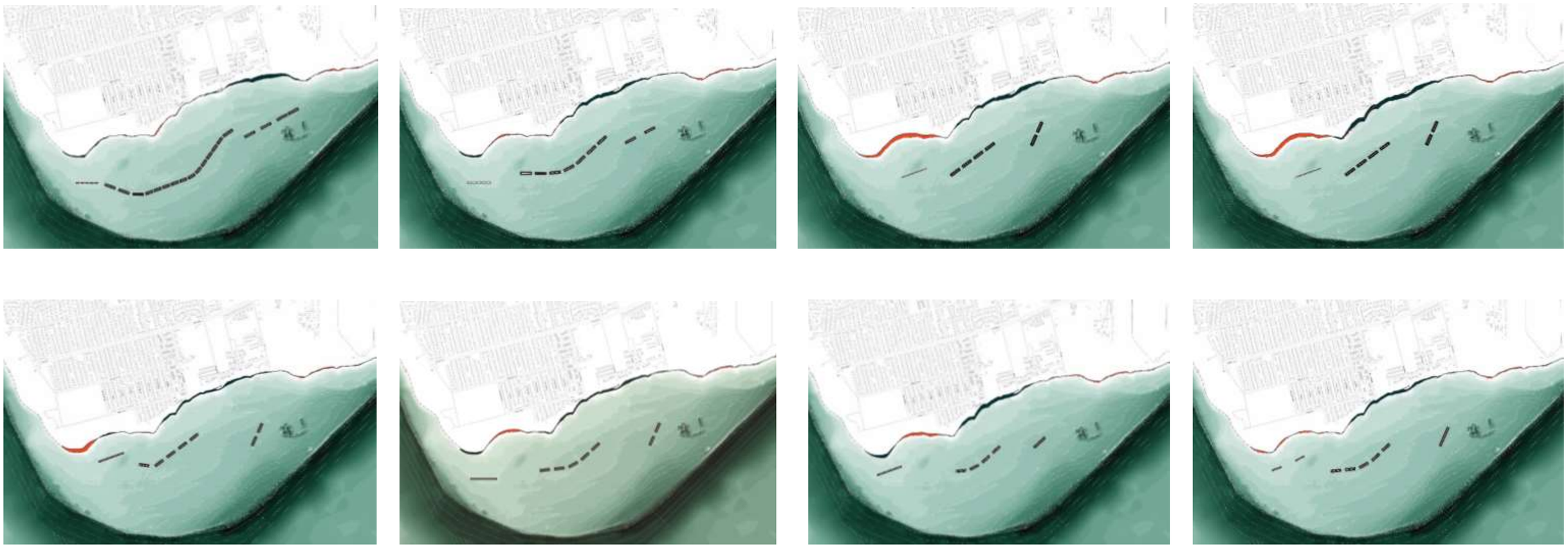
SHORELINE STRUCTURES

BREAKWATER FOOTPRINT

DATA SOURCES:
2035 MHW MODELED BY ARCADIS USING GENESIS
2015 MHW LINE AND SHORELINE STRUCTURES SURVEYED BY NYACK, SUPPLEMENTED WITH 2014 LIDAR AND HISTORIC AERIAL IMAGERY
CHANNEL EDGE: BASED ON COORDINATES PROVIDED BY USACE (JOHN BELOIN-QUINONES) ON 2/25/2015
CONTOUR BATHYMETRY GENERATED BY HILL

0' 500' 1000' 2000'

MODELING SCENARIOS (GENESIS)



MODELED 2032 MHW

MHW SPRING 2012

ANTICIPATED BEACH GROWTH

ANTICIPATED EROSION

SHORELINE STRUCTURES

BREAKWATER FOOTPRINT

PROPOSED BEACH FILL

SCAPE / LANDSCAPE ARCHITECTURE PLLC

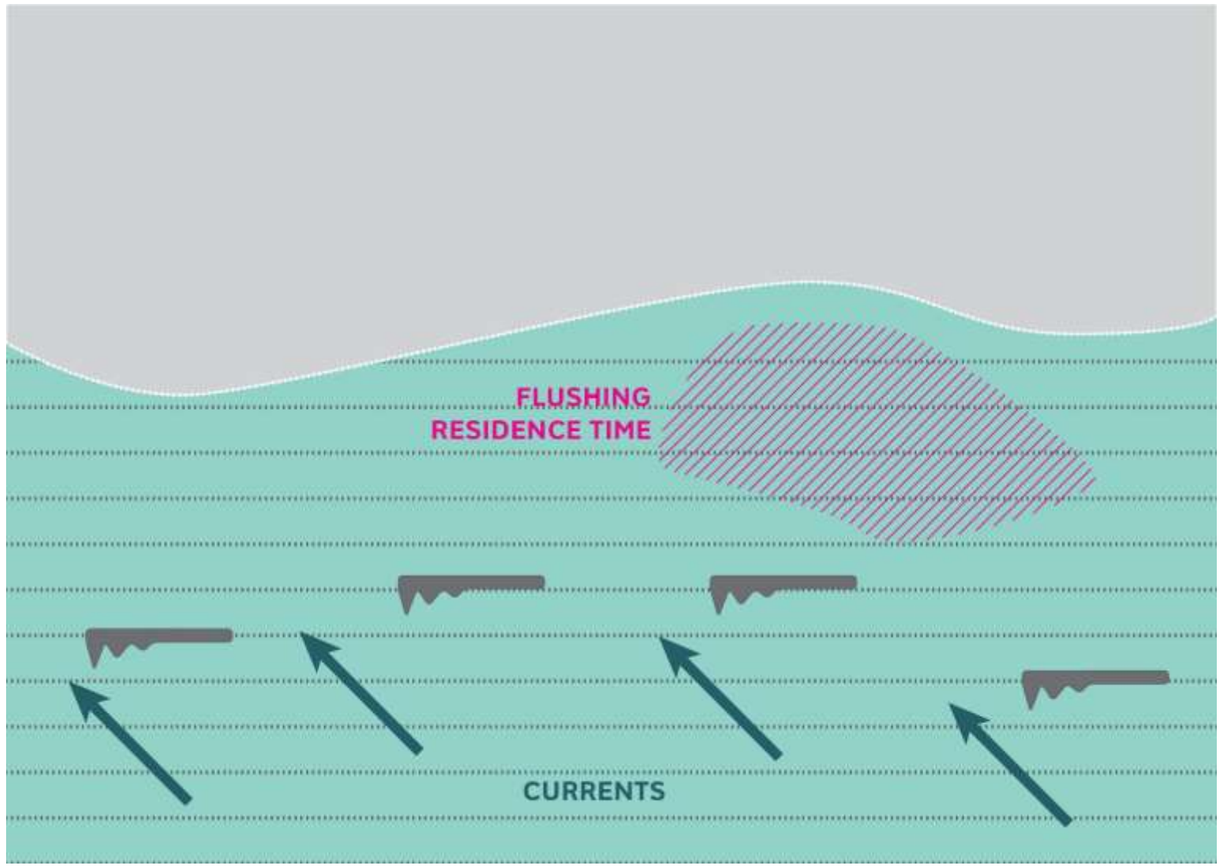
NY RISING

CURRENT 30% DESIGN SCENARIO

GENESIS RESULTS OF 30% DESIGN SCENARIO

Modeling to understand potential impacts on water quality

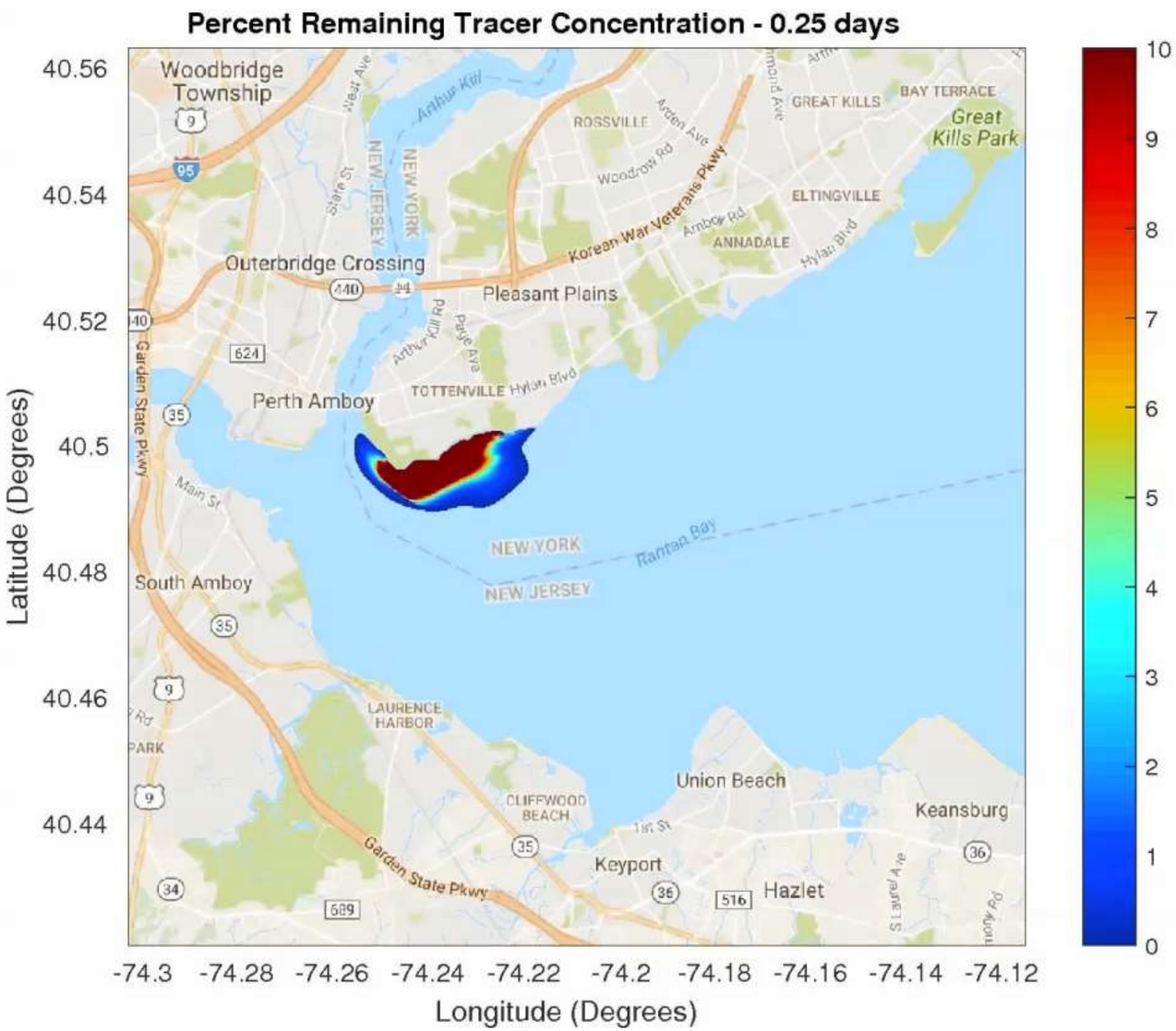
WATER CIRCULATION MODELING*:
DELFT 3D

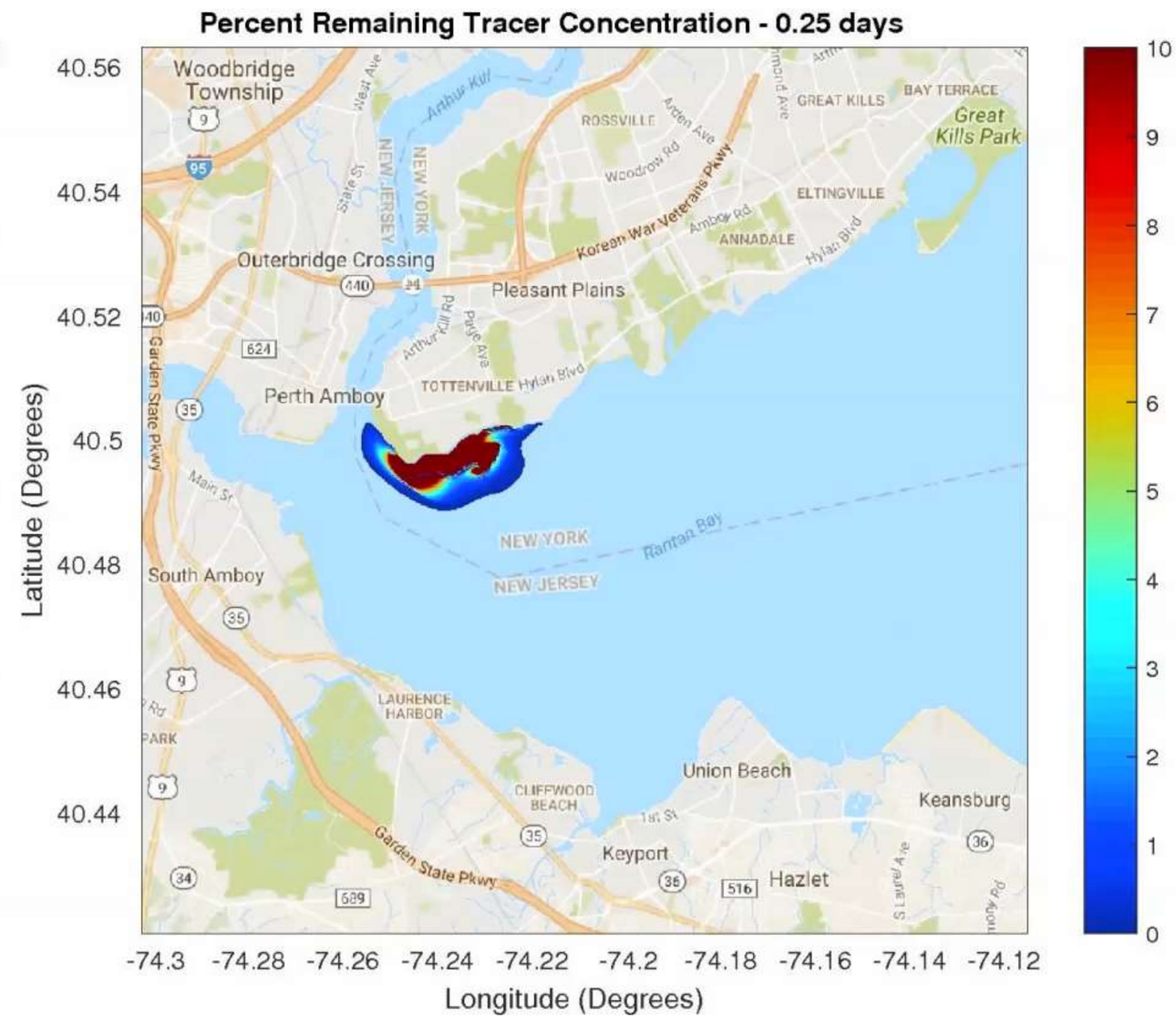


- ASSESS TIDAL CIRCULATION TO UNDERSTAND POTENTIAL WATER QUALITY IMPACTS
- SIMULATE CURRENTS

*MODELING PREFERRED SCENARIO ONLY

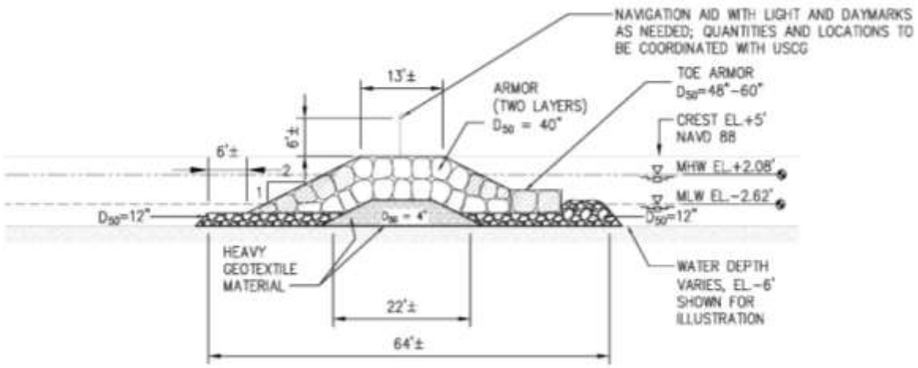
DELFT 3D: WATER CIRCULATION AND FLUSHING

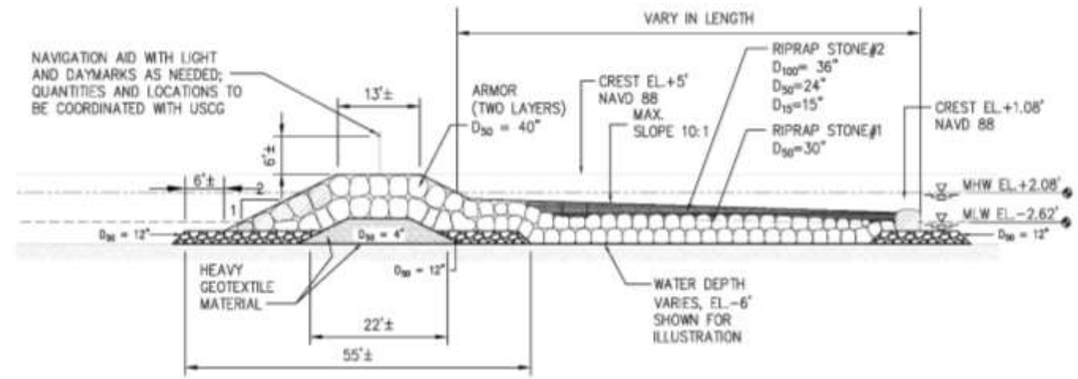




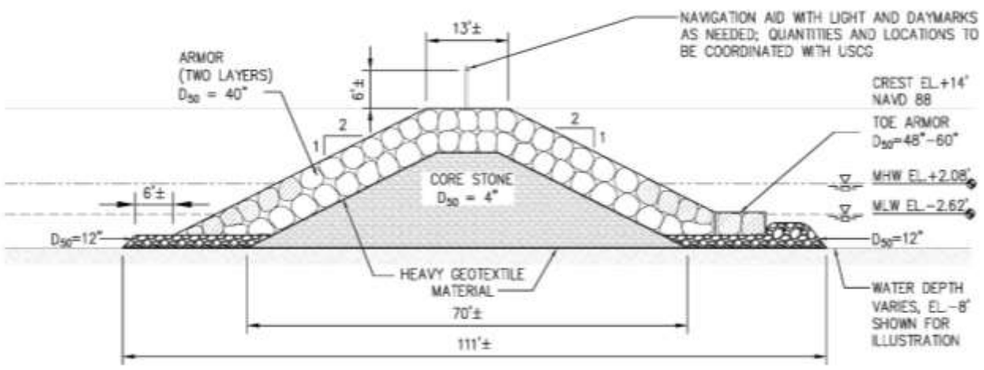
BREAKWATER SEGMENT DESIGN

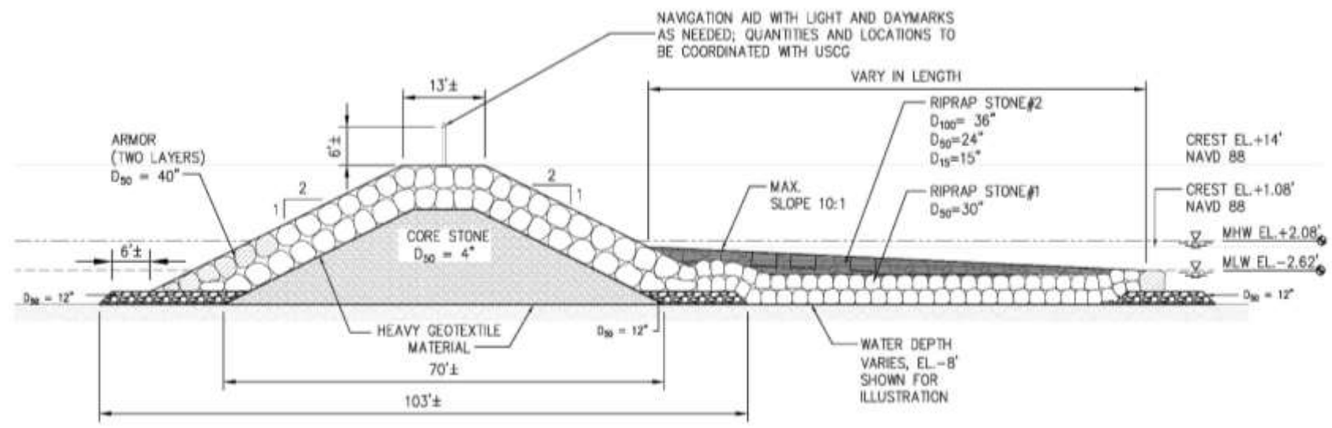
BREAKWATERS CROSS-SECTIONS BY TYPE



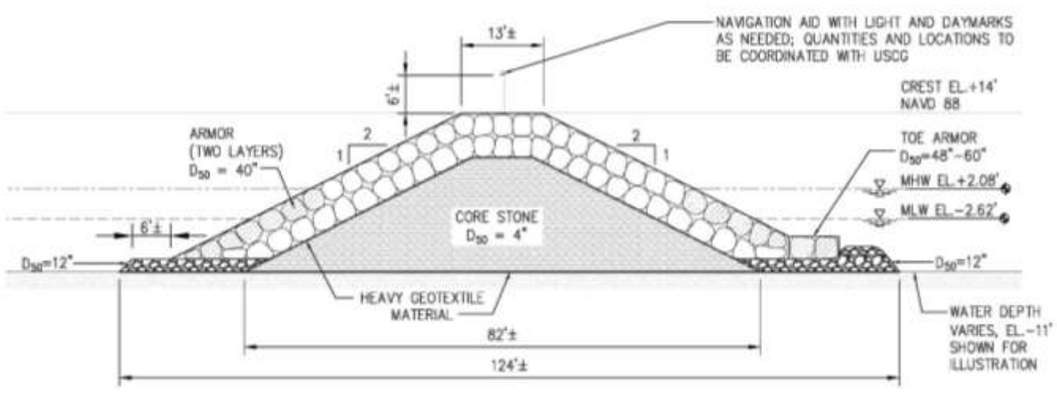


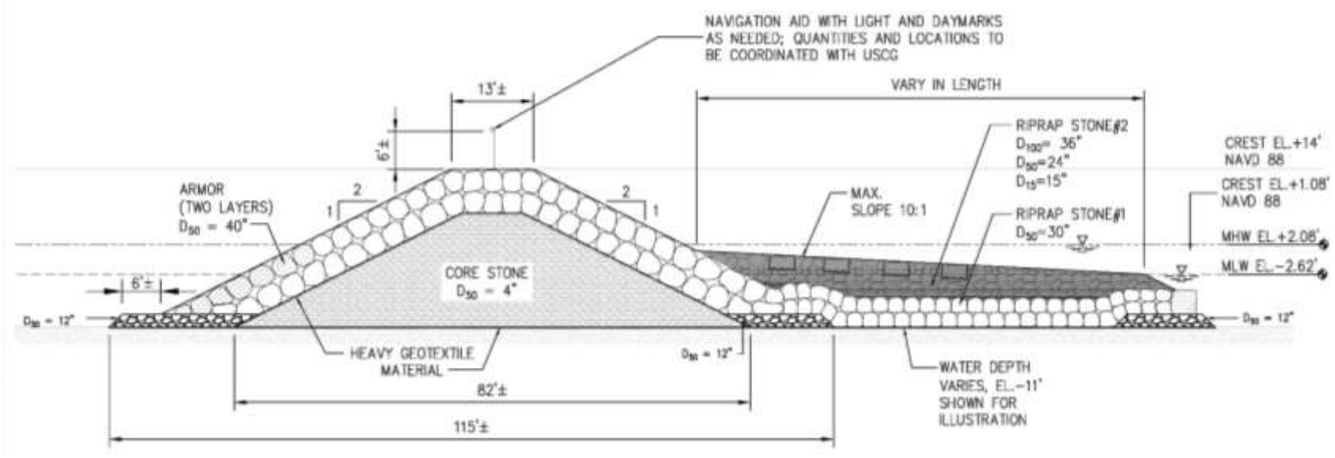
TYPE A



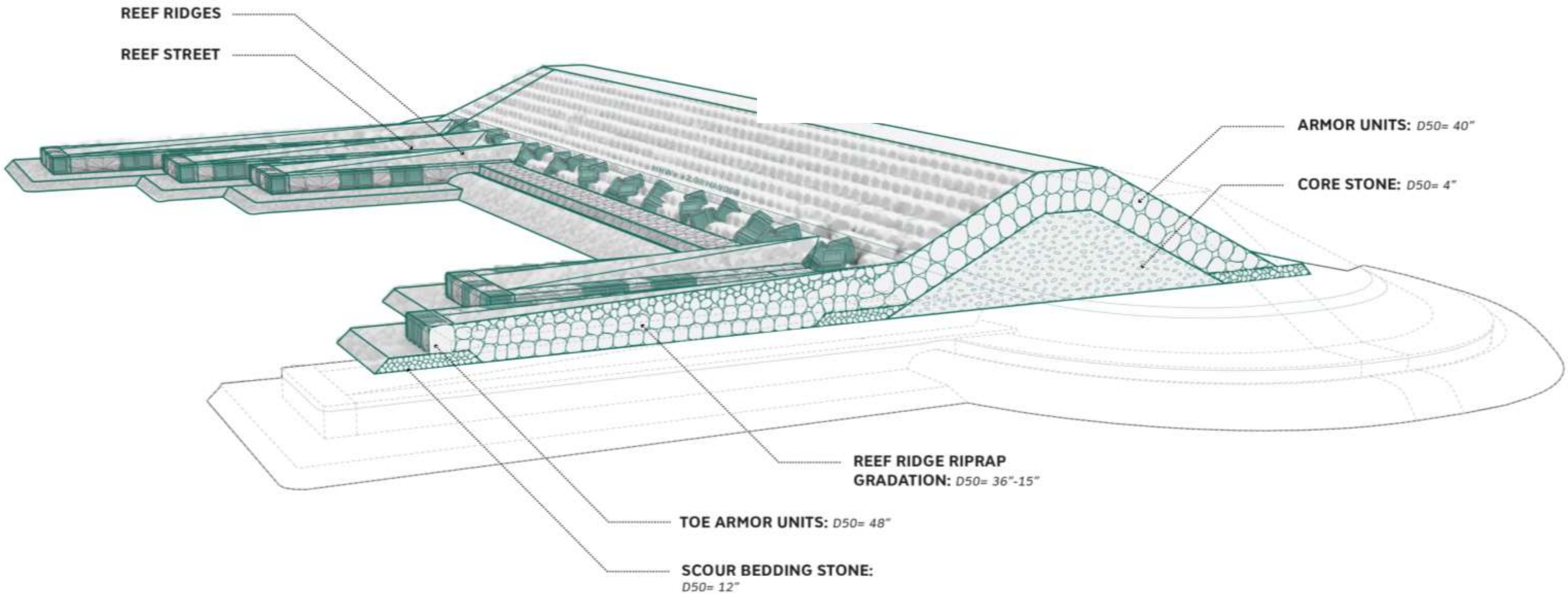


TYPE B

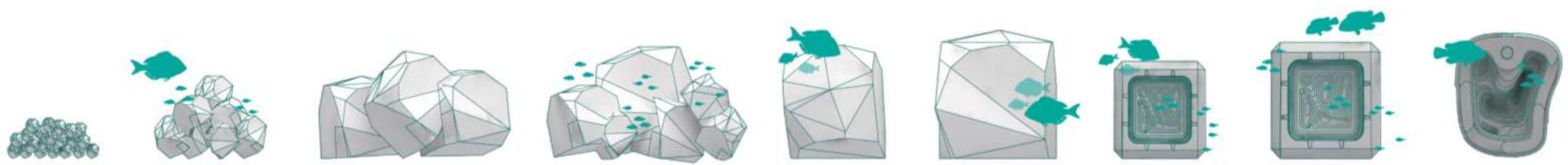




TYPE C



LIVING BREAKWATER MATERIALS



INTERNAL CORE STONE
D50= 4"

SCOUR APRON STONE
D50= 12"

INTERNAL REEF RIDGE RIP RAP GRADATION #2
D50= 30"

REEF RIDGE RIP RAP GRADATION #1
D50= 36", 24", 15"

STONE ARMOR UNIT
D50= 30"

STONE TOE ARMOR UNIT
D50: 48"

BIO ENHANCED ARMOR UNIT
Dimension: 30"x 30"

BIO ENHANCED TOE ARMOR UNIT
Dimension: 4'x 4'

BIO ENHANCED TIDE POOLS
Dimensions vary with placement

MATERIALS

STANDARD ARMOR STONE

Standard exterior stone of the breakwater; approximate average diameter of 3.3 ft and an average layer thickness of 6.6 ft

TOE ARMOR STONE

Slightly larger armor unit to be used at the base of the wave exposed side of the breakwater; approximate average diameter of 4FT to 5FT

RIP RAP STONE #1

Stone used at the base of the reef ridge; approximate average diameter of 2.5 FT

RIP RAP STONE #2

Stone used at the top of the reef ridges; approximate average diameter ranging from 3 FT to 1.25 FT

CORE STONE

Smaller stone forming the central core of the breakwater, approximate average diameter of 0.33 FT

BEDDING STONE (SCOUR APRON)

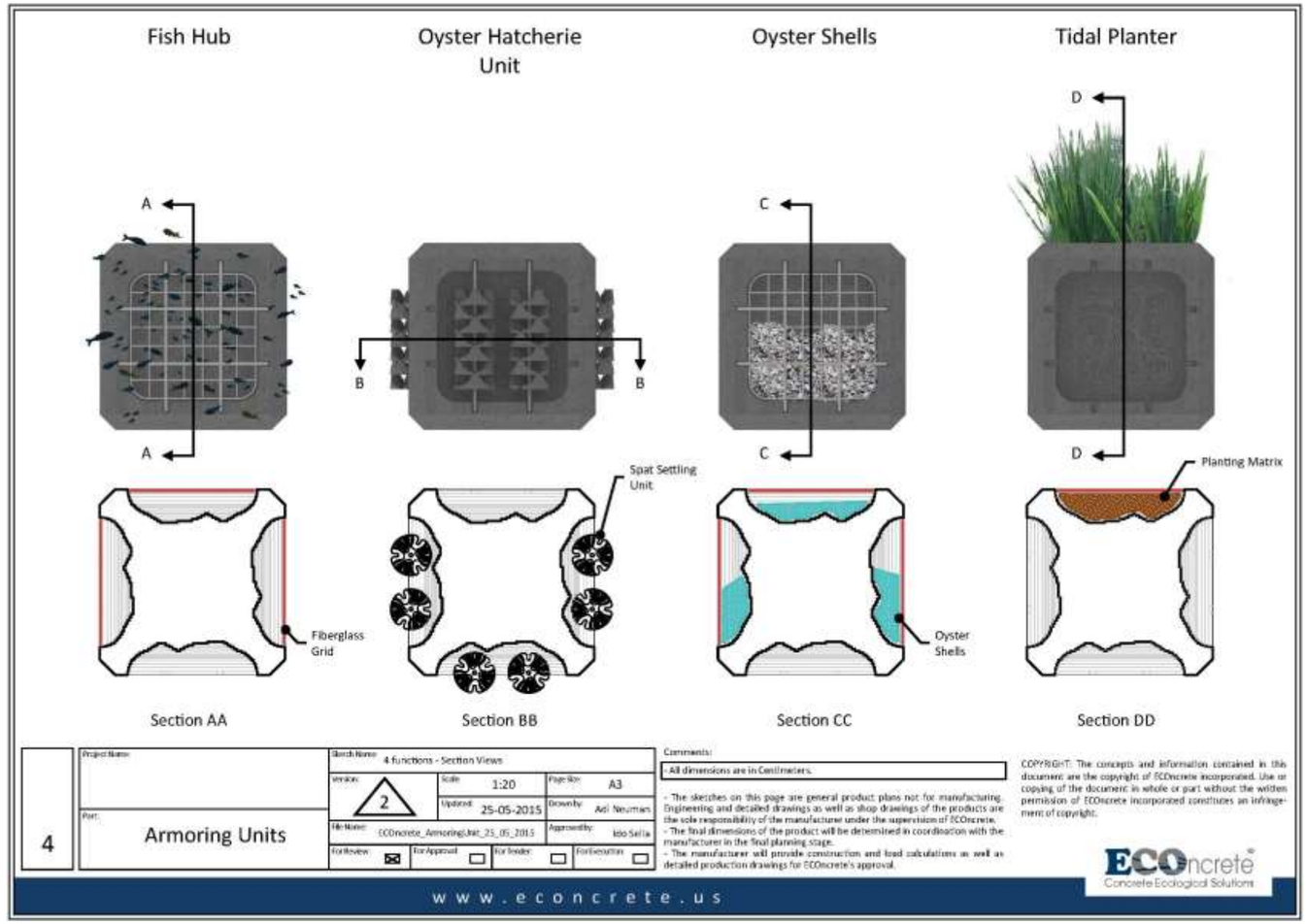
Approximate average diameter of 1 FT, and an average layer thickness of 2 FT.

BIO ENHANCING CONCRETE UNITS AND TIDE POOL UNITS

GEOTEXTILE

BREAKWATER MATERIALS

BIO-ENHANCING CONCRETE UNITS

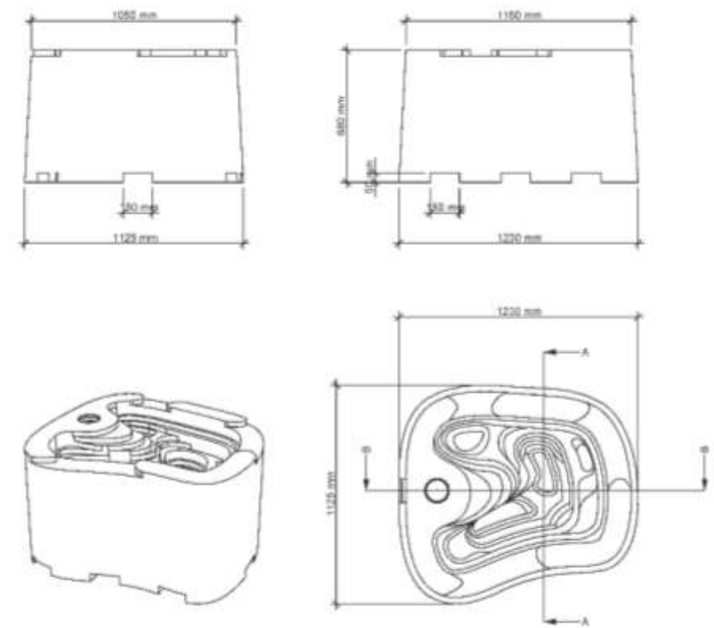


SCAPE / LANDSCAPE
ARCHITECTURE PLLC

NY RISING

BREAKWATER MATERIALS

BIO-ACTIVE TIDEPOOL UNITS



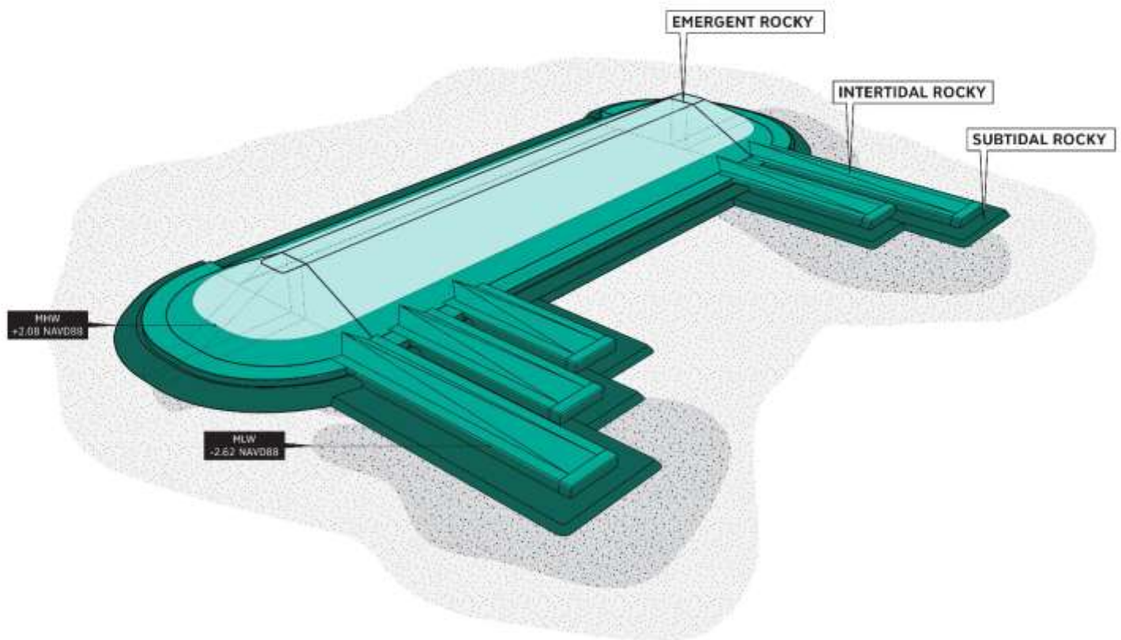
ECOncrete®
Concrete Ecological Solutions

SCAPE / LANDSCAPE
ARCHITECTURE PLLC

NY RISING

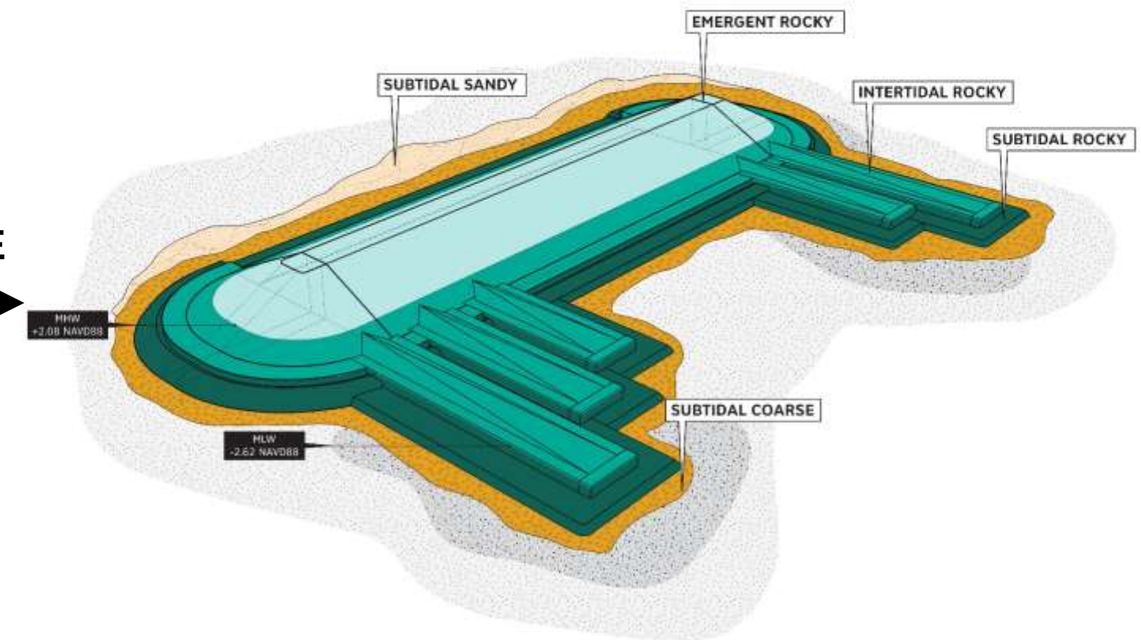
ECOLOGICAL DESIGN

BREAKWATER CONSTRUCTED HABITATS



+ TIME

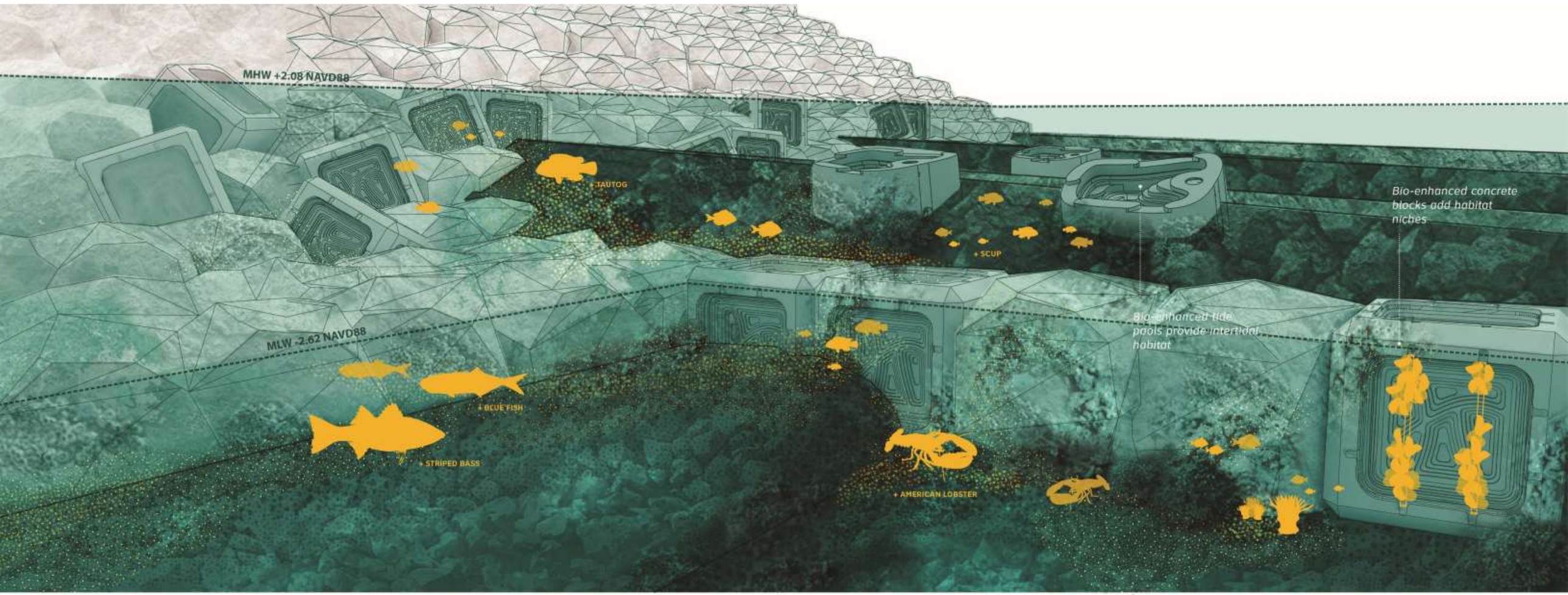
BREAKWATER RESULTANT HABITATS

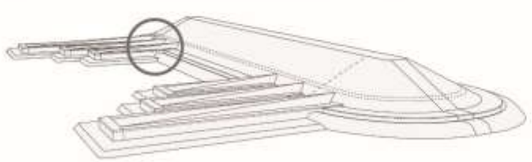


SCAPE / LANDSCAPE
ARCHITECTURE PLLC

NY RISING

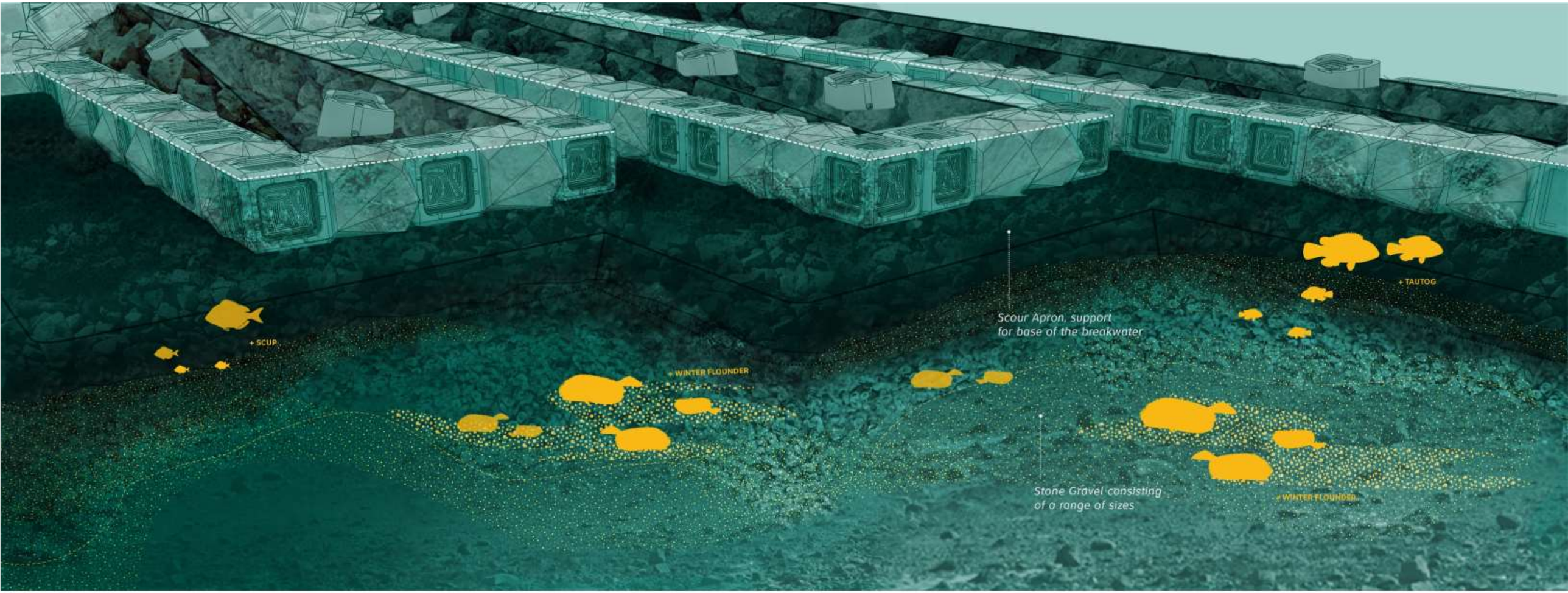
HABITAT CONDITIONS





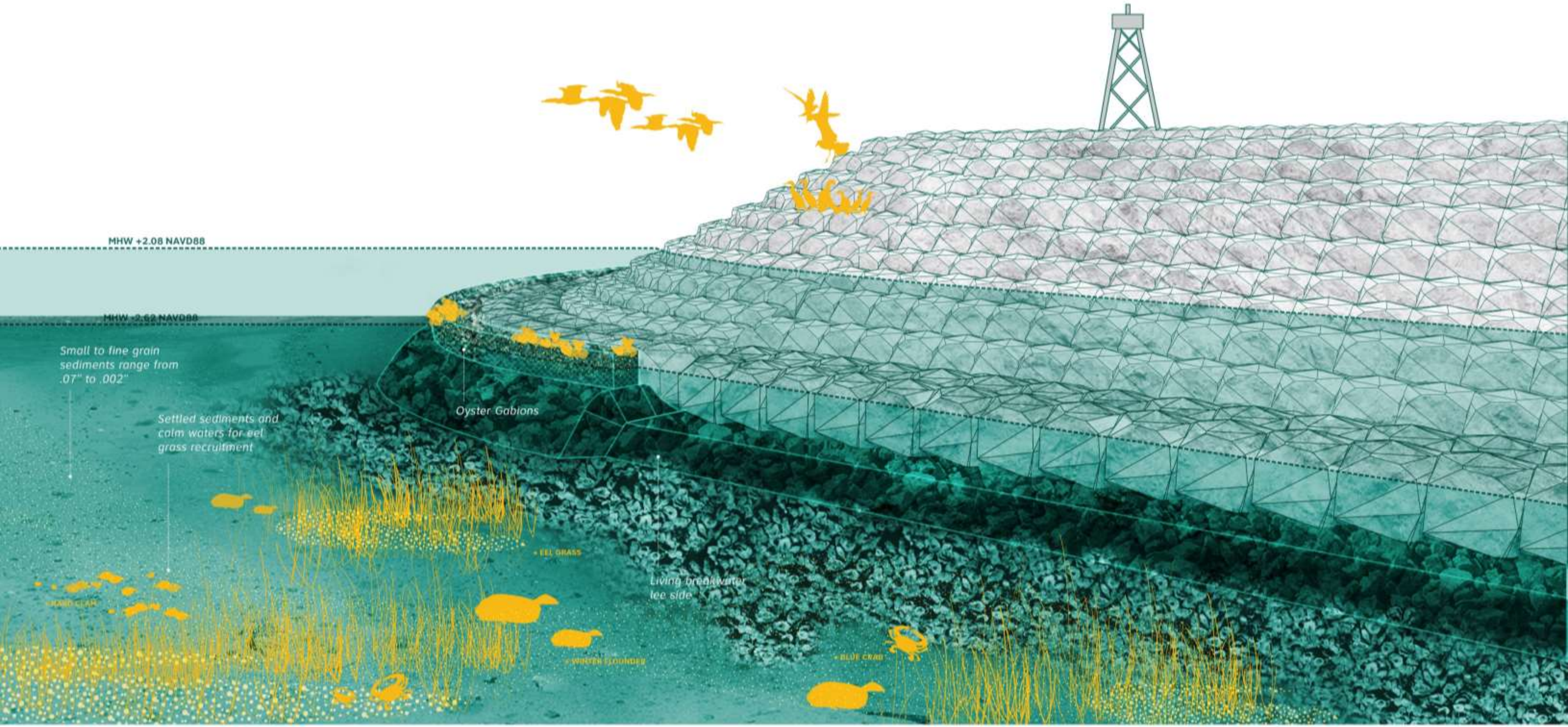
HARD SUBSTRATE LIVING BREAKWATER HABITAT

HABITAT CONDITIONS



LARGE GRAIN LIVING BREAKWATER HABITAT

HABITAT CONDITIONS

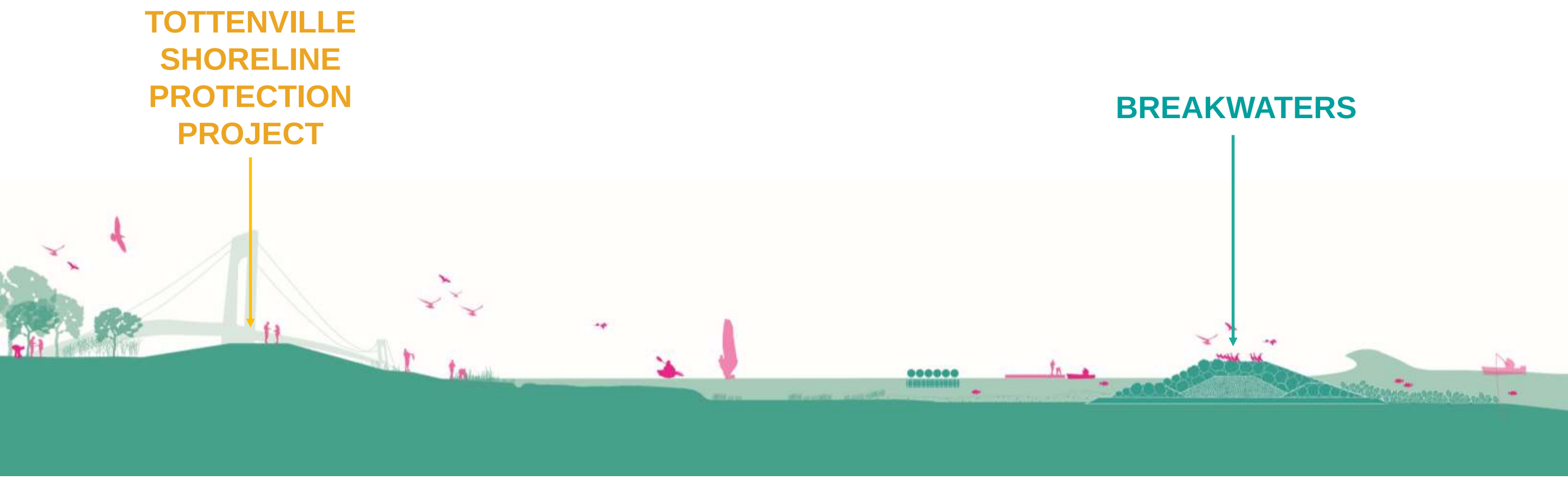


SMALL GRAIN LIVING BREAKWATER HABITAT

FUNCTIONAL GROUPS

Category	Ecosystem value	Example Species
Structure oriented reef fish	Important consumers of benthic invertebrates and fish near structured habitat; Use structured habitat as refuge.	Tautog Cunner Black sea bass
Structure oriented forage fish	Use structure for refuge and breeding (Eggs adhere to structure) consume wide range of prey from algae, to plankton, to crustaceans, molluscs, and other benthic invertebrates. Forage for higher trophic-level fish, and seabirds.	Gobies Blennies
Other forage fish	Forage for higher trophic-level fish, shorebirds; consume zooplankton and planktonic fish and macroinvertebrate larvae.	American sandlance Atlantic menhaden Atlantic silversides Bay anchovy Inland silverside Mummichog, killifish
Transient recreational and commercial fishery	Predatory fish that feed on forage fish linked to or associated with (oyster) reef habitat.	Bluefish Winter Flounder Summer Flounder Atlantic Striped Bass
Habitat-forming filter feeders	Refuge and substrate for primary produces, benthic and epibenthic invertebrates, and fish; filter-feeding (benthic-pelagic coupling); shoreline protection	Eastern Oyster Blue Mussel Hard Clams Barnacles Bryozoans Tunicates Sessile bristle worms Sponges
Motile benthic invertebrates	Important prey and predators of estuarine systems. Larger species are consumers of small fish and (epi)benthic invertebrates; and are prey or providers of reproduction products which are consumed by other organisms. Smaller species are forage, and takes part in the benthic-pelagic coupling (cycling of nutrients between the underwater substrate and overlying water column).	Amphipods Isopods Gastropods Blue Crab American lobster Horseshoe crab
Primary producers (non-phytoplankton)	Primary productivity; foraging and refuge/nursery habitat; coastal protection	Eelgrass

THE LAYERED APPROACH



TOTTENVILLE SHORELINE PROTECTION PROJECT

IN PROGRESS: COORDINATION WITH GREENBELT NATIVE PLANT CENTER

Quercus alba
White Oak

Quercus bicolor
Swamp White Oak

Juglans nigra
Black Walnut

Quercus palustris
Pin Oak

Quercus phellos
Willow Oak

Nyssa sylvatica
Black Gum

Amelanchier arborea
Downy Serviceberry

Prunus maritima
Beach plum

Rosa palustris
Swamp Rose

Rhus glabra
Smooth Sumac

Baccharis halimifolia
Eastern baccharis

Cercis canadensis
Eastern Redbud

IN PROGRESS: STORMWATER ANALYSIS

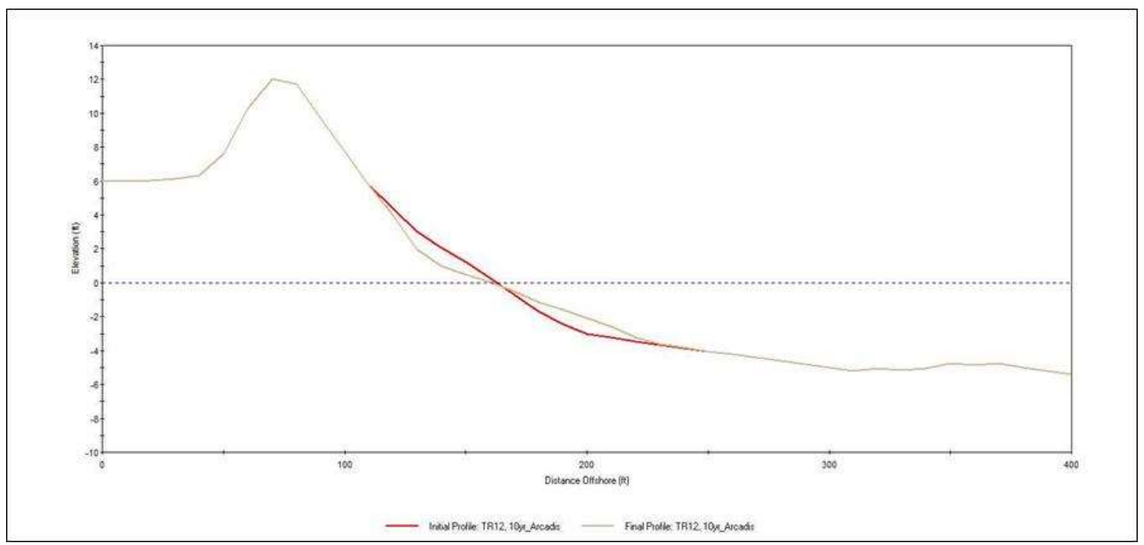
WHAT GOES INTO A STORMWATER ANALYSIS?

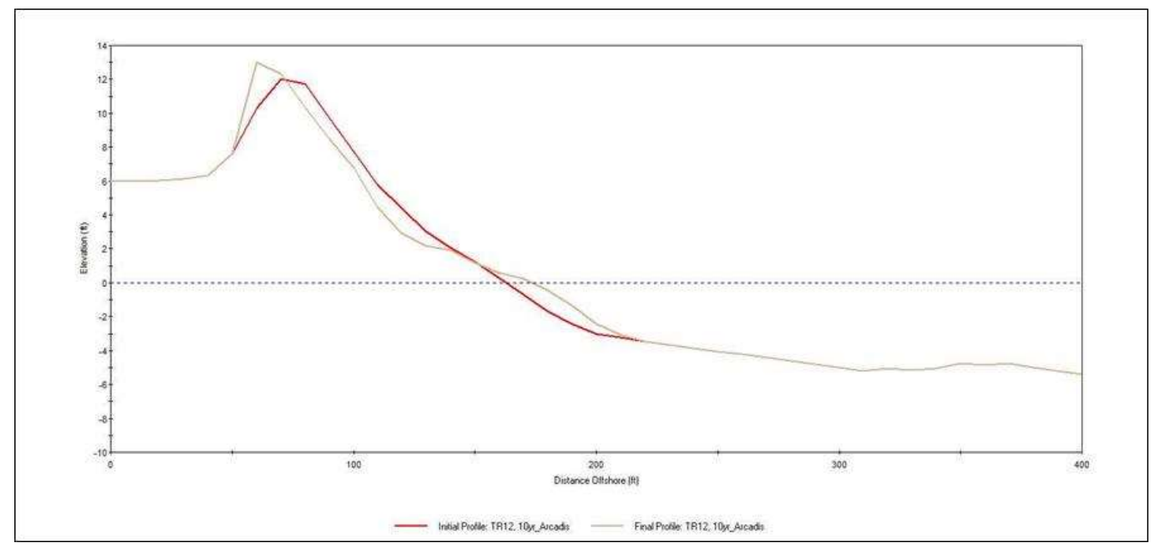
- REVIEW OF EXISTING DRAINAGE PLANS

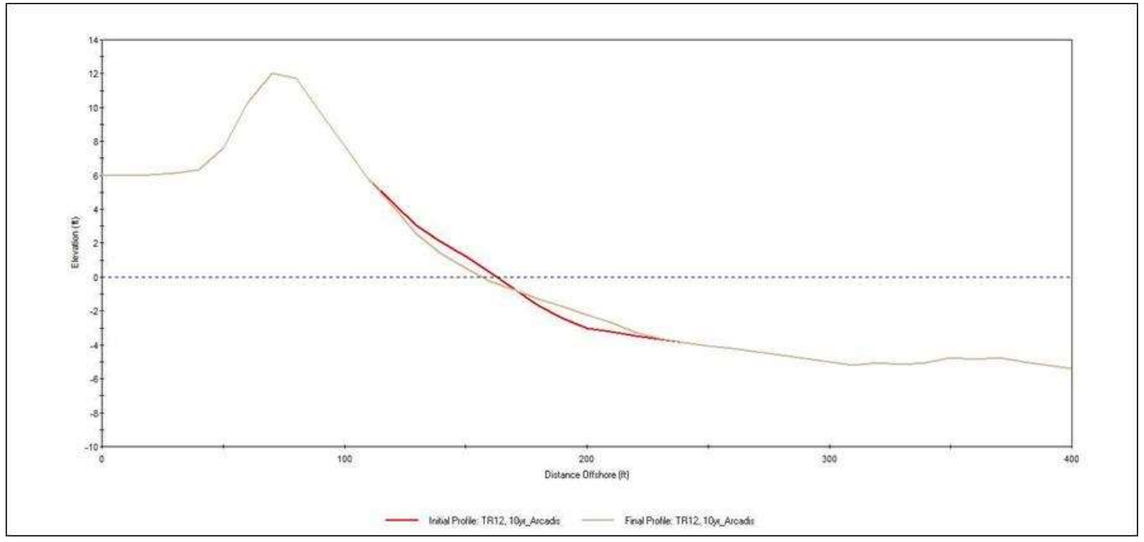
- REVIEW OF EXISTING STORMWATER COLLECTION SYSTEM
  - Number of stormwater outfalls and sizes
  - Extent of stormwater piping

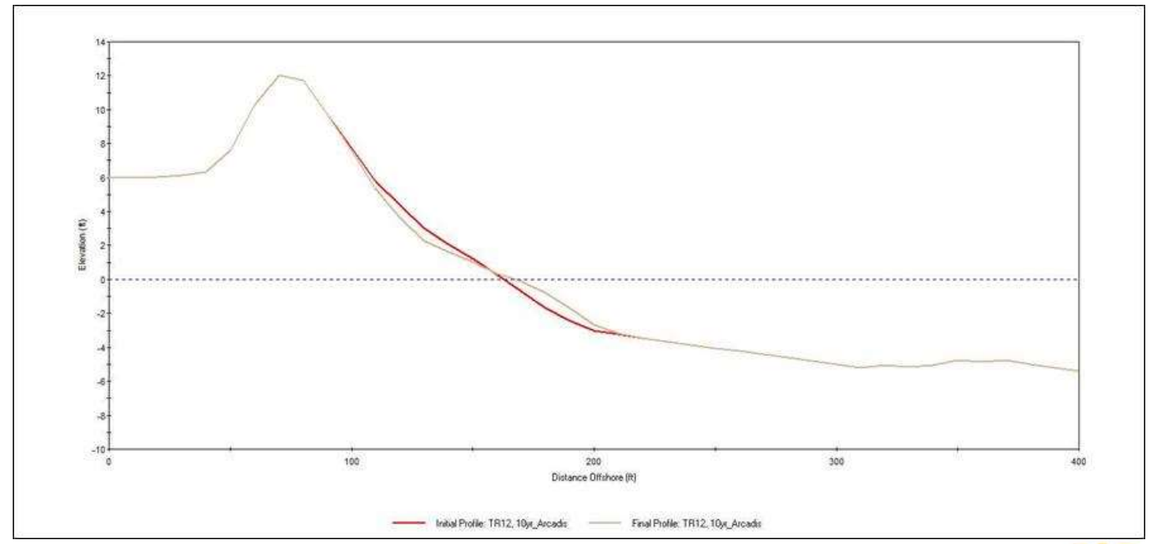
- STUDY OF POTENTIAL DETENTION REQUIREMENTS

IN PROGRESS: SBEACH MODELING & CALCULATIONS



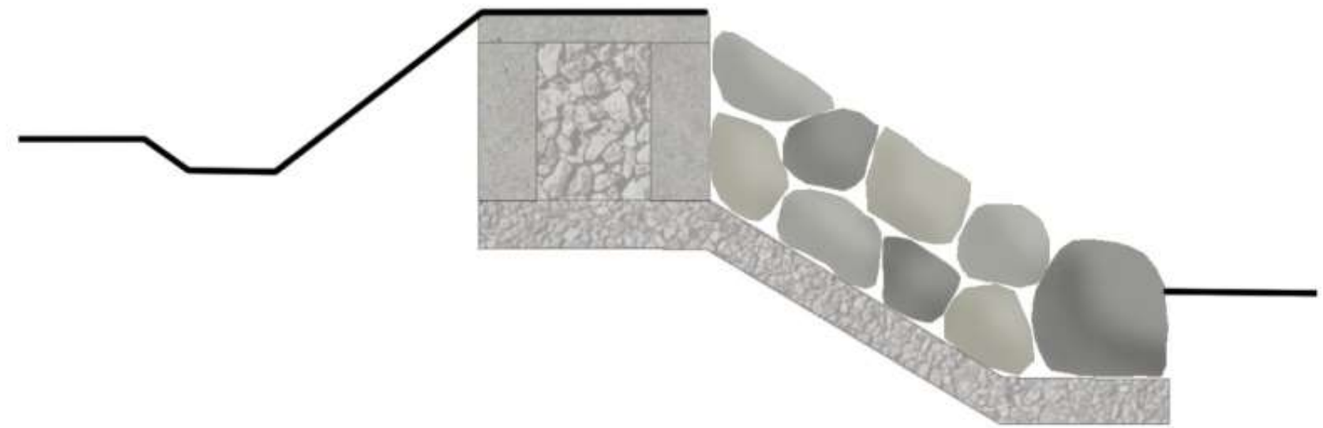


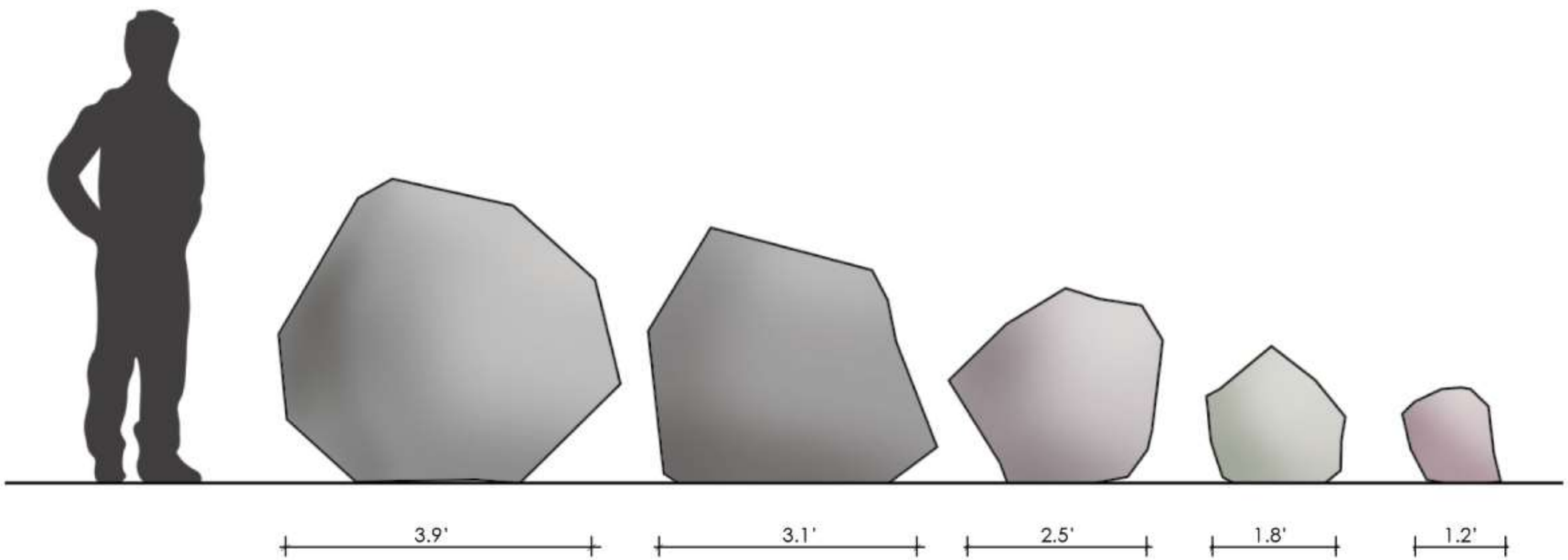




IN PROGRESS: ARMOR STONE CALCULATION

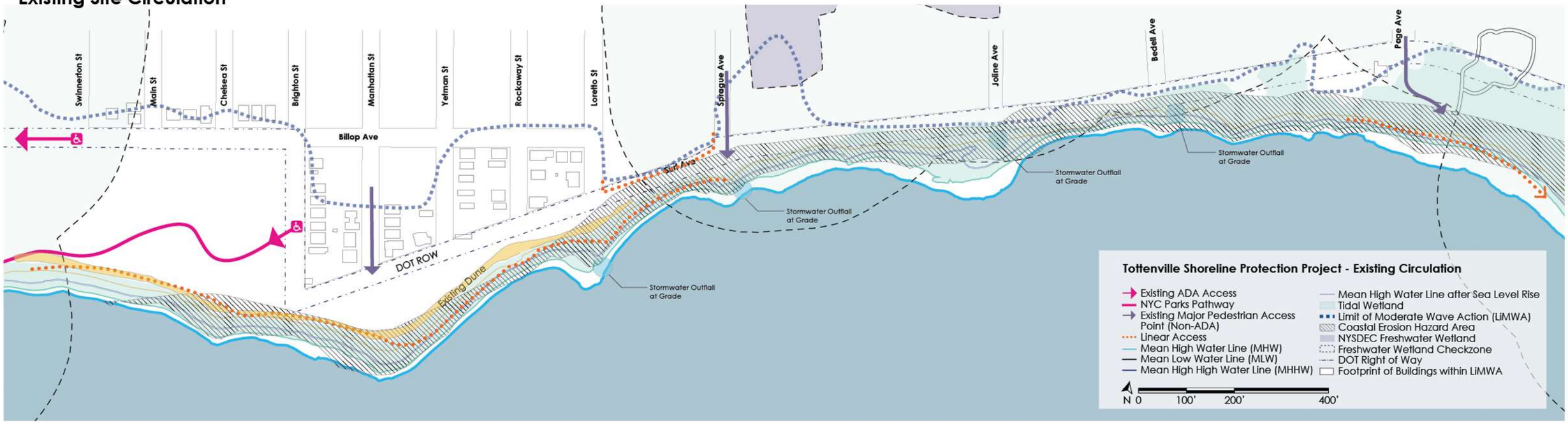
% less than by weight	1:1.5 Slope			
	Armor Layer		Filter Layer	
	Weight (lb)	Dimension (ft)	Weight (lb)	Dimension (ft)
0 (min)	315	1.2	0.8	0.17
15	1009	1.8	1.4	0.2
50	2522	2.5	4.7	0.3
85	4944	3.1	15.8	0.46
100 (max)	10089	3.9	26.5	0.54



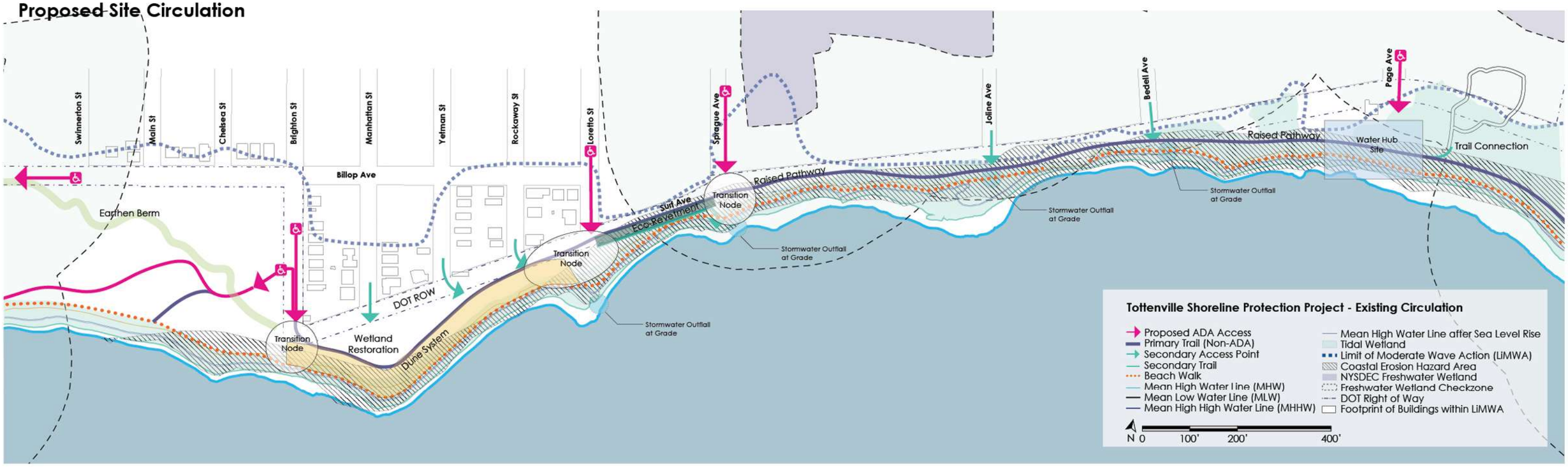


DESIGN: SITE CIRCULATION

Existing Site Circulation



Proposed Site Circulation



DESIGN: FOUR DESIGN TYPES

Tottenville Shoreline Protection Project Plan Rendering

Legend

- Earthen Berm
- Dune System
- Eco-Revetment
- Raised Pathway
- Mean High Water Line
- Mean High High Water Line
- Mean High Water Line after Sea Level Rise
- Mean Low Water Line (MLW)
- Limit of Moderate Wave Action (LiMWA)
- Building Footprints within LiMWA
- DOT Right of Way

N 0 100' 200' 400'

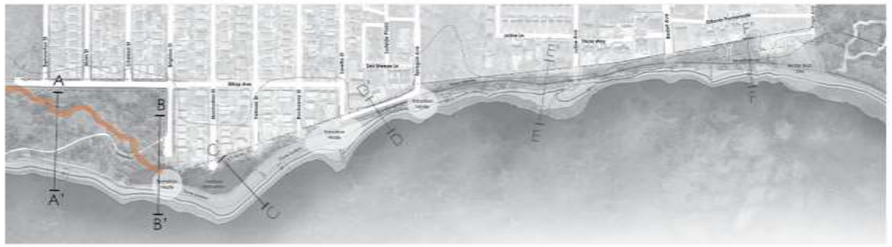
Earthen Berm

Dune System

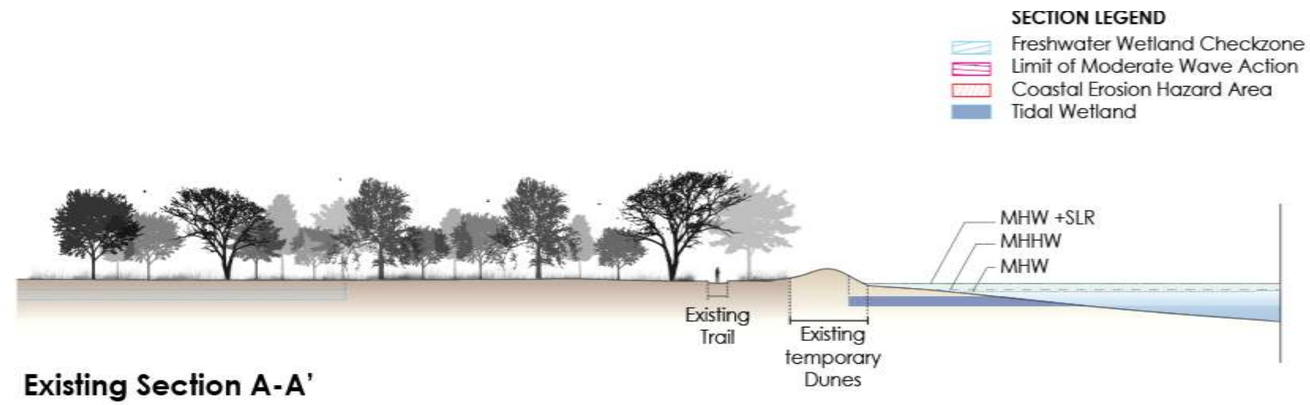
Eco-Revetment

Raised Pathway

EARTHEN BERM

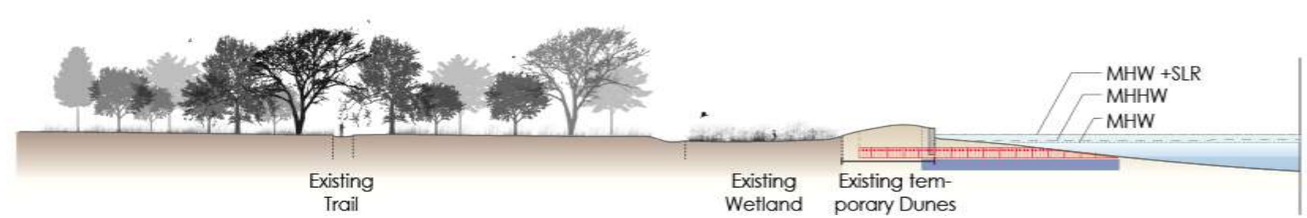


Key Map

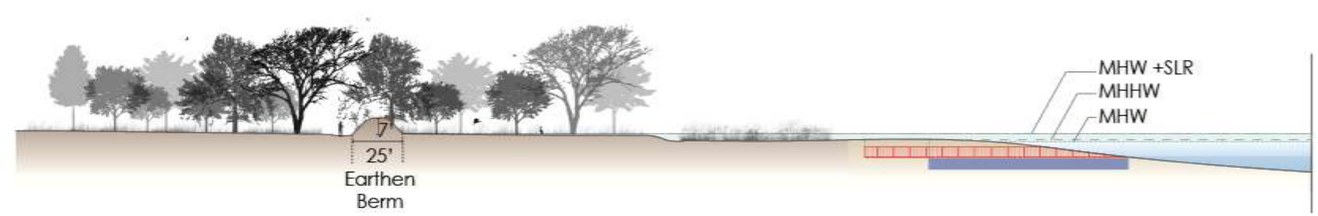


Existing Section A-A'

Proposed Section A-A'

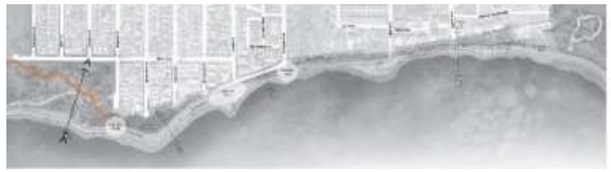


Existing Section B-B'



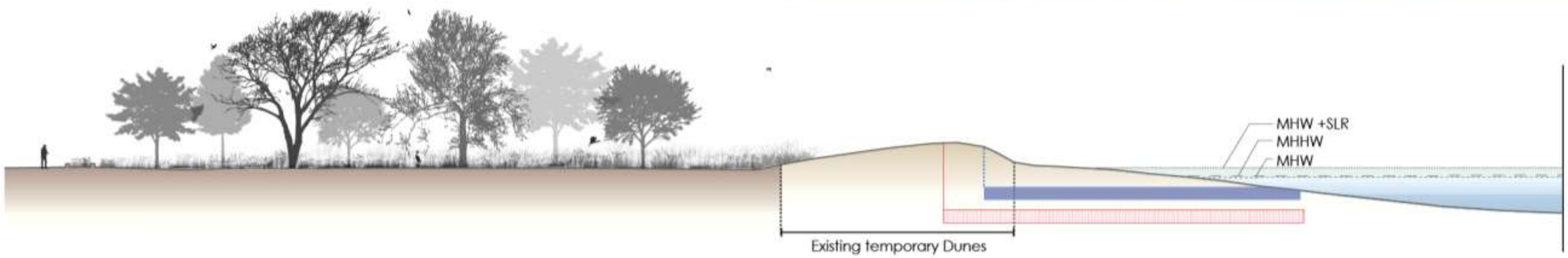
Proposed Section B-B'

EARTHEN BERM

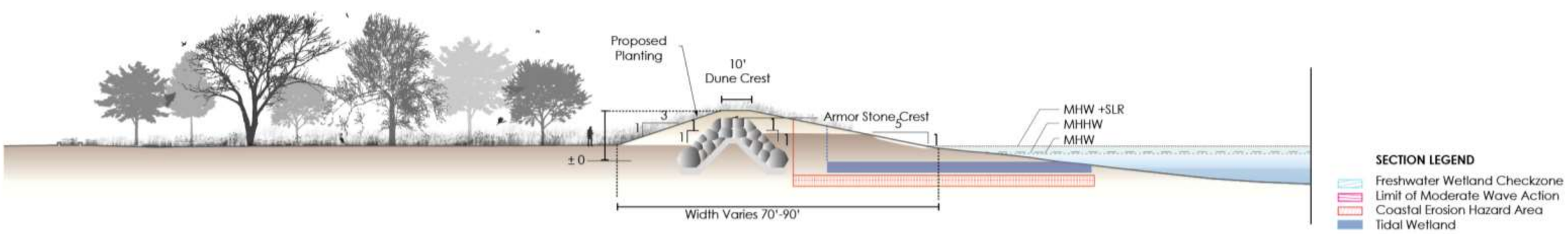


DUNE SYSTEM

Key Map

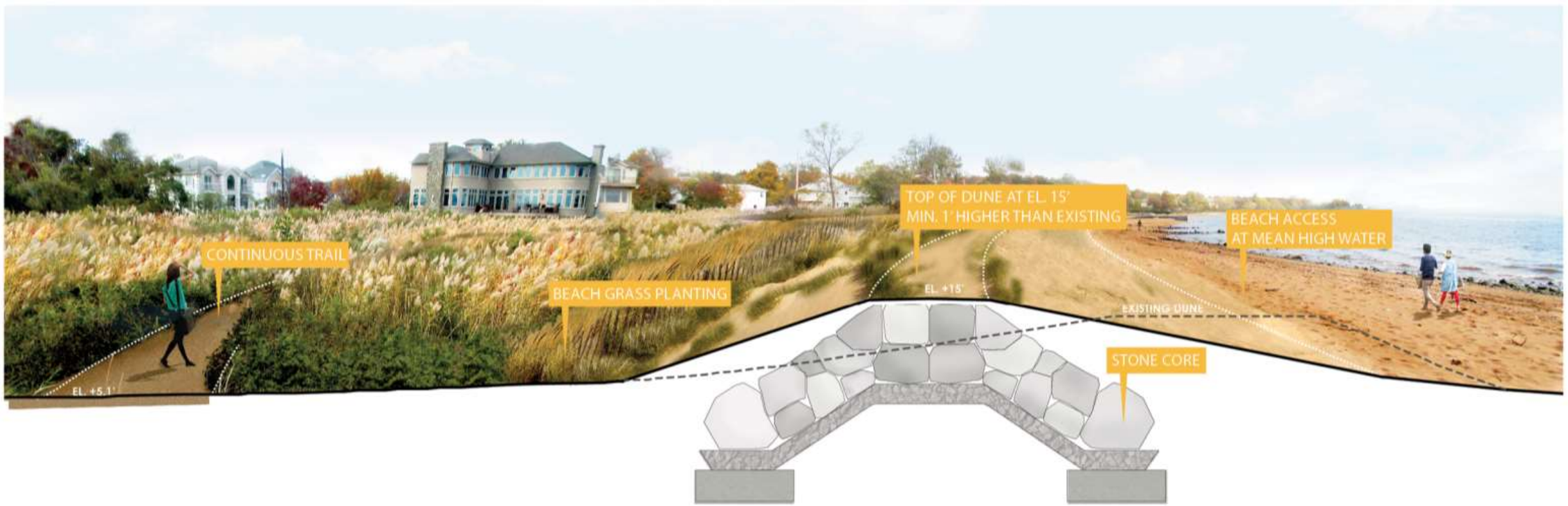


Existing Section C-C'

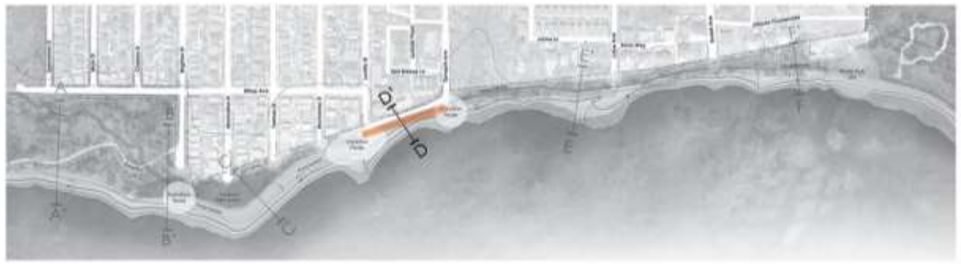


Proposed Section C-C'

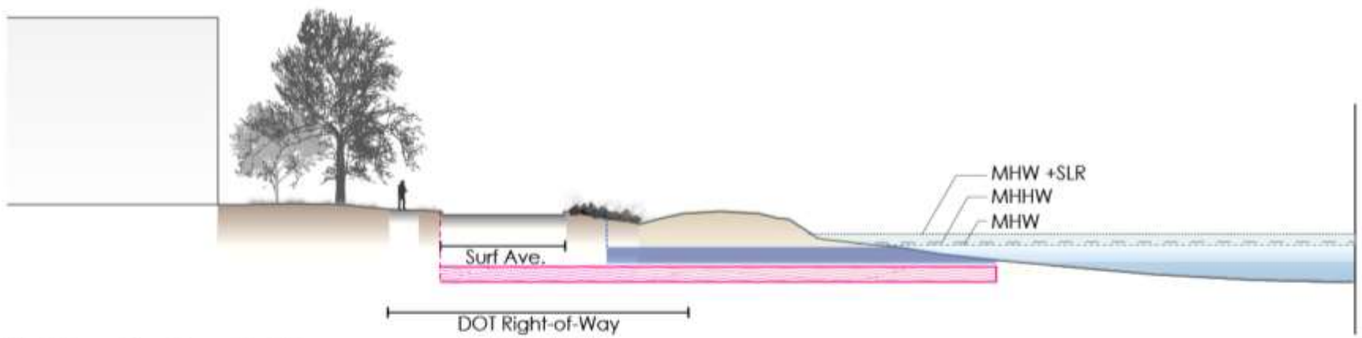
DUNE SYSTEM


CONTINUOUS TRAIL
BEACH GRASS PLANTING
TOP OF DUNE AT EL. 15'
MIN. 1' HIGHER THAN EXISTING
BEACH ACCESS
AT MEAN HIGH WATER
EL. +15'
EXISTING DUNE
STONE CORE
EL. +5.1'

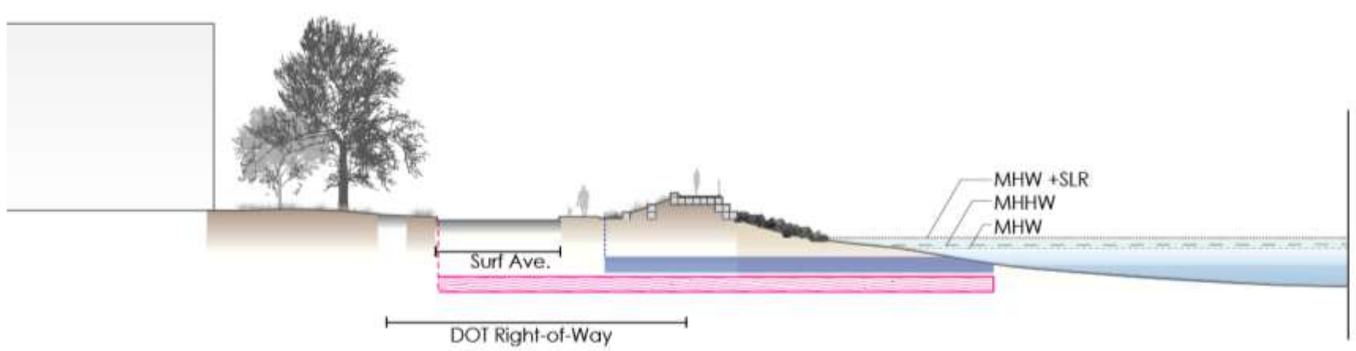
ECO-REVETMENT



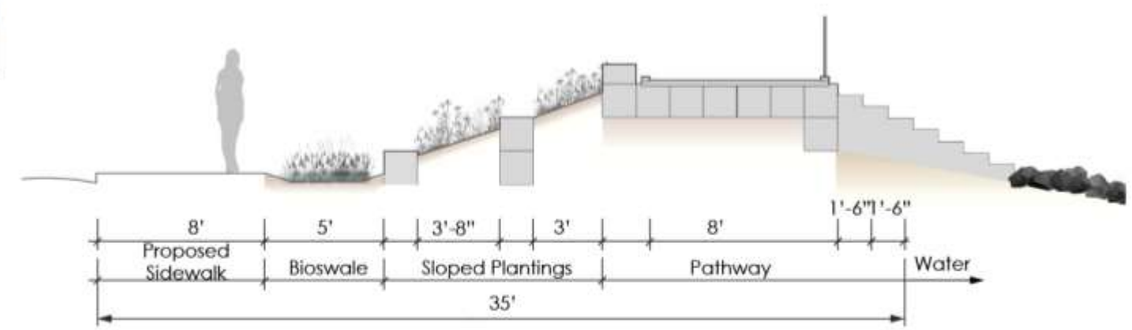
Key Map



Existing Section D-D'



Proposed Section D-D'



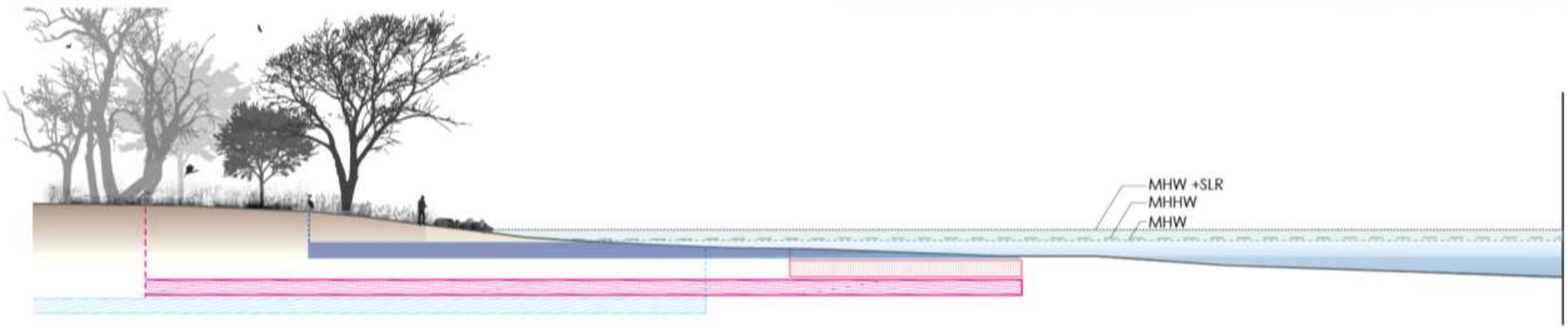
Eco-Revetment Enlargement

SECTION LEGEND
- Freshwater Wetland Checkzone
- Limit of Moderate Wave Action
- Coastal Erosion Hazard Area
- Tidal Wetland

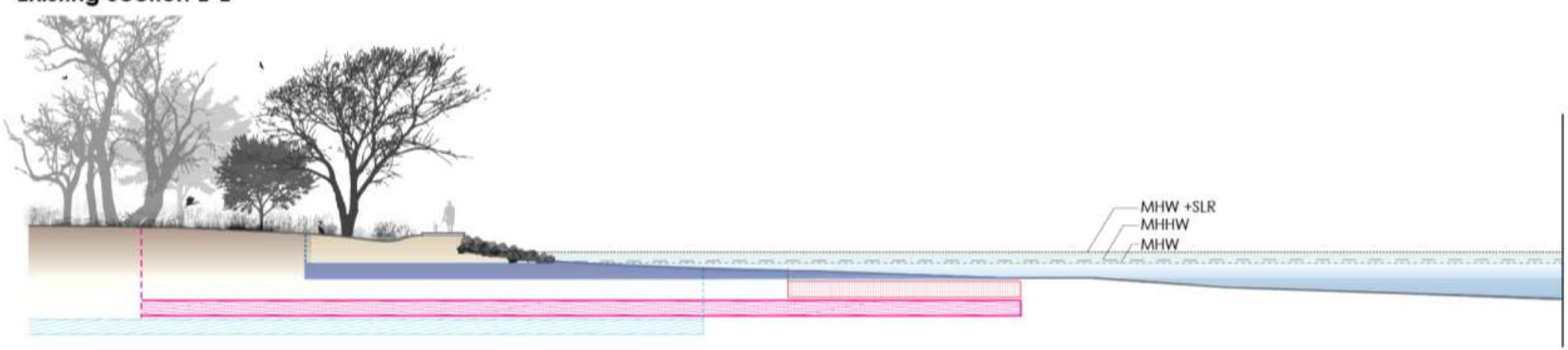
ECO-REVETMENT

RAISED PATHWAY

Key Map



Existing Section E-E'

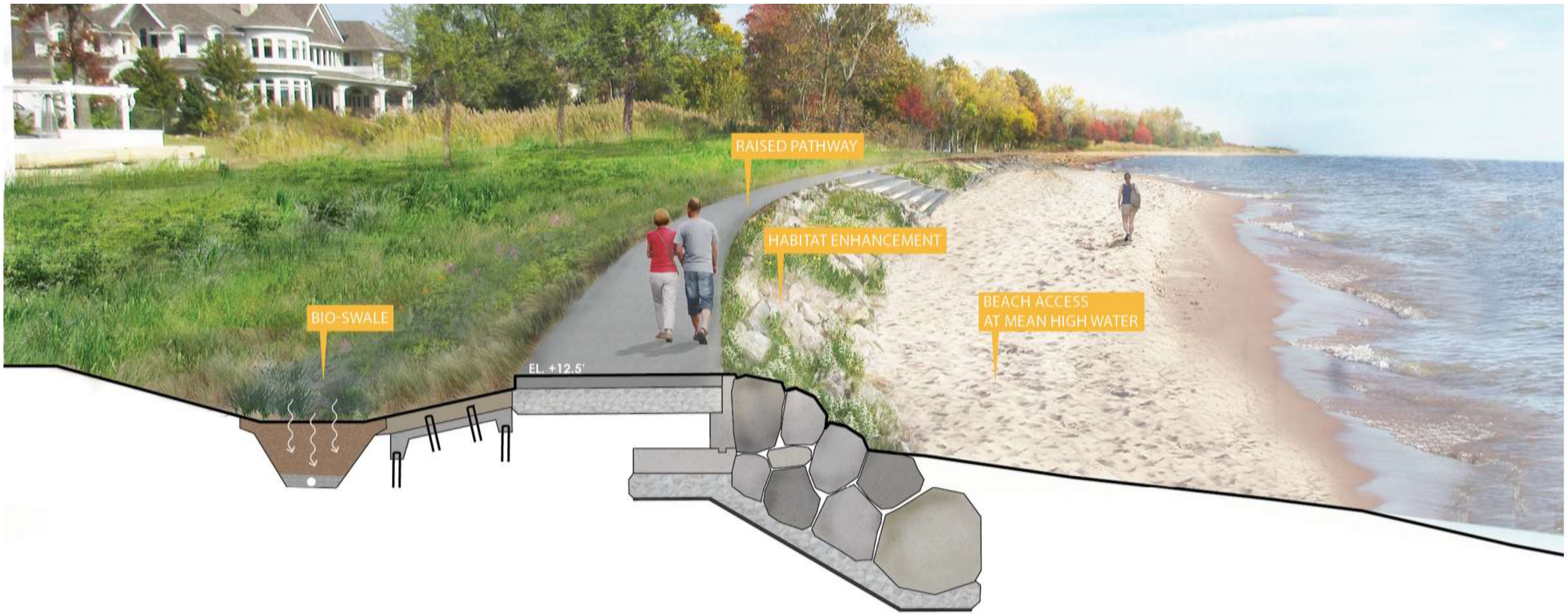


SECTION LEGEND
- Freshwater Wetland Checkzone
- Limit of Moderate Wave Action
- Coastal Erosion Hazard Area
- Tidal Wetland

Note: Tricia Way Study Area was illegally filled after Sandy. This project will restore the original grades.

Proposed Section E-E'

RAISED PATHWAY



DESIGN PRECEDENTS

RIVERWALK URBAN WATERFRONT - CALGARY, CANADA

ECO-REVETMENT PRECEDENTS

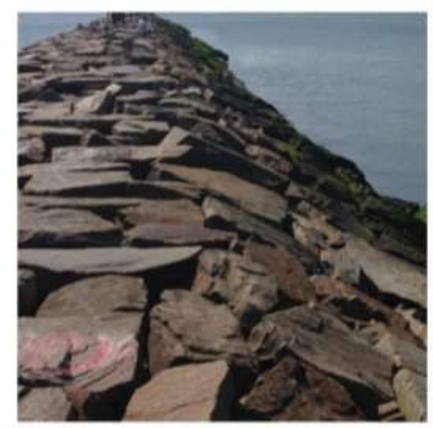
MATERIAL STUDIES

CONCRETE WALLS

NATURAL STONE BLOCK

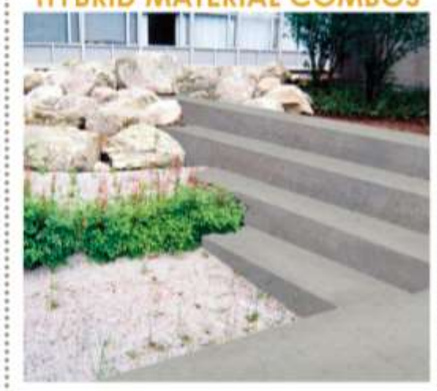
PRE-CAST CONCRETE DETAILS

NATURAL STONE RAW (RIP RAP)



Eco-Revetment Key Map

HYBRID MATERIAL COMBOS



PATHWAY MATERIAL STUDIES

POROUS RESIN BOUND AGGREGATE

Permeability •••••
ADA access •••••
Salt tolerance •••••
Maintenance ••

PERMEABLE BOUND RUBBER CRUMB WITH AGGREGATE

Permeability •••••
ADA access •••••
Salt tolerance •••••
Maintenance •

PERMEABLE BOUND RUBBER CRUMB

Permeability •••••
ADA access •••••
Salt tolerance •••••
Maintenance •

PERMEABLE BOUNDED WOOD FIBER

Permeability ••••
ADA access •••••
Salt tolerance ••
Maintenance •••

Raised Pathway Key Map

PRECAST CONCRETE

Permeability •
ADA access •••••
Salt tolerance •••••
Maintenance ••

DIRT PATH

Permeability •••
ADA access •
Salt tolerance •••••
Maintenance •••

WATER HUB

WATER HUB PROGRAMS

- CLASSROOM
- FLEXIBLE EVENT / EXHIBITION / MEETING SPACE
- STORAGE (INDOOR / OUTDOOR)
- RESTROOMS / LOCKER ROOM
- WATER ACCESS

- WEATHER STATION
- LIBRARY
- PARKING
- GREEN ENERGY
- TOUCH TANK
- OFFICE SPACE
- PREPARED FOOD / SEATING

SITE MAX FOOTPRINT

WEST SITE

EAST SITE

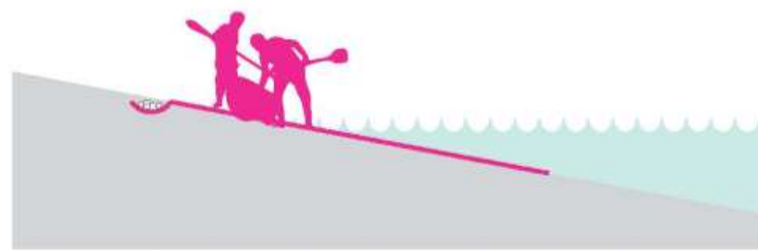
SCAPE / LANDSCAPE
ARCHITECTURE PLLC

WATER ACCESS OPTIONS

OPTION 01: ACCESSIBLE NATURAL LAUNCH

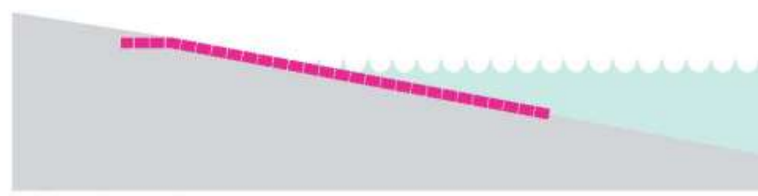
Existing slope 2-4%

OPTION 02: GEOTEXTILE LAUNCH



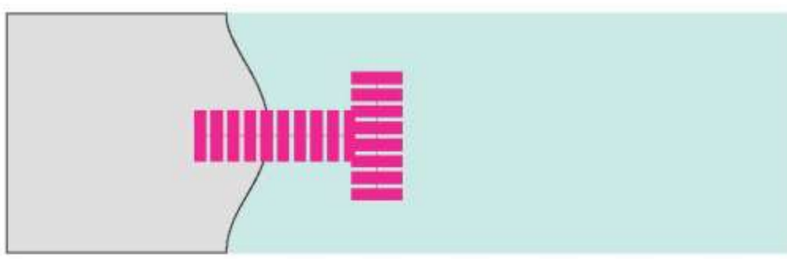
Existing slope 2-4%

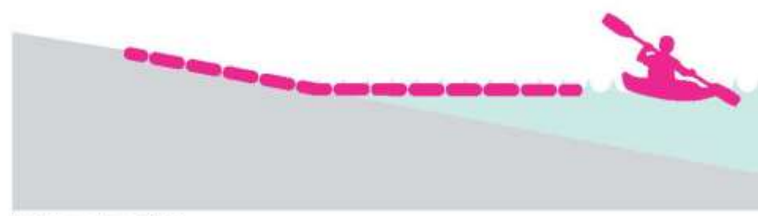
OPTION 03: CONCRETE MAT LAUNCH



Existing slope 2-4%

OPTION 04: TEMPORARY FLOATING LAUNCH

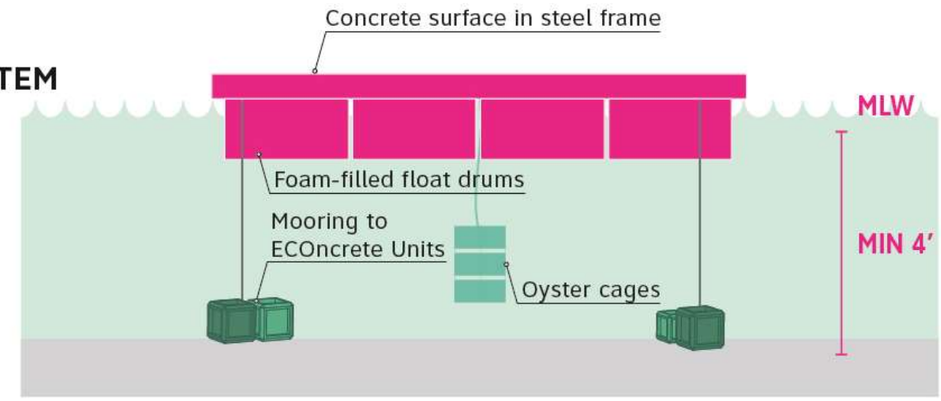




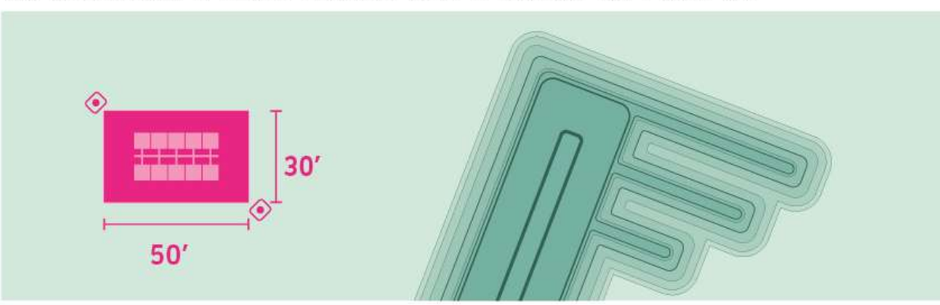
Existing slope 2-4%
Manufacturer: EZDock, Candock, or similar

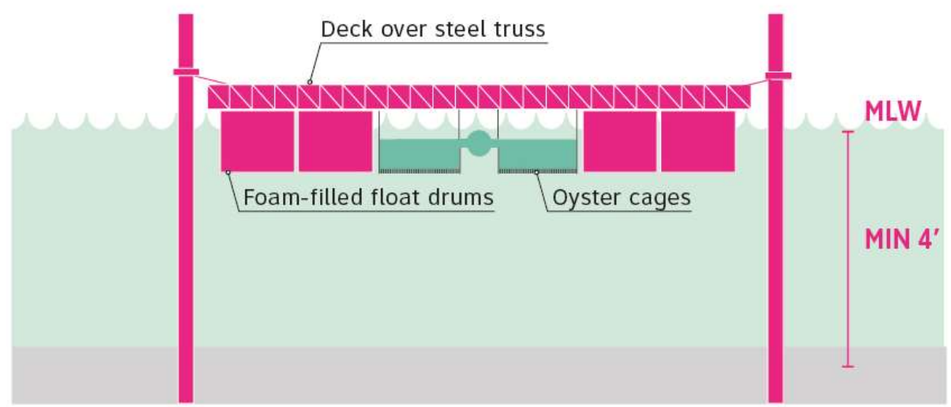
FLOATING DOCK

OPTION 01: PROFLOAT OR SIMILAR FLOATING CONCRETE SYSTEM



OPTION 02: STEEL TRUSS WITH BUILT-IN FLUPSY

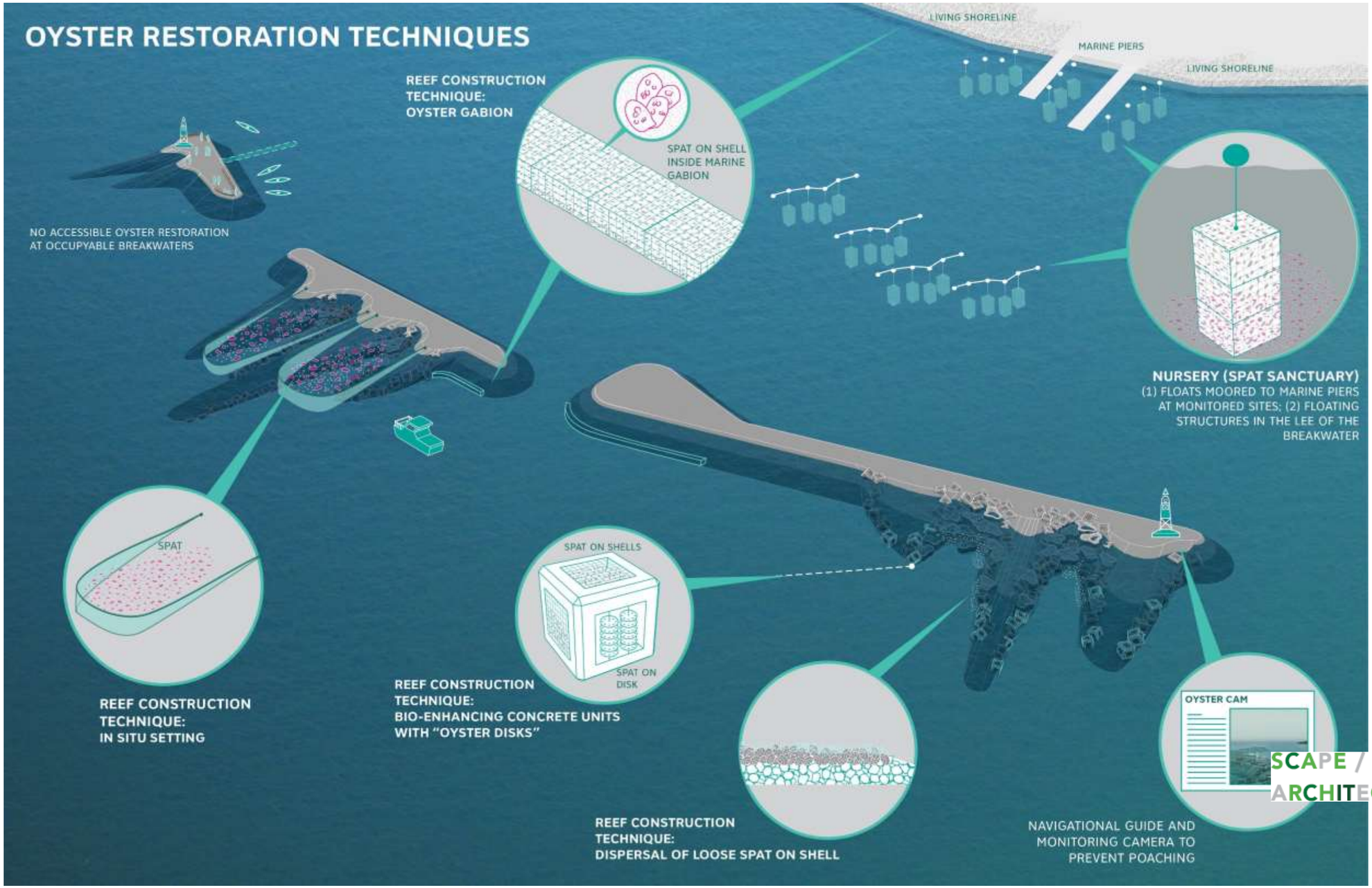




OYSTER RESTORATION EFFORTS

ACTIVE RESTORATION

Piloting oyster restoration techniques
Enhancing habitat potential and fostering stewardship



SCAPE / LANDSCAPE ARCHITECTURE PLLC

NY RISING

SHELL RECYCLING

Collection Achievements

	Fiscal Year Quarters (Q1): July 1 – September 30 (Q2): October 1 – December 31	(Q3): January 1 – March 30 (Q4): April 1 – June 30		2015	2016			
		Units	Total	Q4	Q1	Q2	Q3	Q4
GLOBAL INDICATORS								
1.1	Total shells collected	*Pounds (lbs)*	250.538	9,021	48,580	42,485	56,136	94,316
		US tons (t)	125.3	4.5	24.3	21.2	28.1	47.2
	** estimated*	*Cubic Yards (cy)**	297.4	10.7	57.7	50.4	66.6	112.0
	**estimation based on average .11 lbs/oyster shell*	*(M) oysters recovered**	2.27	0.08	0.44	0.39	0.51	0.9
	**estimation based on 20:1 spat-on-shell ratio*	*(M) potential new live oysters restored!**	45.5	1.6	8.8	7.7	10.2	17.1
1.2	Estimated shells collected per week	*Pounds (lbs)*		1,426	3,351	3,243	4,315	7,279
		US tons (t)		0.7	1.7	1.6	2.2	3.6
1.3	% weekly goal (4 t/week)	*%*		18%	42%	41%	54%	91%
	% achievement 500cy goal	*%*		2%	14%	24%	37%	59%

250
thousand lbs of shells

3.6
t collected per week

+2M
oysters recovered

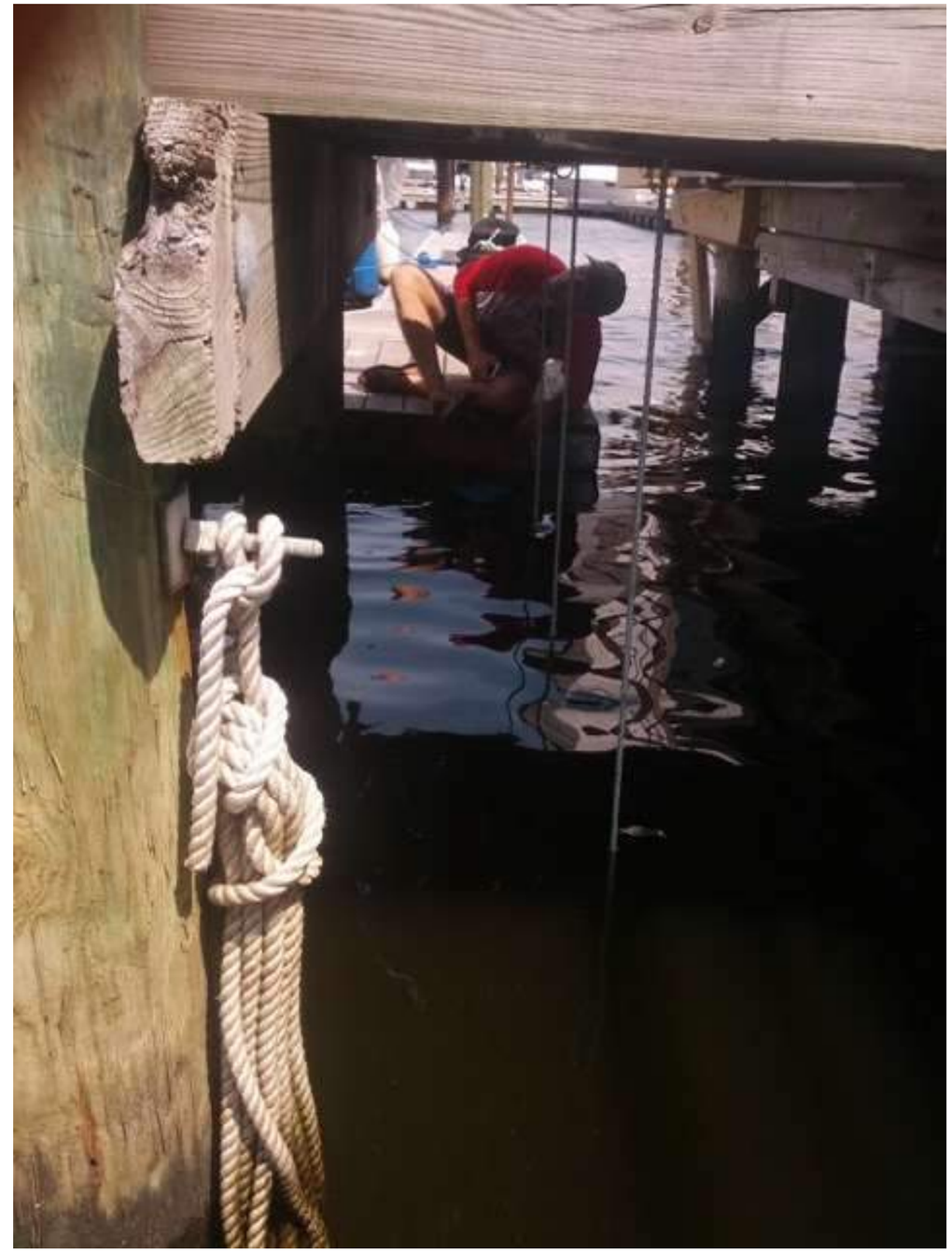
SCAPE / LANDSCAPE
ARCHITECTURE PLLC

NY RISING

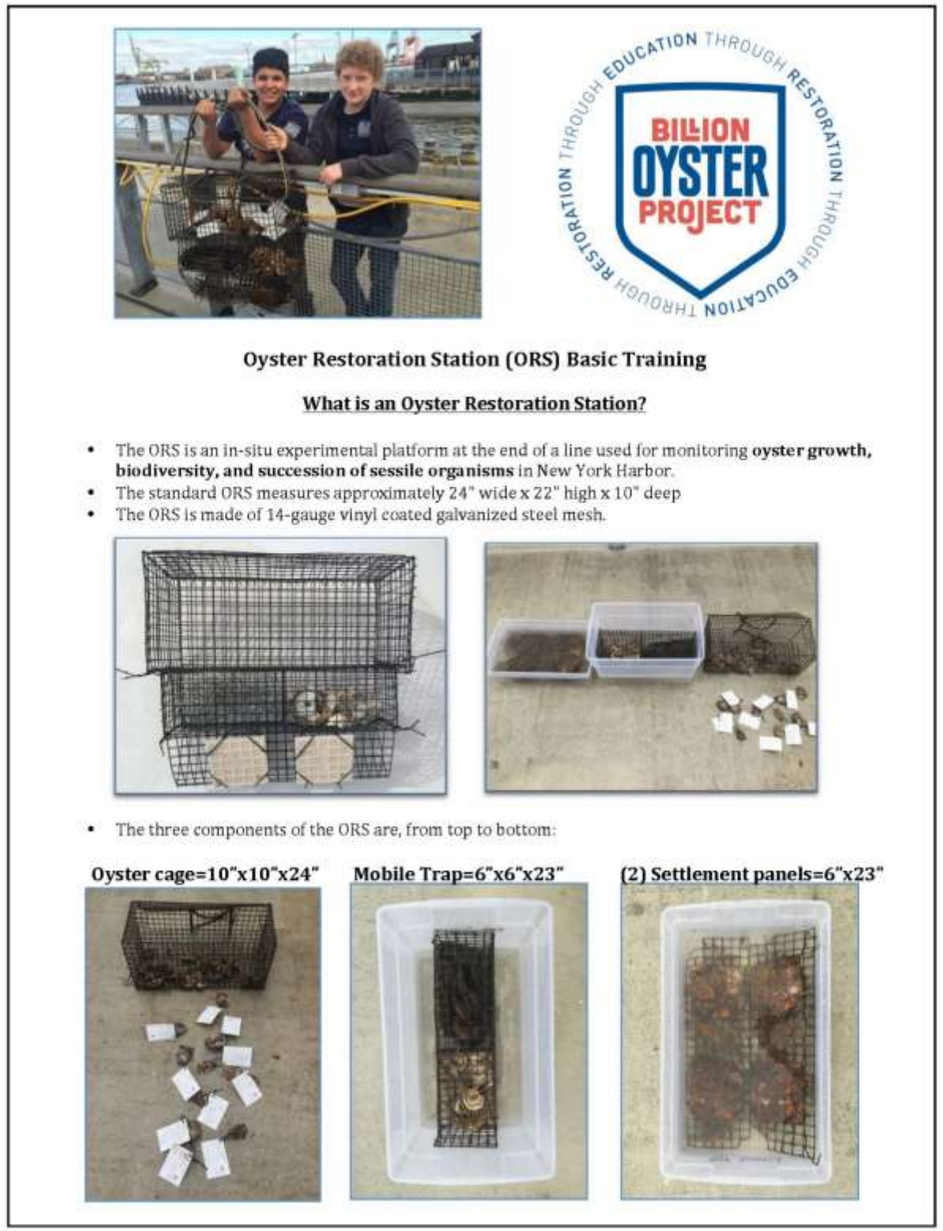
SHELL RECYCLING

LIVING BREAKWATERS & TOTTENVILLE
SHORELINE PROTECTION
CAC MTG #5
9/29/16

OYSTER NURSERIES



BOP CURRICULUM DEVELOPMENT + TEACHER TRAINING



Oyster Restoration Station (ORS) Basic Training

What is an Oyster Restoration Station?

- The ORS is an in-situ experimental platform at the end of a line used for monitoring **oyster growth, biodiversity, and succession of sessile organisms** in New York Harbor.
- The standard ORS measures approximately 24" wide x 22" high x 10" deep
- The ORS is made of 14-gauge vinyl coated galvanized steel mesh.

- The three components of the ORS are, from top to bottom:

Oyster cage=10"x10"x24" **Mobile Trap=6"x6"x23"** **(2) Settlement panels=6"x23"**

- BOP DIGITAL PLATFORM AND CURRICULUM ARCHIVE LAUNCHED
- 36 NEW LESSON PLANS UPLOADED TO THE ONLINE CURRICULUM TOOL
- +25 NEW BOP SCHOOLS SINCE MAY 2016

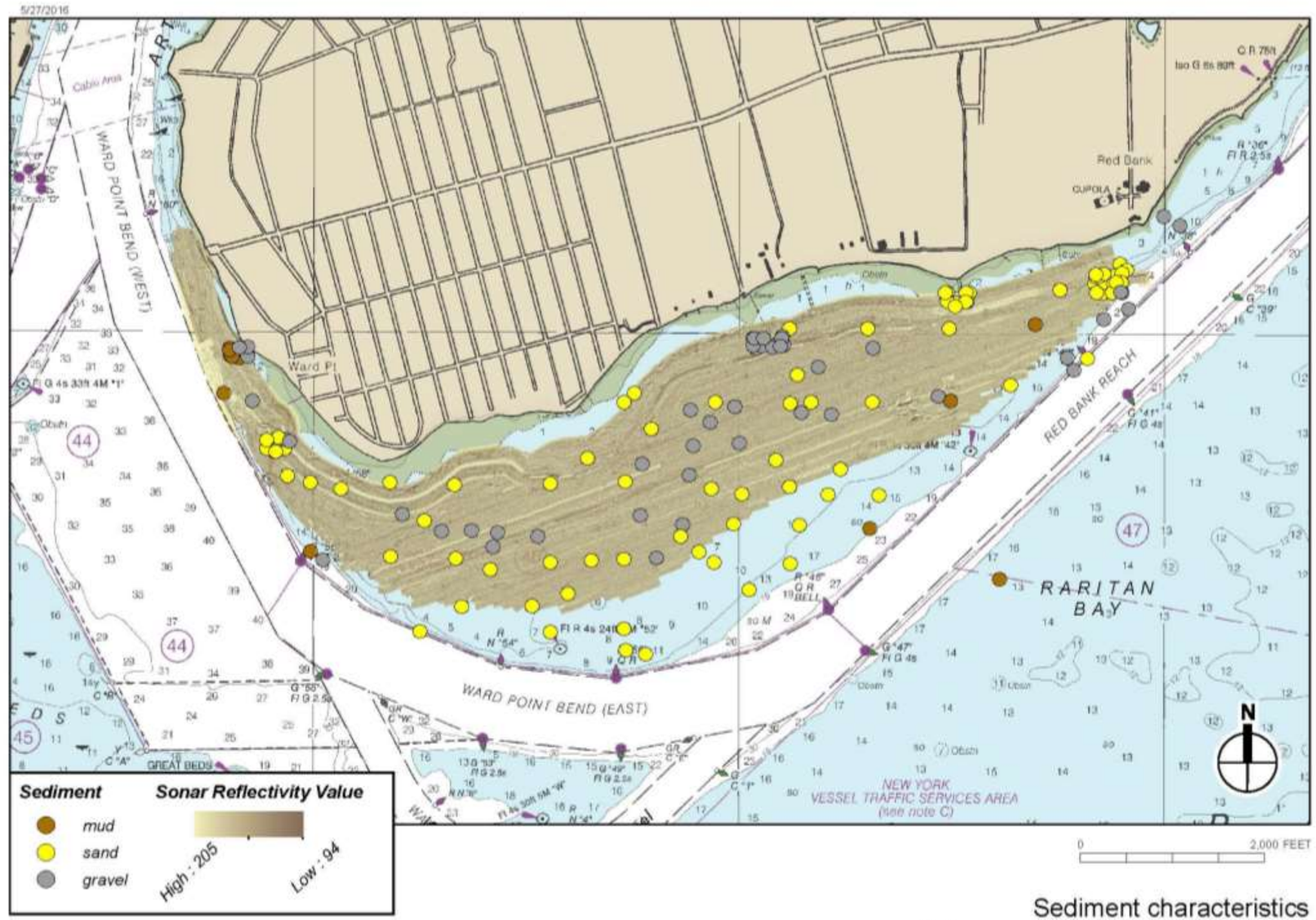
PROGRESS UPDATE:
EIS & PERMITTING

EXISTING CONDITIONS: 2015 AQUATIC SAMPLING

Sampling	Dates
Benthic macroinvertebrates, water quality, sediment grain size	*June and September 2015*
Fish	*June, July and September 2015*
Hard bottom survey of macroinvertebrates and algal biomass	*July and September 2015*
Clam tissue and Sediment Chemistry	*September 2015*

EXISTING CONDITIONS: PRELIMINARY RESULTS WATER AND SEDIMENT

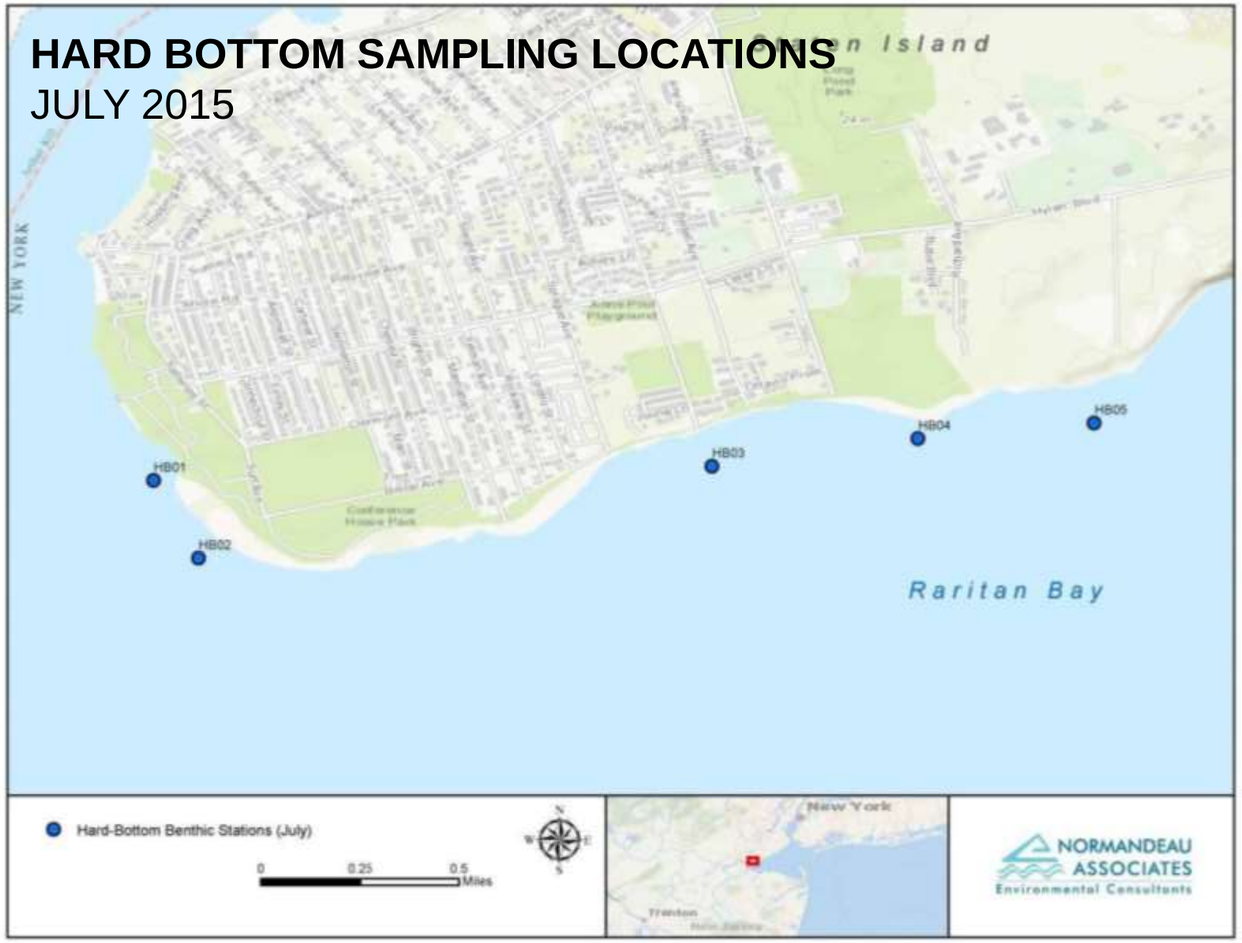
- **Water Quality**
  well-mixed system, sampling results consistent with NYCDEP Harbor Survey
- **Grain size**
  coarse-grained sand and gravel, isolated fine-grained silty sediment and hard bottom
- **Sediment contamination**
  - low – most Class A, no Class C



Sediment characteristics
Side-scan sonar and benthic grabs
Figure 9-15

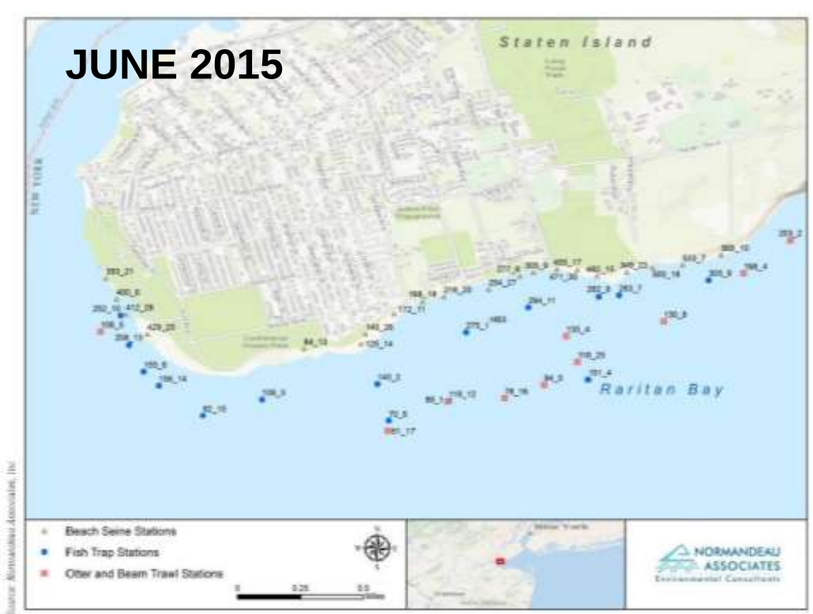
EXISTING CONDITIONS: PRELIMINARY RESULTS BENTHIC INVERTEBRATES

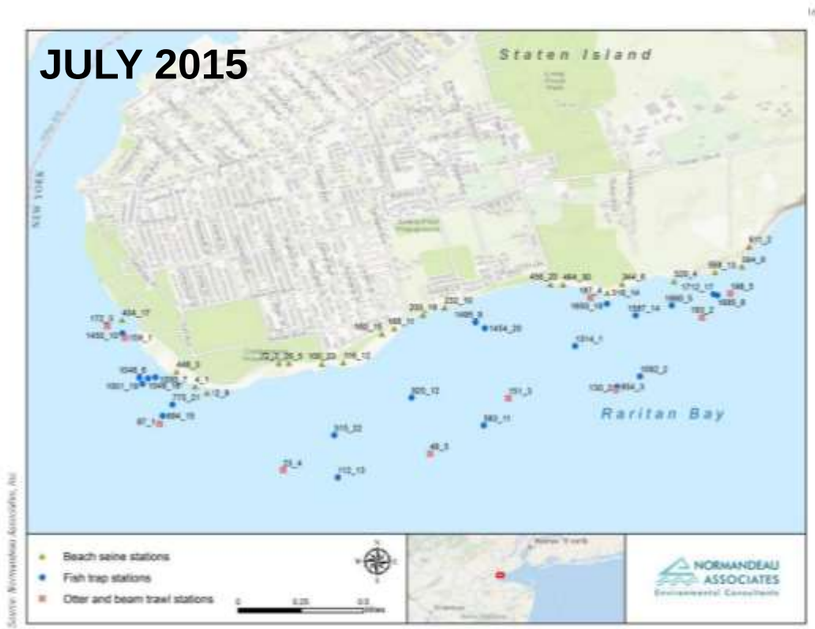
- **Benthic Invertebrates**
  - Richness and abundance greater in June than September (157 taxa vs 27)
- **Two distinct assemblages**
  - Sand/gravel community for most of study area and
  - sand community at SW Conference House Park.
- **Hard bottom**
  - Encrusting community – Hydroids, bryozoans, sponges, anemone, tunicates
  - Macroinvertebrates – Abundance greater in July than September, gastropods, amphipods and polychaete worms
  - Seasonal differences in the community structure greater than site-specific differences

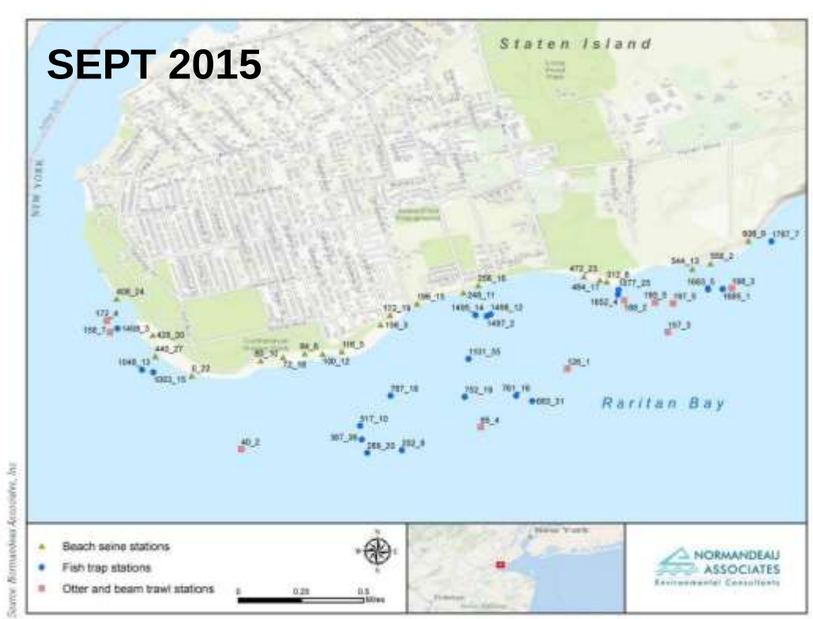


EXISTING CONDITIONS: PRELIMINARY RESULTS FISH

- **Shoreline fishes**
  - 39 fish and crab taxa.
  - Atlantic silversides (91%), Atlantic menhaden, striped killifish, tautog, northern kingfish, bay anchovy, white mullet, bluefish, winter flounder, mummichog, American eel.
  - Abundance and species richness lowest in June
- **Nearshore fish and crustaceans** –
  - Bay anchovy and scup (51%), winter flounder, tautog, summer flounder, Atlantic menhaden, spotfin butterflyfish. Say mud crab, lady crab, portly spider crab, blue crab, and longwrist hermit crabs.

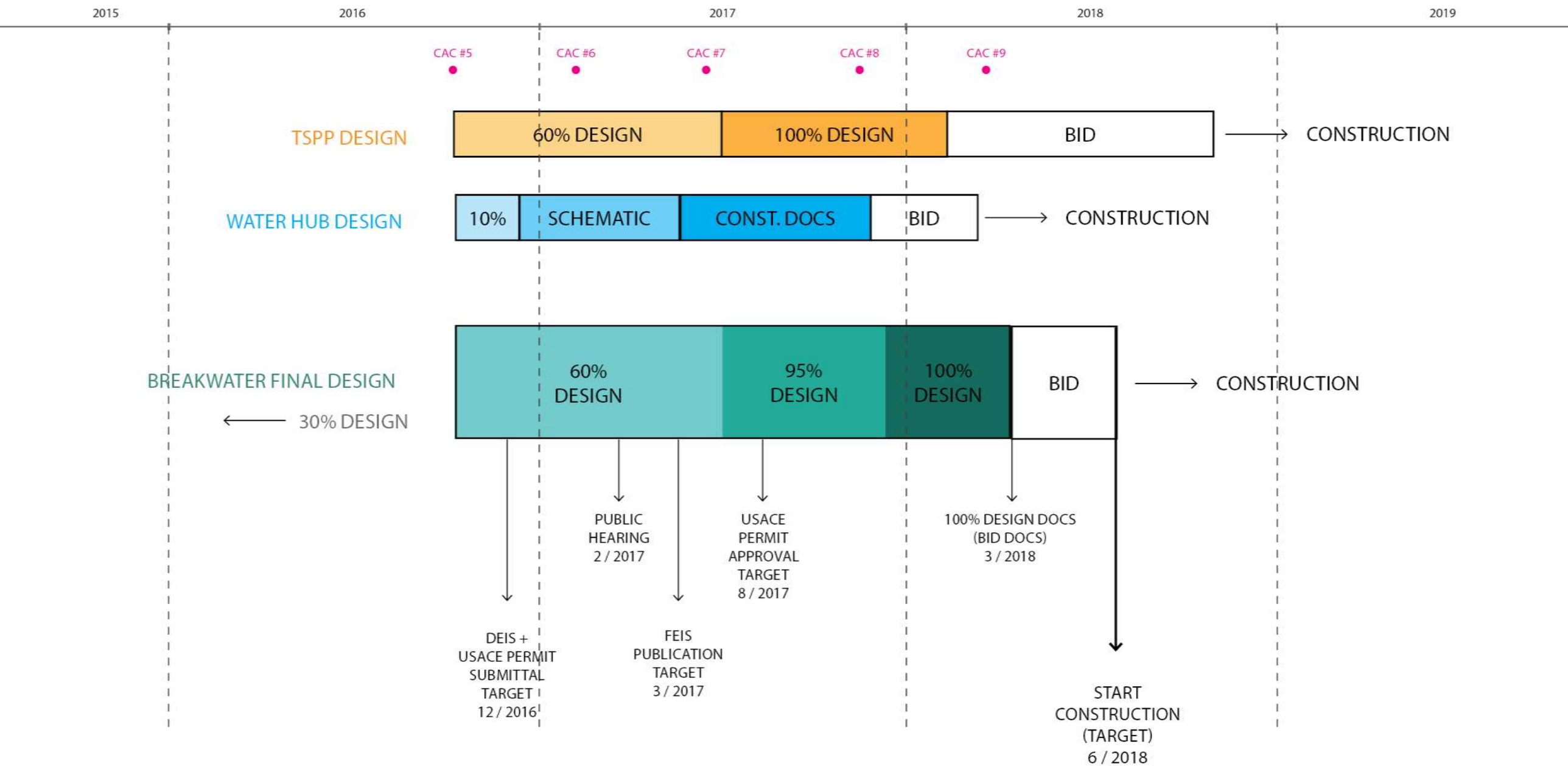






RECAP

THIS IS A BIG MILESTONE!



THANK YOU CAC!

FULL SPEED AHEAD!
NY RISING

Q & A / INFO SESSION