



Coastal Marine Infrastructure Study-
Art & Bioactive Concrete, a use case for social
engagement and ecological enhancement

By: Albert Gomez



Concrete with a purpose

METAMORPHOSIS WITNESSES

**ART
ARCHITECTURE
WATER
ENVIRONMENT
SCIENCE
TECHNOLOGY**



FIU



GREEN/GREY INFRASTRUCTURE

Coastal Marine Infrastructure study, a use case for bioactive concrete as a medium for art, social engagement and ecological enhancement.

FIU BISCAYNE BAY CAMPUS
OLETA RIVER STATE PARK

FIU College of Arts, Sciences & Education
Institute of Water and Environment

FIU Institute of Water and Environment - Southeast Environmental Research Center
CREST Center for Aquatic Chemistry and Environment

FIU By Design
COLLEGE OF ARCHITECTURE + THE ARTS



FIU Engineering & Computing

Alberto Aragón Reyes
METAMORFOSIS

20 December 2017
Opening at 19:00 hrs

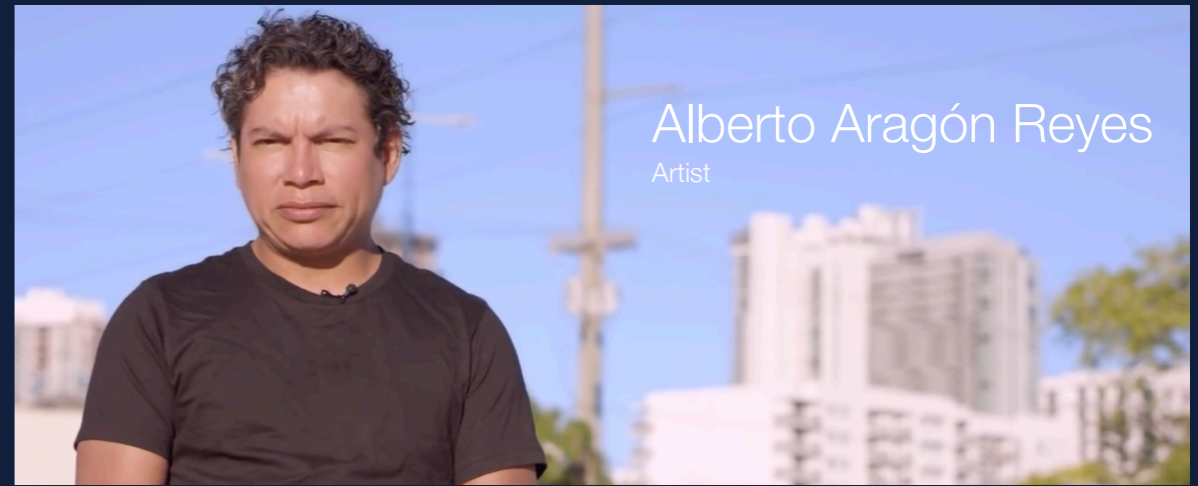
Miami Limited Edition Gallery
2214 North Miami Ave, Wynwood



Co-creators



Albert Gomez
South Florida Resilience System
Third Wave Volunteers



Alberto Aragón Reyes
Artist





Concrete With A Purpose: Sculptures Aim To Raise Awareness About Sea Level Rise

By ODALIS GARCIA · DEC 21, 2017

In an empty lot near the corner of 23rd Street and North Miami Avenue in Wynwood there's a giant statue of a man carrying a fish on his back. A few feet away there are smaller human-like sculptures arranged in a circle facing a pyramid, a sphere and a cube.

The molds for these sculptures have made the long journey from Mexico hoping that, as they are created, these pieces of art ignite conversations about how to deal with sea level rise.



The Fisherman' and the other sculptures will be submerged underwater to create an artificial reef.
CREDIT ODALIS GARCIA / WLRN NEWS

Called "The Fisherman" and "The Witness," respectively, they were created by Oaxaca artist Alberto Aragon Reyes. The entire exhibit is titled "Metamorfosis/Metamorphosis" and have been open to the public since Art Week. Its opening reception was on December 20th.

"They represent society and the figures in the middle represent the sciences. We are witnessing what we are building as humans, crossing the line of time because we can see some things from past and in our time," said Reyes.

They're made with concrete which was infused with a special additive donated by EConcrete Tech. The sculptures will eventually be placed underwater to act as a barrier to protect sea grass from pollutants.

"[The sculptures will] basically recruit biology like coral life, sponges, sea fans and all different types of species that are attracted to the naturalization of the concrete bringing life back to the concrete zone which right now is a dead zone" explained Albert Gomez, who represents EConcrete Tech.

Florida International University is collaborating with EConcrete Tech, the Shoreline Foundation and the city of Miami Beach to monitor these sculptures once they are placed underwater.

"We'd like to focus on biological recruitment of different organisms on the concrete and what sorts of nutrients or potential contaminants are being taken up by the biological organisms, so that we can assess whether that concrete could be having a more of a positive environmental outcome," said Tiffany Troxler, an ecologist and director of the Sea Level Solutions Center.



The sculptures contain a special additive created by the organization EConcrete Tech.
CREDIT ODALIS GARCIA / WLRN NEWS

Troxler also highlighted the importance of using art as a medium to raise awareness to the sea level rise issue. "It can be a common language. [Art is] an incredible mode for connecting people to the issues that are important in Miami and that we all need to address as a community," she said. The University of Miami is also collaborating on this project. It provided the saltwater resilient rebar that holds the sculptures together.

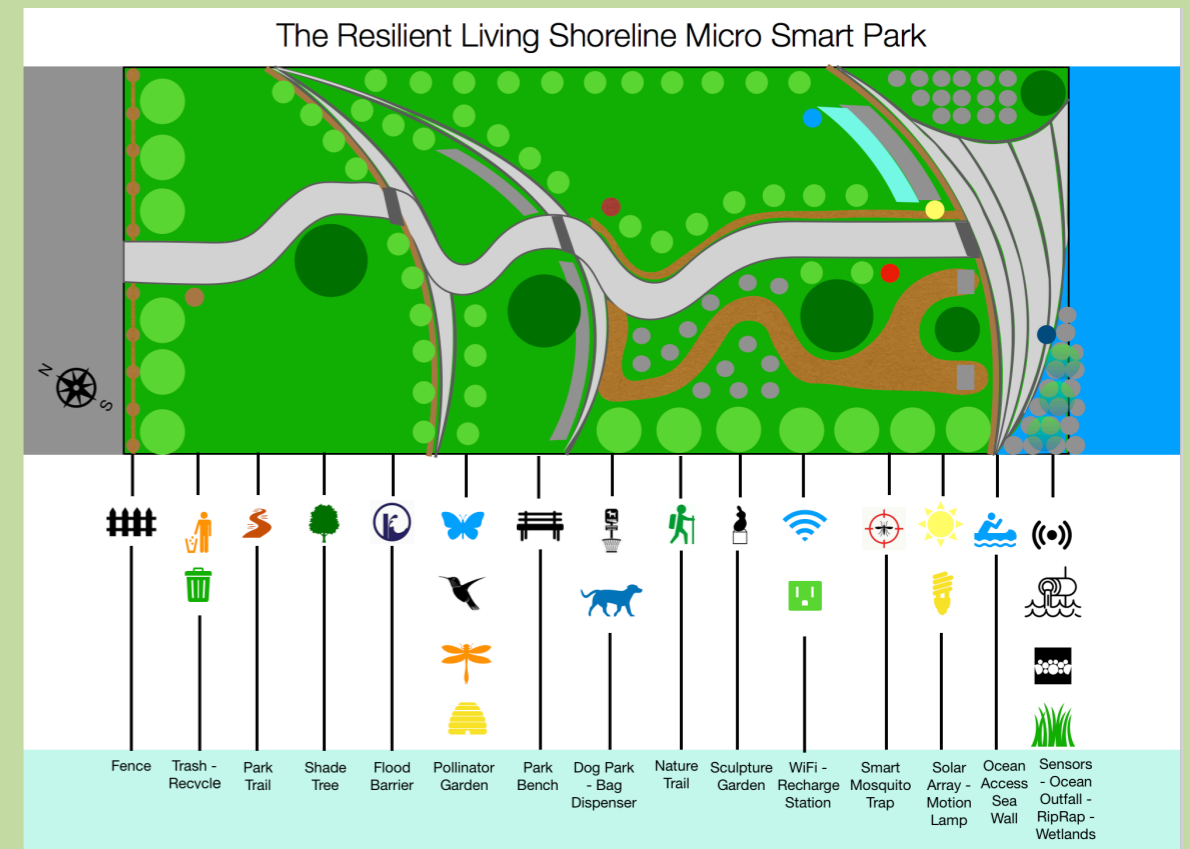
Resilient Living Shoreline Micro Smart Park

MY IDEA TO IMPROVE THIS PLACE...

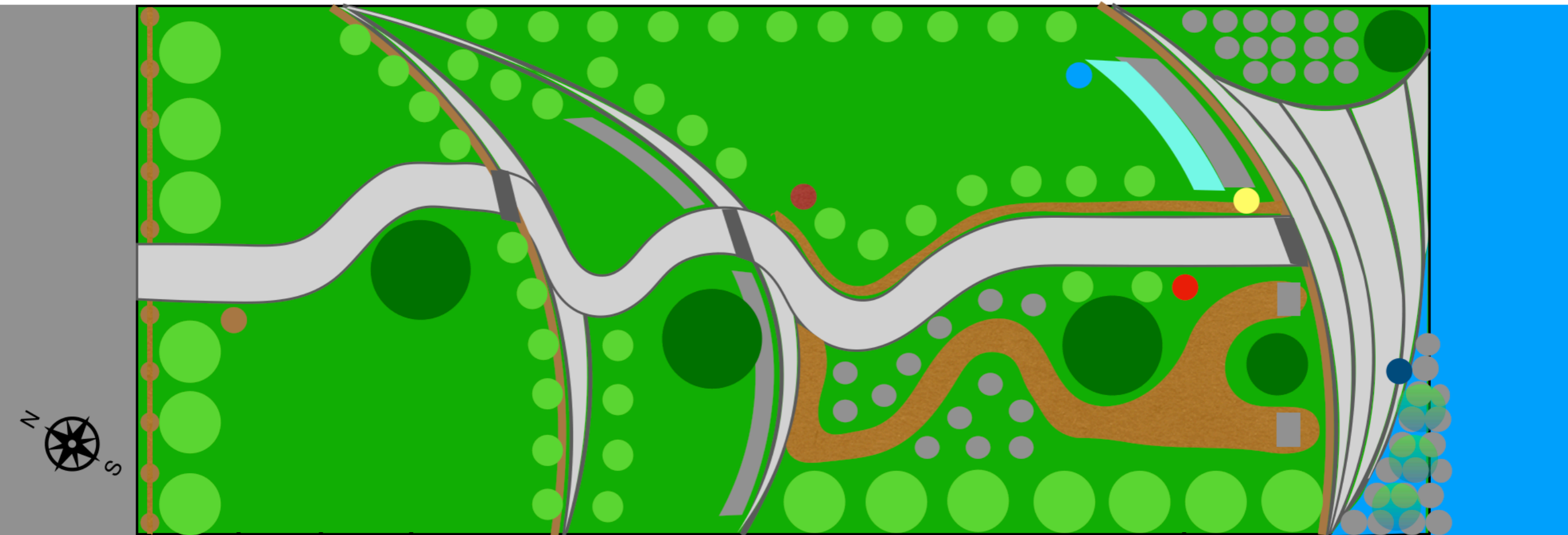
The idea is small with huge implications. Convert a lot adjacent to the bay in North Coconut Grove into a pilot site for a resilient living shoreline micro smart park. It would make the park and neighborhood more resilient to storm surges, while testing out living shoreline methodologies, new infrastructure innovations, such as bio-active concrete and innovative stepped sea walls with integrated mangrove planters, along with landscape designs that help bring wildlife and promote a more robust shoreline, while increasing amenities at the park through integration of a small solar canopy to support sensing arrays that support water/air quality monitoring, remote mosquito monitoring and lighting. This small park can show case big solutions.

SO THAT PEOPLE COULD...

My neighborhood has a lot that is adjacent to the water. It was originally zoned as a street. The deeds were offered up to the city residents. The two owners adjacent to the park, did not want to take ownership of the property, as the local residents use it for their dogs and to sit and enjoy the bay view. Hurricane Irma did significant damage to the sea wall, as in so many other sea walls in the city. This idea would change the topography of the park to a more native living shoreline, while allowing people easy access to the water and improving resiliency during storm surge events. The small footprint of the park allows to test out resilient design methodologies in a controlled budget environment, allowing for future proofing and scaling.



The Resilient Living Shoreline Micro Smart Park



Fence

Trash -
Recycle

Park
Trail

Shade
Tree

Flood
Barrier

Pollinator
Garden

Park
Bench

Dog Park
- Bag
Dispenser

Nature
Trail

Sculpture
Garden

WiFi -
Recharge
Station

Smart
Mosquito
Trap

Solar
Array -
Motion
Lamp

Ocean
Access
Sea
Wall

Sensors
- Ocean
Outfall -
RipRap -
Wetlands



Coconut Grove before Fair (Grove) Isle was dredged out of the bay in 1923. Notice the park is made up of sand fill.

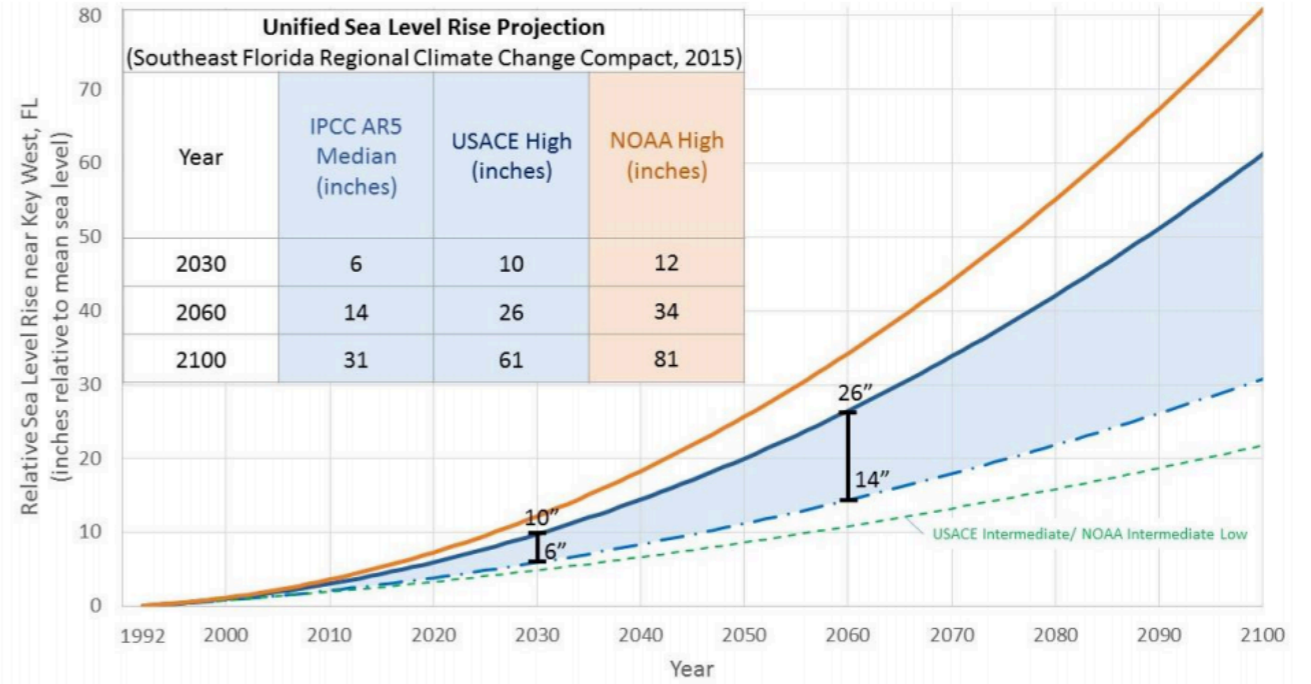
Fair (Grove) Isle development was originally dredged out of the bay in 1923 and made up of sand fill. The original coastline locates the park off shore within the intertidal zone and under water. By re-imaging the park as a resilient living shoreline micro smart park, which puts natural systems design at the forefront, we hope to increase protection against storm surge and sea level rise while remediating the natural damage done to the coast line nearly 100 years ago.

These images show two important images. The first image above shows the coastline just after the initial dredging and sea wall construction in 1923. The following two images to the right show arial shots of Fair (Grove) Isle once created and a close up. You can see a red star on each image marking where the park is today.





South Florida Regional Climate Change Compact Unified Sea Level Rise Projection are showed below. These projections should guide any future coastal construction in South Florida today.



The image below is from the Rising Seas website depicting a 6 Foot Storm Surge Flooding Hurricane Irma. The image to left is the corner of Crystal Court and South Bayshore Dr. at 7AM right after Hurricane Irma hit Florida. One block from the proposed park redesign.



Hurricane Irma, 2017

MARINE MATTRESS

ECOcrete®'s articulated marine mattresses are designed to provide shoreline stabilization and erosion control as well as for anchoring and protecting exposed underwater pipelines. ECOcrete®'s unique chemical and physical properties enhance the ability of the mattress to encourage growth of marine flora and fauna, increase species richness, reduce the dominance of invasive species and elevate biodiversity.

The mattresses are comprised of interlocking concrete blocks connected with a polyester cable making for easy transport and installation as well as the potential for tailor fit sizes.



Demo mattress presenting the difference between ECOcrete sub units to flat standard units

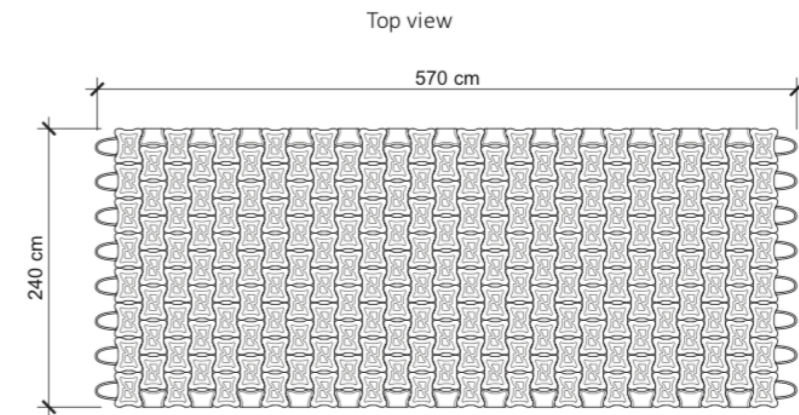
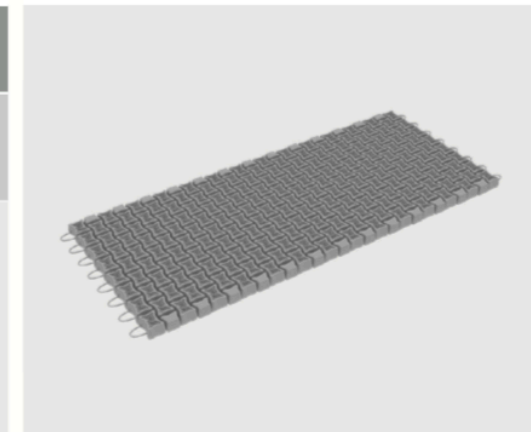


ECOcrete sub unit's water retaining capabilities

Unit Length (cm)	Unit Width (cm)	Unit Height (cm)	Volume (Liters)	Weight (Kg)
570 (225")	240 (95")	15 (6")	1,540 (2 yd ²)	3,700 (8,160 lbs)

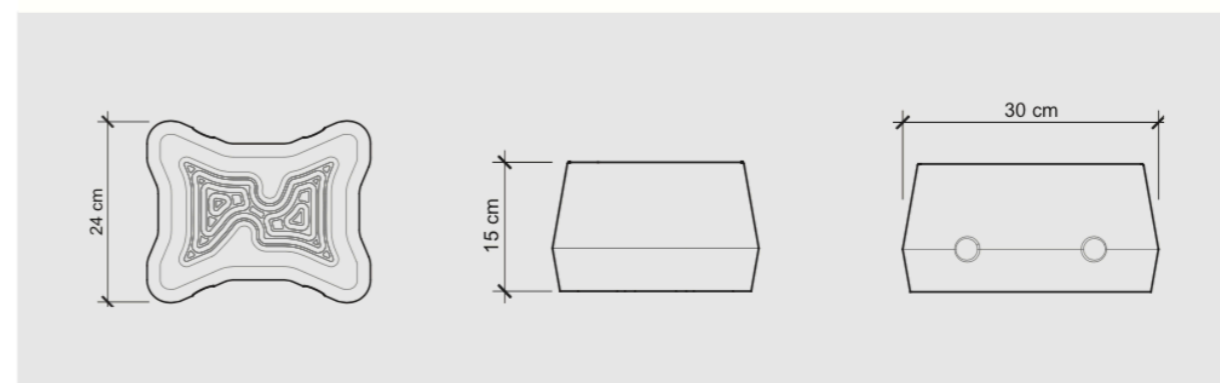
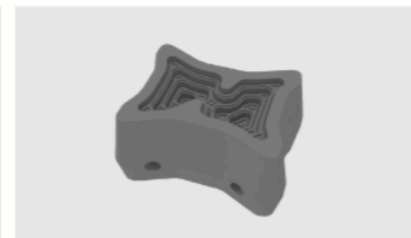
ECOcrete® Marine Mattress dimensions can be tailored to specific project requirements.

The specific concrete matrix used for the casting will be defined according to the project's distinct constructive and biological requirements.



The Product was developed with Besser company, a world leader in drycast manufacturing machinery, under the prestigious BIRD program (The Israel – United States Binational Industrial Research and Development Foundation).

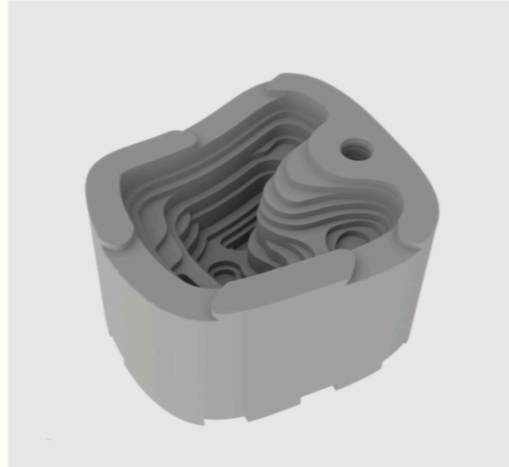
Dry cast production allows for rapid production cycles cost effectiveness and world wide availability.



Unit Length (cm)	Unit Width (cm)	Unit Height (cm)	Volume (Liters)	Weight (Kg)
120 (4')	110 (3.6')	70 (2.3')	600 (0.8 yd³)	1,400 (3,100 lbs)

ECOConcrete® Tide Pool's dimensions can be fitted to specific project requirements.

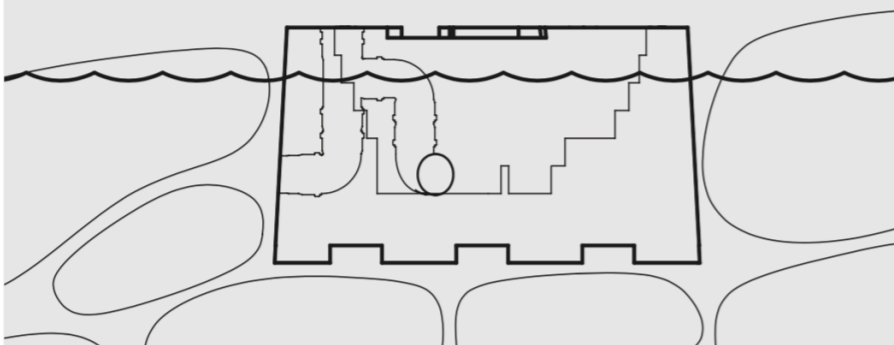
The specific concrete matrix used for the casting is defined according to the project's distinct constructive and biological requirements.



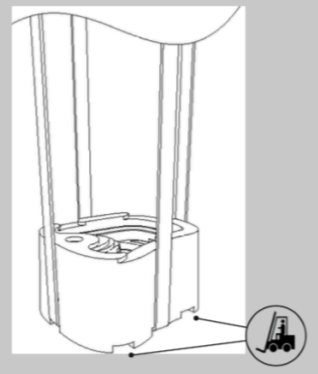
Tidal Pools to be re-engineered as mangrove planters to support a hybrid green grey infrastructure approach for conservation of natural system within the intertidal zone and near ocean outfalls.

ECOConcrete® Tide Pools are designed to mimic natural inter-tidal areas. With the Tide Pool's constructive abilities, it can be integrated within a breakwater system or biologically enhance a shoreline.

For optimal performance, the Tide Pool should be placed from the mean high water (MHW) to the mean low water (MLW). The outer taper of the unit allows for lockage between stones or armoring units.



ECOConcrete® Tide Pools can be transported by forklift and placed using lifting straps/pins.



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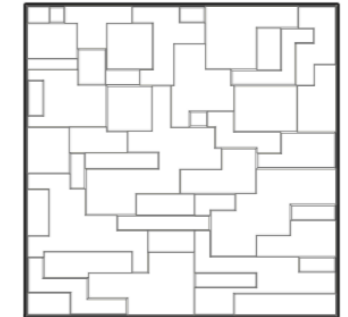
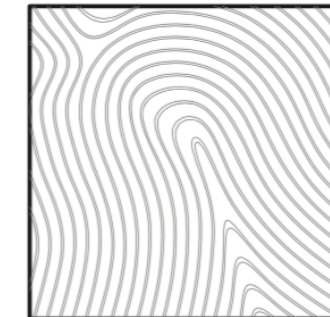
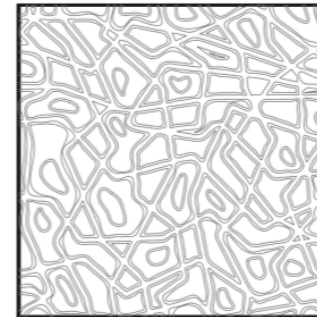
Unit Width (cm)	Wall Width (cm)	Unit Height (cm)	Volume (Liters)	Weight (Kg)
100 (3')	20 (0.6')	400 (13')	1,100 (1.4 yd³)	2,600 (5800 lbs)

ECOConcrete® Sea Wall's dimensions can be fitted to specific project requirements.

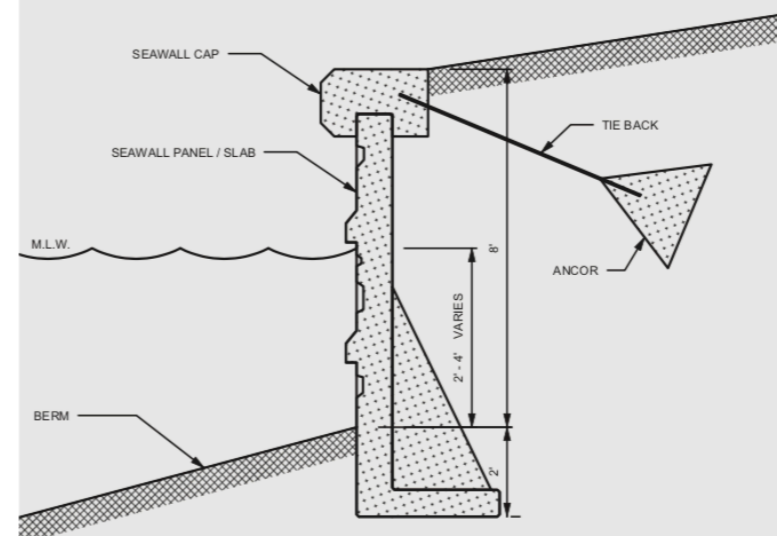
The specific concrete matrix used for the casting will be defined according to the project's distinct constructive and biological requirements.



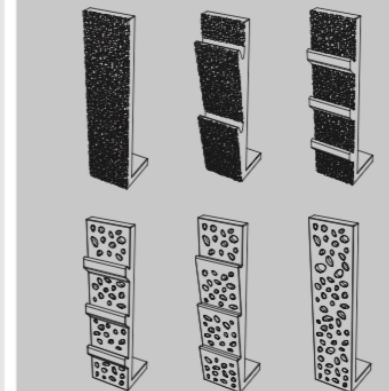
The Sea Walls' surface textures can be modified according to the project's design theme bringing the environmental considerations into account.



ECOConcrete®'s Sea Walls design can be modified to accommodate various anchoring methods used in the industry.



The Sea Walls' surface textures can be modified according to the project's design theme bringing the environmental considerations into account.



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BIO ACTIVE WALL

Bio-active wall elements are designed to induce rapid plant wall coverage of inland buildings. Green plant coverage significantly improves urban landscape, provides cleaner and healthier air, and reduces the ecological footprint of urban development.

The physical and chemical properties of the wall elements strongly influence the capability to support and enhance growth. ECOcrete®'s bio-active wall induces natural growth of wall clinging plants, endolithic algae, lichens and mosses. Its high complexity and porosity create moist niches that support flora, without the need for complex soil systems.

ECOcrete®'s Bio-active wall elements are a great solution for areas like sunken gardens and facades, and can integrate planting pockets for increasing green coverage.

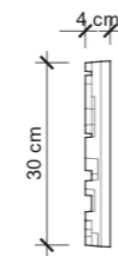


Standard Tile

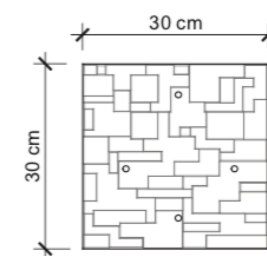
Unit Height (cm)	Unit Width (cm)	Unit Depth (cm)	Volume (Liters)	Weight (Kg)
30 (12")	30 (12")	4 (1.6")	2.3 (140 in³)	5.6 (12.3 lbs)



Side view

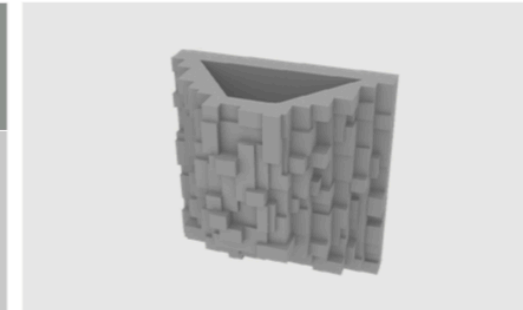


Front view

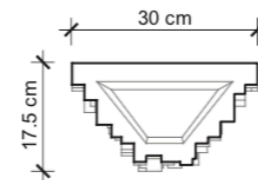


Pocket Tile

Unit Height (cm)	Unit Width (cm)	Unit Depth (cm)	Volume (Liters)	Weight (Kg)
30 (12")	30 (12")	17.5 (7")	6.2 (378 in³)	15 (33 lbs)



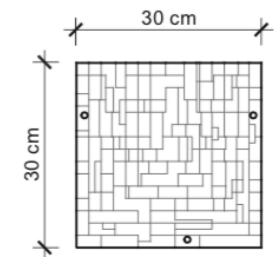
Top view



Side view



Front view



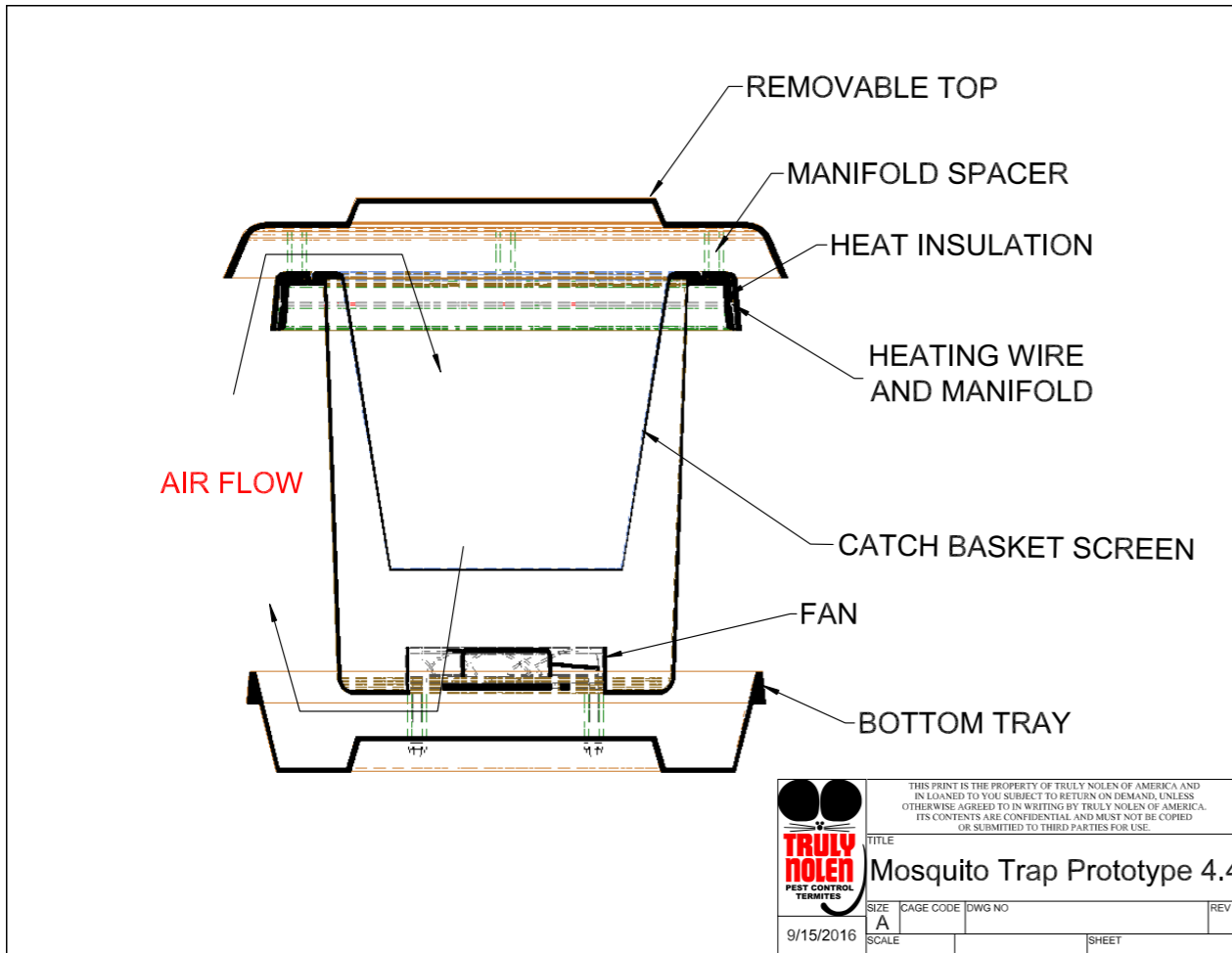
ECOcrete® Bio Active wall Tile's dimensions can be fitted to specific project requirements.

The specific concrete matrix used for the casting is defined according to the project's distinct constructive and biological requirements.

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Pro-Pollinator Mosquito Management Garden

The park goals are to increase the neighborhoods resilience towards storm surge, sea level rise and stormwater bay contamination. Within the park we plan to mitigate grey infrastructure through the planting of a pro-pollinator mosquito management garden inspired by nature, designed to bringing wildlife to the park that can manage mosquitos while pollinating flowering plants. We also plan to bring forward a new solar powered cloud-enabled integrated blockchain and AI IoT smart hub technology with an air and water sampling station and an automated mosquito trap with catch totals and species detection.



Planting Partner List

USDA United States Department of Agriculture
Agricultural Research Service

MONTGOMERY BOTANICAL CENTER
Advancing Research, Conservation, and Education through Scientific Plant Collections

FTBG FAIRCHILD TROPICAL BOTANIC GARDEN
Exploring, Explaining and Conserving the World of Tropical Plants

Urban Paradise Guild

Richard Lyons Nursery, Inc

Plant List

Sophora tomentosa

Guaiacum sanctum

Lonicera sempervirens

Eugenia Axillaris

Salvia Lyrata

Pithecellobium keyense

Hamelia Patens

Heliotropium gnaphalodes

Guilandina bonduc

Suriana maritima

Chrysobalanus icao



Sophora tomentosa



Pithecellobium keyense



Suriana maritima



Chrysobalanus icao



Salvia Lyrata



Guaiacum sanctum



Heliotropium gnaphalodes



Hamelia Patens



Lonicera sempervirens



Eugenia Axillaris

For more information on:

- EConcrete Tech bioactive concrete technology, where to get it and how to integrate it into your project
- Art integration into coastal marine infrastructure hardening
- Technology and Data Sensing integration into coastal marine infrastructure projects
- The use of natural systems for resilient redesign of coastal marine infrastructure

Please contact Albert Gomez here.

albert@icassemblies.com



FIU

Site of Park:

1883-1971 S Bayshore Ln

Miami, FL. 33133

25.736718, -80.222910

36 day picture study of the ocean view from the park.