2020

JORDAN TAYLOR

SUBMERGED OBSERVATORY

EXUMA CAYS LAND & SEA PARK

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FINAL ARCHITECTURAL STUDY | JORDAN TAYLOR | 2019-2020

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PROJECT INFLUENCE

Growing up, I had the privilege of spending my summers by the seas. At an early age, I began developing a deep appreciation and sense of compassion for the ocean. Yet, it wasn't until I started scuba diving that I was able to fully connect and comprehend its value. Scuba diving has exposed me to the vastly unknown marine environment, allowing me to coexist with all I've grown to love.

When I immerse myself into the mysterious depths, I find it to be a holistic experience. I am immediately relieved of all stresses; my senses are activated - I hear; I see; I feel; I taste. I form an emotional connection with the sea. All of my vulnerability is unveiled; I begin to feel small, tiny, and even microscopic. Being able to experience this world focuses my lens allowing me to clearly understand the ocean's capacity and vitality.

Although scuba diving is enlightening, the sport has unfortunately exposed me to devastating destruction. My past few dives have proven to be discouraging. I see a vast amount of bleached coral in places I once saw it thrive. Compared to previous dives, I see significantly less life on the reefs. I see fishing line wrapped around organisms. I see an envelope of barnacles covering the plastic bottles that rest on the seabed. As I ascend to the surface, I am now unsure if the salty drops in my mask are water or tears.

Because I have experienced this devastation, I have become a strong advocate for ocean health. When the time came to begin thinking of my final study, I quickly realized that I was being handed the opportunity to combine my two passions - the ocean and design. After accepting the challenge, the mixture quickly expanded into a project that explores the relationship between the built and marine environments. I immediately aimed to find a way to showcase the wondrous depths of the ocean, making it tangible for the general public. If it caught my heart, it can catch many others; They only need a glimpse.

PROJECT INTRODUCTION

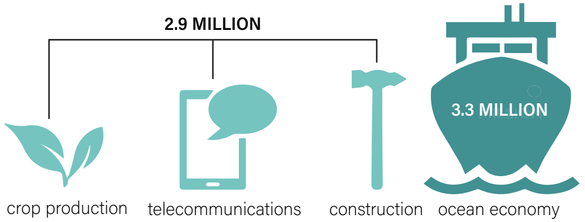
From the start, humans have assumed that our oceans were resistant to the evolving human habits. We have placed a focus on the endangered life that is visible to the naked eye, yet exempt the unseen oceans from being titled as threatened. Only recently have scientists discovered that human activity is leading to exhaustion within our seas. An expanding consumer lifestyle has led to the mass production of goods and an over-consumption of resources which negatively impacts our oceans and the life within. Because the ocean plays a vital role in Earth's scientific functionality, preservation actions must be taken immediately. What precautionary measures can we take to aid in the prevention of ocean destruction? In what ways can we adapt to the undeniable changes in our climate and seas? How can we achieve a societal shift and increase stewardship of the ocean?

This study provides an architectural response that centralizes ocean health in both its functionality and physicality. It upholds the ideas of education, research, and remediation, aiming to showcase the successes and achievements of ocean preservation efforts. It demonstrates innovative responses to the changing seas and corresponding climate. In order to capture a sense of appreciation and responsibility for ocean health within individuals, the project introduces an experiential opportunity which allows visitors to connect with natural marine life in a way that has never been done before.

OCEAN VITALITY

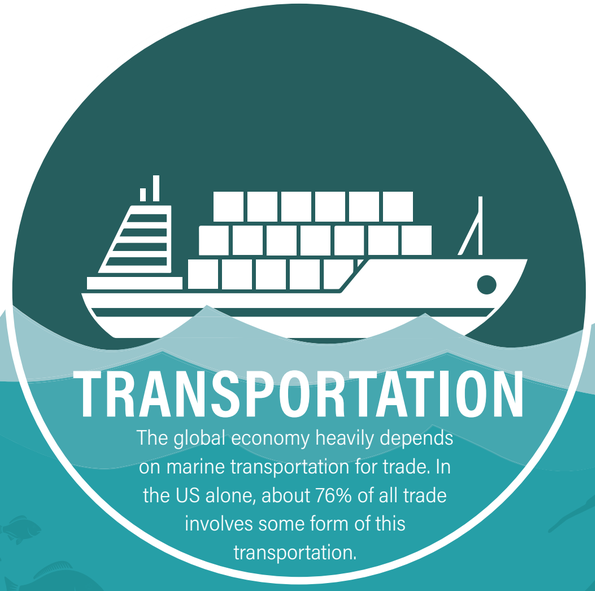
The ocean is a vital source for the Earth's biological, climatic, and societal functionality. It plays an important role in sustaining life, providing an abundance of vital resources and physiological aspects for humans. Because the ocean controls weather patterns, houses a source of food and water, and provides over 70% of the world's oxygen, the situation needs to be approached immediately. Furthermore, the oceans supply economic, recreational, and therapeutic opportunities for all cultures. Outside of necessary life-sustaining resources, societies depend on the oceans for financial stability. Economically speaking, there are 154,000 ocean-dependent business establishments in the United States alone (NOAA). Lastly, the world's coastal regions provide opportunities to fulfill one's meditation desires or high adventure needs. Whether one seeks relaxation, exhilaration, exploration, or inspiration, the ocean offers a variety of recreational opportunities, making it a place to experience it all. Simultaneously, the seas physically separate and connect Earth's regions, but unite all cultures together. Because the ocean is shared by all, we must collectively work to preserve them.

THE OCEAN'S SIGNIFICANCE



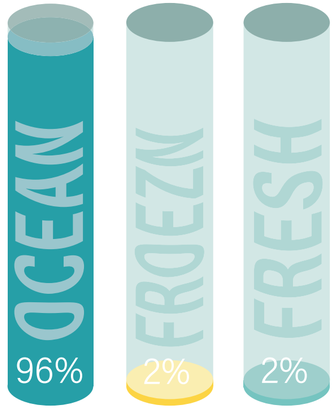
US TOTAL EMPLOYEE COMPARISON

ECONOMIC CONTRIBUTION



TRANSPORTATION

The global economy heavily depends on marine transportation for trade. In the US alone, about 76% of all trade involves some form of this transportation.



HYDROSPHERE

The ocean supplies a little over 96% of Earth's water source (Oceanic Institute).

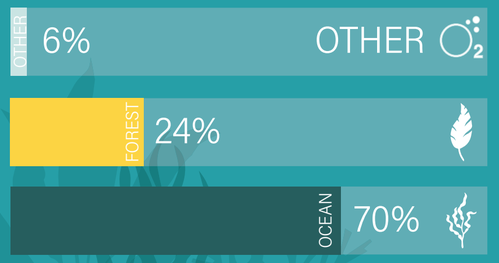
FOOD SOURCE

Fish account for approximately 15.7% of the animal protein consumed globally, making it the number one source (World Fisheries and Aquaculture).

CLIMATE REGULATION

With 71% of Earth's surface area being covered by the oceans (Oceanic Institute), they play an essential role in our global climate system. It predominantly plays a role in controlling the weather patterns by acting as the primary source for most of the world's precipitation, soaking up heat, and transporting water between poles (NOAA).

OXYGEN PRODUCTION



The ocean produces 70% of the oxygen that we breathe, surpassing that of the Amazon Rainforest (National Geographic). Phytoplankton, kelp, and algal plankton produce this oxygen as a byproduct of photosynthesis.

RECREATION & LEISURE

With nearly 40% of Earth's population residing near coastal regions, many people use the ocean for recreation and leisure. From fishing and boating, to diving and whale watching, the seas provide an endless possibility of unique activities.

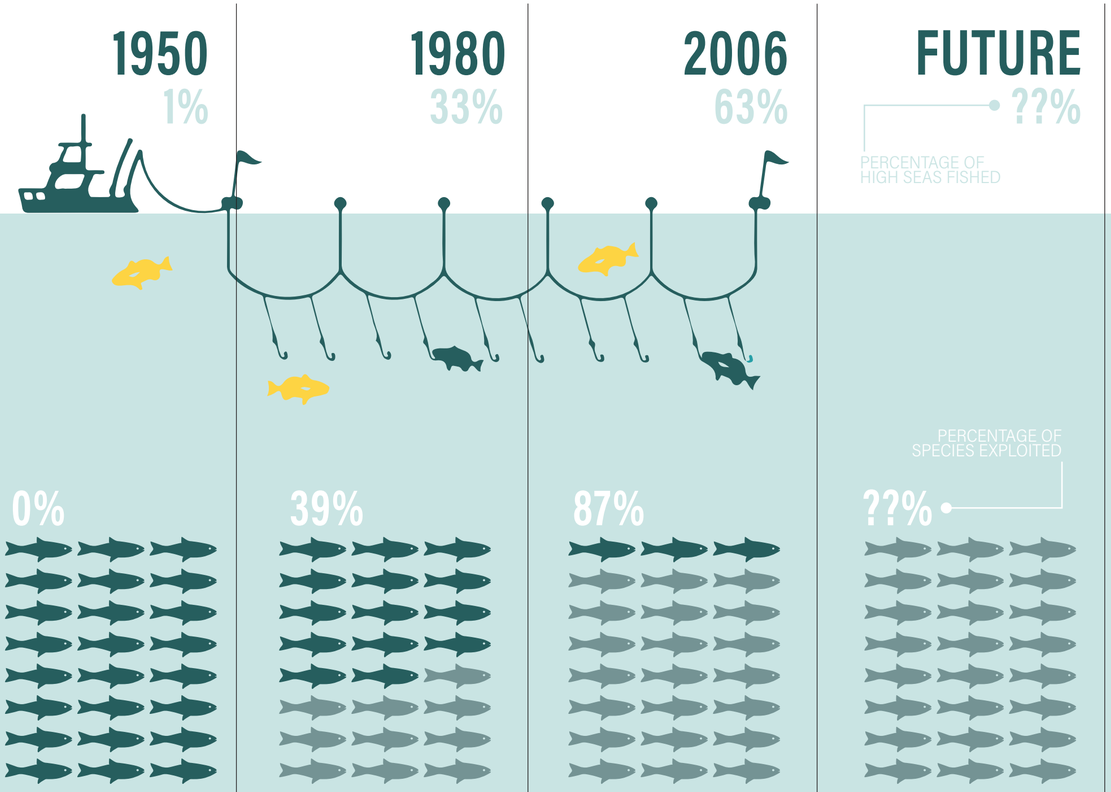
SUNKEN DEVASTATION

A lack of understanding and absence of connectivity within the marine world have led humans to believe our oceans inexhaustible. Unfortunately, an expanding consumer lifestyle has led to the mass production of goods and the mass consumption of resources that negatively impact our oceans and the unseen life. We continuously strain these tremendous bodies of water and their resources with the exertion of various threats; we continue releasing carbon emissions into the atmosphere, we continue dumping waste into the vast seas, and we continue to exploit the marine populations. While the list of threats is endless, they can be categorized into five main categories: 1) acidification, 2) pollution, 3) destruction, 4) overfishing, and 5) warming. We burden our seas more each day, putting more marine species at-risk, dismantling their thriving habitats, and depriving Mother Earth of her vital source. Furthermore, the oceans are misconstrued because of a flawed education system, the ocean's recent politicization, and a lacking exploration.

OVERFISHING

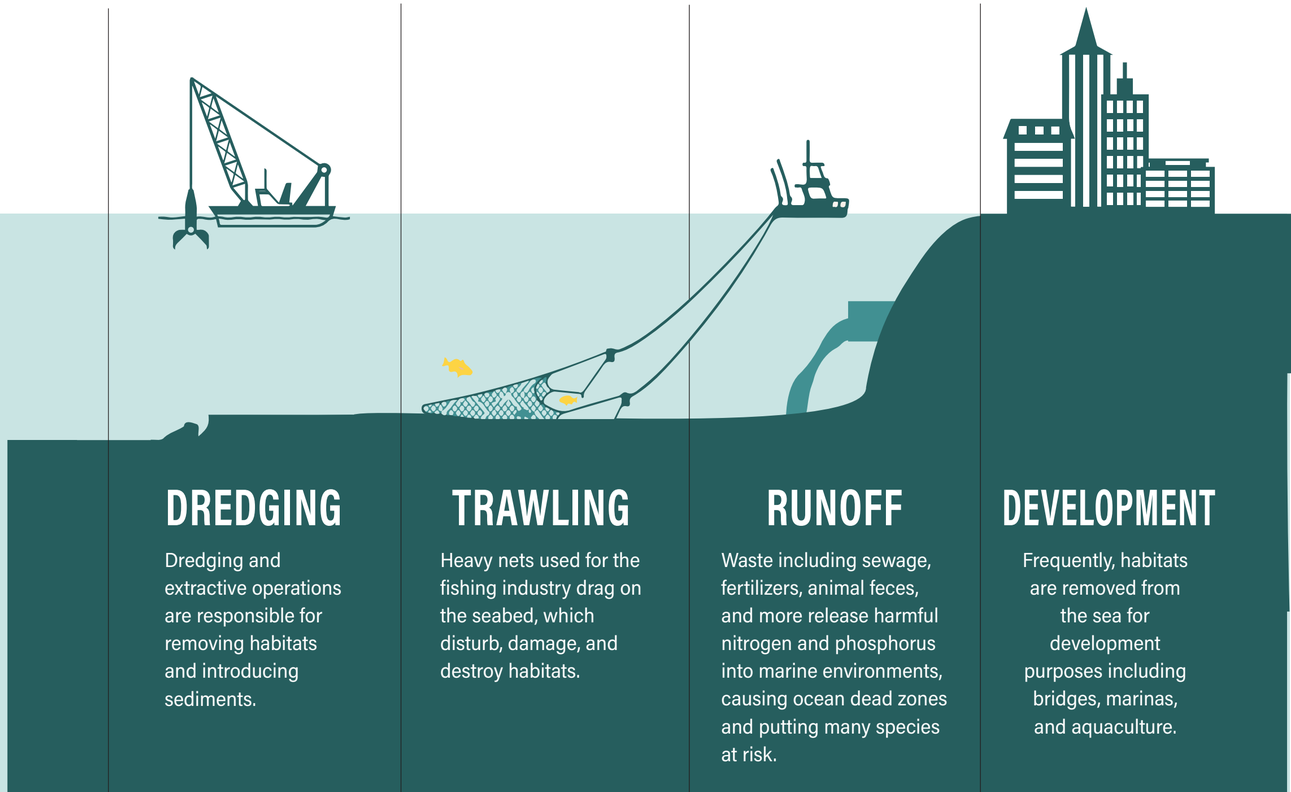
GLOBAL FISH STOCKS

The ocean has been a global food source for the human population since the beginning of time. Mass fishing has become a capitalizing industry as a result of the growing human population. According to both, The World Wildlife Fund and The Environmental Defense Fund, unsustainable fishing has been the leading cause in the exploitation of our coastal ecosystems. Overfishing is the act of catching too many fish at once. The rapid depletion of a breeding population leads to the species' inability to replenish its numbers. We are simply catching and taking fish at a faster rate than any species can reproduce. It often takes a species up to 15 years to replenish itself after a rapid declination or collapse in population numbers, putting them at a high risk for extinction.



DESTRUCTION

"Damage or destruction of habitats kills the plants and animals responsible for the habitat's ecological functions and, in some cases, its survival and regeneration" (Ocean Health Index). A series of human actions affect marine habitats and life, including coral reefs, sea grasses, and mangrove forests. Destructive fishing practices, runoff, development, dredging, bottom trawling, ship hulls, and impoundments are all causes of habitat disturbances. These practices can "displace or destroy habitats, eliminating food, shelter and breeding grounds for numerous species and decreasing primary production due to increased sedimentation" (Ocean Health Index).



DREDGING

Dredging and extractive operations are responsible for removing habitats and introducing sediments.

TRAWLING

Heavy nets used for the fishing industry drag on the seabed, which disturb, damage, and destroy habitats.

RUNOFF

Waste including sewage, fertilizers, animal feces, and more release harmful nitrogen and phosphorus into marine environments, causing ocean dead zones and putting many species at risk.

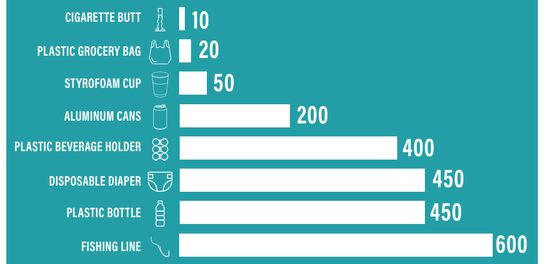
DEVELOPMENT

Frequently, habitats are removed from the sea for development purposes including bridges, marinas, and aquaculture.

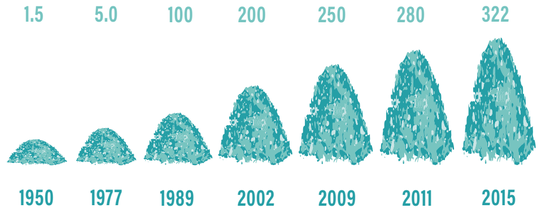
POLLUTION

With the ocean having been used as a waste collector for centuries, pollution is one of today's top issues faced by our marine life. While it made little to no impact for years, the rapid increase in a consumer lifestyle and global population has brought unfathomable waste quantities with it. Roughly 10 million tons of plastic end up in our oceans every year (Our World In Data). Researchers have labeled plastic debris as a top hazardous waste because of its tendency to absorb and carry toxic chemicals. More importantly, plastic holds a quality that never allows it to decompose (Georgetown Environmental Law Review). Macroplastics (> 5mm) may break down, but only into tiny pieces called microplastics. Currently, there are 5.25 trillion particles residing in our seas. This ocean waste has been a leading cause of death for our sea-life by ingestion and entanglement (Cole).

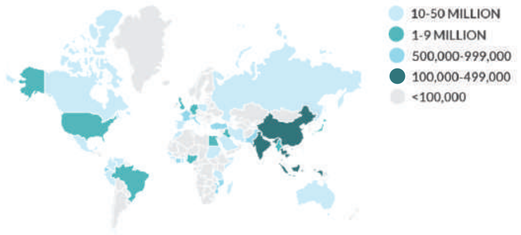
YEARS IT TAKES FOR WASTE TO BIODEGRADE



WORLD PLASTIC PRODUCTION (IN MILLION TONS)



EVERY YEAR, 10 MILLION TONS OF PLASTIC IS DUMPED INTO THE OCEAN



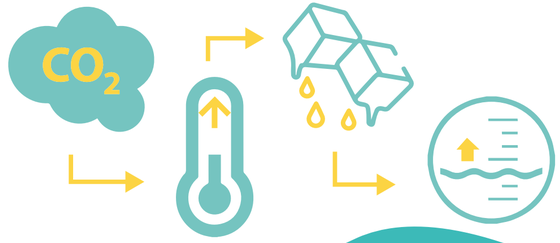
OF PEOPLE EXPECTED TO BE UNDER SEA LEVEL BY 2100

US STATES THREATENED BY RISING SEA LEVELS

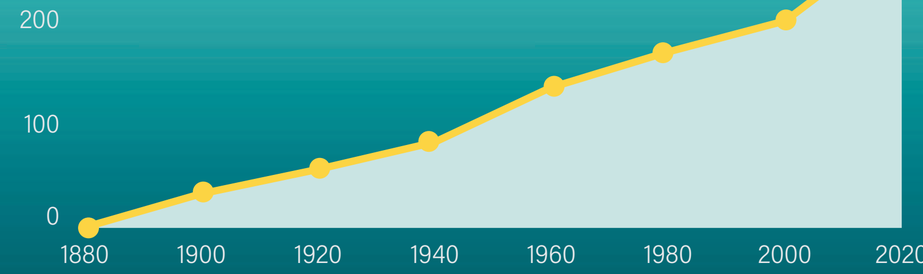
CLIMATE CHANGE

RISING SEA LEVELS

In addition to plastic pollution, global warming poses a challenge that will affect coastal regions world-wide. Despite opposing views on the cause of climate change, research shows that the occurrences in rising global temperatures are undeniable. The properties of water enable absorption and diffraction of heat. With its immensity, the top eight feet of the ocean holds as much heat as the entire atmosphere (NASA). According to the US National Oceanic and Atmospheric Administration, the temperature has, on average, risen 0. 13° Fahrenheit per decade since the early 1900s (NOAA). With this temperature rise studied on Earth, along with the corresponding melting ice, the sea level is said to rise up to 18 inches by 2050. With 60% of the world's population living on the coastline, the rising seas are going to make a horrific impact. It's estimated that 200 million people in the world will live below the sea line by the year 2100 (Kulp).



SEA LEVEL (1880-2020)

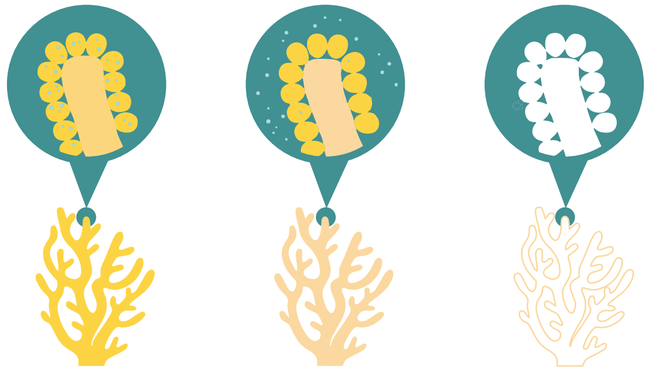


BY 2050 THE SEA LEVELS WILL RISE +1.5'

CLIMATE CHANGE CONTINUED

In addition to rising sea levels, the rising sea temperatures pose as a threat to marine life. Many marine organisms are sensitive to slight or short-lived temperature changes (National Geographic). One of these organisms is coral. Coral is an organism that has already experienced some of this devastation, as it is very sensitive and can only survive within a certain temperature range. With rising temperatures, we have begun witnessing bleaching of this immaculate species. Bleaching is the expulsion of vital algae from the coral organism. Without these algae, coral is put under stress and subject to mortality.

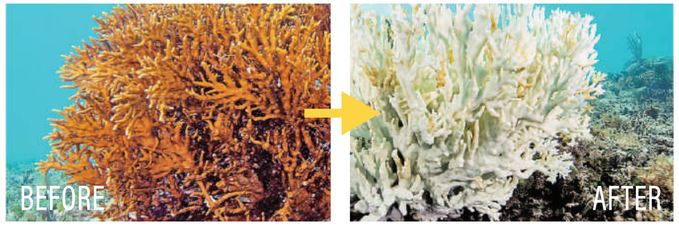
CORAL BLEACHING



HEALTHY CORAL
Coral and algae depend on each other to survive

STRESSED CORAL
If stressed, algae leaves the coral

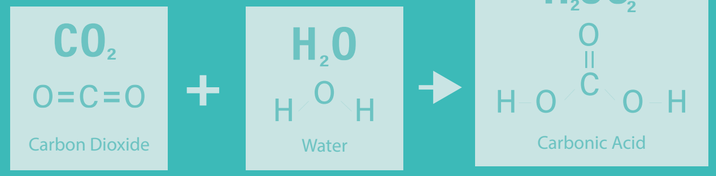
BLEACHED CORAL
Coral is left bleached and vulnerable



ACIDIFICATION

Since the industrial revolution, the concentration of carbon dioxide in the atmosphere has increased due to burning fossil fuels (NOAA). When CO2 is absorbed by sea water, a chemical reaction occurs resulting in higher acidic levels. A change in pH levels can produce harmful effects on marine life. These changes can impact the communication, reproduction, and growth of organisms, likely resulting in extinction (Ocean.si).

THE OCEAN **ABSORDS *CARBON DIOXIDE*** FROM THE ATMOSPHERE, **CREATING *CARBONIC ACID*** THAT **ALTERS THE *PH BALANCES*** THAT MARINE LIFE DEPENDS ON.



LACKING EXPLORATION

Although the oceans exist on Earth - making physical contact with all continents, they remain vastly unexplored. Even with increasing exploration efforts, only five percent of the seafloor has been topographically imaged (Schmidt Ocean Institute). Because it is not widely discovered and extensively understood, many find its importance incomprehensible. Furthermore, its vitality could still remain partially unknown.

> "WE HAVE KNOWN MORE ABOUT THE TOPOGRAPHY OF MARS THAN WE DO ABOUT THE EARTH'S SEAFLOOR, AND OCEANS CERTAINLY HAVE A MUCH MORE DIRECT IMPACT ON OUR EVERYDAY LIVES THAN THE SURFACE OF MARS,"
> - VICE ADMIRAL SHIN TANI

ONLY 5 % OF OUR OCEANS HAVE BEEN EXPLORED

EDUCATION

The ocean's role in Earth's biological system is not widely understood. Because of its vastness and enormity, many individuals are convinced that the oceans are capable of supplying the indefinite resources needed to sustain the current ways of life. A vast amount of people have not received education regarding the ocean. People are disconnected to the sea because it only reveals its surface, leaving the depths unseen. Furthermore, ocean health has recently been politicized. While it's important to politicize issues to implement new policies, the politicization of an issue tends to bring opposing views. Regardless of affiliation, we must understand that the ocean is not a 'left' or 'right' matter by responding to the scientific findings.

"EDUCATION IS NOT A KEY TO SUCCESS. EDUCATION IS A WAY OF SURVIIVAL", -
TUSHAR MANGLE

ARCHITECTURAL INTERVENTION

Currently, little protection is offered for our threatened marine life. With less than 2% of our oceans set aside as marine reserves, the exploitation of our natural resources has become a simple task. Presently, preservation efforts are limited to marine reserves, non-profits, as well as research and educational programs. While we have managed to see advancing solutions for the ocean epidemic, little has been explored regarding the built environment. With seas rising and the ocean spreading inland, the market could be asking for a solution to this upcoming problem. Innovative solutions and alternative sustainable strategies must be thought of to lead the change in architectural design.

With inevitable future consequences, the built environment must find efficient responses to climate change and ocean threats. As a profession, architecture must accentuate nature, making efforts to safeguard the natural resources and habitats on and off site. We must implement new standards that least affect the environment, producing the least amount of waste and energy. If possible, the built environment should not only protect the ecosystems, but enhance them with its existence. Considering the at-risk coastal regions, we must also explore ways to adapt to fluctuating sea levels. Spatially speaking, we can provide spaces that educate and places to experience, guiding occupants toward comprehension and connection.

EXUMA CAYS
LAND & SEA PARK

Because of its marine-oriented preservation efforts and achievements, The Exuma Cays Land and Sea National Park was chosen as the project's client. Opening as the Caribbean's first national marine reserve in 1958, the park continually advocates for ocean health, making efforts to enhance the seas and prevent destruction. They prove their conservation dedication by protecting 127 square miles of land and sea. In addition to conservation attempts, the park provides recreational, educational, and scientific opportunities. Today, the Exuma Cays Land and Sea Park is the most visited national park in the Bahamas. Offering safe anchorages, various recreational opportunities, and pristine beauty, the park welcomes thousands of boaters every year. Its healthy ecosystem and proper fishery management also makes it an ideal spot for researchers and scientists to conduct various types of research (BNT). ECLSP accentuates the need for education by transforming and engaging learning experiences. Most importantly, the Land and Sea Park presents itself as a place where people can physically immerse themselves in nature, allowing them to spiritually connect with the environment. By experiencing the beauty of untouched waters and flourishing lands, visitors can come to understand the Ocean's capacity to harbor life.

PARK VALUES

"CONSERVE & PROTECT THE NATURAL RESOURCES OF THE BAHAMAS, THROUGH STEWARDSHIP & EDUCATION FOR PRESENT & FUTURE GENERATIONS".

PARK GOALS

ENGAGING EDUCATION

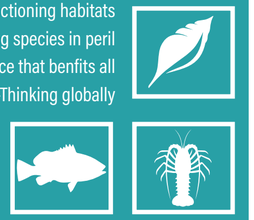
-Touching the lives of youth
-Outdoor classrooms
-Building environmental stewardship

PARK STORIES

-Sharing their impact
-Inspiring investment in natural capital
-Celebrating conservation leadership

BIODIVERSITY CONSERVATION

-Ensuring Functioning habitats
-Protecting species in peril
-Science that benfits all
-Thinking globally



INVESTING IN NATURE

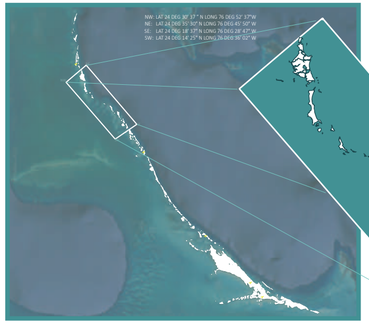
-Immersing donors in work
-Member Matter
-Capital for conservation
-People for parks

MANAGING SPACES

-Bringing people to parks
-Safeguarding natural resources
-Maintaining special places

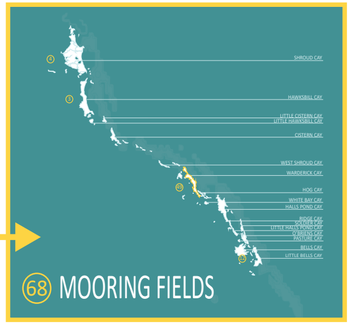
21.7%↑ in visitation numbers

ECLSP BOUNDARIES

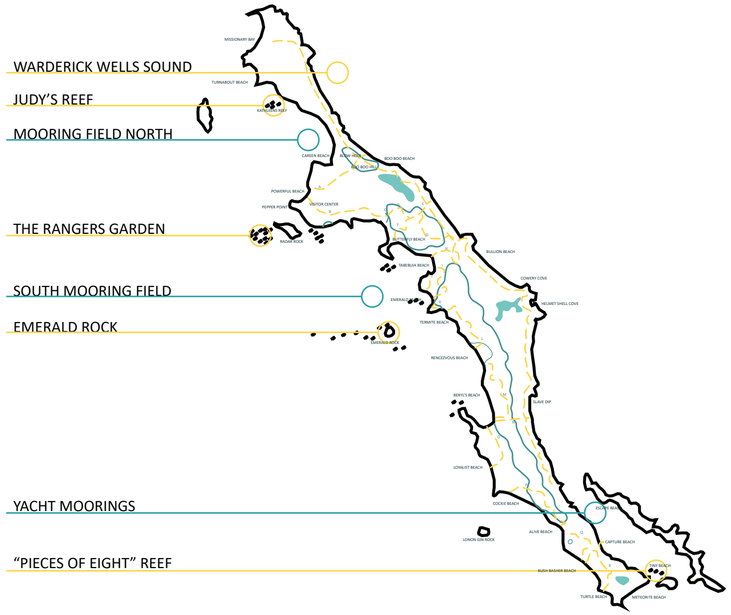


127 MILES² OF LAND AND SEA

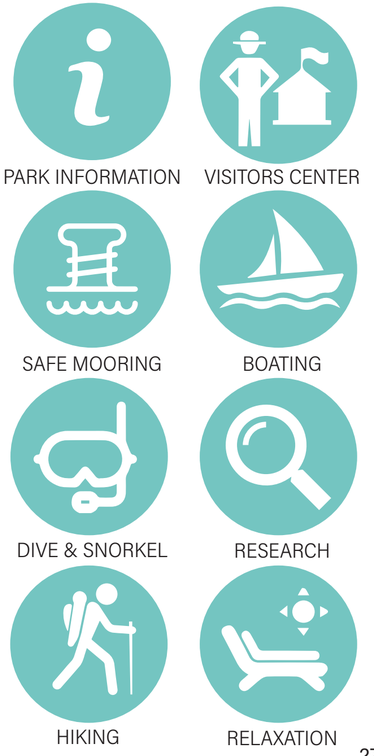
16 ISLANDS



↓WARDERICK WELLS CAY



ISLAND ATTRACTIONS



PROGRAM DEVELOPMENT

Since its opening, the park has been managed by the Bahamas National Trust, a non-profit/non-government membership organization. Because the park operates on a significant deficit, it is seeking to increase their income from revenue sources. Although the park has seen a recent increase in visitation, management continues searching for innovative ways to attract more guests. In its current condition, the park facilities do not have the capacity to endure the escalating use. In order to attract more revenue and to facilitate the increasing visitor numbers, the park has requested a visitors center addition and expansion.

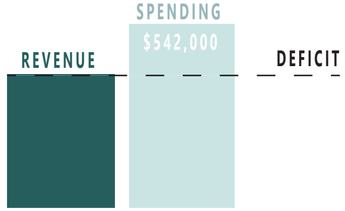
THE NEED FOR AN EXPANSION

To begin understanding a spatial program that suits the client's needs, we must first understand the background and goals of the client. Because the park has experienced increased usage and because it is in need of attracting more revenue sources, there was a demand for an expansion. The increased usage has created a dire need for more enforcement capacity. At the same time, there was also a need for efforts directed at the community outreach to raise awareness for the park's regulations. These directed awareness efforts also aim to gather stewards, gaining support for ocean preservation efforts. Before proposing spaces for the program, it was necessary to understand the current park activities, user groups, and client goals.

INCREASE VISITATION

As of 2017, the park has recently seen a 21.7% increase in visitation. These trends have continued to rise since.

ATTRACT MORE REVENUE SOURCES



The park currently runs on a deficit and is looking for new ways to attract more visitors for revenue sources.

INCREASED STAFF

CURRENT STAFF

4

- ADMINISTRATOR
- ADMINISTRATOR ASSIST.
- MAINTENANCE OFFICER
- OFFICE MANAGER

STAFF TO BE HIRED

7

- VISITOR CENTER CLERK
- CHIEF PARK WARDEN
- PARK WARDEN
- X3 DEPUTY PARK WARDEN
- OUTREACH OFFICER

With the staff expansion, there will be 11 employees working for the park. 7 of these staff positions will spend a majority of their time on-site, working within the facility. The other 4 spend a majority of their time off-site, monitoring and protecting the park grounds.

PARK USERS & ACTIVITIES

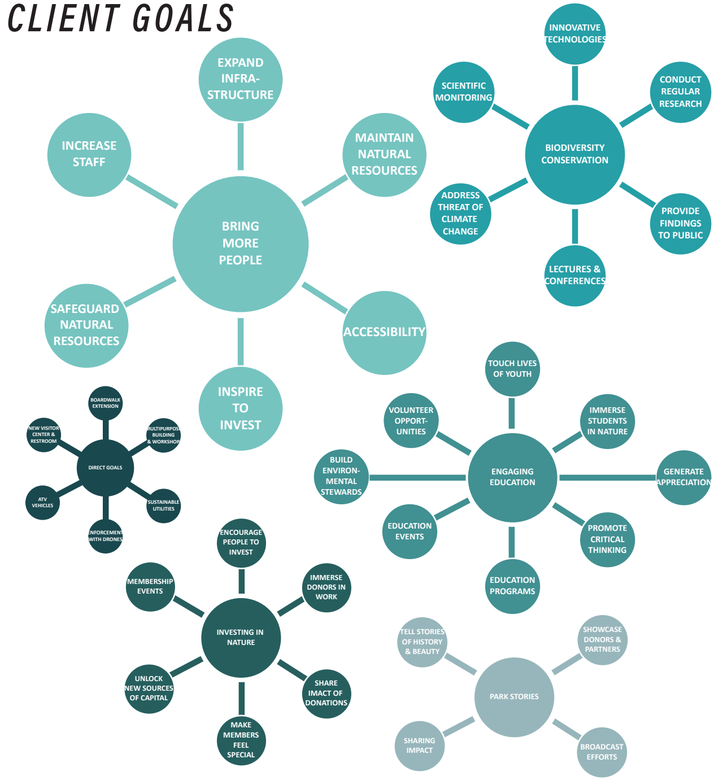
PARK PROGRAMS

Some of the programs the park manages include enforcement, sea life monitoring, education, research, and volunteer programs. The corresponding park users include park management, yachtsmen, day tour operators, scientific researchers, academic groups, volunteers, and recreational tourists. The user groups range in size depending on their focus, but visitation numbers never exceed 49 people at one given time.

PARK USER GROUPS

GROUP TYPE	# (PEOPLE)
RESEARCH GROUPS	5-20
SOCIAL GATHERINGS	30-49
ACADEMIC GROUPS	10-49
VOLUNTEER GROUPS	2-20
RECREATIONAL TOURISTS	2-10

CLIENT GOALS



PROGRAM CONSIDERATIONS

MULTI-USE LOBBY → MULTI-USE AREA (GATHERING, TEMPORARY EXHIBITION, LOUNGING, INFO DESK)

PERMANENT EXHIBITION → REFLECTION SPACE, TERRACED SEATING, EXHIBITION, LECTURING

ADMINISTRATION → FACILITATE MANAGEMENT OPERATIONS

EXTERIOR → MEANS OF ACCESS, GATHERING, EVENTS

CONSIDERATIONS → SECLUDED MULTI-USE ROOM

After dissecting and understanding these goals, I was able to propose a series of spaces that functionally meet the needs of the park programs

CLIENT GOALS & NEEDS

The program development began with an investigation to understand the client's goals, which were extracted from their 2018-2022 strategic plan. Through this research, we found that the park wants to attract more people while safeguarding the natural resources. They aspire to uphold conservative efforts regarding biodiversity by facilitating research, monitoring sea life, and sharing information with the public. They want to invest in nature and encourage donations by upholding the value of their members. They wish to share their impact by broadcasting their efforts and achievements. They aim to continue education programs, immerse students in nature, promote critical thinking, build environmental stewards, and generate appreciation.

STRATEGIC PLAN

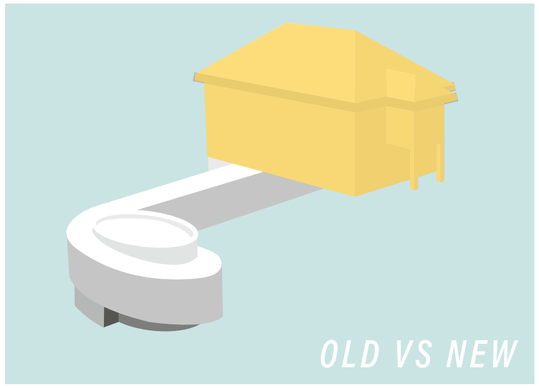
"Every day, we are managing unique spaces as a form of biodiversity conservation; fostering environmental stewardship by offering engaging education; encouraging philanthropists and the business community to become involved by investing in nature; then sharing the impact we create together by telling our park stories." – BNT

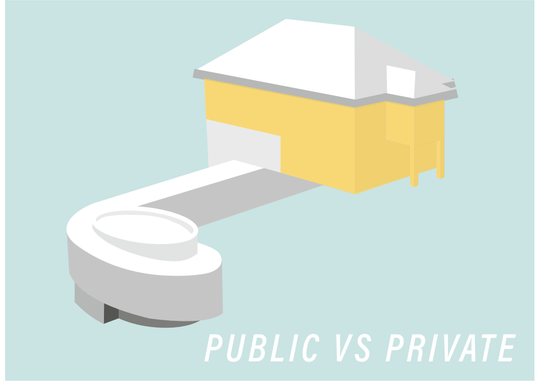
SPATIAL PROGRAM

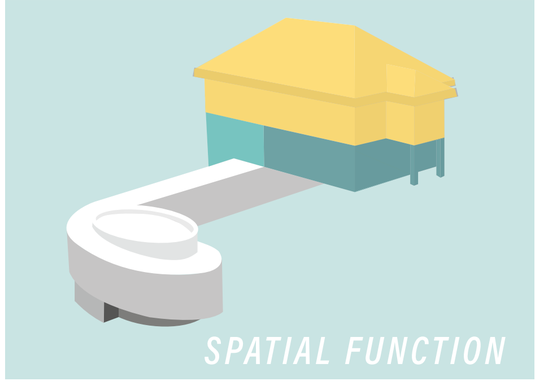
The program was configured to facilitate all current and future park activities and functions with their corresponding user groups. First and foremost, the project intends to create a visitors' center that educates on marine life, scientific findings, and conservation necessity. With the park's recent expansion, there was a growing need for work and collaboration space, gathering and lecture spaces, and an educational exhibit space.

To minimize waste and to and to eliminate the consumption of virgin materials, it was decided that the administrative expansion would utilize and renovate the existing building. The remodel will provide more working and collaboration space for both, park staff and small education groups. Within the existing building, a new reception desk will also be added to act as the park's portal. Because we know the building will face an inevitable hurricane, expensive equipment (desalination plant, energy convertors, and all mechanical and plumbing needs) were provided within custom, hurricane-proof shipping containers.

To attract people to the location and showcase the successes of the park's preservation efforts, it was decided that the project addition would become a submerged observatory. This project addition was created to engage visitors, inspiring a personal connection with marine life through a submerged, unique experiential opportunity. This attraction aims to connect visitors with sea life in a way that the general public has never done before, hoping to give visitors a sense of responsibility by revealing the exuberance of an untouched ocean. This submerged addition further aims to benefit both, humans and marine life as it becomes an artificial reef that allows for a thriving marine ecosystem.





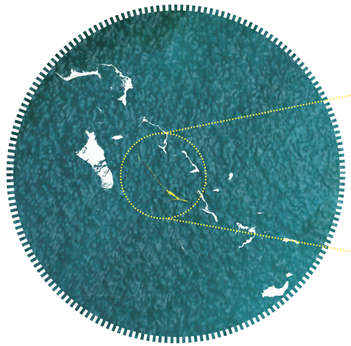


SPATIAL PROGRAM

SPACE REQUI.	SPACE REQUI.	OCC.	#	~SIZE
MULTI-USE LOBBY		**49**		**400**
RECEPTION/INFORMATION DESK	~100 SF	49		100 SF
LOUNGING	15 SF / P	20		300 SF
UNDERWATER OBSERVATORY		**49**		**1500-2000**
TERRACED SEATING	18 IN. PP | 7 SF/P	49		900 SF
EXHIBITION THROUGHOUT CIRCULATION	30-50 SF / PP	20		600-1000 SF
ADMINISTRATION		**5-10**		**1300**
OFFICES	150-200 SF / P	5	5	750 SF
CONFERENCE ROOM	15 SF / P	8-10	1	150 SF
STORAGE	<100 SF	-	1	<100 SF
FILE ROOM	200 SF	-	1	200 SF
RESEARCHERS COLLAB SPACE	15 SF / P	6	1	100 SF
SERVICES		**49**		**500**
RESTROOMS		49		200
MECHANICAL		-	2	?
STORAGE		-	2	<100
EXTERIOR		**49**		**600**
MULTI-USE EXTERIOR DECK	30-50 SF / PP	20	1	600
DOCK (BOATS)		DOCK	5-10	
ENTRY DECK				
				4300 / 4800

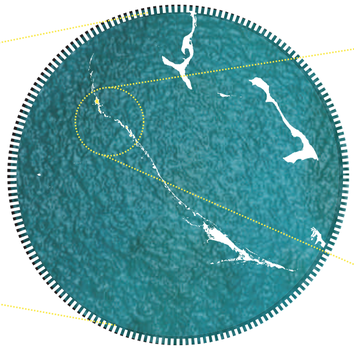
THE SITE

The Exuma Cays Land and Sea Park resides in the Bahamas archipelago, The Exuma Cays. The park protects 127 square miles of land and sea, encompassing 16 of the Exuma Cay Islands. The Exuma Cays are famous for their immaculate, untouched land and seascapes. The site is one that offers every shade of blue imaginable and is home to some of the most diverse marine species populations. It's a place where time seems to stand still and is said to be incomparable to any other place on Earth. Throughout the park, one can explore the preserved underwater magnificence of coral reefs, mangroves, and seagrasses. Visitors can also stroll along pristine beaches, hike a variety of trails, and observe an immense amount of wildlife. The park's wardens and officers are stationed on Warderick Wells Cay, which accommodates the current visitor's center. Because of its existing establishment and popularity, Warderick Wells was the predetermined site for the project.



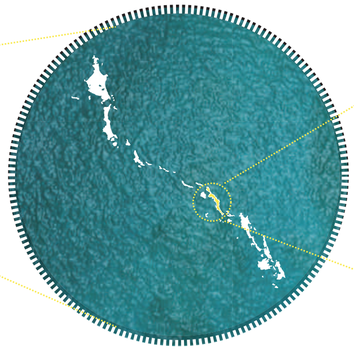
THE BAHAMAS

The Bahamas is a chain of nearly 300 islands that sit in the Atlantic Ocean, located east of Florida.



EXUMA CAYS

The Exuma Cays is a centralized archipelago, made up by 365 islands.



EXUMA CAYS LAND & SEA PARK

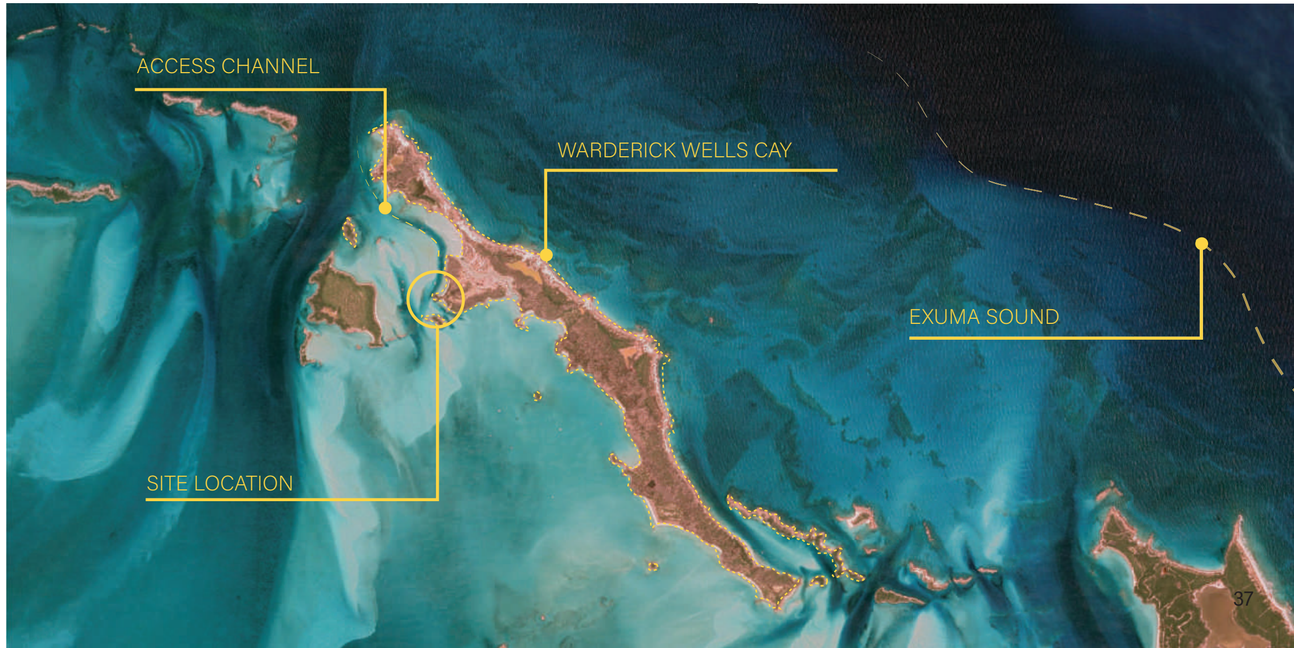
The Exuma Cays Land & Sea Park covers 127 square miles, emcompassing 16 of the Exuma Cay Islands.

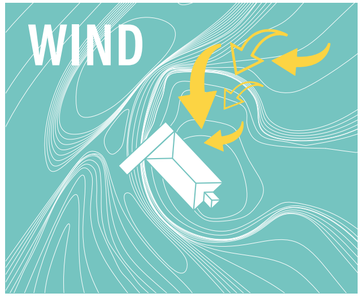
WARDERICK WELLS CAY

Warderick Wells Cay houses the park's headquarters and offers a variety of intriguing land formations.

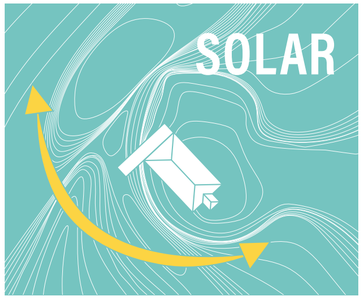
EXUMA CAYS

The current visitors center sits on the protected, western side of the island. This side of the Warderick Wells is protected from the strong currents posed by the Exuma Sound, which sits east of the island. The Exuma Sound reaches depths over 2,600 feet, bringing strong currents and waves to the island's eastern banks. The only access to the island is by boat. Of the 68 mooring locations offered by the park, 49 of them sit within Warderick Wells boundaries making it the most visited island within the park. The tropical climate adds a challenge to design with the hot, humid, and hurricane-prone area. The existing visitor's center sits adjacent to the park's largest mooring field on a geographical cape. The building was constructed in the 1970's and remains sturdy with its timber frame.





Winds arrive predominately from the east, averaging 12 miles per hour.



The solar path rises in the East and sets in the West, lighting the water-front facade of the park's existing building.

The site is only accessible by boat. Users typically arrive in larger yacht vessels and must transfer to smaller dinghys to move throughout the site.

THE EXISTING SITE

HIKING TRAILS

SURFACE TEMPERATURE

The ocean surface temperature ranges between 75° in the winter and 88° in the summer.

CURRENT VISITORS CENTER

18 FEET DEEP

The topographic elevation of the specified site has a low point of -18 feet below sea level, with a highpoint on land sitting at +8 feet (a 26' change in elevation).

+8 FEET

EROSIVE SAND DUNES

MOSTLY SAND AND ROCK

TIDES

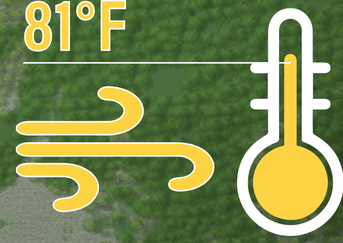
Annually, the ocean tide ranges from -0.1 feet at low tide to +4.2 feet at high tide. However, the tides only fluctuates approximately 3 feet a day.

HURRICANE FREQUENCIES

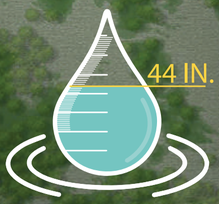
On average, hurricanes visit the Bahamas once every two years. Their winds can reach up to 160MPH and can bring with them a storm surge that can reach depths of 24 feet. According to the building code, the structure must be built to withstand 130MPH.

AIR TEMPTERATURE

The air temperature ranges from 77° to 86°, with the annual average remaining under 81°F.



ANNUAL PRECIPITATION



JAN JUL
FEB AUG
MAR SEP
APR OCT
MAY NOV
JUN DEC

Rain season lasts from January to December. With rainy conditions lasting for 11/12 months of the year, the citizens are no stranger to a moist, wet climate.

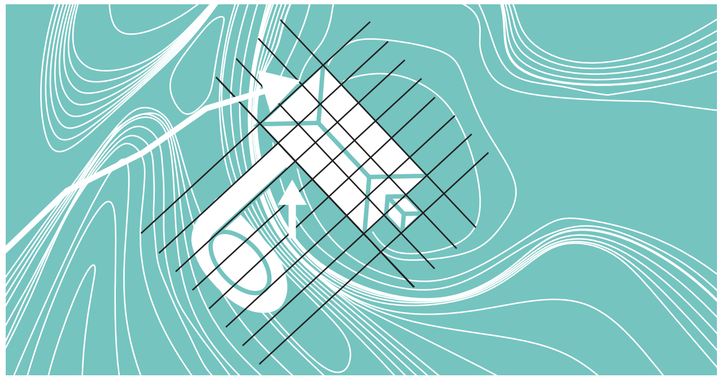
DESIGN DEVELOPMENT

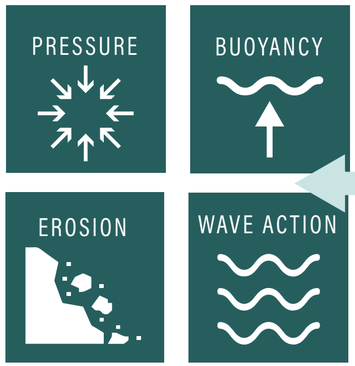
Regarding the ocean epidemic, the building was designed to offer architectural remediation by providing innovative and unique responses to the rising ocean complications. It serve as a prototype, expressing strategies to adapt the built environment to climate change and the corresponding ocean alterations. The project was developed and designed to consider the existing visitors' center, tropical and submerged conditions, present and future tides, marine life enhancement, and sustainability.

FORM INFLUENCE

EXISTING STRUCTURE

Because the wooden structure is being salvaged, the pre-existing visitors center heavily guided the project's development. To blend the old and new structures together, the project's new addition rightfully responded to the 6x3 grid exhibited by the timber structure.



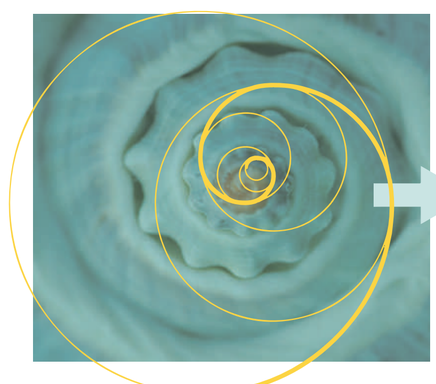


SUBMERSION

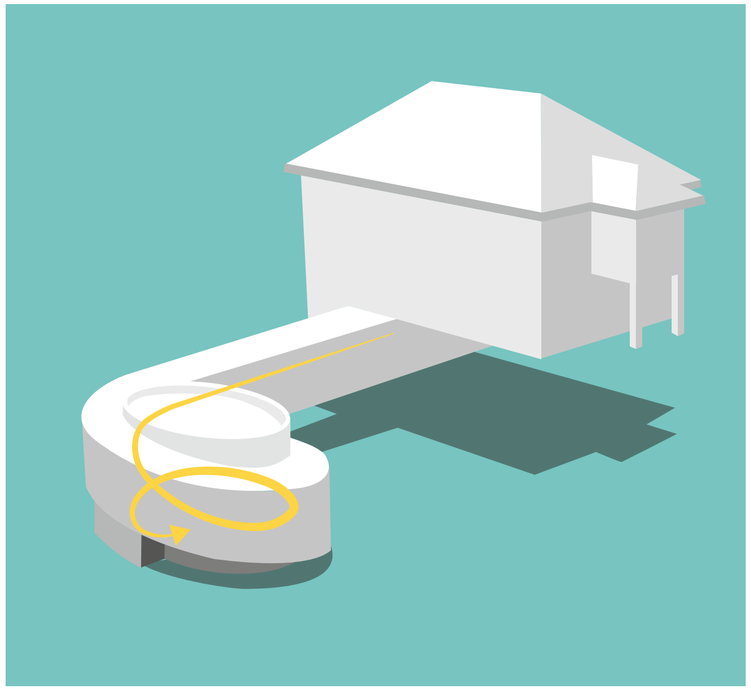
Because the building is flaunting submersion, design considerations were analyzed to properly respond to the sunken conditions. As a substance, liquids carry powerful properties, introducing pressure, wave action, currents, and prevailing movement. These forces increase the loads that the structure must endure. Research proves that elliptical shapes respond best to the pressure exhibited within sunken conditions. The project responds using these research findings to provide strength and stability, conforming to a curved and elliptical shape.

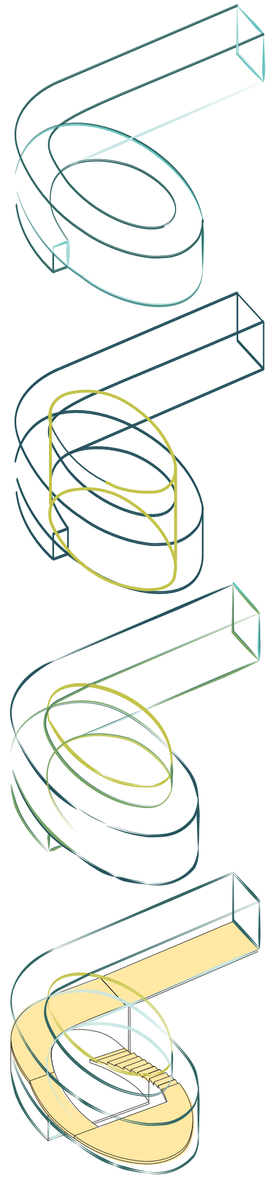
QUEEN CONCH

The Queen Conch Shell is an endangered sea snail, but the species is one that the park proves to be benefitting. The shells are glorious in their creation and form, supplying an immaculate shelter for the snail. They are formed in a natural Fibonacci sequence, spiraling to the core where life itself is held. This spiraling effect came to be a leading driver for the project's physical and circulatory aspects.

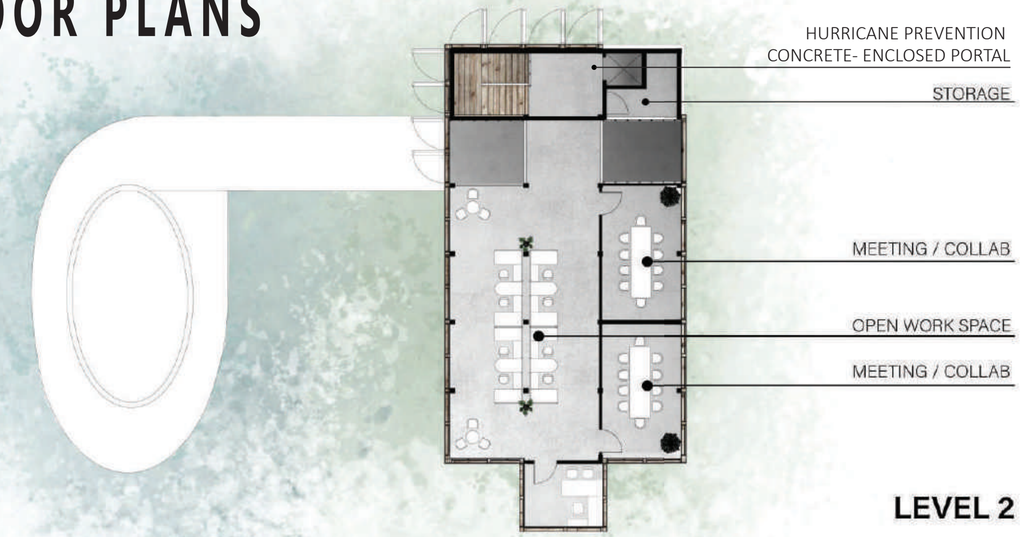


FORM DEVELOPMENT

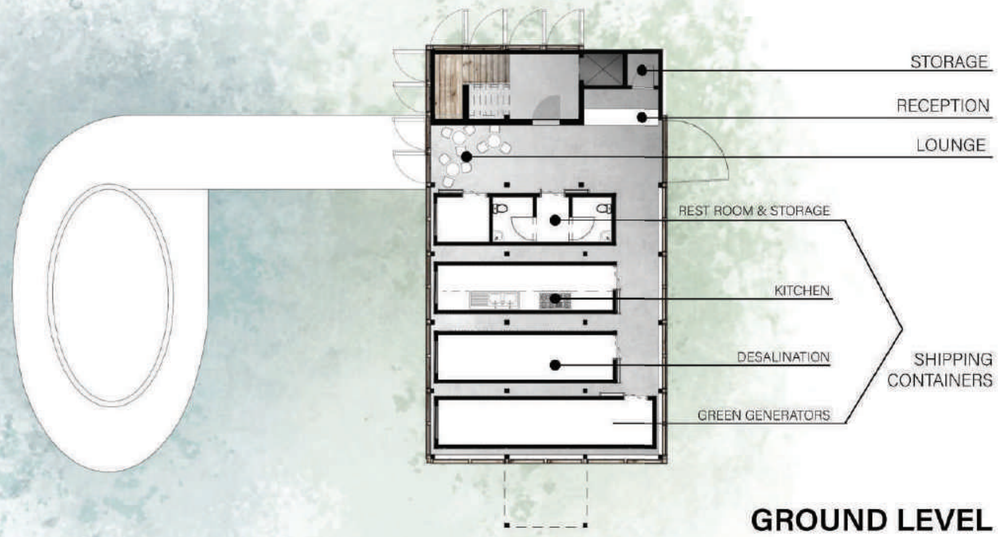




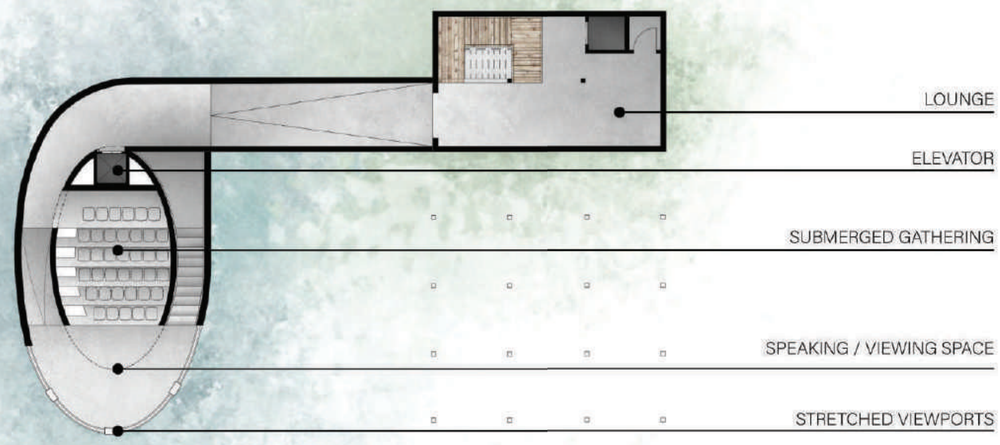
FLOOR PLANS



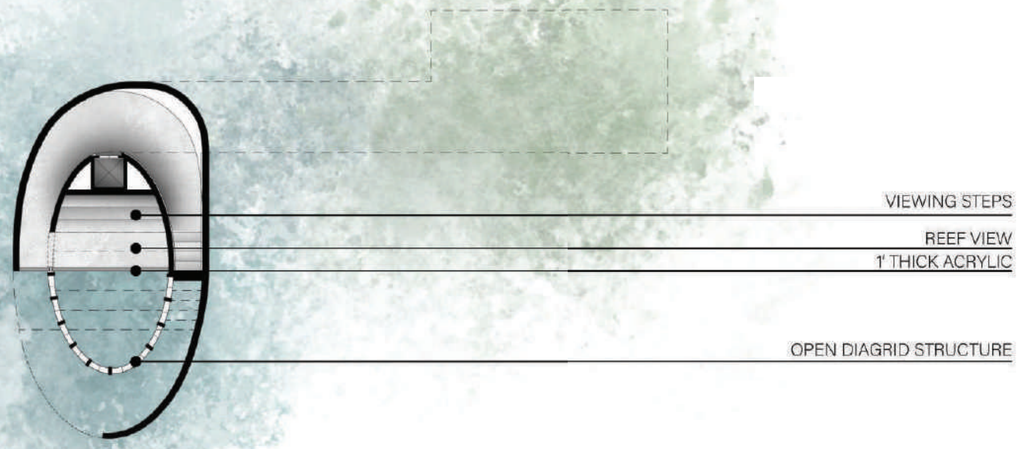
LEVEL 2



GROUND LEVEL



SUB-LEVEL



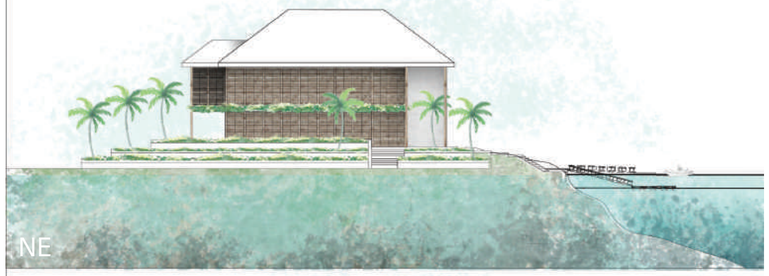
SEABED

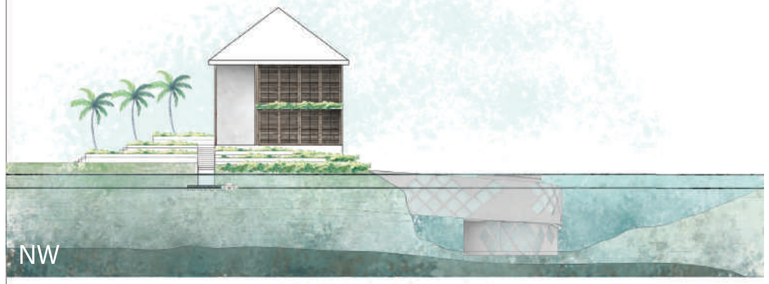
ELEVATIONS

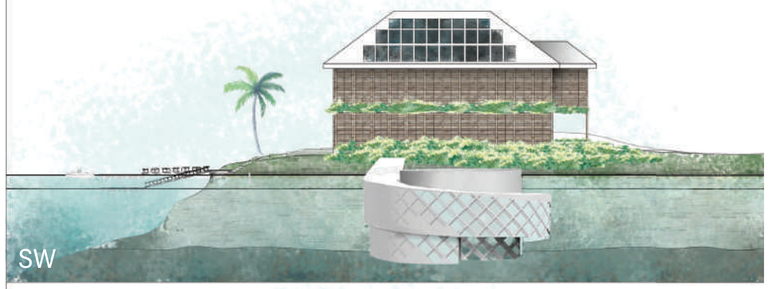
The design resulted in an asymmetrical, spiraling form. At its core, an elliptical volume rests near the sea bed, extending above the surface. Around this volume, a spiral guides the circulation through the exhibit. This circulation spirals, leading one through the emerging tunnel, through and around the lecture seating, ending in a space that displays a panoramic view of the structure's diagrid cave that ultimately exhibits vigorous marine-life in a thriving state. The structure is draped in a net-like envelope, captivating the users within and reversing the universal roles of the life involved.

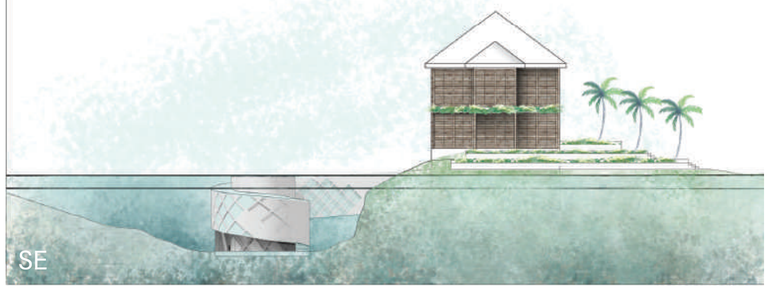
The existing building's historic character was preserved with its renovation. Its balloon frame, timber structure was saved and used in the remodel to uphold the conservation values that it stands for. The wood was salvaged, reclaimed, and reused to create the timber envelope that boasts operable louvers. To tie the remodel and new addition together, and to add reinforcement to the historic structure, concrete was used on portions of its façade.

CLOSED LOUVERS

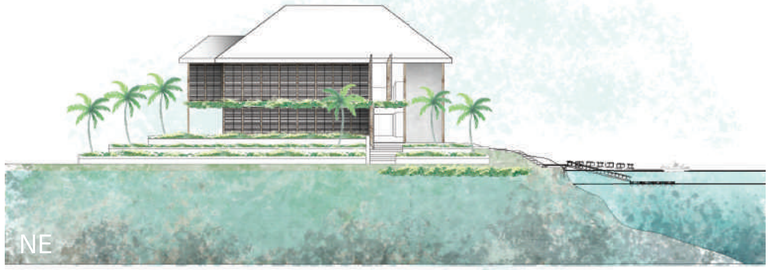


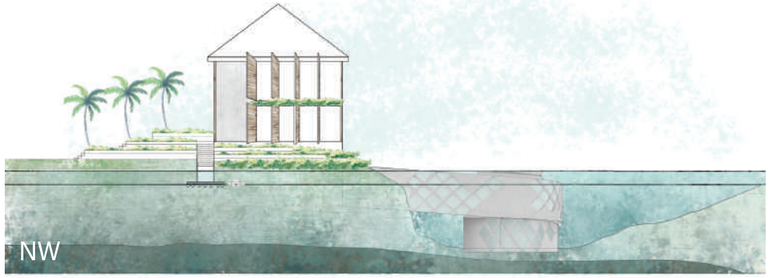


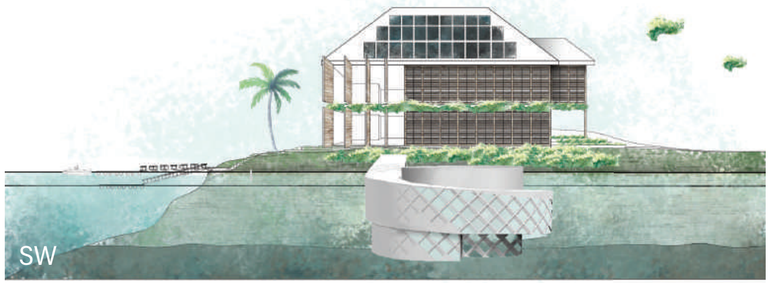


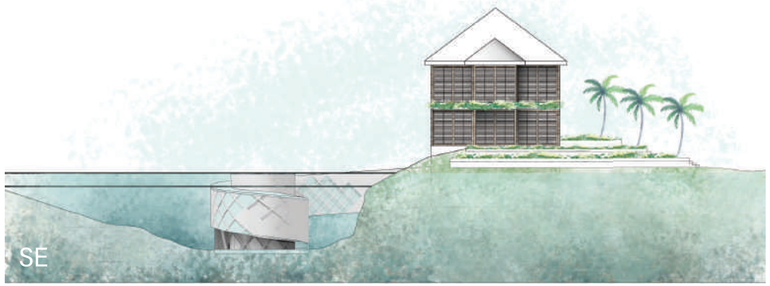


OPEN LOUVERS



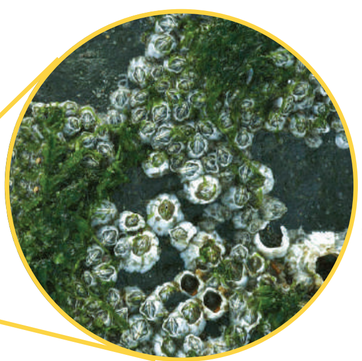


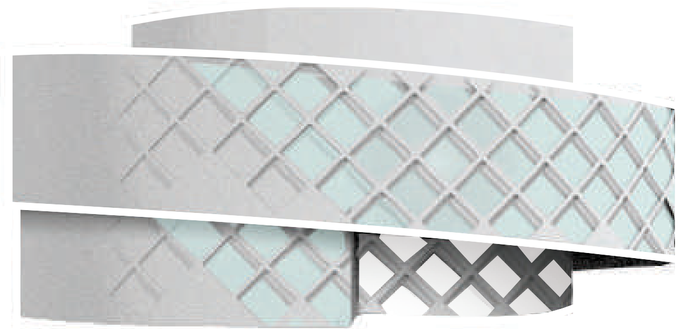




ARTIFICIAL REEF

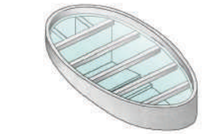
As a remediation effort, the project was designed to act as an artificial reef. Rather than destroying the environment, the form was created and materials were considered to allow for the growth of a diverse ecosystem. This artificial reef will become a prototype for symbiotic architecture, creating a space that benefits both, humans and marine life.

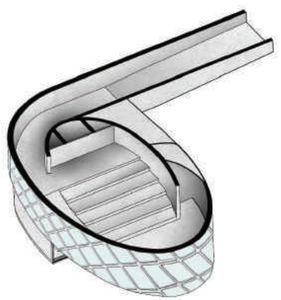


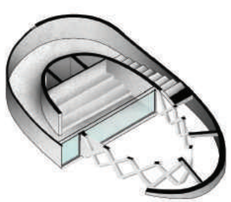


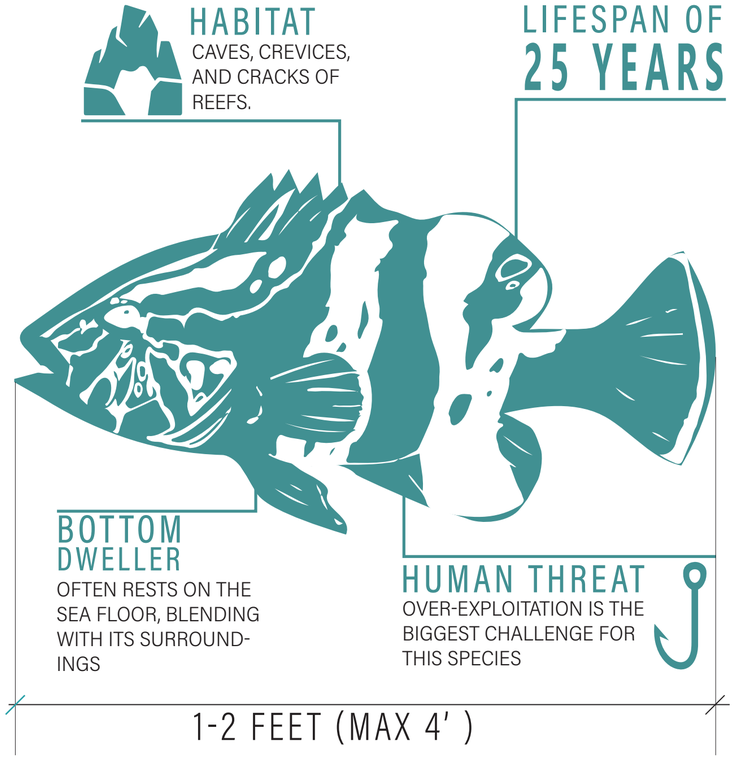
CONCRETE MATERIAL

Because of its durability and porous texture, concrete was chosen as the material to facilitate the artificial reef. The porous characteristics of the concrete, along with the dimension exhibited by the diagrid, allows for organisms to latch onto the structure. These latching organisms include, but are not limited to, barnacles, algae, sponges, anemones, coral, and fan worms. These organisms supply nutrients that attract many other species. With time, the envelope will become more diverse, making the experience more intriguing.







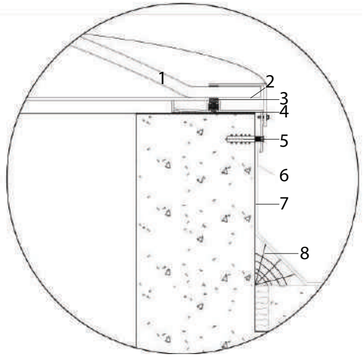


NASSAU GROUPER

The park is a no-take reserve, meaning it has implemented a no-fishing policy to enable endangered/at-risk species to replenish their population numbers. Because of this implementation and consistent patrol, the park has seen data that reveals a growth in endangered species populations within their boundaries One of these species is the Nassau Grouper, which are threatened by overexploitation.

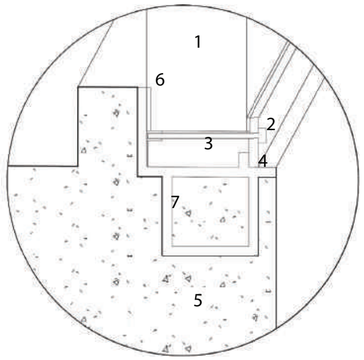
To truly showcase the successes of the park, the submerged structure was designed to consider its thriving fish species, the Nassau Grouper. This fish species dwell in habitats that flaunt crevices, cracks, and caves. They also rest on the seafloor to blend in with their surroundings. The observatory form took this into consideration, as it creates nooks and crevices with its diagrid structure. To further attract the species, it displays overlapping, cantilevered elements, and even flaunts a cave that rests near the sea floor. The cave is created with the continuation of the diagrid, but permits liberating openings for the species to swim throughout.

SECTION PERSPECTIVE



1 - SKYLIGHT

1 - SOLID ACRYLIC
2 - STEEL FRAME
3 - WATER CONTACT SWELLING SEAL
4 - SILICONE SEAL
5 - ANCHOR
6 - DRIP NOSE
7 - WATERPROOFING MEMBRANE
8 - CANT STRIP



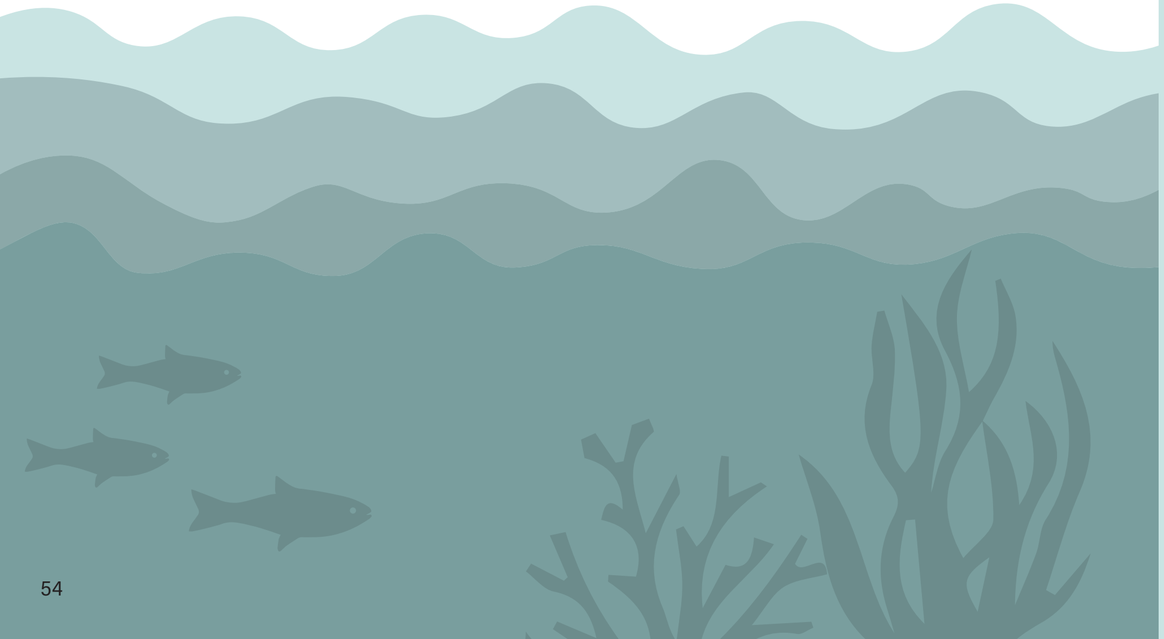
2 - ACRYLIC PANEL

1 - 12" SOLID ACRYLIC PANEL
2 - SCREW
3 - WATER CONTACT SWELLING SEAL
4 - STEEL FRAME
5 - WATERPROOFED CONRETE
6 - WATER RESISTANT INSULATION
7 - FRAME ANCHORED IN CONCRETE

SEA LEVEL RISE

The form demonstrates an architectural solution that focuses on adaptation to sea level rise. By acting as a visual reference for rising sea levels, the architecture uses its form to educate the public, putting them in the problem's foreground. To take advantage of the fluctuating daily tides, the structure's form considered its above water visibility. The observatory was designed using today's tide levels, and considers the 1 ½ foot sea level rise of 2050 in its concept. With present tide levels, the volume's top will appear little above the water line at high tide. At low tide, the volume faces more exposure, revealing more of its shape while maintaining its mysterious character. Because the seas continue to rise, the structure will disappear with time, never to reveal itself above water again. To further expose the rising sea epidemic and to metaphorically represent its corresponding devastation, the structure was designed to be fully submerged by 2050.

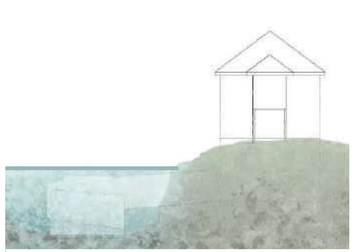
To further address sea level rise, the structures top exhibits a retaining water capturing system. At high tide, the enclosure captures water. At low tide, it retains this water. Within the submerged structure's lecture space, this water endlessly reflects moving light.

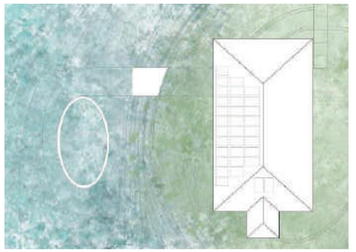


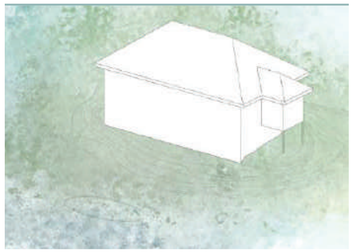
ELEVATION

TOP

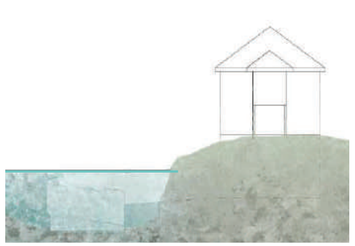
PERSPECTIVE

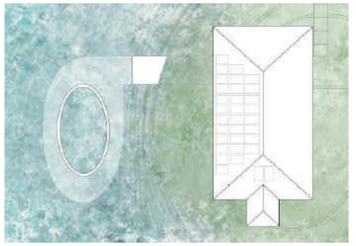


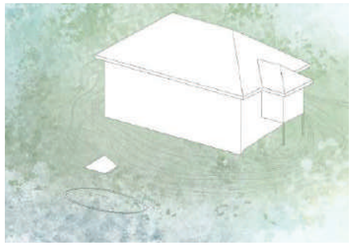




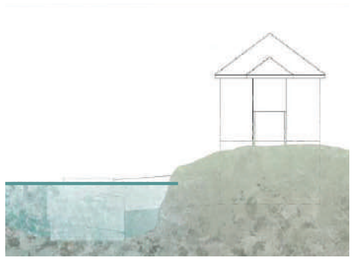
FUTURE TIDE +6'

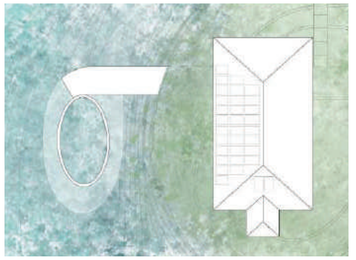


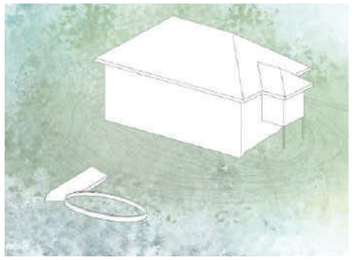




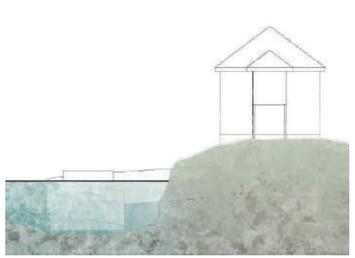
HIGH TIDE +4'

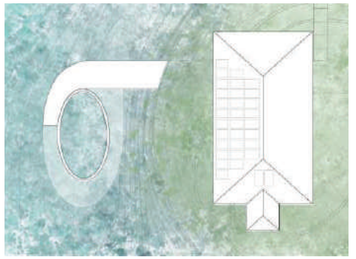


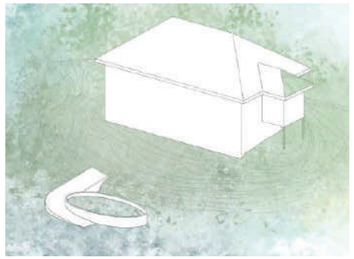




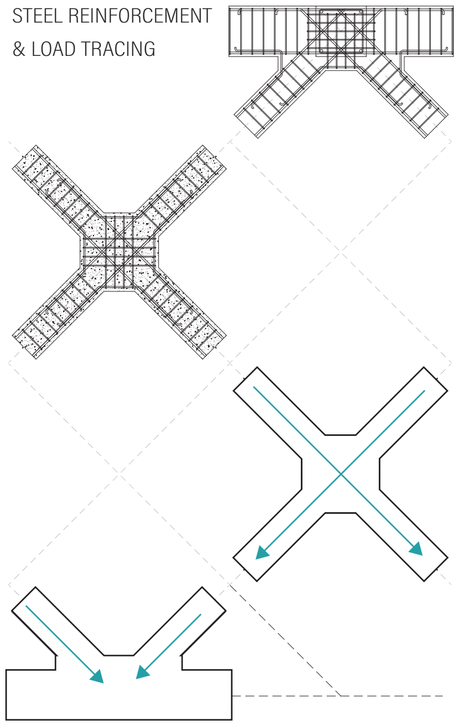
MID TIDE +2'

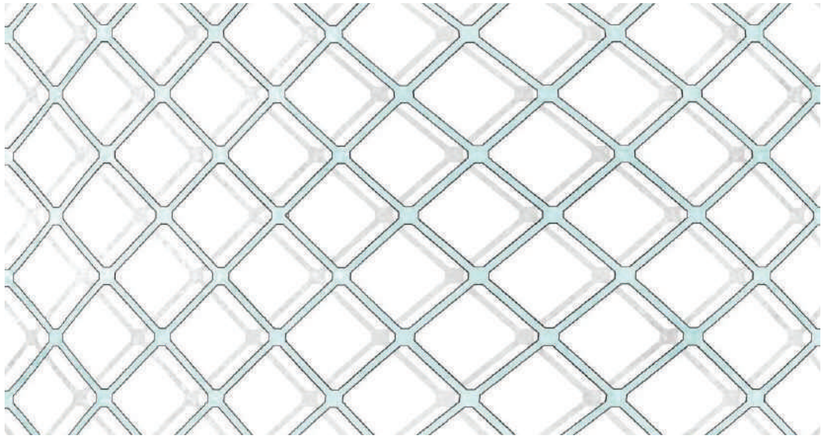




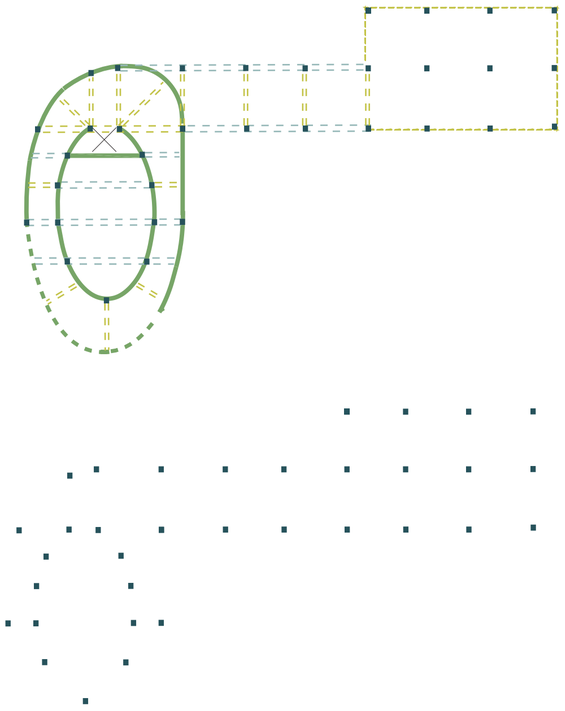


LOW TIDE 0'



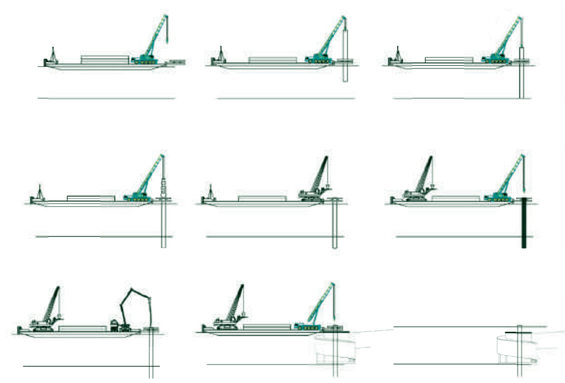


STRUCTURE



HURRICANE PRECAUTION

Precautionary measures were taken to prevent hurricane damage and to protect the observatory through future disasters. The concrete, diagrid structure, as it's designed, should be capable of withstanding a hurricane on its own. However, the existing building that acts as the observatory's portal remains threatened. Because of the structures' attachment to one another, the submerged construct was initially threatened by flooding. However, the portal was re-thought to have concrete extend to its perimeter. This concrete portal extends itself to the second floor of the existing building – when the park is hit by an inevitable hurricane and takes the visitors' center with it, the submerged structure and its land-based portal will remain.



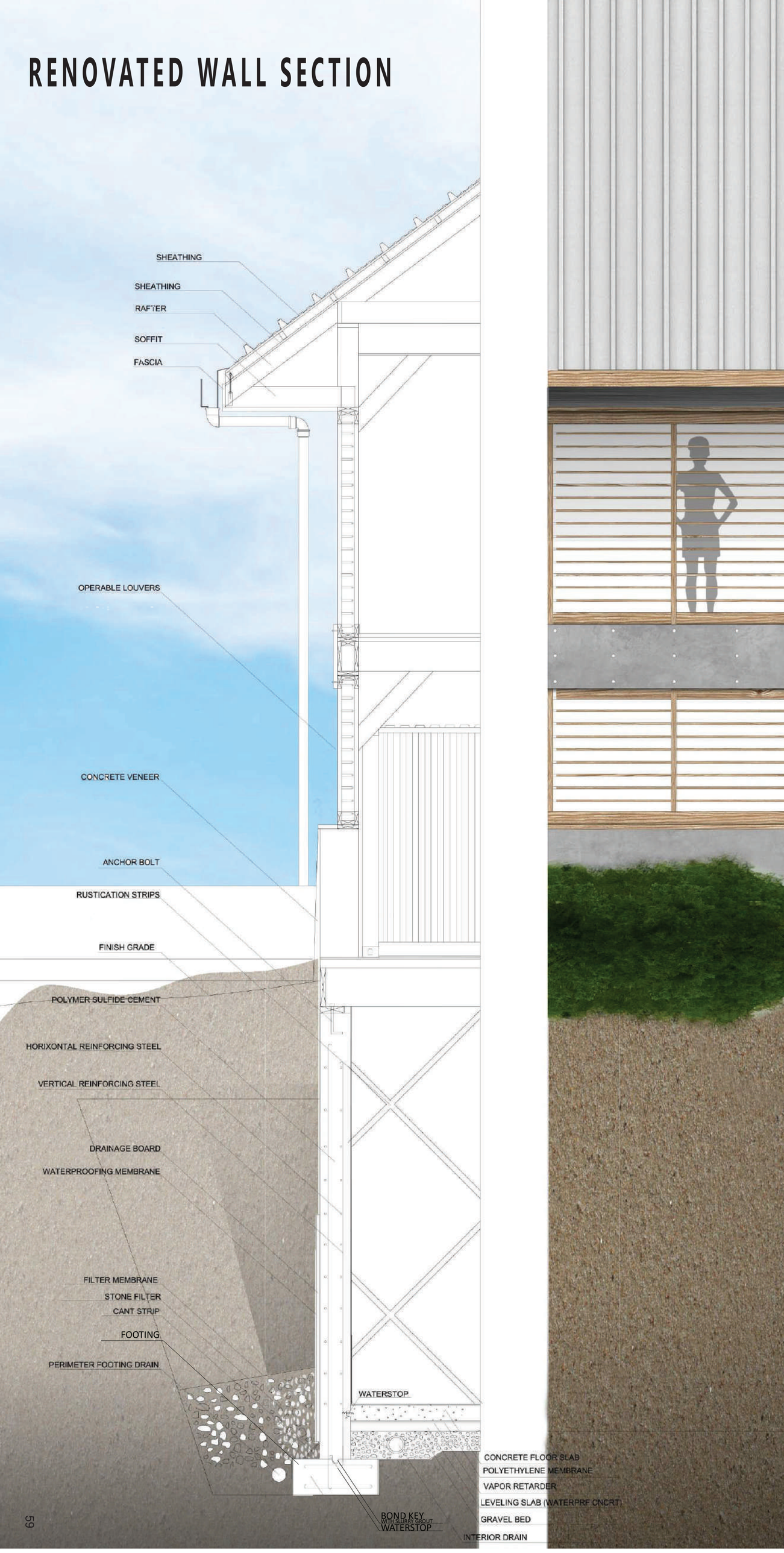
STRUCTURAL SYSTEM

The diagrid does not solely display a metaphorical purpose, but also justifies itself as the observatory's structural system. The diagrid provides strength and durability with its concrete materiality and truss-like functionality. Furthermore, the structure utilizes a two-way flat slab as its top to maximize the open space within, and to decrease the need for columns and beams, which would threaten the head height.

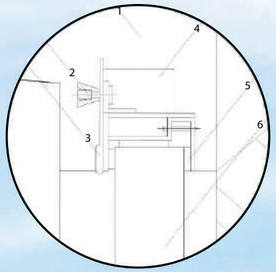
CONSTRUCTION METHOD

The submerged structure and its elements will be constructed off-site and brought in on a barge. After initial research of the specific site's sea bed, it was found that no significant marine life dwells on the sandy seabed. Still, to least disrupt the seabed and supply ample stability, piles were used as the structure's foundation. Once the piles are cast in place and cured, the diagrid form will be lowered and anchored to the submerged foundation.

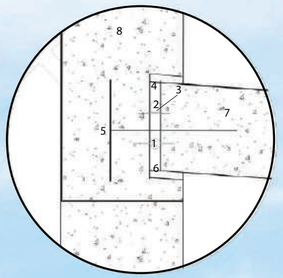
RENOVATED WALL SECTION



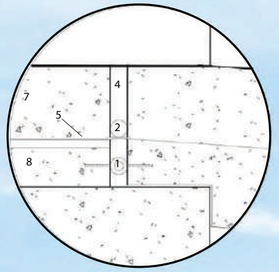
SECTION



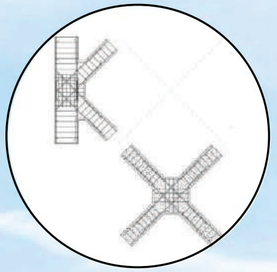
DETAIL 1
1 CONCRETE DIAGRID
2 DILATANT BOLT
3 SEAL
4 GROUT
5 SILICONE SEAL
6 SOLID ACRYLIC PANEL



DETAIL 2
1 PVC WATER STOP
2 FOAM ROD FILLER
3 10 MM BOND BREAKER
4 URETHANE BITUMAP SEALER
5 CONCRETE TIEBACK
6 EXPANSION BOARD FILLER
7 TWO WAY FLAT SLAB
8 CONCRETE BEAM



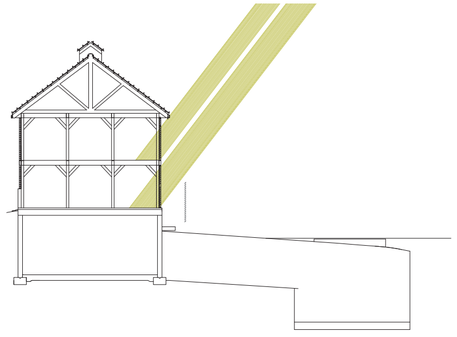
DETAIL 3
1 PVC WATER STOP
2 FOAM ROD FILLER
3 10 MM BOND BREAKER
4 URETHANE BITUMAP SEALER
5 LIQUID APPLIED MEMBRANE
6 EXPANSION BOARD FILLER
7 WATERPROOFED CONCRETE TOPPING
8 WATERPROOFED CONCRETE SUBSTRATE



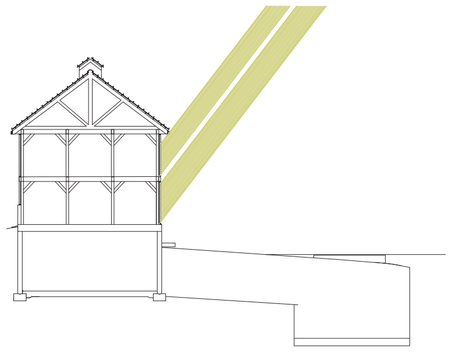
DETAIL 4
CONCRETE DIAGRID REINFORCING

PRESERVATION EFFORTS

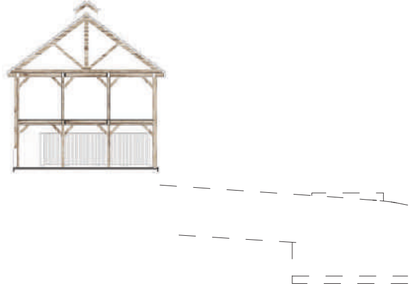
STRIVING FOR NET ZERO ENERGY



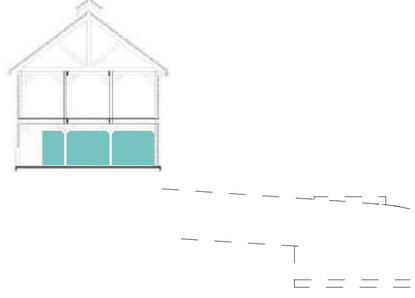
OPERABLE LOUVERS (OPEN)



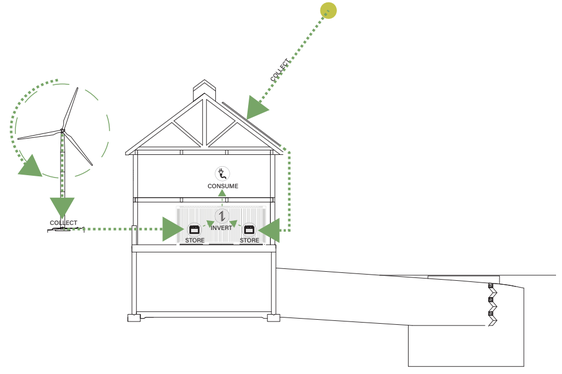
OPERABLE LOUVERS (CLOSED)



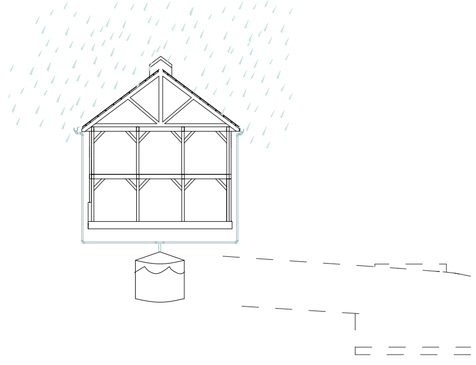
RECLAIMED WOOD



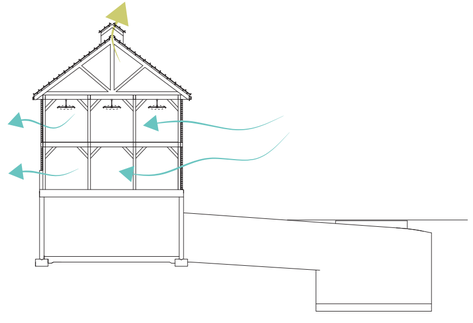
SHIPPING CONTAINERS



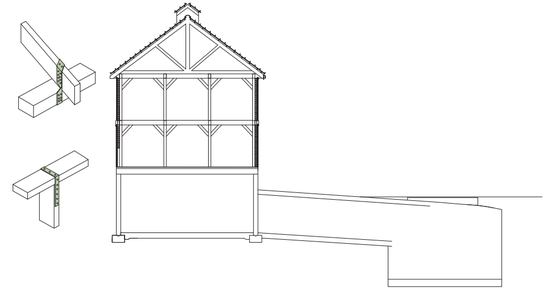
RENEWABLE ENERGY



WATER COLLECTION



CROSS VENTILATION



HURRICANE PREPARDNESS

CONCLUSION

This project is one that explores architectural remediation and adaptation, responding to our threatened oceans with creative solutions. The project itself embodies values that include preservation and conservation, aiming to educate on the vast, yet vulnerable seas. Working on this project over the course of the year has been an exciting and challenging endeavor. As a project that combines my two passions – architecture and marine environments – it is one that will be cherished forever.

COMMITTEE

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CHAIR

GEOFFREY BOOTH
CO-CHAIR

BRENT FORTENBERRY
MEMBER

DAWN JOURDAN
MEMBER

BRIAN GIBBS
PROFESSOR

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MASTER OF ARCHITECTURE FINAL STUDY

COMPLETED BY JORDAN TAYLOR

TEXAS A&M UNIVERSITY

2019-2020