

## **A PHYSICAL AND BIOLOGICAL SURVEY OF THE MID-REACH MITIGATION REEF SET NUMBER 1**

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### **INTRODUCTION**

The Brevard County Mid-Reach Shore Protection Project will place sand fill along 7.6-miles of Atlantic Ocean shoreline located between Patrick Air Force Base and Indialantic, Florida. The project is anticipated to impact approximately 3 acres of existing nearshore rock hardgrounds. To mitigate the anticipated impacts to the nearshore hardgrounds, the project will also include construction of artificial reef structures upon the nearshore seabed offshore of the project shoreline (Brevard County NRMO, 2018) (Olsen Associates, 2008).

“The mitigation reef structures will consist of articulated concrete mats with a coquina-rock surface. Each articulated reef mat will consist of approximately 18 cable-connected blocks. Each mat would be about 8-ft x 16-ft x 1-ft high and comprise about 90 lineal ft of valleys (ridges) between blocks and adjacent mats (Figure 1). Forty-two mats, in 6 rows and 7 offset columns would be placed adjacently -- along with two additional ‘top-layer’ mats along the landward edge to form an overhanging ledge. This would constitute one “set” of 44 mats. Each “set” of mats would create between about 0.15 and 0.16 acres of hard-bottom structure. Each set of mats would be placed upon the sand seabed at ambient depths of between about -14.4 ft and -15.6 ft MLW; i.e., approximately centered along the -15 ft MLW contour, and located about 1000-ft from the mean low water shoreline (Figure 2). Between two and five “sets” of mats would be spaced about 50 to 60 feet apart, along the approximate -15 ft contour, to form a reef “group”. These reef “groups” would be spaced about 400 to 9000 feet apart, or more, to create the requisite total area of reef mitigation along the shoreline. The top surface of the reef mat structures will feature almost all coquina cover with 1” to 4” deep crevices between the coquina stones that emulate the surface of the existing nearshore rock. The valleys between blocks, and the overhanging “ledge” on the landward end of a set of units, emulate the physical relief of crevices and ledges found across the existing natural hardbottom reef. In addition to the ledge feature, 8” to 16” gaps between the ends and sides of placed reef mats are purposefully intended to would provide resting areas appropriately sized for juvenile green turtles observed to rest and forage in similarly-sized crevices on the existing Mid Reach rock resource” (Brevard County NRMO, 2018) (Olsen Associates, 2008). The first set of mitigation reefs was deployed in the summer of 2017 offshore of Pelican Beach Park at latitude 28.168561 and longitude -80.584314 as shown in Figure 3.

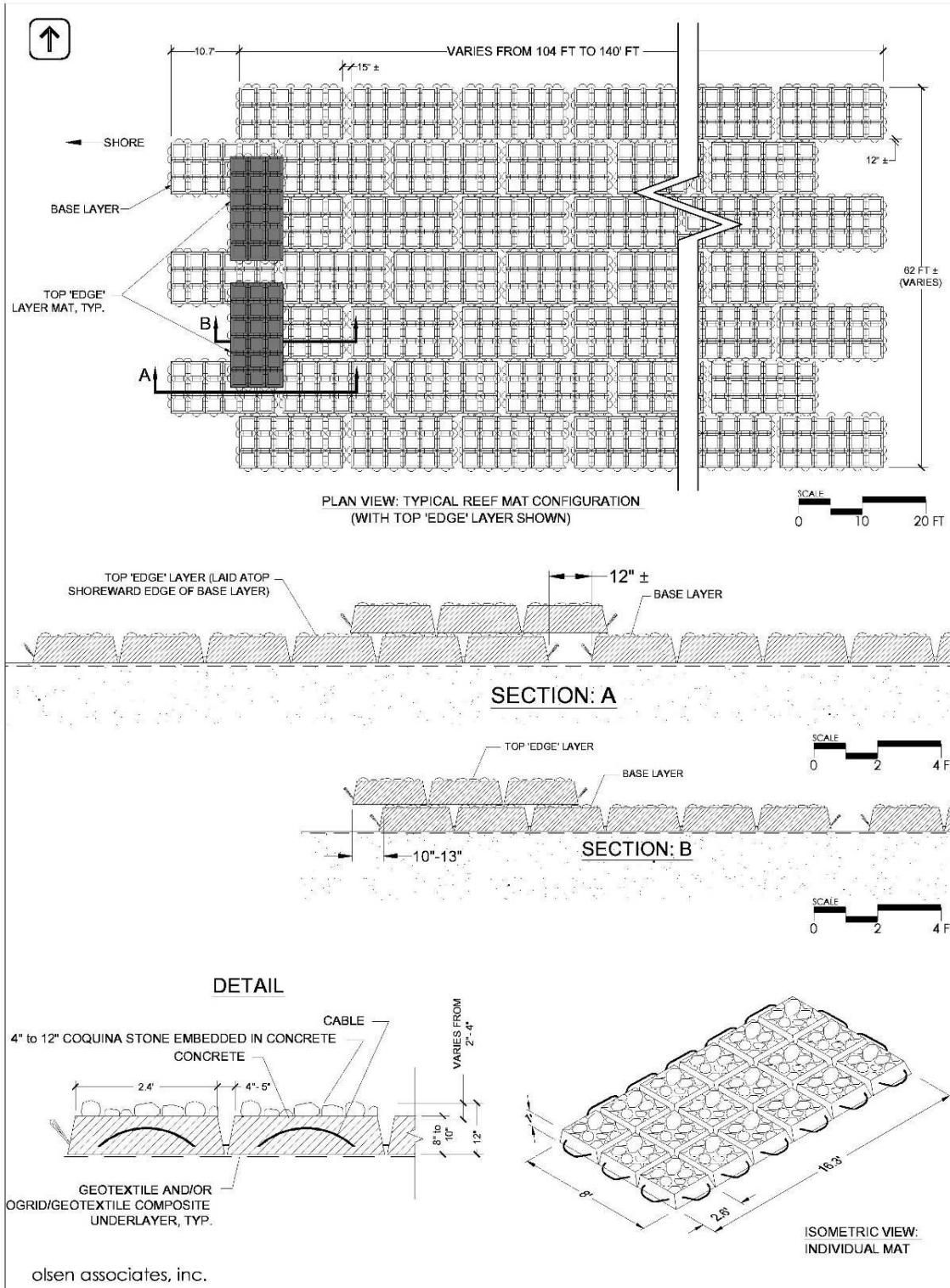


Figure 1. Mid-Reach mitigation reef construction. (Olsen Associates, 2008)

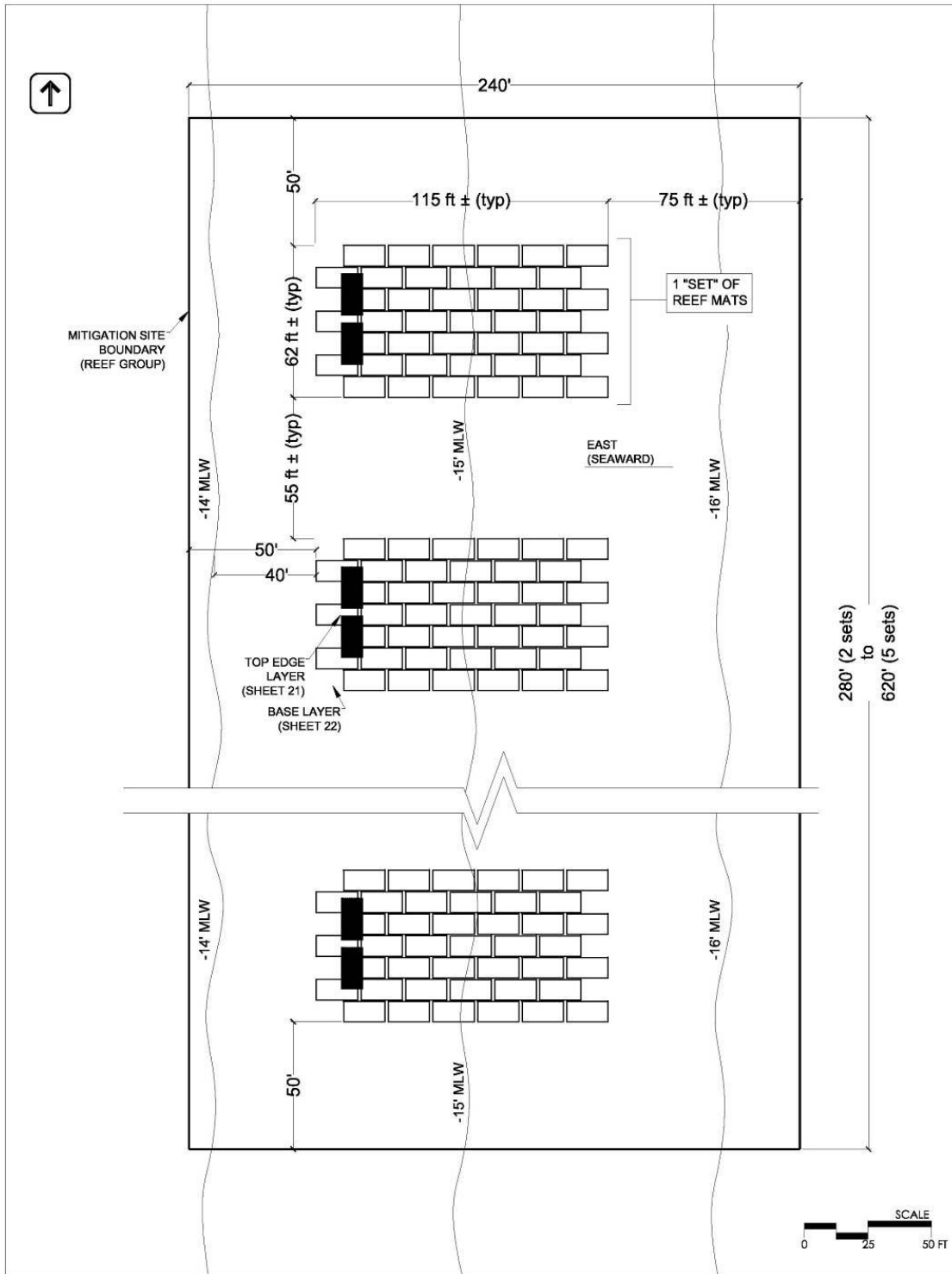


Figure 2. Mid-Reach mitigation reef layout. (Olsen Associates, 2008)

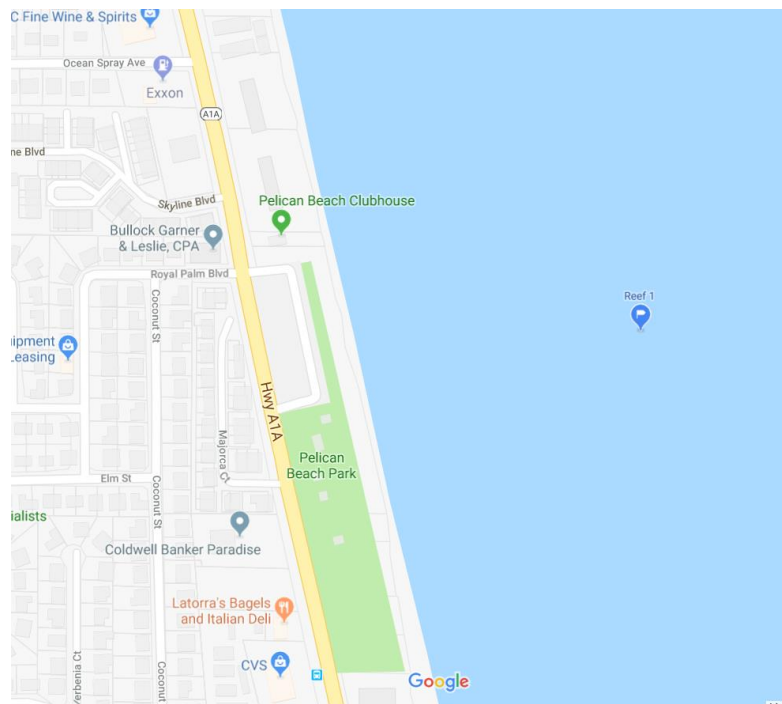


Figure 3. Mid-Reach mitigation reef set number 1 location. (Google, 2018)

### **SURVEY OF REEF SET NUMER 1**

A physical and biological survey of mitigation reef set number 1 was performed on August 11, 2018 by members of the Department of Ocean Engineering and Marine Science at the Florida Institute of Technology and Jacobs Engineering. The purpose of the survey was to assess the effectiveness of the artificial reef as mitigation for the expected loss of natural reef along the Mid-Reach of Brevard County.

#### **Ocean Conditions during Survey**

The sea surface was calm and glassy during the survey. There was less than 1 foot of swell present. The underwater visibility varied from 1 to 3 feet at reef depth with periods of zero visibility due to turbulence.

#### **Survey Methods**

The survey team utilized SCUBA and snorkeling gear to perform a physical inspection of the reef. Underwater cameras were used to take photographs of the reef and any biological organisms inhabiting the reef. Two quadrants were carried by the divers, but the poor visibility rendered them useless for collecting photoquadrats. Instead very closeup photographs were taken of the predominant species noted on the reef. These photographs were analyzed by members of the Center for Corrosion and Biofouling Control at the Florida Institute of Technology to identify the organisms.

### Physical Survey Results

The artificial reef appeared to be intact. Some buckling between the reef segments was noted but there was no evidence of damage or missing segments. The sediment overburden on the reef varied from 0 to 3 inches. The vertical relief of the reef segments, above the sandy seabed, varied from 0 to 3 feet. The extra foot of elevation was due to the buckling between some segments which raised the top layer elevation above its design height of 2 feet. No settlement or burial of the reef segments was noted. Some scour was noted around the edges of the reef which created ledges and holes where fish could hide. Numerous crevices and holes were noted in the spaces between the reef segments which provided hiding areas for fish and other sea life.

### Biological Survey Results

The reef was well colonized with epibiota and fishes. A list of the organisms identified via survey photographs is shown in Table 1. Some example survey photographs are shown in Figure 4. No sea turtles were noted during the survey. There were numerous colonies of sabellariid worm (worm rock) that exceeded 4 square feet of reef coverage noted during the survey. Due to the poor visibility, it was not possible to quantify the coverage of any specific organism on the reef during the survey.

Organism	Common Name
<i>Phragmatopoma caudata</i>	sabellariid worm, worm rock
<i>Diplosoma glandulosum</i>	colonial tunicate
<i>Portunus spinimanus</i>	Blotched Swimming Crab
<i>Echinometra lucunter lucunter</i>	Rock Boring Urchin
	White Colonial tunicate
	Red Colonial Tunicate
	Green Filamentous Algae
	Arborescent Bryozoan
	Black Durgon/ Black triggerfish
	Sheepshead

Table 1. Organisms identified via survey photographs. (Humann & Deloach, 1992)

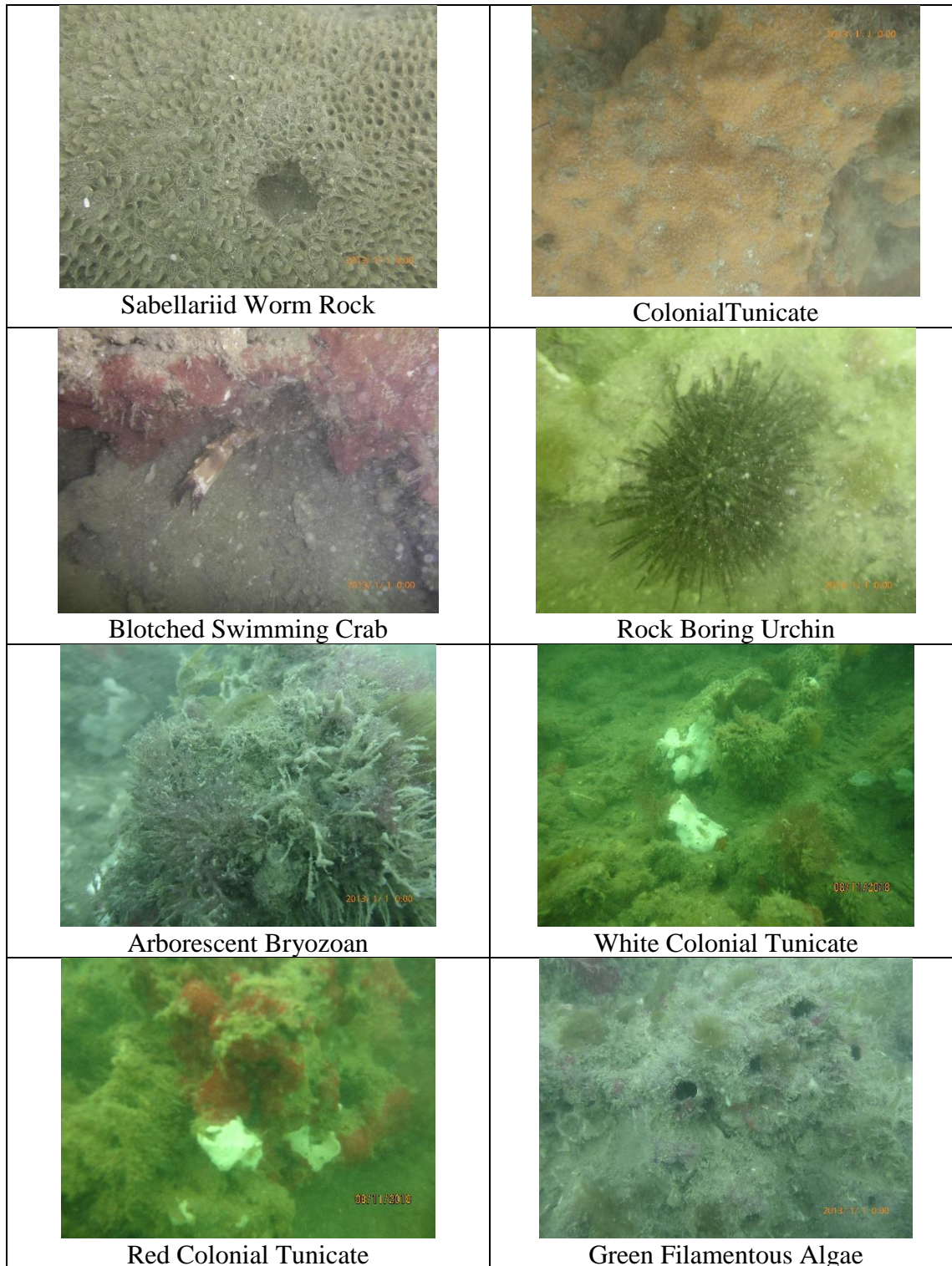


Figure 4. Examples of survey photographs.

## **SURVEY OF REEF SET #1 CONCLUSIONS**

Artificial Reef Set #1 appeared to be in good condition one year after deployment. The reef withstood Hurricane Irma without any obvious signs of damage. The reef was well colonized with epibiota and fishes. The organisms identified via survey photographs appeared similar to the organisms identified on the natural reef during a survey performed in 2005 (Continental Shelf Associates Inc., 2005). Based on all the available data collected during this survey, the artificial reef appears to be performing its function as mitigation for the expected loss of natural reef from the Brevard County Mid-Reach Shore Protection Project.

## **REFERENCES**

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- Continental Shelf Associates Inc. (2005). *Results of Epibiotic Surveys of Nearshore Rock Outcrops in the Mid Reach Project Area in Brevard County, Florida*. Jupiter, FL: Continental Shelf Associates Inc.
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