November 2014

Benthic Habitat Survey

for the

Culebra Auxiliary Cargo Ferry Terminal at San Ildefonso

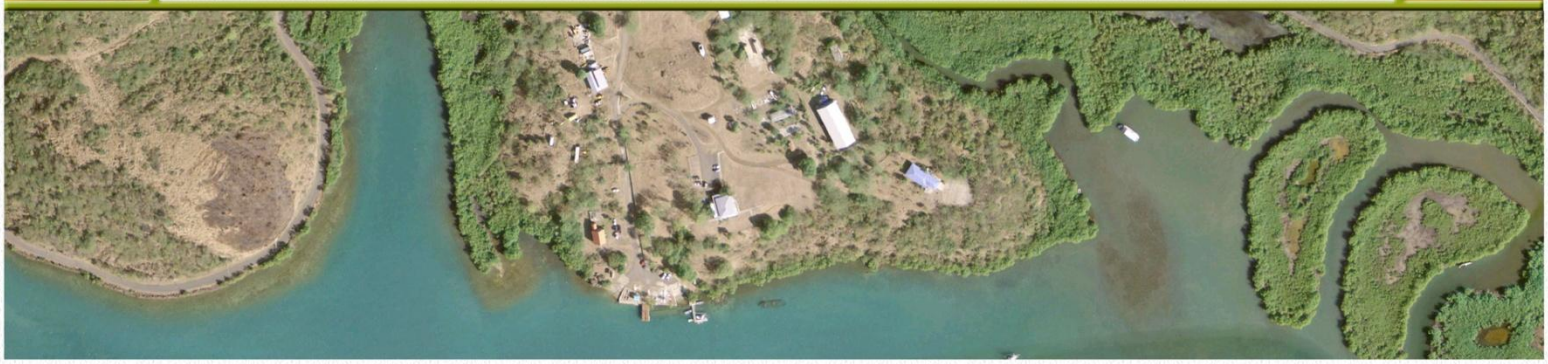
Culebra, Puerto Rico

Prepared For :

AUTORIDAD de los PUERTOS de PUERTO RICO

Prepared By:

ATKINS



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Introduction

Pursuant to the damages experienced at the Culebra Passenger Ferry Terminal Platform in Sardinas Bay after Hurricane Irene on 2010, the Puerto Rico Ports Authority (PRPA) started to evaluate the structural condition of the cargo platform and ramp. A site visit was conducted in August 2010 to assess the conditions of these structures and a report, dated September 2010 was submitted to the Maritime Transport Authority (MTAPR)

Advanced deterioration was found in the deck slab and concrete beams, which has probably spread to the entire concrete surface. This appears to be a result of previous storm events, hurricanes and wave action. While it may be possible to patch and repair the deteriorated structure, any repairs attempted for this facility would be of short-term duration. Furthermore, if the repair and reconstruction of the cargo terminal is not conducted promptly, structural failure may occur.

Being the only heavy commercial cargo transportation port in Culebra, the cargo ferry provides an essential service to the residents of the island. The PRPA has prepared this document for the reconstruction and repair of the cargo platform in the Municipality of Culebra. An evaluation of potential temporary cargo operations resulted in the proposed construction of an auxiliary cargo pier at San Ildefonso in Ensenada Honda Bay, which is the safest harbor in the region, the historic location of the first settlement in the island, and the site for Camp Roosevelt, the US Navy operation that lasted from 1903 until their departure in 1975.

The proposed Culebra Auxiliary Cargo Ferry Terminal Facilities are located in the Flamingo Ward, on a peninsula in the northern shoreline of Ensenada Honda Bay. It is bordered to the north by Road 250, to the east by Caño Quebrado, on the west by Ensenada del Cementerio, and on the south by Ensenada Honda. Its coordinates are **Latitude *18°18'22.63"N* and Longitude *65°17'00.44"W*.** (***Figure 1, Location Map***). The highest point within this area is located on the "Y" intersection, at approximately 28 feet above mean sea level (msl).

The proposed construction will take place within the previously impacted area, originally modified by the by the US Navy to established the Culebra Naval Reservation ***Figure 2*** is an ***Aerial Photograph of San Ildefosno taken in 1964*** showing the area during its occupation by the US Navy.

The site is presently used for passive recreation and includes two boat ramps, a pier on pilings with a maximum depth of 13 feet, a seawall approximately 140 feet in length, three heavy duty bollards, an intake structure for a desalination plant, concrete park benches and roofed areas. Its maritime access is through Ensenada Honda Bay, which encompasses approximately 700 acres, with a marked navigation channel and proper aids (outer and inner range channel markers and seven navigation buoys).

The proposed project is a two phase coordination; the first is the construction of the Auxiliary Terminal at San Ildefonso, and the second phase, which will be the reconstruction of the Ferry Terminal. This phase would commence once the Auxiliary Terminal at San Ildefonso is completely operational.

FEMA and the Governor's Authorized Representative, on behalf of the PRPA, have proposed this project to provide a safe and efficient cargo and passenger transportation that is in compliance with state and federal authorities and the needs of the population of Culebra.

One of the main missions of the Federal Emergency Management Agency (FEMA) is to support the citizens of the United States of America and first responders to ensure that as a nation, we work together to build, sustain and improve our capability to prepare for, protect against, respond to, recover from and mitigate all hazards from natural disasters. The Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The HMGP aims to reduce the loss of life and property due to natural disasters and enable mitigation measures to be implemented during the immediate recovery from a disaster. The program is authorized under *Section 404* of the *Robert T. Stafford Disaster Relief and Emergency Assistance Act*.

However no funds have being granted to the proposed project.

Project Description

The proposed Culebra Auxiliary Cargo Ferry Terminal includes the construction of a floating pontoon platform measuring 40 feet in length with a width of 56 feet (2,334.18 square feet) and 4 to 6 round steel pipes with a diameter of 14 inches, driven into the bottom 35 to 38 feet below msl. A vehicular bridge (platform) measuring 35 feet long by 22 feet wide (770 square feet) will connect the pontoon platform to land. An aluminum catwalk will connect the existing pier and the pontoon platform, allowing passengers to board and disembark the ferry while docked. A pile cap and fender measuring 56 feet in length by 6 feet in width (336 square feet) with approximately ten H-piles that will measure 14 inches will be installed on the seaward side of the pontoon platform, with two new cast steel bollards installed at its ends. This structure will allow the cargo ferry to dock with the pontoon platform without damaging the structure. No demolition work or dredging will take place at the area.

See ***Figure 3***, ***Proposed Layout Plan for the Auxiliary Cargo Ferry Terminal, San Ildefonso***, ***Figure 4, Proposed Plan for the Auxiliary Cargo Ferry Terminal, San Ildefonso*** and ***Figure 5, Proposed Section for the Auxiliary Cargo Ferry Terminal, San Ildefonso.***

The construction is estimated to last 6 months. During this period, one barge will use retrievable spuds to secure itself in position, temporarily impacting the sandy bottom. Once this auxiliary platform is completed, the scheduled cargo ferry service from Fajardo to Culebra will dock at San Ildefonso while the existing cargo platform in Sardinas Bay is demolished and rebuilt.

Location

The proposed Culebra Auxiliary Cargo Ferry Terminal Facilities are located on San Ildefonso in Flamingo Ward, on a peninsula in the northern shoreline of Ensenada Honda in the island municipality of Culebra, Puerto Rico. It is bordered to the north by Road 250, to the east by Caño Quebrado, on the west by Ensenada del Cementerio, and on the south by Ensenada Honda. This area was the historic location of the first settlement in the island, named San Ildefonso de la Culebra. The proposed project coordinates are Latitude *18°18'22.63"N* and Longitude *65°17'00.44"W* (***Figure 1, Location Map***).

***Above**: View of Ensenada Honda Bay, looking southwest from the location of the Culebra Auxiliary Cargo Terminal.*

*Drawing not to Scale

Source: Atkins

AUTORIDAD de los PUERTOS de PUERTO RICO	CULEBRA AUXILIARY CARGO FERRY TERMINAL AT SAN ILDEFONSO BENTHIC HABITAT STUDY	LOCATION MAP	ATKINS	FIGURE 1

*Drawing not to Scale

Source: USGS, Atkins

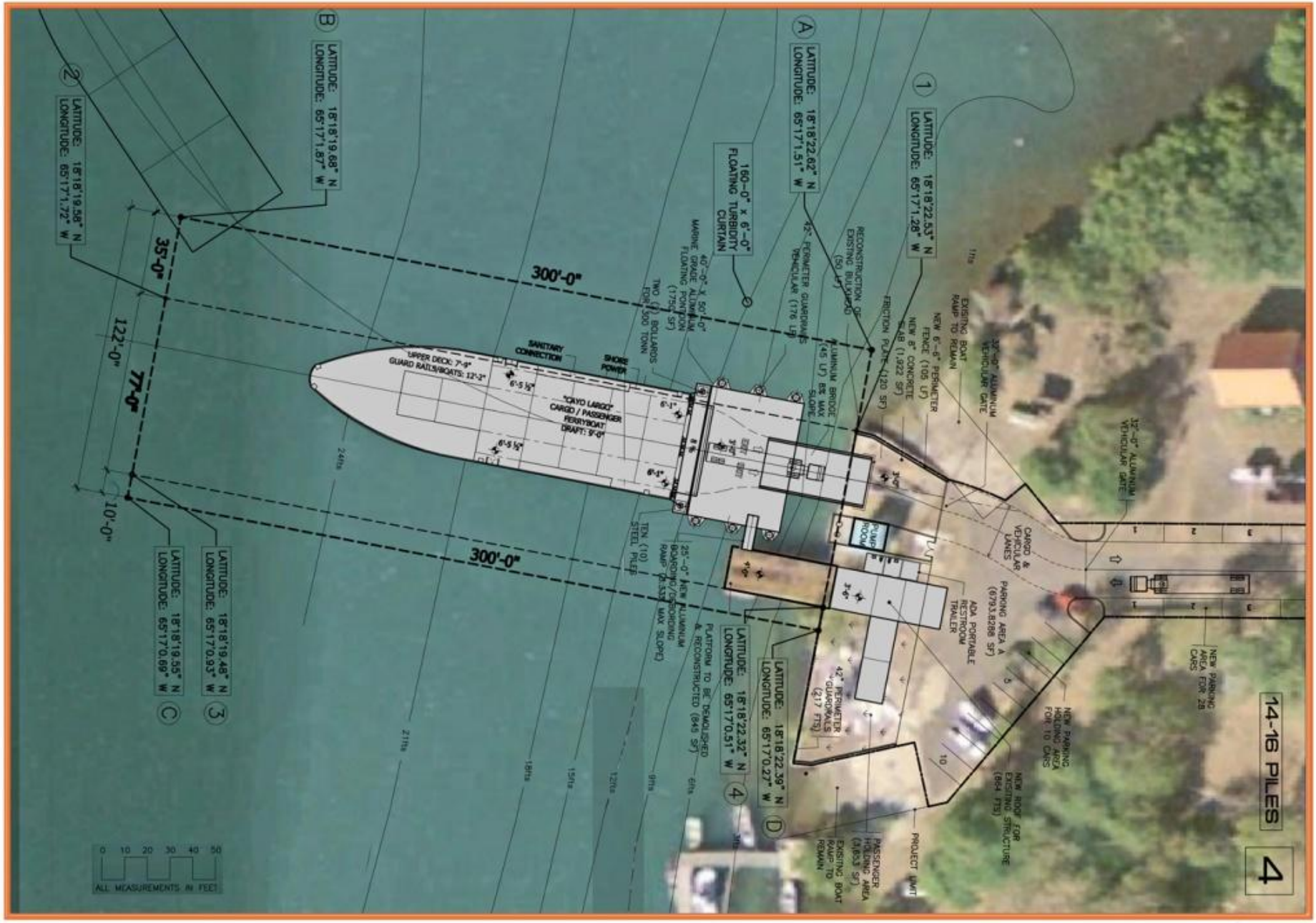
AUTORIDAD de los PUERTOS de PUERTO RICO

CULEBRA AUXILIARY
CARGO FERRY TERMINAL
AT SAN ILDEFONSO
BENTHIC HABITAT STUDY

SAN ILDEFONSO
1964 AERIAL PHOTOGRAPH

ATKINS

FIGURE
2



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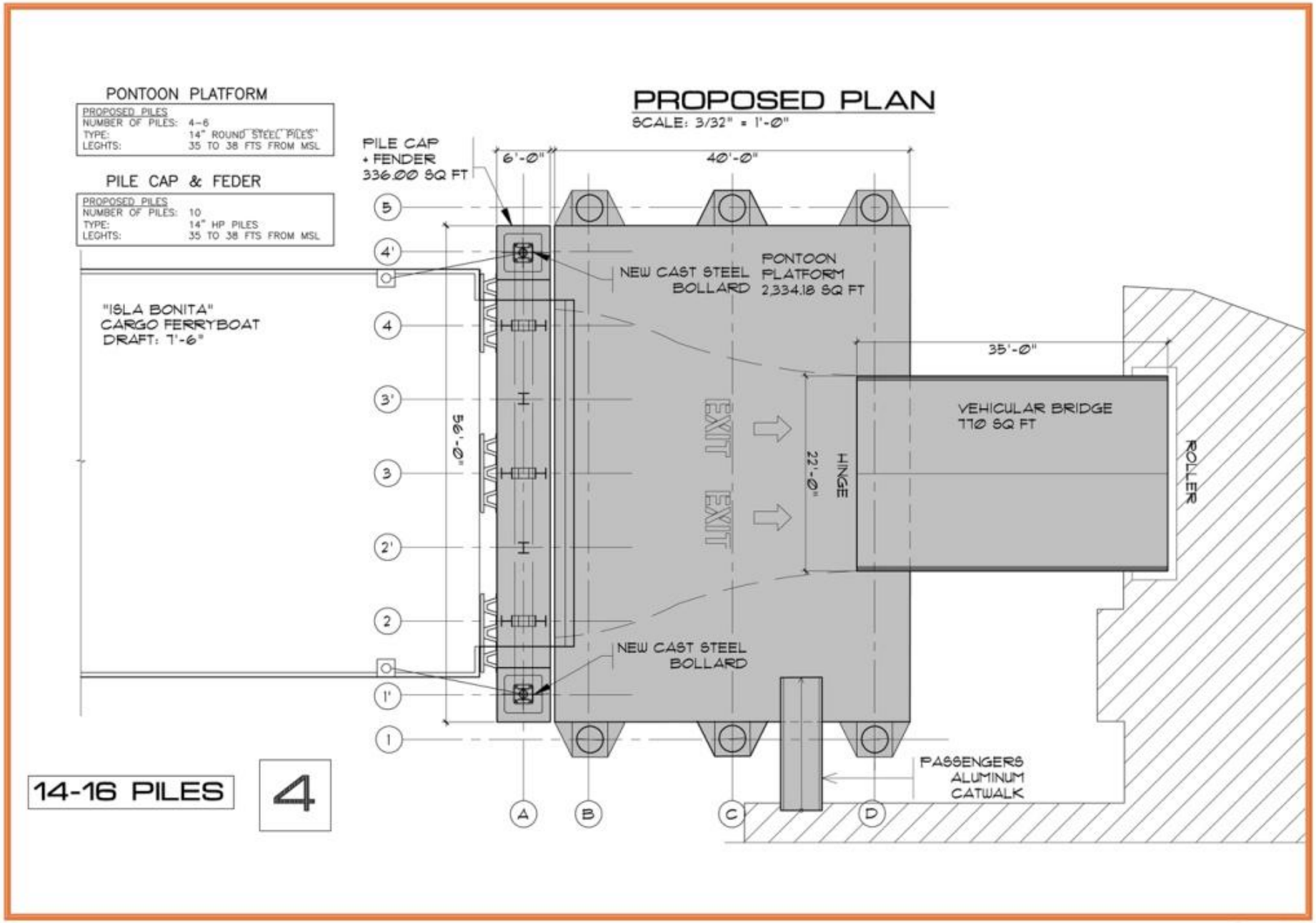
AUTORIDAD de los PUERTOS de PUERTO RICO	CULEBRA AUXILIARY CARGO FERRY TERMINAL AT SAN ILDEFONSO BENTHIC HABITAT STUDY	PROPOSED LAYOUT PLAN FOR THE AUXILIARY CARGO FERRY TERMINAL SAN ILDEFONSO	ATKINS	FIGURE 3



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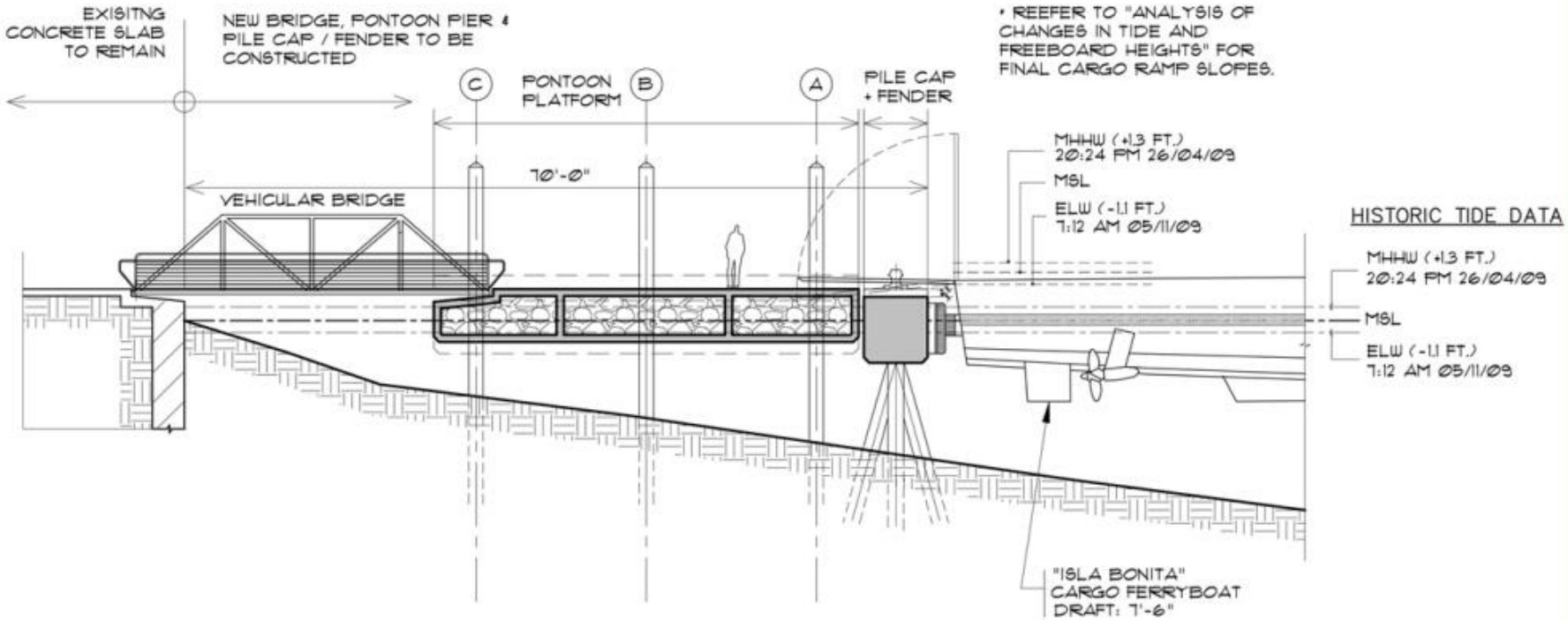
AUTORIDAD de los PUERTOS de PUERTO RICO	Culebra Auxiliary Cargo Ferry Terminal At San Ildefonso Benthic Habitat Study	Proposed Plan for the Auxiliary Cargo Ferry Terminal San Ildefonso	ATKINS	Figure 4



PROPOSED SECTION A-A

SCALE: 3/32" = 1'-0"

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AUTORIDAD de los PUERTOS de PUERTO RICO	CULEBRA AUXILIARY CARGO FERRY TERMINAL AT SAN ILDEFONSO BENTHIC HABITAT STUDY	PROPOSED SECTION FOR THE AUXILIARY CARGO TERMINAL SAN ILDEFONSO	ATKINS	FIGURE 5

Preliminary Assessment

A preliminary reconnaissance of the project area was conducted prior to data collection which allowed the survey team to identify the habitat types present within and to determine the most suitable methodologies for assessing the benthic communities and environmental resources. In addition, aerial photographs, nautical charts and past literature from the area were used to establish the methodology for the field study.

General Site Description

The project is located in an existing pier area situated in the north-central shore of Ensenada Honda (see ***Figure 1***). The seawall structure is composed of encased concrete pilings with a solid concrete beam spanning the entire front that measures nearly 140 feet. East and west of the seawall/dock, there are a pair of boat ramps that measure approximately 25 feet in width. Near the center of the seawall/dock structure is a concrete pier covered in wood slabs measuring approximately 20 feet wide by 40 feet in length, supported by approximately 20 encased pilings/columns.

***Above**: View of the location of the proposed Culebra Auxiliary Cargo Terminal at San Ildefonso.*

Beyond the seawall, the seafloor is covered in riprap and debris of anthropogenic source. Further away, the bottom consists of unconsolidated, fine sediments. A variety of cover organisms are found below sea level, as described below.

Methodology

The field effort for the environmental baseline survey was conducted on August 18 through 21, 2014. The objective of this study is to document benthic communities present in the area and to create a map of the benthic communities found. During the time of the survey, water clarity was below average but typical of the area, with visibility in the deeper sections at around 8 feet and minimal wave action. A team of 3 scuba divers/scientists conducted the study.

The survey consisted of plotting seven 300 foot transects starting perpendicular to the concrete beam of the dock and separated from one another by 20 feet. A 300 foot measuring tape was placed on the initial location on shore, in which a waypoint was marked with a Garmin GPSMap 78 GPS unit. Using a compass, a diver proceeded to swim out at a 210° perpendicular to the shoreline carrying the end of the measuring tape and a diver/marker buoy attached to a line. Once reaching the 300 foot mark, the measuring tape was dropped to the bottom and the location identified with another waypoint. Starting from the shoreline, Atkins scientists proceeded to dive along the bottom, describing substrate, cover organisms, and estimating percent coverage using a 1 meter by 1 meter quadrant with a 0.1 meter grid, documenting macroinvertebrates and vertebrates sighted.

Atkins scientists advanced through the bottom following the tape measurepreviously placed transect line, setting the quadrat at each change of cover type. Once the quadrat was set, the divers noted the date and time, depth, distance from shore, characterizing the benthic habitat and substrate composition, photographed the area (using a Canon D30 camera), estimated percent cover of benthic vegetation, and identified other benthic organisms present.

Seagrass Mapping

To document the location of existing seagrass beds near the vicinity of the proposed project, Atkins scientists initially conducted a preliminary reconnaissance swim using snorkelling equipment to identify the relative location of seagrass beds in the area. After the preliminary reconnaissance, the edge of the seagrass bed was documented. One scientist swam directly above the edge of bed, followed closely behind by a snorkeler collecting geospatial data using a Garmin GPSmap 78 handheld GPS unit. Seagrass species composition and photographs were

also recorded. ***Figure 6*** is a ***Seagrass Habitat Map*** of the seagrass beds located west of the project.

Seagrass communities in Ensenada Honda are influenced by depth due to the low water visibility in the bay, which limits their growth to shallow areas. This has been a combined result of historically poor land management practices, frequent runoff pulses and continuos sewage pulses around Ensenada Honda. Nevertheless, seagrasses are still largely productive and constantly frequented by the endangered Green Turtle *(Chelonya mydas)* and still support a myriad of reef fishes in their juvenile stages, as weel as frequent large foraging predators such as Barracudas *(Sphyraena barracuda)* , Snappers *(Lutjanus sp.)* and small to medium sized sharks (Edwin A. Hernández, 2008).

***Above**: General view of the seagrass habitats located west of the proposed Culebra Auxiliary Cargo Terminal at San Ildefonso.*

Coral Survey

The preliminary reconnaissance revealed that no Acroporid corals are present within the survey area. For this reason, it was not necessary that the *Acropora* spp. survey protocol from the National Marine Fisheries Service (NMFS) be conducted at the project location. Because the survey was being conducted for the purposes of estimating impacts from the proposed construction, it was determined that the documentation of individual coral colonies would provide the most valuable information in terms of estimating and minimizing impacts to the coral community. For this reason, field efforts focused on identifying and mapping those coral colonies larger than or equal to (≥) 10 cm in diameter within the impact area. The ultimate goal

of these mapping efforts was to estimate impacts to the coral community and to determine potential avoidance/minimization and mitigation options.

Habitat Cover Descriptions

Habitats or features smaller than approximately five square meters were not considered. For example, colonized rubble among barren mud/sand substrate is too small to be mapped independently. Cover type refers only to predominate biological component colonizing the surface of the feature and does not address location (e.g., on the shelf or in the lagoon). The cover types are defined in a collapsible hierarchy ranging from eight major classes (coral, seagrass, macroalgae, coralline algae, turf algae, emergent vegetation, uncolonized, and unknown), combined with a density modifier representing the percentage of the predominate cover type (10%≤50% sparse, 50%≤90% patchy, 90% to 100% continuous). For the San Ildefonso/Ensenada Honda project site, only seagrass, macroalgae, and uncolonized cover types were documented. Following is a description of the cover types that were identified within the project site.

Seagrasses:

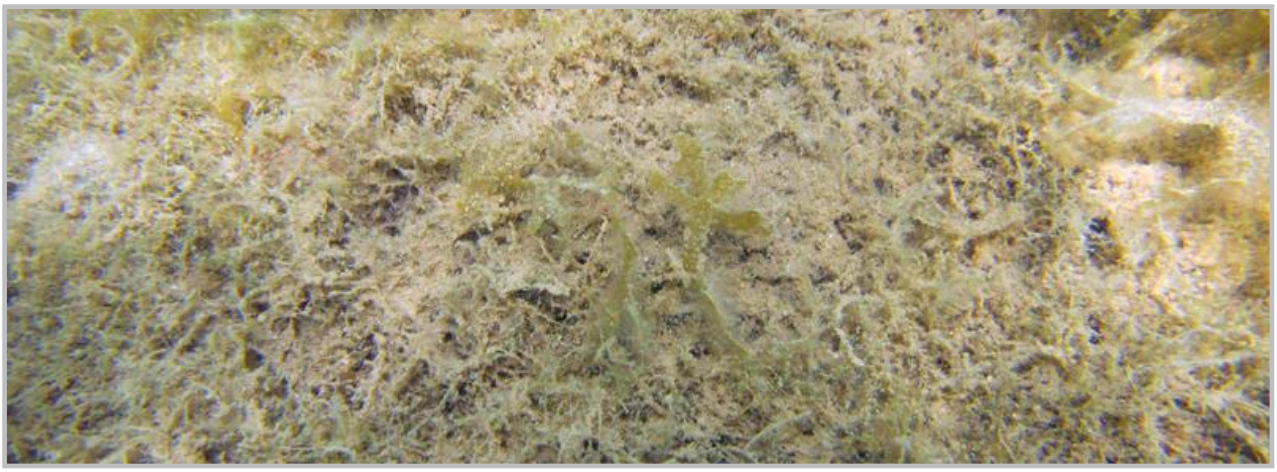
Habitat with 10 percent of more of seagrass.

- **Continuous Seagrass:** A seagrass community covering 90% or greater area of the substrate.
- **Patchy Seagrass:** A discontinuous seagrass community with breaks in coverage that are too diffuse or irregular, or result in isolated patches of seagrass that are too small to be mapped as continuous seagrass. Overall cover is estimated at 50%≤90% of the bottom.
- **Sparse Seagrass:** A discontinuous seagrass community with breaks in coverage that are too diffuse or irregular, or result in isolated patches of seagrass that are too small to be mapped as continuous seagrass. Overall cover is estimated at 10%≤50% of the bottom.

Macroalgae

Substrates with 10 percent or greater coverage of any combination of numerous species of red, green, or brown macroalgae. Usually occurs in shallow backreef and deeper waters on the bank/shelf zone.

- **Continuous Macroalgae:** Macroalgae covering 90 percent or greater of the substrate. May include patches of less than 9 percent of the total area that are too small to be mapped independently
- **Patchy Macroalgae:** Discontinuous macroalgae with breaks in coverage that are too diffuse or irregular, or result in isolated patches of macroalgae that are too small to be mapped as continuous macroalgae. Overall cover is estimated at 50%≤90% of the bottom.
- **Sparse Macroalgae:** Discontinuous macroalgae with breaks in coverage that are too diffuse or irregular, or result in isolated patches of macroalgae that are too small to be mapped as continuous macroalgae. Overall cover is estimated at 10%≤50% of the bottom.

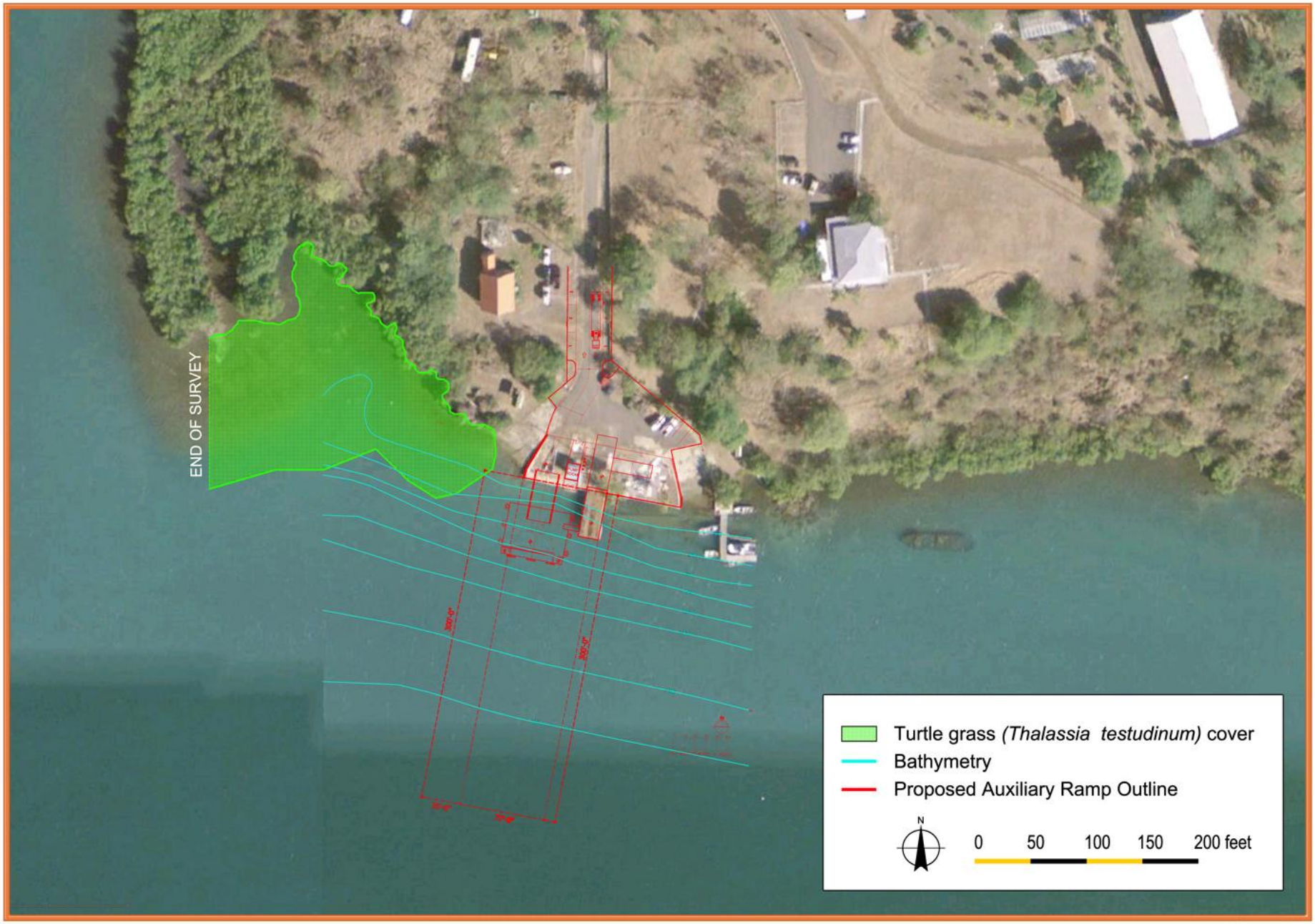


***Above**: Typical macroalgal cover within the location of the Culebra Auxiliary Cargo Terminal at San Ildefonso.*

Uncolonized

Substrates not covered with a minimum of 10% of any of the above biological cover types. This habitat is usually on sand or mud structures. Overall uncolonized cover is estimated at >90of the bottom.

***Above**: Infaunal burrows typically present in the area.*



*Drawing not to Scale

Source: Atkins

AUTORIDAD de los PUERTOS de PUERTO RICO

CULEBRA AUXILIARY
CARGO FERRY TERMINAL
AT SAN ILDEFONSO
BENTHIC HABITAT STUDY

SEAGRASS HABITAT COVER

ATKINS

FIGURE
6

General Condition of the Survey Area

The benthic substrate immediately adjacent to the seawall structure west of the existing pier(within the impact area) consisted mainly of a mix of rip-rap (rock rubble) intermixed with small amounts of sand, which were colonized by patches no wider than 3 feet, 1 to 10 feet long of turtle grass *(Thalassia testudinum)* (Transects 3 to 7). With the exception of a few very small colonies of encrusting *Siderastrea radians* observed on the rock rubble, no corals were documented on the substrate adjacent to the seawall.

East of the existing pier outside of the impact area, a concrete slab that was originally part of the pier, lies in between 3 to 4 feet of water at approximately less than 30 feet from the seawall. This slab has a dense macroalgal growth composed mostly of *Dictyota sp* and small colonies of *Siderastrea radians* adhered to its edges. A dense growth of *Thalassia testudinum* was documented growing at a distance of up to 13 feet from the seawall.

The seawall, which measures 140 feet from one end to the other, provides habitat for typical encrusting organisms, such macroalgae, crustose coralline algae, mollusks, sponges, tunicates, bryozoans, and polychaete worms.

The pier support piles were encrusted with invertebrates, such as macroalgae, oysters, crustose coralline algae, mollusks, sponges, tunicates, bryozoans, and polychaete worms.

Moving away from the seawall, the substrate generally transitioned to sandy/muddy habitat where various species of macroalgae, mostly a mix of *Dictyota spp*., *Halimeda spp*., and *Caulerpa prolifera* are present.

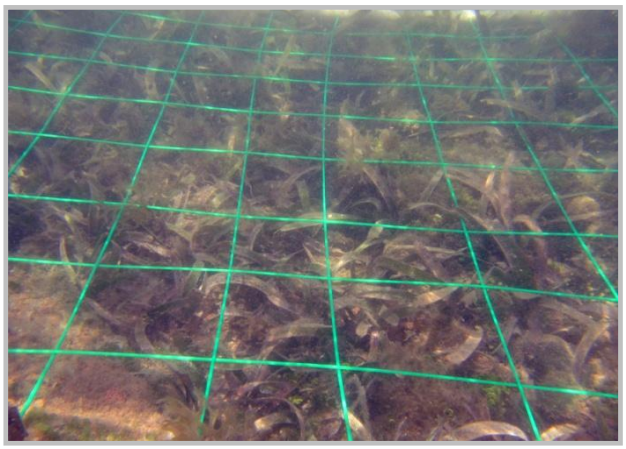
See ***Figure 7*** for the ***Benthic Habitat Map***,

Above: *Submerged concrete slab located on the east side of the pier.*

Findings

Transect 1

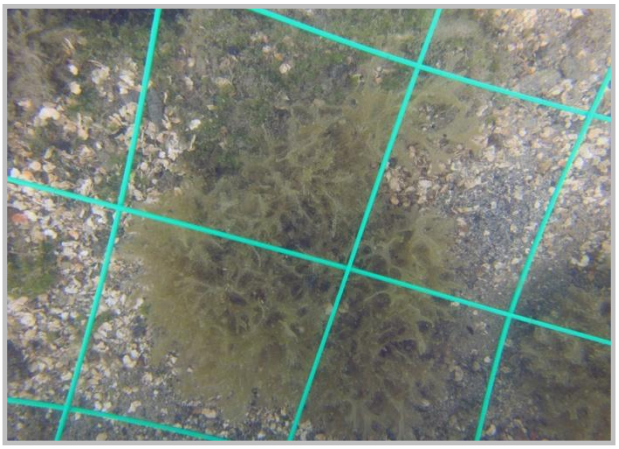
The initial point of Transect 1 is located at *18°18'22.39"N, 65°17'00.29"W*, being the easternmost transect line. Starting at the seawall, the substrate composition is mostly covered by riprap/rock rubble from 1.3 to 22 feet (distances are from the seawall) and reaches a maximum depth of 4 feet. These areas have a dense growth of seagrass dominated by *Thalassia testudinum* (50% cover), in addition to sparse macroalgae such as *Caulerpa prolifera* (28% coverage), *Halimeda spp*. and *Dictyota spp*. (10% coverage). The concrete slab, which begins at a distance of 22 to 35 feet, is covered in a dense macroalgae growth, mostly *Dictyota spp.* (70% cover) with various small *Siderastrea* corals of less than 8 cm in diameter. Once reaching the end of the slab, the bottom drops and substrate composition changes to a mix of sand, mud and riprap until a distance of 57 feet, at a depth of 13 feet, with a sparse macroalgal growth mostly composed of *Dictyota spp.* (55% coverage), and filamentous algae. At a distance of approximately 71 feet, substrate composition shifts to a mostly mud and sand bottom, with sparse growth of *filamentous algae* (less than 5% cover). At between 86 and 108 feet, various patches of *Halophila decipiens* (less than 10% cover) were found among the sparse macroalgal growth. Beyond the 108 feet, the transect line continues with a mostly uncolonized mud/sand bottom substrate until reaching a distance of 150 feet at a depth of 22 feet. Visibility becomes close to zero beyond 150 feet and 20 feet in depth.



Above, left**: View of seagrass habitat found in the area between the seawall and the concrete slab.* ***Above, right: *Patches of Halophila decipiens.*

Transect 2

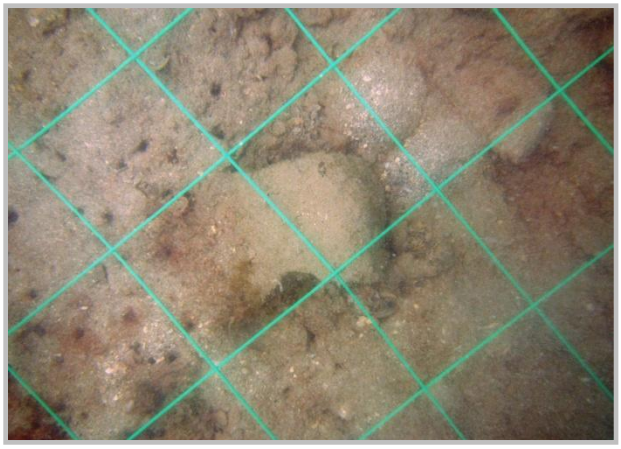
The initial point of Transect 2 is located at *18°18'22.43"N, 65°17'00.48"W*. Starting at the seawall, the substrate composition is mostly riprap/rock rubble from 2 to 27 feet and reaches a maximum depth of 5 feet. These areas have a sparse macroalgal growth generally composed of species such as *Dictyota spp.* (10% cover), *Halimeda spp*. (10% cover), and mat algae association. A 50% coverage of seagrass dominated by *Thalassia testudinum* is located between the seawall and the concrete slab. This concrete slab is located at a distance of 25 to 45 feet from the seawall. It is covered in a dense macroalgae growth of *Dictyota spp.* (70% cover) and mat algae associations (20% cover) with various small *Siderastrea* corals of less than 8 cm in diameter. At the end of the slab, the bottom drops and substrate composition changes is mostly riprap until reaching a distance of 77 feet, at a depth of 17 feet, with a patchy macroalgal growth mostly composed of *Dictyota spp* and associated growth. At a distance of approximately 77 feet, substrate composition is generally mud and sand, with a limited growth (less than 8% cover) of *Dictyota spp*. Beyond 121 feet and 17 feet in depth, the transect line continues with a mostly uncolonized mud/sand bottom substrate until reaching a distance of 150 feet, with depths of 23 feet.



***Above, left**: Macroalgae. **Above, right:** A patch of Dictyota spp. in shallow near the concrete slab.*

Transect 3

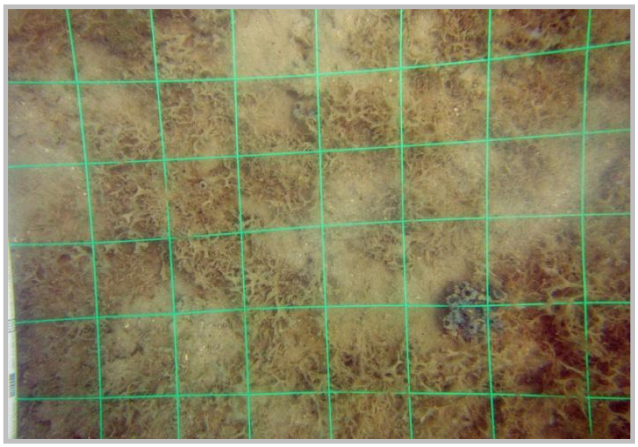
The initial point of Transect 3 is located at *18°18'22.04"N, 65°17'00.74"W*, which is right at the ende of the existing pier. This point was started at 41 feet from the seawall at a depth of 12 feet. This transect was not started at the seawall due to the dangers of navigating under the pier and through the pier pilings, where many hazards were present, such as exposed rebars that were suspended into the water, in addition to discarded fishing lines and hooks. Substrate composition at a distance of 42 feet from shore is mostly sandy mud with riprap. Debris such as discarded tires, a zinc sheet, a pair of concrete benches (same as those used in the existing Plaza Artesanal structure) and discarded fishing gear where found in at the bottom in the end of the dock. Other than an approximately 20 % cover of Poriferans, the substrate was mostly devoid of any life. A patchy macroalgal growth of mostly *Dictyota spp.* (35% cover) and *Halimeda spp.* (10% cover) was documented, in addition to typical algae matt association and sponge growth (20% cover) to a distance of approximately 108 feet. Beyond 108 feet, the transect line continues with a mostly uncolonized mud/sand bottom substrate, except for a small patch of *Halophila decipiens* (less than 10% cover) at nearly 115 feet, before reaching a distance of 150 feet and 22 feet of depth. Substrate composition remains similar throughout, although with a reduced content of rubble with increased distance from the seawall.



Above, left**: Small sponge growths near the dock in Transect 3.* ***Above, right: *Typical bottom composition near at approximately 20 feet in depth.*

Transect 4

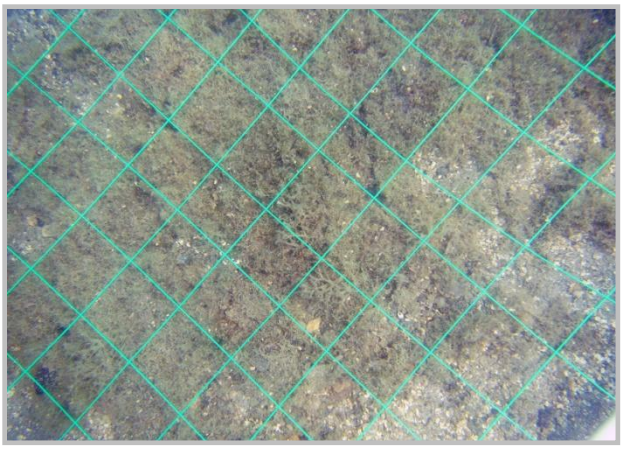
The initial point of Transect 4 is located at *18°18'22.48"N, 65°17'00.87"W*. This transect starts in the location of the PRASA water intake for the desalination plant. The substrate composition is mostly riprap/rock rubble, sand and mud with a patchy macroalgal growth of mostly *Halimeda spp*., (10% cover), *Dictyota spp.* (10% cover) and filamentous algae (40% cover) at a distance from 0 to 17 feet from the seawall. Bottom substrate continues with a similar composition until reaching a distance of nearly 74 feet and 21 feet in depth, where it changes to mostly mud and sand. A patchy discontinuous macroalgal cover of approximately 37%, composed mostly of filamentous algae (20% cover) and *Dictyota spp*. (10% cover) was observed. Further down the transect line (between 74 to 110 feet) there is a patch of macroalgal growth with a coverage percentage of approximately 85% mostly composed of *Dictyota spp*. (80% cover) and various scattered sponge clusters. A *Siderastrea* coral and various organisms (mostly macroalgae) were documented encrusting in what appeared to be a discarded engine block at a distance of over 80 feet from the seawall, in addition to a presence of *Halophila decipiens.* The bethic coverage decreases farther from the shoreline, becoming barren beyond 115. A 6 inch pipe was documented at a distance of 119 feet from the seawall, parallel to the shore.

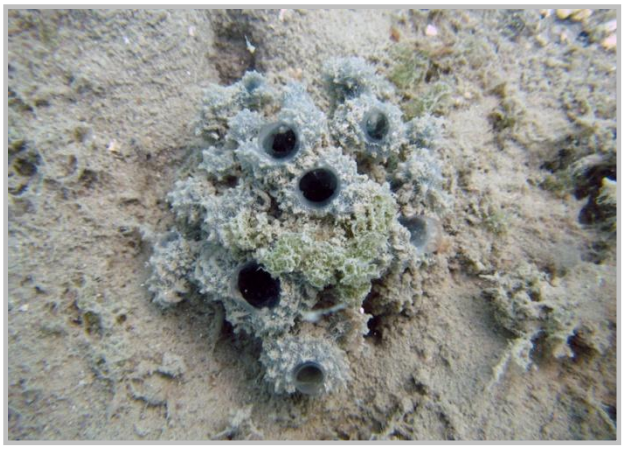


Above, left**: Typical macroalgal cover found in Transect 4.* ***Above, right: *A Siderastrea coral and various organisms (mostly macroalgae) were documented encrusting in what appeared to be a discarded engine block at a distance of over 80 feet from the seawall. A patch of Halophila decipiens can be observed in the background, at right.*

Transect 5

The initial point of Transect 5 is located at *18°18'22.52"N, 65°17'01.06"W,* near the center of the proposed location of the auxiliary terminal. Beginning at the seawall, the substrate composition is mostly riprap/rock rubble from 0 to 5 feet and reaches a maximum depth of 5 feet. There is a discontinuous patchy cover of macroalgae, mostly *Caulerpa prolifera* (10% cover), *Halimeda spp* (10% cover) and *Dictyota spp* (40% cover). A sparse 15% seagrass cover of *Thalassia testudinium* can be found among the rock rubble near the seawall in open sandy substrate. At a distance of 5 to 42 feet from the seawall, the bottom substrate composition changes to a mixture of sand/mud and riprap, with the dominant cover being macroalgae, mostly *Dictyota spp.* (40% cover). Beyond 103 feet, bottom composition remains mud and sand, generally uncolonized. A 6 inch pipe was documented at a distance of 103 feet from the seawall at an angle to shore.

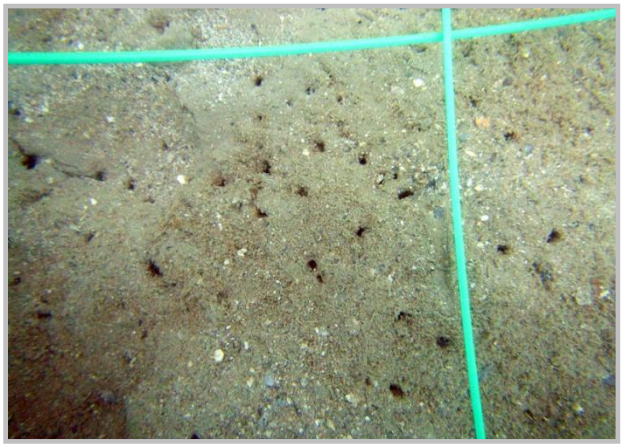




***Above, left**: Typical macroalgae cover (quadrant grid overlay, 50% ≥ 90% cover). **Above, right:** One of the sponges chracteristically dotting the mud/sand bottom.*

Transect 6

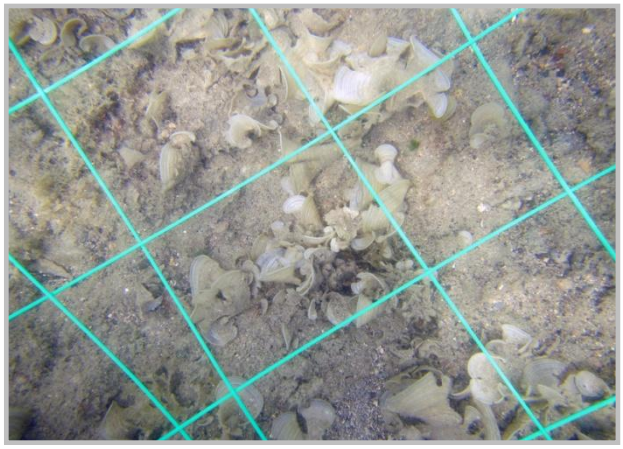
The initial point of Transect 6 is located at *18°18'22.55"N, 65°17'01.26"W,* at the westernmost end of the existing seawall. Beginning at the seawall, the substrate composition is mostly riprap/rock rubble with sand and mud from 0 to 9 feet and reaches a maximum depth of 6 feet. There is a discontinuous patchy cover of macroalgae (82% cover), mostly *Caulerpa prolifera* (10% cover), *Halimeda spp.* (15% cover) and *Dictyota spp* (25% cover). A sparse 5% seagrass cover of *Thalassia testudinium* was observed among the rock rubble near the seawall in open sandy substrate. At a distance of 9 to 59 feet from the seawall, the bottom substrate composition changes to a mixture of sand/mud and rubble, with the dominant cover being macroalgae, mostly *Dictyota spp* (50% coverage) and a 25% cover of associated matt algae. Average depth is 15 to 20 feet. From 59 to 111 feet from the seawall, bottom composition is mostly mud and sand, with a sparse macroalagal cover of 11%, mostly *Dictyota spp*. At a distance of 111 to 135 feet, bottom substrate composition remains mud and sand, with a 4% macroalgal cover. The benthos remains mostly uncolonized to 300 feet, at depths ranging from 20 to 23 feet.



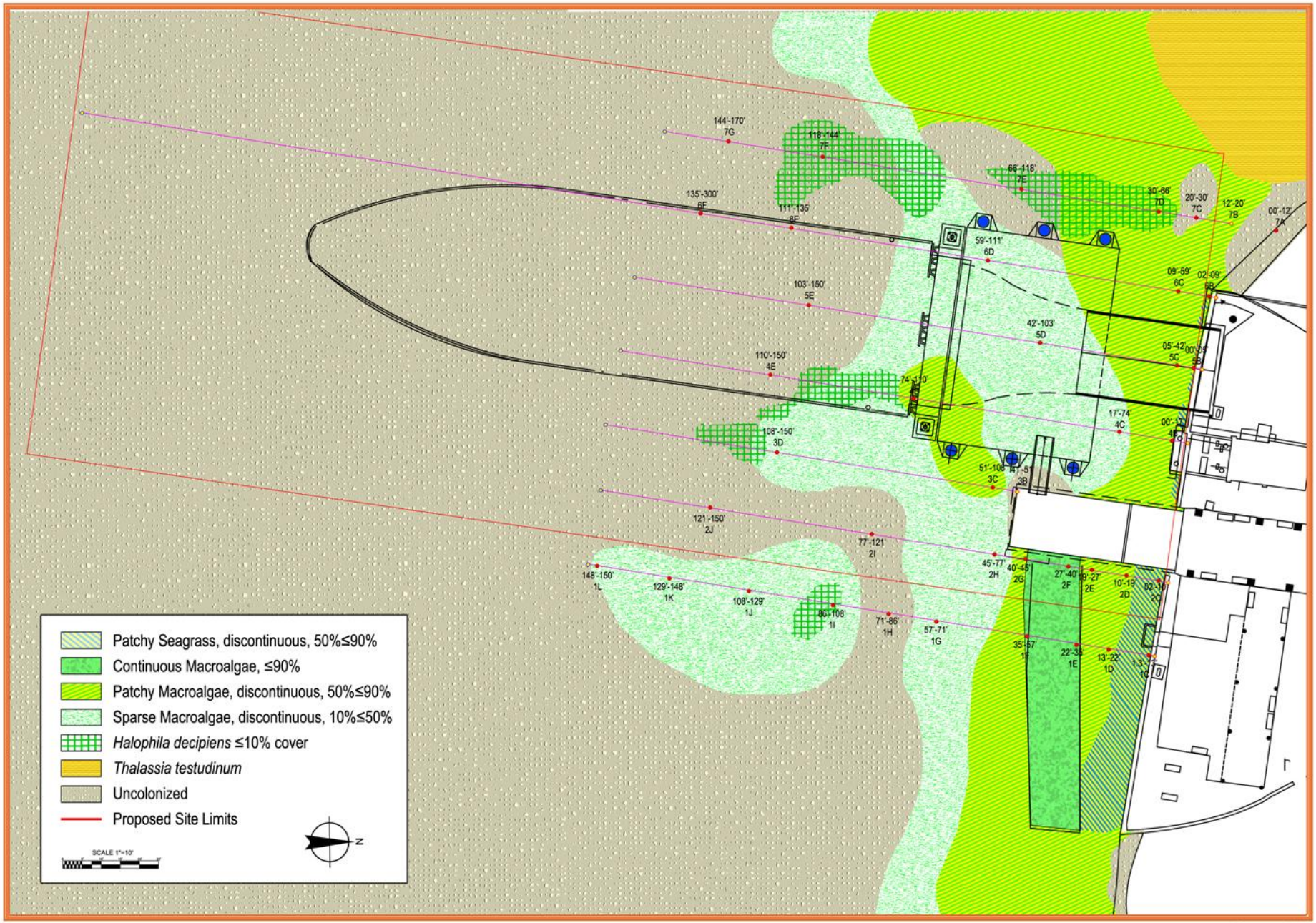
Above, left**: Typical seagrass cover among the rock rubble near the seawall.* ***Above, right: *Infaunal burrows on the muddy substrate typical of the majority of the bottom in the study area.*

Transect 7

The initial point of Transect 7 is located at *18°18'22.59"N, 65°17'01.46"W.* The westernmost transect line begins at the boat ramp at a distance of 0 (mean low tide level) to 20 feet. The area near the waterline is mostly uncolonized, with an artificial substrate (concrete slab). At a distance of approximately 12 feet, with depths from 0 to 2 feet, there is a patchy growth of macroalgae, mostly *Dictyota spp.* (20% cover) and *Padina jamaicensis* (50% cover). At a distance of 20 to 30 feet, substrate is mostly composed of rubble, debris, sand and mud, with a depth of approximately 6 feet. A 46% cover of macroalgae is present, mostly *Dictyota spp.* (15%) and *Padina jamaicensis* (20%). This cover trend continues farther from shore (30 to 66 feet), with *Padina jamaicensis* cover transitioning to *Dictyota spp.* as depth the increases. At a distance of approximately 30 feet, there is a patchy cover of *Halophila decipiens* (< 10%) in a sand/mud substrate that is present to approximately 140 feet, with depths near 23 feet. A 6 inch pipe was documented at a distance of 103 feet from the seawall at an angle to shore.



Above, left**: Close-up view of a typical patch of Halophila decipiens (< 10% cover). identified within the study area.* ***Above, right: *Padina jamaicensis, common in shallow waters near the boat ramp.*



*Drawing not to Scale

Source: Atkins

AUTORIDAD de los PUERTOS de PUERTO RICO	Culebra Auxiliary Cargo Ferry Terminal At San Ildefonso Benthic Habitat Study	Benthic Habitat Map	ATKINS	Figure 7

Table 1: Plantae Species

	Scientific Name	Common Name	Family
1	*Caulerpa mexicana*	--	Caulerpaceae
2	*Caulerpa sertularioides*	feather algae	Caulerpaceae
3	*Dictyota spp*	forkweed	Dictyotaceae
4	*Halimeda goreaui*	small leaf hanging vine	Halimedaceae
5	*Halimeda incrassata*	three finger leaf alga	Halimedaceae
6	*Halimeda opuntia*	halimeda	Halimedaceae
7	*Halophila decipiens*	paddle grass	Hydrocharitaceae
8	*Padina jamaicensis*	white scroll algae	Dictyotaceae
9	*Penicillus capitatus*	penicillus	Udoteaceae
10	*Penicillus pyriformis*	penicillus	Udoteaceae
11	*Rhipocephalus phoenix*	pinecone algae	Udoteaceae
12	*Sargassum spp*	sargassum	Sargassaceae
13	*Thalassia testudinum*	turtle grass	Hydrocharitaceae
14	*Ventricaria ventricosa*	bubble algae	Valoniaceae

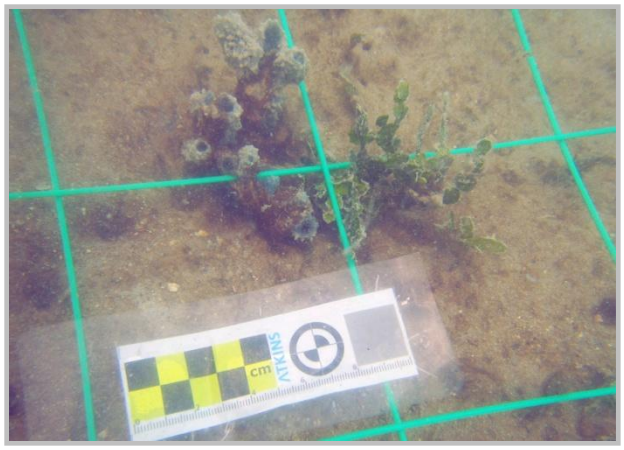
Note: *the identification of all algal species encountered not possible under present scope of work*

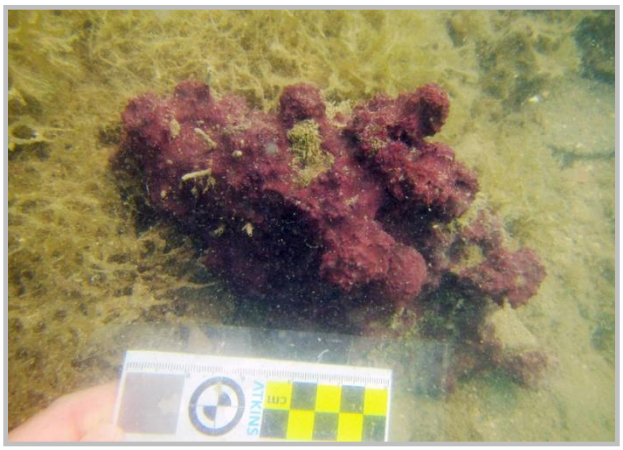
Table 2: Animalia Species

	Scientific Name	Common Name	Family
1	*Acanthurus coeruleus*	blue tang	Acanthuridae
2	*Bartholomea annulata*	corkscrew anemone	Aiptasiidae
3	*Cassiopea xamachana*	upside-down jellyfish	Cassiopeidae
4	*Chaetodon capistratus*	foureye butterflyfish	Chaetodontidae
5	*Condylactis gigantea*	giant Caribbean anemone	Actiniidae
6	*Diploria spp*	brain coral	Faviidae
7	*Dondice occidentalis*	sea slug	Facelinidae
8	*Ecteinascidia turbinata*	mangrove tunicate	Perophoridae
9	*Gerres cinereus*	yellow fin mojarra	Gerreidae
10	*Holothuria mexicana*	donkey dung sea cucumber	Holothuriidae
11	*Isostichopus badionotus*	three-rowed sea cucumber	Stichopodidae
12	*Lutjanus griseus*	mangrove snapper	Lutjanidae
13	*Madracis sp*	madracis coral	Astrocoeniidae
14	*Mulloidichthys martinicus*	yellow goatfish	Mullidae
15	*Ocyurus chrysurus*	yellowtail snapper	Lutjanidae
16	*Oreaster reticulatus*	red cushion sea star	Oreasteridae
17	*Platybelone argalus*	keeltail needlefish	Belonidae
18	*Pomacanthus paru*	angelfish	Pomacanthidae
19	*Sabellastarte magnifica*	magnificent feather duster	Sabellidae
20	*Scarus taeniopterus*	princess parrotfish	Scaridae
21	*Siderastrea radians*	lesser starlet coral	Siderastreidae
22	*Siderastrea siderea*	massive starlet coral	Siderastreidae
23	*Sphyraena barracuda*	great barracuda	Sphyraenidae
23	*Stegastes diencaeus*	longfin damselfish	Pomacentridae
24	*Synodus intermedius*	sand diver	Synodontidae

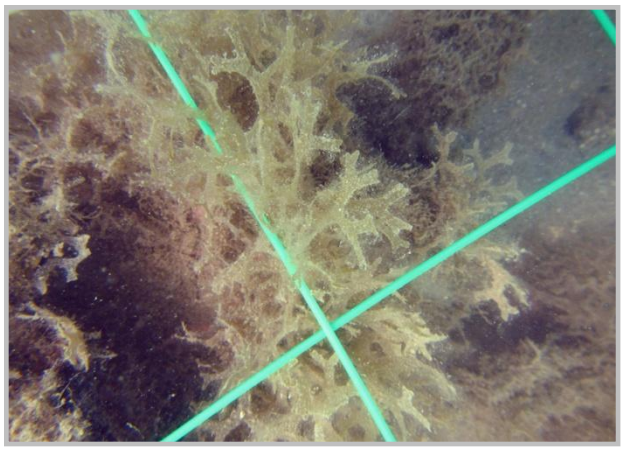
Note: *the identification of Ascideans, Bryozoans, Poriferans and various Mollusks and Polychaetes not possible under present scope of work.*

Photographic Documentation



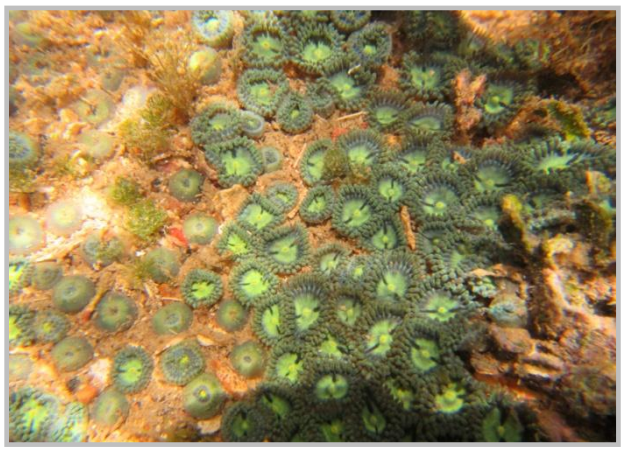


Above, left**: A sponge cluster (left) and Halimeda goreaui observed in Transect 1.* ***Above, right: *Another sponge cluster observed along Transect 1.*

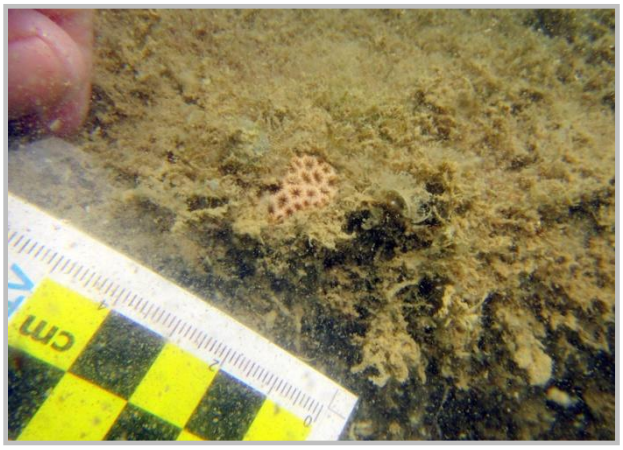


Above, left**: Close up view of a Dictyota spp., the dominant macroalgae in the study area.* ***Above, right: *Thalassia testudinum with young Halimeda sprouting in the foreground, in areas of Transect 1.*

Photographic Documentation

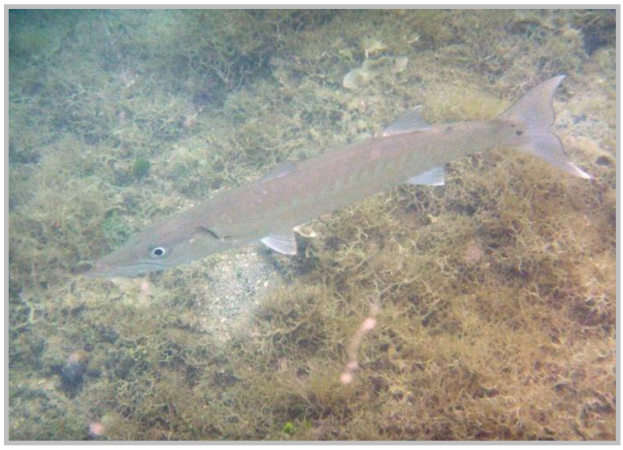


Above, left**: Madracis sp. identified among the rocks near the dock and seawall in Transect 2.* ***Above, right: *A sea cucumber, Isostichopus badionotus among the Dyctiota spp. algae on the concrete slab in Transect 2.*

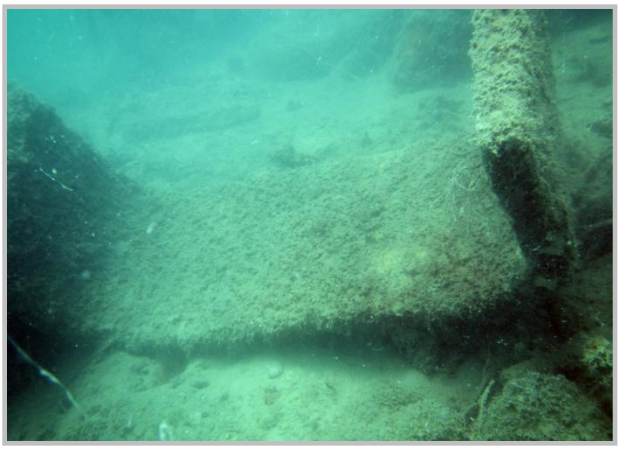


Above, left**: Debris found at the end of the dock in Transect 3. A discarded concrete bench can be observed in the top portion of the photograph.* ***Above, right: *A very small (less than 2cm diameter) Siderastrea radians on the edge of the concrete slab in Transect 2.*

Photographic Documentation



Above, left**: Synodus intermedius, a common species along sandy/muddy bottoms typical of the area.* ***Above, right: *A juvenile Sphyraena barracuda swimming near the west boat ramp.*



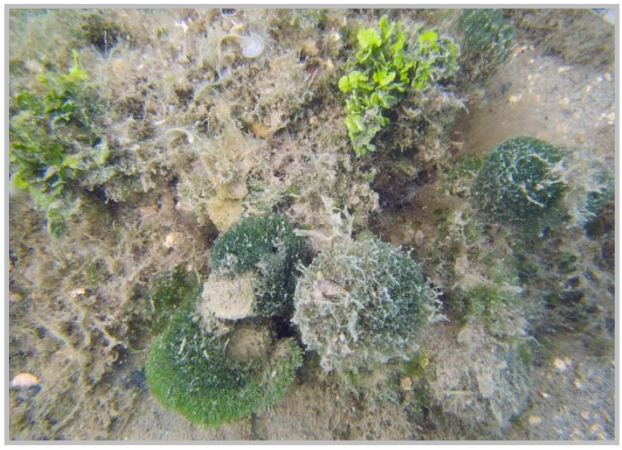
Above, left**: Debris found at the end of the existing pier.* ***Above, right: *Lead scientist Francisco Pérez noting on observations in Transect 3.*

Photographic Documentation – Transect 4

Above, left**: A pair of Lutjanus griseus among the debris near the dock in Transect 4.* ***Above, right: *Ocyurus chrysurus, Mulloidichthys martinicus and various Acanthurus spp. amongst the debris at the end of the dock in Transect 4.*

Above, left**: Various encrusting organisms attached to the seawall in Transect 4 .* ***Above, right: *PRASA desalination plant intake at the seawall.*

Photographic Documentation



***Above, left**: Various macroalgae species common in the study area, Transect 5; Halimeda spp. (top, light green) and Penicillus capitatus (spherical "brushes"). **Above, right:** The 6 inch pipe documented in the area that crosses east-west at an angle to the shoreline.*

***Above, left**: Encrusting organisms, mostly mussels and clams, attached to a PVC pipe in the existing dock. **Above, right:** Unidentified juvenile fish swimming over the seagrass beds west of the proposed location of the Auxiliary Terminal in Bahía del Cementerio.*

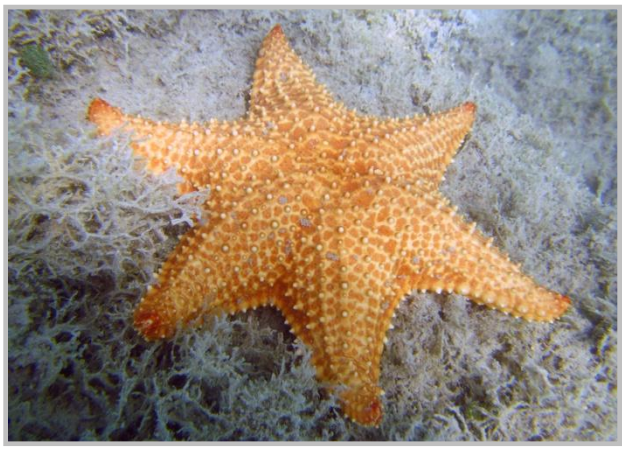
Photographic Documentation

Above, left**: Seagrass cover near the seawall in Transect 6.* ***Above, right: *A Cassiopea xamachana jellyfish, common among mangrove habitats. This individual was fiund among the macroalgae cover in Transect 6*

Above, left**: Halimeda goreaui growing among mat algae in Transect 6.* ***Above, right: *Penicillus capitatus, common species throughout the area.*

Photographic Documentation

***Above, left**: A colony of sea squirts, Ecteinascidia turbinata, attached to a rock near the seawall in Transect 7.*
***Above, right:** A nudibranch**,** Dondice occidentalis, observed over Halophila decipiens in Transect 7.*



Above, left**: Bartholomea annulata sea anemone among the rock rubble near the seawall.* ***Above, right: *A six legged Oreaster reticulatus seastar among the Dyctiota algae near the boat ramp in Transect 7.*

Conclusions

The proposed construction of the Culebra Auxiliary Cargo Ferry Terminal is located in an area of Ensenada Honda that has been previously impacted by the construction and operation of the existing seawall and dock. These docking facilities have been present since the San Ildefonso area was developed by the US Navy, which had settled on Culebra in 1903 when the Culebra Naval Reservation was established. The continuity of the mangrove fringe forest and the seagrass habitats that are found elsewhere throughout Ensenada Honda was interrupted when these facilities were built, meaning that the existing benthic communities are typical of mangroves and seagrass areas, although with diminished abundance growth. There is a limited presence of small coral colonies of the genus *Siderastrea*, particularly *Siderastrea radians*, which do not form large colonies and are commonly found in shallow areas of mangrove and seagrass habitats. These colonies were found attached to riprap or other hard substrate, mostly artificial.

The project area is primarily composed of soft, sandy/muddy substrate colonized by various species of macroalgae and sessile and mobile macroinvertebrate taxa including sponges, solitary and colonial tunicates, sea stars, polychaete worms, snails, and crustaceans. This soft-bottom habitat is common within Ensenada Honda. Light availability is limited, with photosynthetic organisms such as seagrasses and zooxanthellate corals unlikely to be found mainly above 15 feet.

An examination of the adjacent, unimpacted seagrass habitat shows a healthy, dense growth (100% cover) and that associated reef-building organisms thrive at nearby locations within Ensenada Honda.

While seagrass is classified as Essential Fish Habitat for the spiny lobster (*Panulirus argus*) and queen conch (*Lobatus gigas*) Fisheries Management Plans, *Halophila decipiens* present in the project area are small, sparse, monotypic patches that only provide a limited grazing resource for herbivores, including conchs. Live- and hard-bottom habitat in the project area is limited and almost exclusively uncolonized mud/sand substrate, although there is a significant sparse macroalgae cover. Besides the rock rubble, seawall, and the dock pilings, there is little to no structural complexity in the area that would provide suitable habitat for juvenile and adult reef

fishes or spiny lobster. The poor light penetration and limited hard substrate makes this area ill-suited for coral settlement and growth.

The site generally lacks any significant coral growth due to the limited sunlight penetration in the area. Coral diversity and abundance was higher in areas east of the existing dock, where the concrete slab and its remaining pilings have created additional hard substrate for them to attach. Various families of coral, such as those belonging to *Siderastrea*, *Diploria* and *Madracis* where identified on the area east of the existing dock that were not found on the western area of the dock where the auxiliary terminal will be located.

Except for a few individual colonies of *Siderastrea*, corals were confined to shallow waters (less than 10 feet) where sunlight is sufficient. Small colonies of less than 10 cm in diameter can be observed in the rock rubble near the seawall on the concrete slab.

No endangered species of coral, including those recently listed, and seagrass habitats were observed within the study area. It is worth mentioning that the Center for Coastal Monitoring and Assessment classifies seagrass habitat as areas with “10% or more of coverage”. As stated in the **Habitat Cover Descriptions** section, “Continuous segrass” are communities with “90% or greater coverage of the substrate”. “Patchy seagrass” includes discontinuous seagrass areas estimated at 50% to less than 90% coverage. “Sparse seagrass” include discontinuous seagrass beds with coverage estimated at between 10% and less than 50%. The Halophila decipiens patches within the project area are considereda marginal seagrass habitat, since none of the existing patches reached a cover of 10%.

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July 2015

Coral Survey

for the

Culebra Auxiliary Cargo Ferry Terminal at San Ildefonso

Culebra, Puerto Rico

Prepared For :

AUTORIDAD de los PUERTOS de PUERTO RICO

Prepared By:

ATKINS

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Introduction

Pursuant to the damages experienced at the Culebra Passenger Ferry Terminal Platform in Sardinas Bay after Hurricane Irene on 2010, the Puerto Rico Ports Authority (PRPA) evaluated the structural condition of the cargo platform and ramp. A site visit was conducted in August 2010 to assess the conditions of these structures and a report, dated September 2010 was submitted to the Maritime Transport Authority (MTAPR). Advanced deterioration was found in the deck slab and concrete beams, which has probably spread to the entire concrete surface. This appears to be a result of previous storm events, hurricanes and wave action. While it may be possible to patch and repair the deteriorated structure, any repairs attempted for this facility would be of short-term duration. Furthermore, if the repair and reconstruction of the cargo terminal is not conducted promptly, structural failure may occur.

As the only heavy commercial cargo transportation port in Culebra, the cargo ferry provides an essential service to the residents of the island. Spatial limitations prohibit the reconstruction to occur while simultaneously providing the cargo and passenger ferry service. An evaluation of potential temporary cargo locations resulted in the proposed construction of an auxiliary cargo pier at San Ildefonso in Ensenada Honda Bay, which is the safest harbor in the region, the historic location of the first settlement in the island, and the site for Camp Roosevelt, the US Navy operation that lasted from 1903 until their departure in 1975.

***Above**: Aerial photograph of the existing dock structure in San Ildefonso.*

The site is presently used for recreation and includes two boat ramps, a pier on pilings with a maximum depth of 13 feet, a seawall approximately 140 feet in length, three heavy duty bollards, an intake structure for a desalination plant, concrete park benches and roofed areas. Its maritime access is through Ensenada Honda Bay, which encompasses approximately 700 acres, with a marked navigation channel and proper aids (outer and inner range channel markers and seven navigation buoys).

The proposed project is two phased: the first is the construction of the Auxiliary Terminal at San Ildefonso; once the Auxiliary Terminal at San Ildefonso is operational, the reconstruction of the Sardinas Bay Ferry Terminal would begin.

Location

The proposed Culebra Auxiliary Cargo Ferry Terminal Facilities are located on San Ildefonso in Flamingo Ward, on a peninsula in the northern shoreline of Ensenada Honda in the island municipality of Culebra, Puerto Rico. It is bordered to the north by Road 250, to the east by Caño Quebrado, to the west by Ensenada del Cementerio, and to the south by Ensenada Honda. This area was the historic location of the first settlement in the island, named San Ildefonso de la Culebra. The proposed project coordinates are Latitude *18°18'22.63"N* and Longitude *65°17'00.44"W* (***Figure 1, Location Map***).

Project Description

The proposed Culebra Auxiliary Cargo Ferry Terminal includes the installation of a pre-fabricated floating aluminum platform (pontoon platform) that will match freeboard ferryboat highs and ease loading and unloading activities. This floating pontoon platform will have a length of 40 feet by a width of 56 feet, with a total gross area of 2,240 square feet (208.2 square meters) and will be anchored to the bottom using 6 round concrete piles with a 30 inch diameter, which will be driven approximately 20 to 30 feet below msl. These concrete piles will hold the floating platform in place. An aluminum pre-fabricated vehicular bridge-platform, measuring approximately 35 feet long by 22 feet wide, with a total gross area of 770 square feet (71.5 square meters) will connect the pontoon platform to land.

The existing recreational dock is a reinforced concrete structure measuring approximately 17 feet in width by 44 feet in length and supported by 28 steel encased concrete piles with a 14 inch diameter. Due to existing, unsafe structural conditions it will be demolished and replaced with a new dock built out of a prefabricated aluminum platform and supported by eight steel encased concrete piles 18 inches in diameter. The new dock will occupy the same area as the existing one. The existing piles will be removed at the mudline. The new dock will be connected to the new replacement pier and the pontoon platform via an aluminum passenger boarding ramp that will measure 20 feet in length by 4 feet in width (80 square feet, or 7.4 square meters). This boarding ramp will allow passengers to board and disembark the cargo ferry separately from vehicular loading and unloading.

To protect the floating pontoon platform from the cargo ferry during docking maneuvers, a pile cap and fender measuring approximately 56 feet in length by 6 feet in width (336 square feet, or 31.2 square meters) will be built, supported by eleven round concrete piles with a diameter of 30 inches. The stern of the cargo ferry will be tied to the steel bollards in the pile cap. This pile cap beam will be located at an approximate distance of 64 feet from the existing seawall at an approximate depth of -17 feet msl. To protect the existing historical seawall, a pile cap beam measuring 3 feet long by 29 feet wide supported.

*Drawing not to Scale

Source: Atkins

AUTORIDAD de los PUERTOS de PUERTO RICO

Culebra Auxiliary Cargo Ferry Terminal At San Ildefonso Coral Survey

Location Map

ATKINS

Figure 1

by five concrete piles with a diameter of 18 inches will be constructed at a distance of approximately 5 feet from the existing seawall.

No dredging works will be necessary to meet the required operational depth for the cargo ferry. Landside improvements related to the development of this facility will include construction of required facilities such as a ticket booth, upgrading the parking area, road and drainage improvements. The landside facilities will not impact any wetland areas or existing drainages.

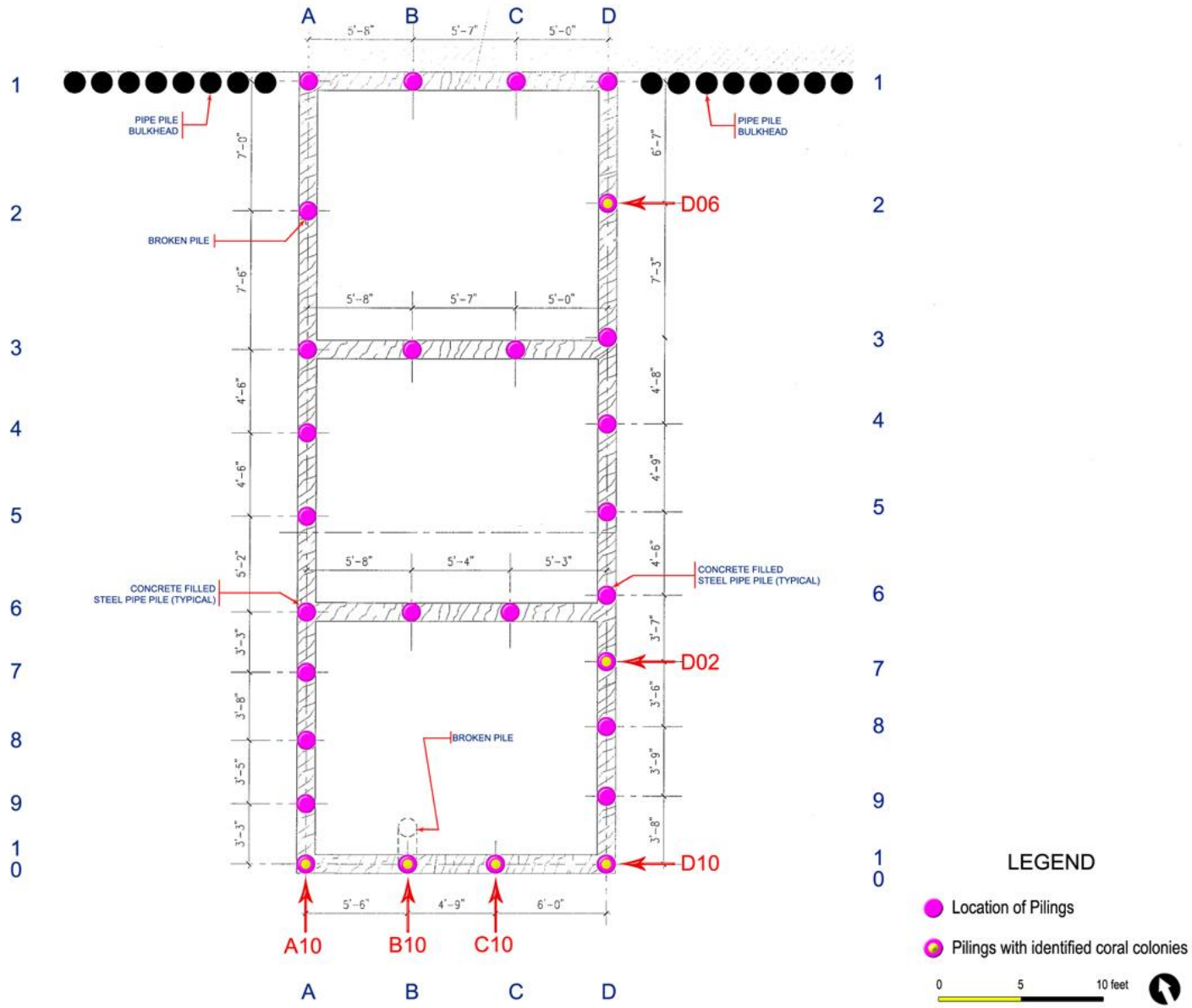
Construction of the Auxiliary Terminal is estimated to last 6 months. During this period, one barge will use retrievable spuds to secure itself in position, temporarily impacting the sandy bottom. Once this auxiliary platform is completed, the scheduled cargo ferry service from Fajardo to Culebra will dock at San Ildefonso while the existing cargo platform in Sardinas Bay is demolished and rebuilt.

Survey Methodology

The field effort for the coral survey was conducted on June 30, 2015. Water clarity was poor, with visibility conditions of less than 10 feet. Wave action was minimal at the time of the survey, although strong winds were blowing from the east at over 15 knots. Prior to the data collection, a preliminary reconnaissance of the dock pilings was conducted. This preliminary reconnaissance allowed the survey team to assess the general condition of the dock area, as well as identify pilings in which coral colonies were present and determine the most suitable methodology for the survey. Due to the relatively shallow depths in the area and the limited space to maneuver between pilings, the survey was conducted using snorkel gear.

Using a plan view of the existing dock structure, the pilings were identified as a grid layout (***Figure 2***). Starting from the existing seawall (north to south), each of the 24 pilings were identified by a column (letters A through D) and number (numbers 1 through 10). Pilings identified as A1, B1, C1 and D1 were part of the seawall structure.

***Above, left**: Existing dock structure in San Ildefonso, eastern side.* ***Above, right**: Existing dock structure in San Ildefonso, western side.*



*Drawing not to Scale

Source: Atkins

AUTORIDAD de los PUERTOS de PUERTO RICO

CULEBRA AUXILIARY CARGO FERRY TERMINAL AT SAN ILDEFONSO CORAL SURVEY

PLAN VIEW OF DOCK STRUCTURE AND LOCATION OF CORAL COLONIES

ATKINS

FIGURE 2

Atkins biologists conducted a thorough visual inspection of each of the 24 pilings and their immediate surroundings to document the presence of coral colonies. For those coral colonies ≥10 cm in diameter, the following information was recorded:

- *Location information (piling number and piling face/position north/south/east/west face along the seawall)*
- *Coral species, where possible*
- *Colony dimensions (length, width, height)*
- *Depth from the top of piling or sheet pile seawall to the bottom of the coral colony*
- *Additional comments related to the health of the coral colony were also noted (e.g., partial mortality of the colony, overgrowth by macroalgae, etc.).*

Coral Survey Results

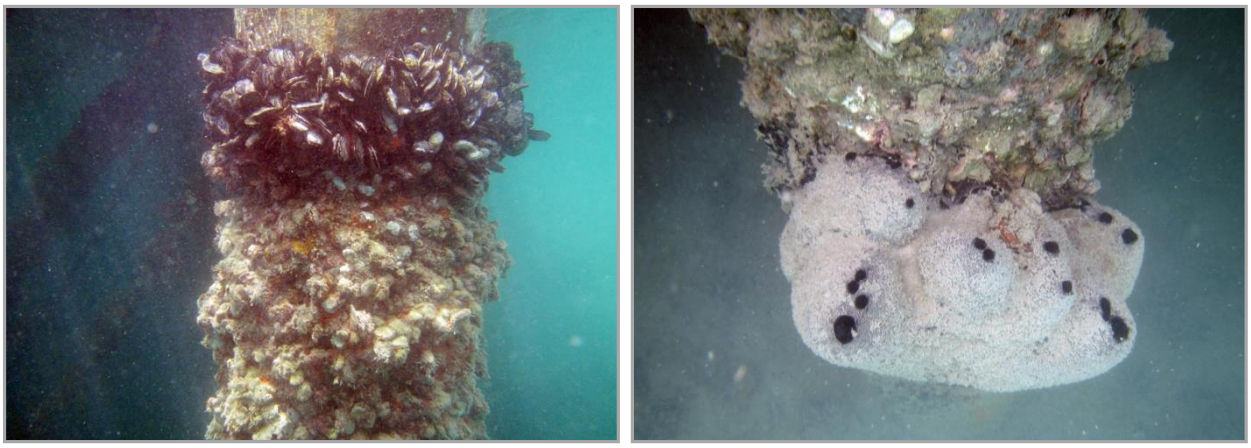
The preliminary reconnaissance revealed that no Acroporid corals were present within the survey area, eliminating the need to conduct the *Acropora* spp. survey protocol from the National Marine Fisheries Service (NMFS) at the project location. Since the survey was conducted for the purpose of assessing presence of coral colonies on the dock structure and immediate surroundings, as well as the presence or absence of listed coral species, it was determined that the documentation of individual coral colonies would provide the most valuable information. As a result, field efforts focused on identifying and mapping those coral colonies larger than or equal to (≥) 10 cm in diameter. The ultimate goal of these mapping efforts was to estimate impacts to the coral community and to determine potential avoidance, minimization and mitigation options.

***Above, left**: Southern section of the dock structure in San Ildefonso.* ***Above, right**: Eastern section of the existing dock structure in San Ildefonso.*

The existing dock structure has a total of 24 steel encased-concrete support pilings with a diameter of 14 inches. From the 24 pilings, 20 receive some sun exposure, and thus have the potential for being colonized by corals. The preliminary reconnaissance revealed that no corals were located on the four shaded pilings beneath the dock concrete slab. For a plan view of the pilings of the dock structure, see ***Figure 2*.**

A photograph of each colony was also collected. These details are presented on the Coral Colony Photographic Documentation (pages 14 through 20) and ***Table 2***.

During the preliminary reconnaissance, substantial structural deterioration of the existing dock structure and pilings was noted. This deterioration included the delamination of the underside of the concrete slab and severe spalling of the outer layer of concrete. At least two piles were broken and separated from the concrete slab at the point of connection. A large number of rebars from the concrete slab had separated and were hanging into the water.



Above: *Growth of encrusting organisms in one of the pilings.*

All 24 pier support piles assessed were encrusted with invertebrates, such as macroalgae, oysters, crustose coralline algae, mollusks, sponges, tunicates, bryozoans, and polychaete worms, which are common in this habitat. From a total of 24 pilings assessed, only 5 pilings (identified as **A10**, **B04**, **C04**, **D06** and **D02**) had encrusting of coral colonies with a diameter greater than 10 cm, for a total of 12 colonies from 7 species. Most of these colonies had encrusting organisms of their own (sponge growth, tube worms) or had sections covered in detritus.

A total of six coral species were identified: Symmetrical Brain Coral *(Diploria strigosa),* Star Coral *(Madracis pharensis),* Great Star Coral *(Montastraea cavernosa),* Mustard Hill Coral *(Porites astreoides),* Lesser Starlet Coral *(Siderastrea radians),* and Massive Starlet Coral *(Siderastrea siderea).* The largest coral colony identified belonged to *Madracis pharensis*, which was attached near the base of piling D02 in approximately 3 feet of water.

Table 1: Description of identified Coral Species

	Scientific Name	Common Name	Description
1	*Diploria strigosa*	Symmetrical Brain Coral	This is the most widely distributed species in this genus occurring in exposed locations, protected back reef environments and in bays with high sediment loads. It is found from 0.5-55 m depth; however, it is most common above 10 m. In certain environments, like in reef-crest environments, it can form monospecific stands.
2	*Madracis pharensis*	Star Coral	This species is found in cryptic habitats (e.g., in crevices, caves, under ledges) in fore reef and deep reef environments, and is also found in silty back reef lagoon environments, from 5-30 m. It is found in deep-water fore reef environments below 25 m, with a maximum depth recorded of 99 m. *Madracis pharensis* is common, but in low abundances throughout its range.
3	*Montastraea cavernosa*	Great Star Coral	This species is widely distributed through most reef environments from depths of 0.5-95 m, with peak abundance from 10-30 m in depth. Colonies have been observed to 113 m depth. Although this coral has a high tolerance for turbid and silty environments, it is not adapted to eutrophic conditions. *Montastraea cavernosa* is common and tends to be the more abundant of the *Montastraea* species in environments with moderate sedimentation.
4	*Porites astreoides*	Mustard Hill Coral	This species is found in all reef and near-reef environments. It dominates on the shallow exposed fore reef where other massive species are rare, and it is found on the deep reef and in the back reef; depths range from 0.2-70 m, with the highest abundance from 1-15 m. Also present in subtidal rocky environments and seagrass beds. They commonly inhabit disturbed reef surfaces (and are often the first to recolonize areas following disturbance), and are also common in areas of high sedimentation and high turbidity. This species is extremely abundant, and in some places this may be the numerically dominant coral. Corals are short-lived and generally small, but exhibit extremely high rates of recruitment.
5	*Siderastrea radians*	Lesser Starlet Coral	This species is found in shallow reef environments, hard-bottom communities, tidal flats, seagrass beds and rubble fields, to 3 m depth. *Siderastrea radians* is very common in shallow-water reef and hard-bottom habitats. Some localized declines have been reported, but no major range-wide declines have been observed.
6	*Siderastrea siderea*	Massive Starlet Coral	This species occurs in all types of reef environments from the shallow subtidal to 70 m depth, and is most common at 5-15 m depth. *Siderastrea siderea* does well in areas with high sedimentation and high turbidity. This species is common in most reef environments, at low to moderate abundances. In certain localized areas, this species can be the most abundant coral. Localized declines have been reported, but no major range-wide declines observed.

Source: http://www.iucnredlist.org

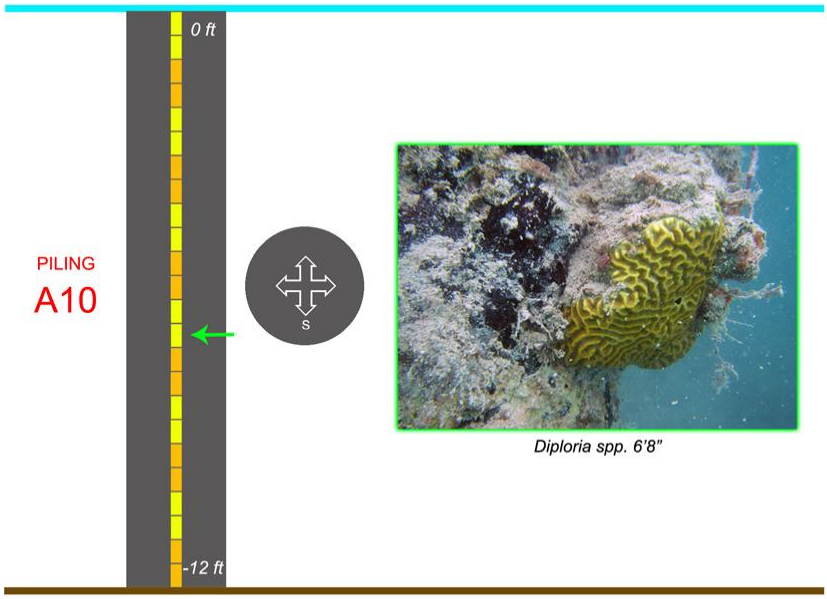
On pages 14 through 20 is the Coral Colony Photographic Documentation, including a visual representation of the location of each coral colony, its vertical location on each piling (represented on the gray column/graph), its depth, and its cardinal direction (represented on the compass rose).

Table 3: Identified Coral Species, Size and Location

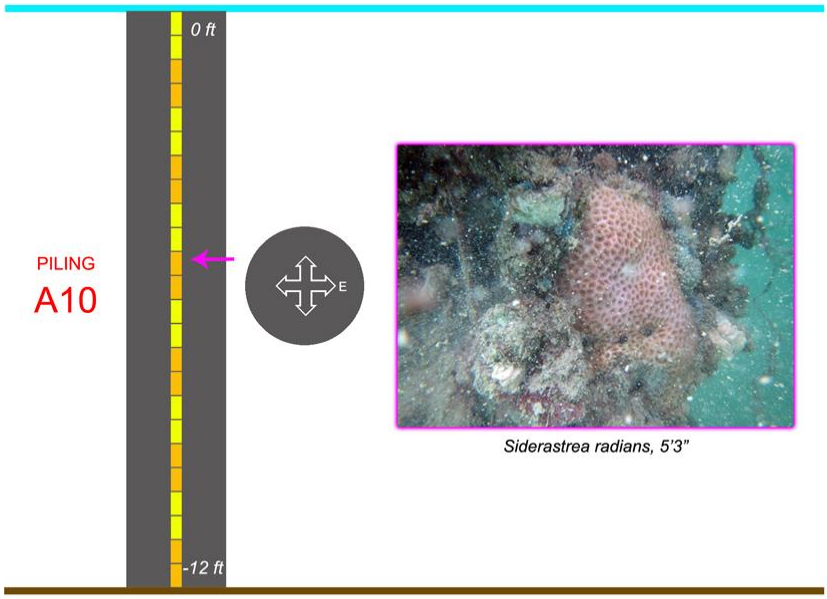
Piling Id	Species	Location	Colony Depth	Length (cm)	Width (cm)	Height (cm)	Comments
A10	*Siderastrea radians*	E	5'3"	10 cm	7 cm	1cm	detritus
	Diploria spp	S	6'8"	12 cm	15 cm	2 cm	detritus, sponge
	Porites astreoides	E	10'6"	28 cm	14 cm	4 cm	detritus
	Porites astreoides	E	11'	20 cm	37 cm	5 cm	detritus/base of piling
B04	*Montastraea cavernosa*	S	8'6"	12 cm	28 cm	5 cm	tube worm attached, sponge
	Siderastrea radians	S	10'6"	12 cm	21 cm	4 cm	detritus
C04	*Siderastrea radians*	S	7'11"	20 cm	22 cm	10.5 cm	sponge
D06	*Siderastrea radians*	E	4'6"	8 cm	11 cm	2.5 cm	on slab/sponge growth present
	Montastraea cavernosa	E	5'6"	13 cm	30 cm	2 cm	near slab
D02	**Madracis pharensis*	NES	2'	40 cm	90 cm	45 cm	covers base of piling/sponge growths present
	Siderastrea siderea	seafloor	3'	10 cm	11 cm	4 cm	adjacent to base of piling
	Madracis pharensis	seafloor	3'	11 cm	8 cm	1 cm	adjacent to base of piling

**Largest coral colony*

Coral Colony Photographic Documentation: Piling A10

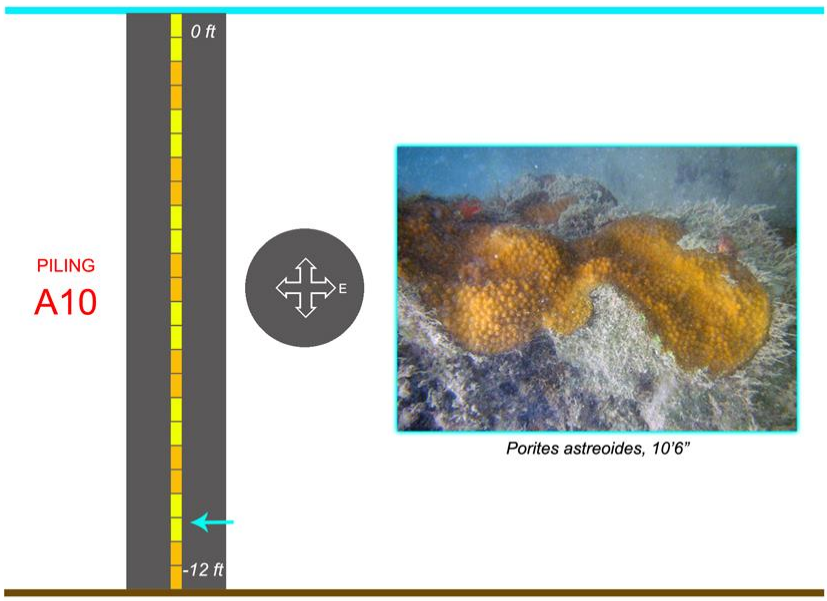


Diploria spp. 6'8"

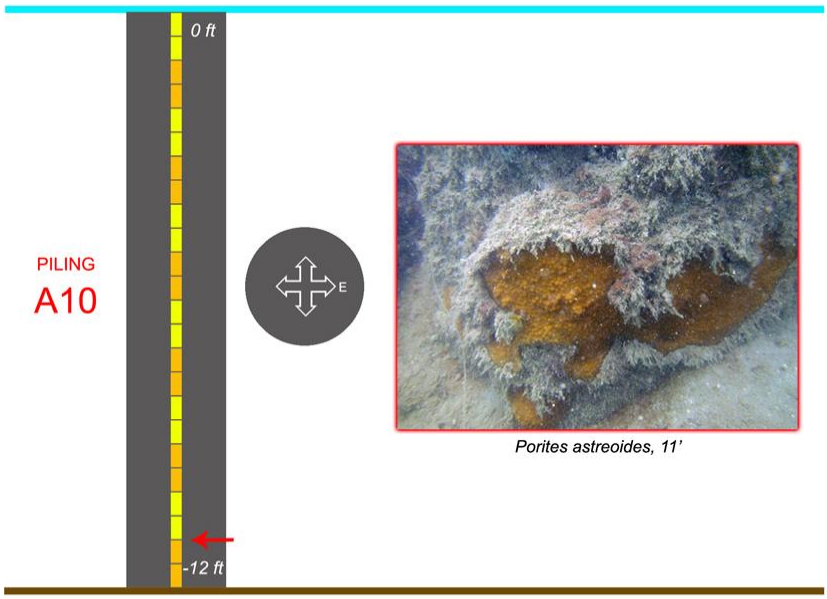


Siderastrea radians, 5'3"

Coral Colony Photographic Documentation: Piling A10 (Cont.)

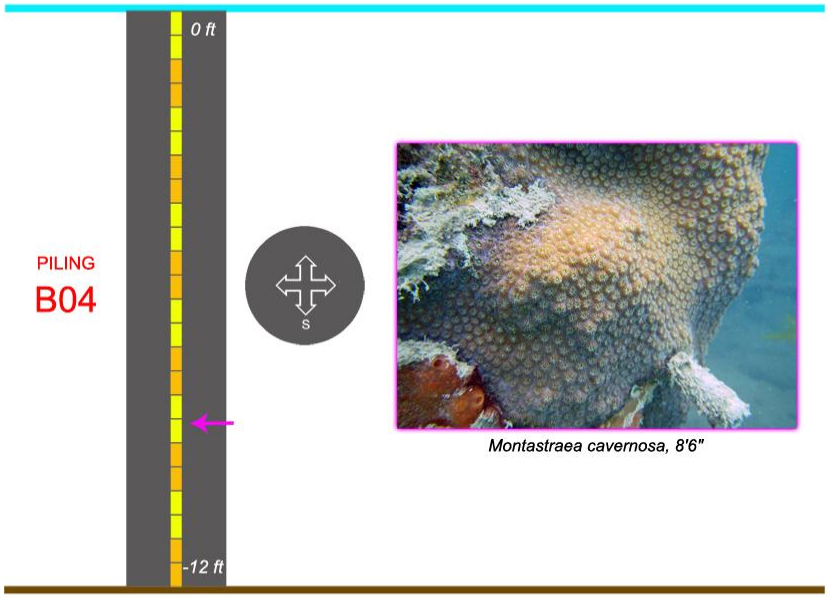


Porites astreoides, 10'6"

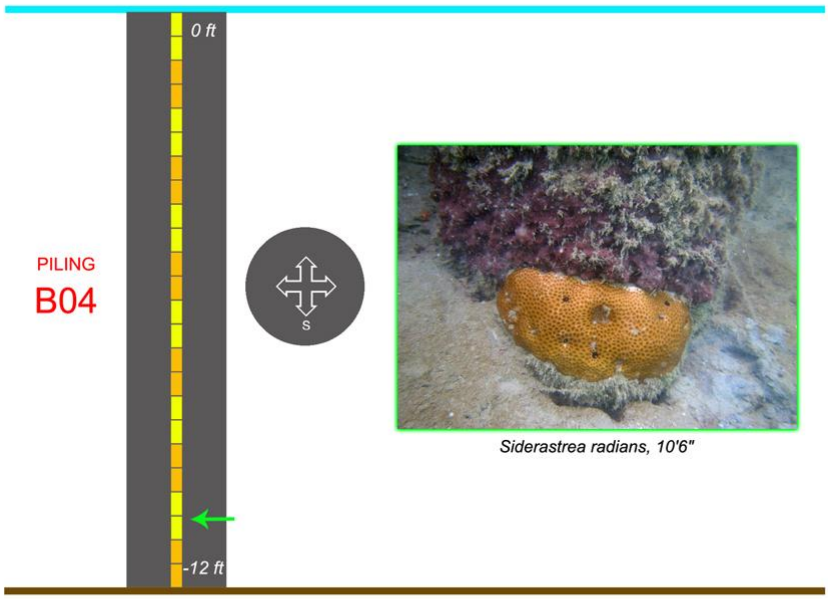


Porites astreoides, 11'

Coral Colony Photographic Documentation: Piling B04

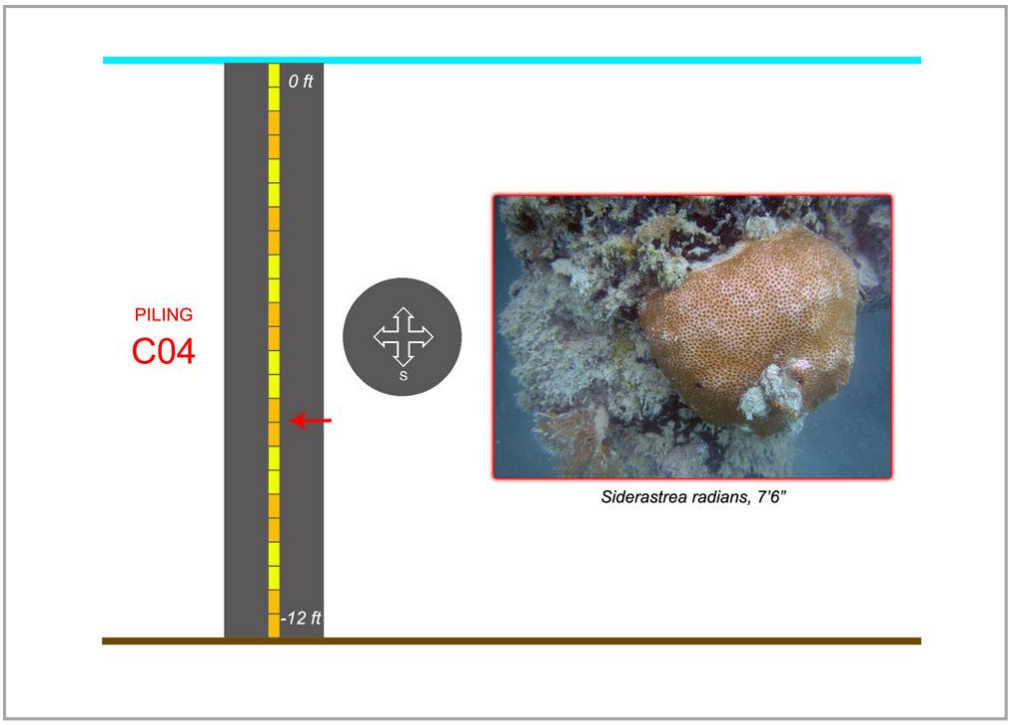


Montastraea cavernosa, 8'6"

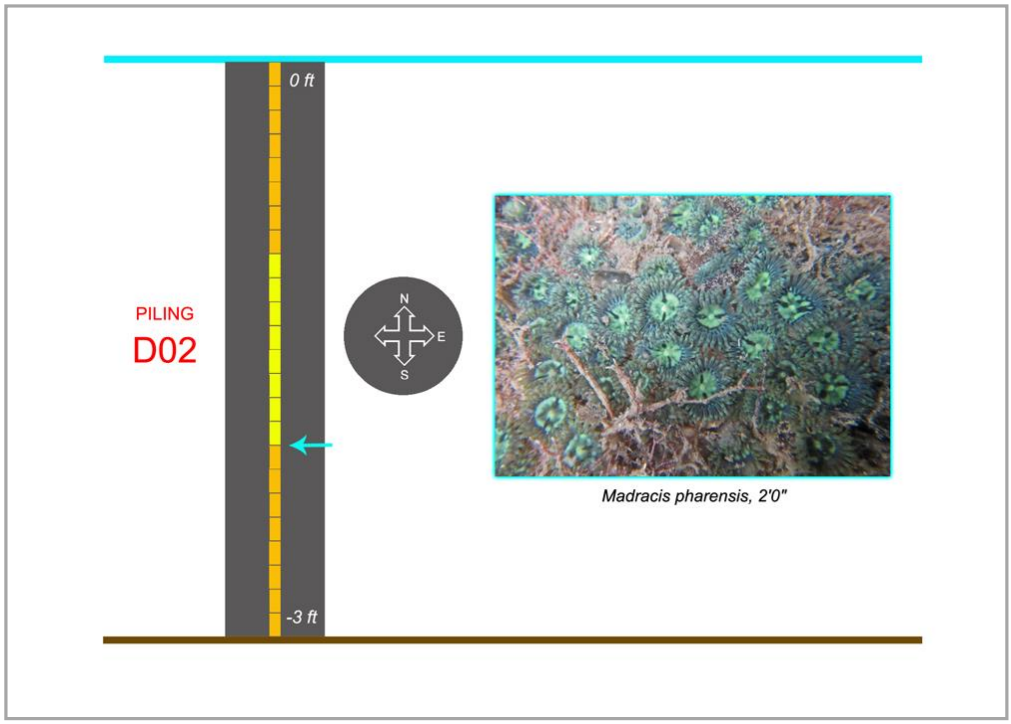


Siderastrea radians, 10'6"

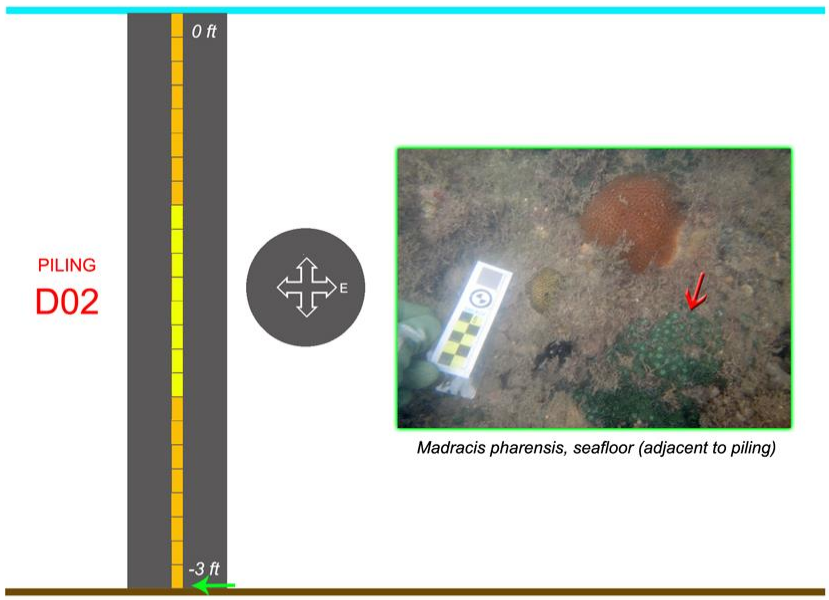
Coral Colony Photographic Documentation: Piling C04



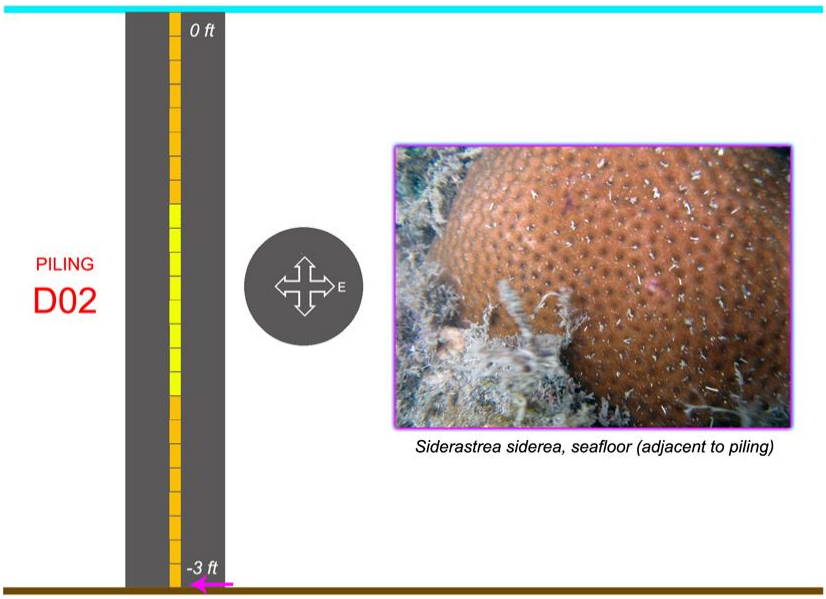
Coral Colony Photographic Documentation: Piling D02



Coral Colony Photographic Documentation: Piling D02 (Cont.)

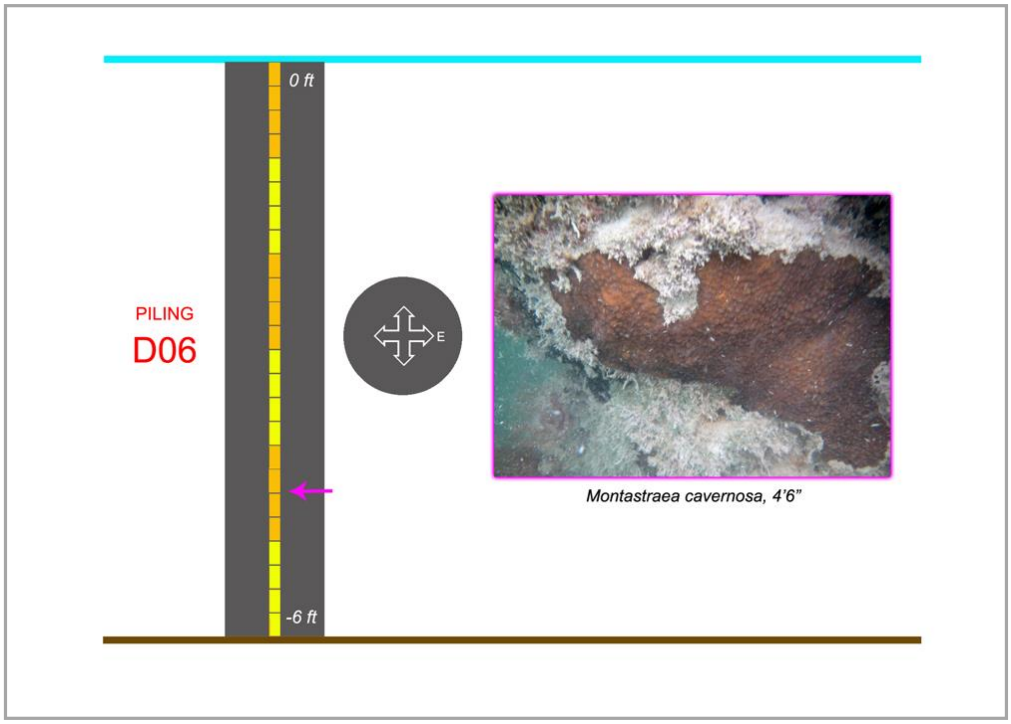


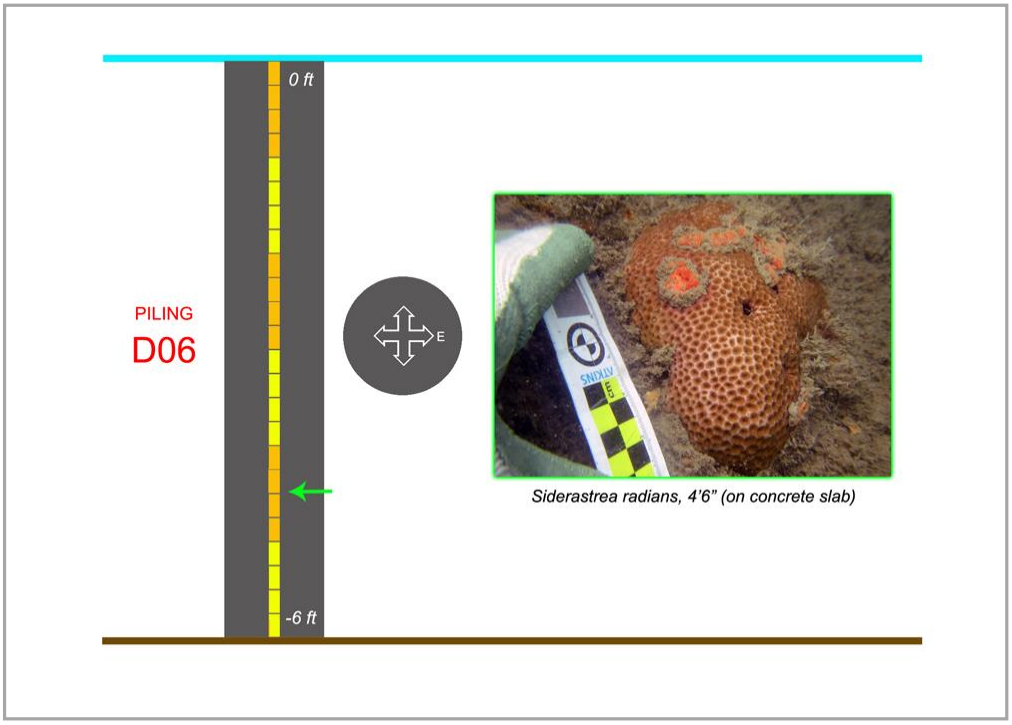
Madracis pharensis, seafloor (adjacent to piling)



Siderastrea siderea, seafloor (adjacent to piling)

Coral Colony Photographic Documentation: Piling D06





Conclusion

The project area is primarily composed of soft, sandy/muddy substrate colonized by various species of macroalgae and sessile and mobile macroinvertebrate taxa including sponges, solitary and colonial tunicates, sea stars, polychaete worms, snails, and crustaceans. This soft-bottom habitat is common within Ensenada Honda. Light availability is limited, with photosynthetic organisms such as seagrasses and zooxanthellate corals limited to depths above 15 feet.

All 24 pier support piles assessed were encrusted with a dense fouling community consisting of macroalgae, oysters, crustose coralline algae, mollusks, sponges, tunicates, bryozoans, and polychaete worms, common in these habitats. From a total of 24 pilings assessed, only 5 pilings, identified as **A10**, **B04**, **C04**, **D06** and **D02**, had coral colonies with a diameter of more than 10 centimeters, for a total of **12 colonies** from **6 species**: the Symmetrical Brain Coral *(Diploria strigosa),* Star Coral *(Madracis pharensis),* Great Star Coral *(Montastraea cavernosa),* Mustard Hill Coral *(Porites astreoides),* Lesser Starlet Coral *(Siderastrea radians),* and Massive Starlet Coral *(Siderastrea siderea).* Most of these colonies had encrusting organisms of their own (sponge growth, tube worms) or had sections covered in detritus. The largest coral colony identified and measured belonged to *Madracis pharensis*, which was attached near the base of piling D02 in approximately 3 feet of water.

Coral diversity and abundance was higher in areas east of the existing dock, where the concrete slab and its remaining pilings have created additional hard substrate for them to attach. Various families of coral, such as those belonging to *Siderastrea*, *Diploria* and *Madracis* where identified on the area east of the existing dock that were not found on the western area of the dock where the auxiliary terminal will be located.

There is a limited presence of small coral colonies of the genus *Siderastrea*, particularly *Siderastrea radians*, which do not form large colonies and are commonly found in shallow areas of mangrove and seagrass habitats. These colonies were attached to riprap or other hard substrate, mostly artificial.

During the survey, no endangered species of coral, including those recently listed, were observed within the existing dock structure or its immediate surroundings.

References

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