

Energía del Pacífico

LNG to Power Project ADDITIONAL MARINE BIODIVERSITY STUDY

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1 Additional Marine Biodiversity Study

1.1 INTRODUCTION

This report summarizes additional marine biodiversity studies undertaken to complement the ESIA for the EDP “LNG TO POWER” Project. The study is focused on fish, mammals and turtles. This report was prepared in response to the questions and comments received from the potential project lenders as presented in their December 2016 Report.

Additional secondary marine biota information was obtained to undertake an assessment of biodiversity values and impact on the marine ecosystems present in the project area of influence. Including information on observations and/or circulation of sea turtles and cetaceans (whales, dolphins and porpoises).

Primary data was collected through additional survey work conducted in the offshore area of the Project.

The project area is characterized by its proximity to cliffs of compact volcanic ash (talpetate) as well as small sandy beaches with shell remains in the intertidal zone. The ocean floor in the shallow subtidal portion of the study area, presents compact clay and scattered boulders in the shallow part. In the deepest zone, the sea floor consists of fine sediment with remains of scattered shells and crags.

1.1.1 Objectives

The objectives of this additional marine study are detailed as follows:

1. Update marine field surveys to enhance the marine biological assessment/report by including an additional season, expanding on whale migratory patterns, turtle nesting activity, and oyster bed locations.
2. Undertake and document Marine Biodiversity assessment related to the marine regasification terminal (MRT) – with particular interest in sea turtles, coral reef and oysters – and provide a critical habitat assessment.
3. Prepare a complementary Biological Report to document the critical habitat assessment, based on background information (experts, literature and NGOs) for sea turtles and coral reef, including:
 - Evaluation of the importance of the project area for turtles.

- Review data available on coral reef species (corals and fish).
- Mapping of sea turtle nesting sites near to the project area.

1.1.2 Methodology

The expected area of influence for the new MRT was surveyed from a boat for 2 days in February 2018. To characterize the demersal and pelagic biota of fish found in the study area, each sampling site was surveyed by six trawls (three bottoms and three surface). For the catches, gillnets of different sizes were used, operated by the fishermen of the community. A "bottom and surface drift and bottom stationary" approach to gillnetting was followed. This collection effort ensured a greater record of species. In addition to the sampling surveys, the fishermen who assisted with the catches were interviewed in regards to the seasonal variation of species.

The presence of whales was established through the review of secondary, technical and scientific information on whales along the Salvadorian coast; this was further supported through interviews with local fishermen and observations during the site survey.

For turtles, information from MARN and NGO's was collected and supported through data gathered during interviews with fishermen and observations during the site visit.

The species were reviewed with the List of endangered or threatened species from MARN, and species of special interest, included in Annex 1-1.

1.1.3 Overview

El Salvador has a continental platform of more than 19,000 km², with a maximum width of 80 km which is gradually extended to the border with Nicaragua. El Salvador has a coastline of 332 km in length, which includes areas with cliffs separated by sandy beaches. The coastline has a remarkable predominance of mud-sandy bottoms, making up 91% of the total surface. Sand content increases as it approaches the slope. (Gierloff-Emden, 1976, Villagas et al, 1985).

The Marine Coastal Zone (MCZ) is defined as the geographical space in which the main exchanges of matter and energy between marine and terrestrial ecosystems take place (Windevoxhel, Rodrigues, & Lahmann, 1998) (**Table 1-1**).

Table 1-1 - Data about the Marine Coastal Zone (MCZ) of El Salvador	
Relevant Data	
<i>National Territory</i>	21,040.0 km ²
<i>Territorial Sea</i>	99,752.0 km ²
<i>Area total MCZ</i>	19,829.0 km ²
<i>Marine Zone Area</i>	13,834.0 km ²
<i>Coastal Zone Area</i>	5,995.0 km ²
<i>Coastal Length</i>	321.0 km ²
<i>Coral reef</i>	67.9 km ²
<i>Population in the MCZ</i>	16.60%
<i>El Salvador Population's 2007</i>	5.74 million
<i>Mangrove Area</i>	398.9 km ²
<i>Coral reef</i>	67.9 km ²

Source: MARN-TNC, 2018.

El Salvador has a rich coastal-marine biodiversity with a great number of species, for example 565 species of fish and 134 species of molluscs. The continental aquatic ecosystems and estuaries represent only 5.4% of the Salvadorian territory, but they are essential for many local communities and support activities related to recreation, fishing and tourism. They provide habitat services for a wide range of aquatic plant and animal species.

The project is located within “The Western coastal plain” that sits between the estuary of Paz River and Punta Remedios. The Western coastal plain is characterized by extended beaches interspersed by estuaries that form coastal lagoons, such as the estuary of Bola de Monte and Barra de Santiago (Estuary), with influences of river discharges and of the contribution of marine water by the tide. These coastal lagoons have large extensions of salty forests on their borders with the land. A distinctive feature of the coastline in the first section of Punta Remedios, to the southeast of the Port of Acajutla, is a terrace coastline extending into the sea, constituting a rocky reef with patches of coral at depths greater than 20 meters. In this area the water temperature is around 28°C and transparency is higher than 10 meters in the dry season which has allowed the adaptation and development of corals.

1.1.4 Sampling Stations for Fish

Four sampling stations were established for fish sampling in a transept where the submarine pipeline and floating LNG vessel will be located. The coordinates/locations of the sampling stations are noted in Table 1-2, and shown on Figure 1-1.

Table 1-2 Location of fish monitoring and capture stations. G: degrees, M: minutes, S: seconds.						
STATIONS	NORTH			WEST		
	G	M	S	G	M	S
1	13	35	59.9	89	50	7.0
2 START	13	34	59.9	89	50	12.5
2 FINAL	13	34	58.5	89	50	20.7
3 START	13	34	58.3	89	50	25.3
3 FINAL	13	34	55.4	89	50	34.3
4 START	13	34	58.3	89	50	45.6
4 FINAL	13	34	56.5	89	50	55.1

Source: Consulting Team, February 2018.

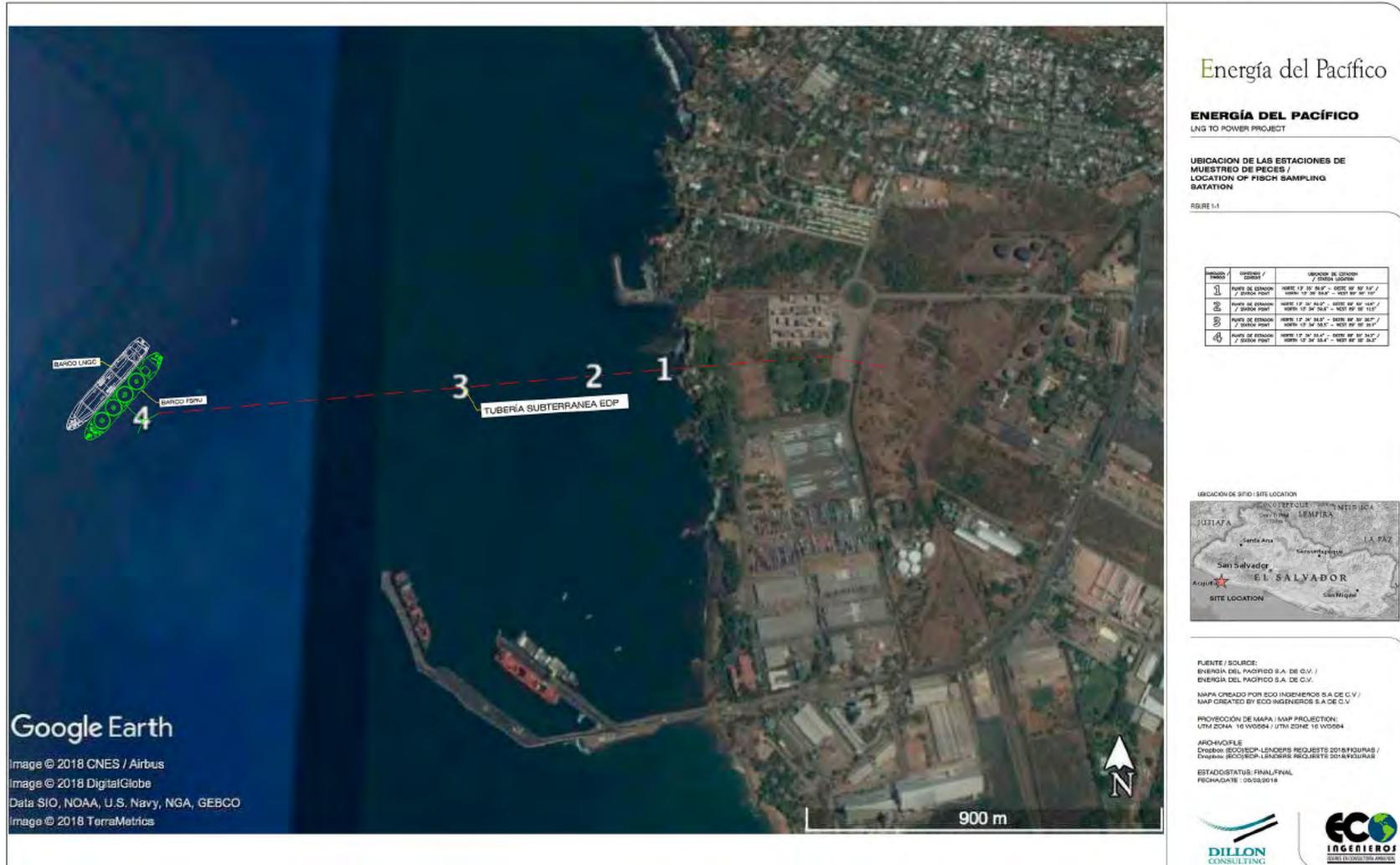
Photograph 1-1 presents an image of the area of cliff where underwater inspection was carried out. (Station 1).

Photograph 1-1 Sampling Station 1



Source: Consulting Team, February 2018.

Figure 1-1 Location of Fish Sampling Stations



Source: Consultant Team

At Station 1, which was close to the shoreline, underwater observations were made by diving on the nearby compact clay irregularities in the seabed.

At Stations 2, 3 and 4, a trammel bottom was placed from east to west in the transect, as shown in Figure 1-1. The trammel placement time was 20 minutes at each station in order to prevent the incidental capture of sea turtles. Sampling with drifting nets could not be carried out because the current would drag the net towards the rocks, with the possibility of losing the equipment.

Photograph 1-2 Fish collection with bottom net in sampling station 2



Source: Consulting Team, February 2018.

Photograph 1-3 Specimen of Caranz caballus captured with bottom net in sampling station 3



Source: Consulting Team, February 2018.

At the same Stations (2, 3 and 4) observations of sea turtles and cetaceans were made during boating surveys following a route to the southwest and south that is shown in Figure 1-2.

Figure 1-2 Routes for marine fauna observation



Source: Consultan Team, 2018

1.2 FISH (PHYLLUM CHORDATA)

There are reports of 565 fish species in the Salvadoran Pacific. The registered species belong to two classes. The first class is the Chondrichthyes know as "cartilaginous fish", from this only one order Rajiformes (striped rays) is reported, with 2 families and 3 species; Carcharhiniformes (sharks), within this class we have a record of 16 species. The second class is the Osteichthyes "bony fish" that has a record of 546 species.

1.2.1 Survey for Fish

Below are the results of sampling and observation of marine fauna found from the four survey areas described above. Table 1-3 summarizes the fish observed at station 1. They are characteristic species of the rocky bottoms of the Salvadoran coast as noted by González-Murcia et al (2012), Segovi (2012) and Barraza (2013). None of these fish species are included in the official list of threatened and endangered species identified in Agreement number 74 of the Ministry of Environment and Natural Resources.

Table 1-3 – Fishes associated with hard bottoms observed in station 1.	
SPECIES	COMMON NAME
<i>Abudefduf concolor</i>	Burrita
<i>Abudefduf troschelii</i>	Burrita
<i>Anisotremus caesius</i>	Pepino
<i>Anisotremus taeniatus</i>	Pepino
<i>Bodianus diplotaenia</i>	Perico
<i>Cirrhitus rivulatus</i>	Mero chino
<i>Chaetodon humeralis</i>	Pez mariposa
<i>Halichoeres notospilus</i>	Señorita
<i>Microspatodon dorsalis</i>	Burrita
<i>Ophoblennius steindachneri</i>	Sin nombre común
<i>Stegastes acalpucoensis</i>	Burrita
<i>Plagiotremus azaleus</i>	Sin nombre común
<i>Stegastes flavilatus</i>	Burrita
<i>Thalassoma lucasanum</i>	Periquito

Source: Consulting Team, February 2018.

Only *Abudefduf concolor* was reported in the surveys completed in previous years for the project. Most species found have been reported in Los Cobanos area, except *Anisotremus caesius*, *Anisotremus taeniatus*, *Bodianus diplotaenia*, *Microspatodon dorsalis* and *Ophoblennius steindachneri*.

Table 1-4 presents the fish caught with bottom nets at Stations 2, 3 and 4 (Table 1). The abundance of *Caranx caballus* (quinoa), (Photograph 1-4) was evident in these samplings. (Photograph 1-5 to Photograph 1-8). Previous observations in the Port area and the protected natural area Los Cóbanos complex allow us to affirm that *Caranx caballus* is an abundant species and is always present. The abundance of this species can also be related to the fact that it moves in schools of up to 400 individuals.

Table 1-4 – Species captured in sampling stations 2, 3 and 4					
Species	Common name	E2	E3	E4	Total
<i>Anisotremus caesius</i>	Pepino	1		-	1
<i>Caranx caballus</i>	Quinoa jurel	4	1	-	5
<i>Cyclopsetta panamensis</i>	Hoja	-	-	1	1
<i>Nematistius pectoralis</i> *	Gallo	1	-	-	1
<i>Oligoplites sp.</i>	Alma seca	-	1	-	1
<i>Tylosurus sp.</i> *	Zanate	-	-	1	1
<i>Urotrygon sp.</i>	Stingray “Raya”	-	-	1	1
TOTAL					

* Specimens observed in the water during the samplings.
Source: Consulting Team, February 2018.

In the sampling previously performed for the project, the species *Anisotremus caesius*, *Caranx caballus*, *Cyclopsetta panamensis*, *Nematistius pectoralis*, and *Urotrygon sp.* were found. These species were not found during this survey.

Photograph 1-4 Specimens of *Caranx caballus* (quinoa). Sampling station 2



Source: Consultan Team, 2018

Photograph 1-5 Specimens of *Oligoplites* csp. (alma seca). Sampling station 3



Source: Consultan Team, 2018

Photograph 1-6 Specimen of *Anjsotremus caesius* (pepino). Sampling station 2



Source: Consultan Team, 2018

Photograph 1-7 Juvenile specimen of *Urotrygon* sp. (raya). Sampling station 4



Source: Consultan Team, 2018

Photograph 1-8 Specimen of *Cyclopsetta panamensis* (pez hoja). Sampling station 4



Source: Consultan Team, 2018

All the species included in **Table 1-4** serve as food for humans. Most, except for *Anisotremus caesius*, occur on soft and rocky bottoms. The latter, tends to reside in areas with rocky bottoms. These species are not listed on the official list of threatened and endangered species as per Agreement number 74 of the Ministry of Environment and Natural Resources.

The capture of the sole “Lenguado” and stingray coincides with the increase in depth at station 4, as well as the existence of fine sediment bottoms, in which these species live (Robertson y Allen, 2015).

Other species of tropical fish associated with rocky bottoms that previous research of Barraza (2013, 2014) observed in the project area and surrounding areas are: *Caranx caninus* (jurel), *Caranx sexfasciatus* (jurel), *Diodon holocanthus* (zorro), *Diodon hystrix* (zorro), *Echindna nocturna* (morena), *Echidna nebulosa* (morena), at least two species of the genus *Epinephelus* (cabrilla, mero), *Johnrandalia nigrirostris* (pez mariposa), *Kyphosus elegans* (chopa), *Lutjanus argentiventris* (pargo), *Lutjanus guttatus* (pargo), *Sargocentron suborbitalis* (pez ardilla), *Stegastes flavilatus* (burrita). Also, two species of the genus *Apogon* (cardenales) and four species of the genus *Haemulon* (rucos) are reported.

1.3 DOLPHINS AND WHALES

There are twenty-one species of wales and dolphins reported in El Salvador, as listed in Annex 1-2. Species reported by tour operators and MARN are included in Annex 1-3. From 2012 to 2016, the species reported included: *Orcinus orca* (killer whale), *Megaptera novaengliae* (humpback whales), *Tursiops truncatus* (bottlenose dolphin), *Stenella attenuate* (pantropical spotted dolphin) and *Stenella coeruleoalba* (striped dolphin)

Dolphins and other cetaceans were not observed during the boating tour following the route shown in Figure 1-2. However, during other tours at different times of the year, groups of the bottlenose dolphin (*Tursiops truncatus*) have been observed in areas located 3km west, northwest and southwest of the project area. Observations of humpback whales (*Megaptera novaengliae*) have also be reported in the Protected Natural Area of the Los Cóbano Complex. Both cetaceans are listed as endangered species. See Figure 1-3.

According to a report from The State of Whale Watching in Latin America¹, the following species can be observed all year round off the coast of El Salvador: bottlenose dolphin *Tursiops truncatus*, pantropical spotted dolphin *Stenella attenuata*, sperm whale *Physeter microcephalus*. From November to February the humpback whale *Megaptera novaeangliae* can also be seen.

According to FIAES2, there are records of humpback whales being observed in El Salvadorian waters since approximately 2006. The warm waters of El Salvador can attract these cetaceans. The humpback whales migrate, once a year or every two years, from north to south, in search of warmer temperatures during the winter months. During these period they give birth and seek out waters with temperate temperatures for the calves and because it is easier to find food to feed the calves.

During the dry season, whales have been seen off the beaches of Los Cóbano, where they stay for up to 6 months. In general, this species migrates in groups. In 2010, six adult whales and one whale calf were observed. They stay in waters of about 30 -40 meters in depth where they find plankton.

There are records that various species of dolphins, such as the bottlenose dolphin, the spotted dolphin and the common dolphin can visit throughout the year and it is common to observe them near the shrimp boats at the time of coldest water in the country (From November to February), since they feed on shrimp and in cold waters where food availability is higher.

Information on the numbers of each species that visit the area is not available.

Local fishermen report that in the surrounding areas of the CEPA-Acajutla dock, at least two crocodiles (*Crocodylus acutus*) have appeared over the last two years. The crocodiles were not observed during field observations for this study nor are there records regarding their circulation in the Energía del Pacífico project area. The presence of the crocodiles could not be verified in the vicinity of the dock, due to boat

¹ "The State of Whale Watching in Latin America", Erich Hoyt and Miguel Iñiguez, International Fund for Animal Welfare, Global Ocean and Wahle and Dolphin Conservation Society.

² "Mejor Ambiente" magazine, FIAES, December 2010, First Edition.

access restrictions in the area. This species is classified as endangered by the Ministry list referred to above.

Sea lions are not frequently seen on the Salvadorian coast, in 2015 one sea lion was observed in the Coast in the Los Cobanos area³. In the year 2016, as mentioned in the previous EIA, a sea lion was observed in the buoys of the refinery to the south, for several weeks.

³ <http://www.lapagina.com.sv/ampliar.php?id=110541>

Figure 1-3 Observation and circulation sites of marine mammals



Source: Consultan Team, 2018

1.4 MARINES TURTLES

There are four species of sea turtles that nest on the Salvadorian coasts: the olive ridley turtle “Golfina” (*Lepidochelys oliveacea*), the baule turtle “Laúd” or “Siete Filos” (*Dermochelys coriacea*), the hawksbill turtle “Carey” (*Eretmochelys imbricate*) and the brown turtle “Negra” o “Prieta” (*Chelonia agassizi*), the first one is threatened and the other three are in danger of extinction according to the official MARN list. According to the red list of the World Conservation Union (UICN), hawksbill is critically endangered, the brown is endangered and the baule and olive ridley are vulnerable. The brown and baule are in appendix I, CITES.

According to FIAES-FUNZEL there are records of the following turtles nesting on the beaches of the ANP Complejo Los Cóbano: hawksbill, olive ridley, brown and bauley. The most abundant turtle in the area is the olive ridley, followed by the brown, the hawksbill and finally the baule. The baule is not reported by FUNZEL in Los Cobanos area. See detail of turtle nesting sites in Figure 1-4 and Annex 1-4.

Four adult hawksbill turtles have been marked with GPS satellite devices, this record indicates that they move between the Gulf of Fonseca, the Bay of Jiquilisco and Los Cóbano, they do not leave the Salvadoran territory, likely because they have enough food to survive in the area. Sea turtles are residents of the country. See Figure 1-5 with the sites considered important for nesting of hawksbill turtles.

The different species do not compete for food. The species found closest to the coast are hawksbill turtles because they feed on sponges, jellyfish and algae that grow near the shore and so they are often seen near natural coral and rocky reefs. The brown turtle that feeds on seagrass and algae is found a bit further out from the shore. And the olive ridley is found in deeper waters and feeds on shrimp, which is why we usually find it near shrimping boats. This species tends to get caught in the nets where cabs can die by suffocation. The baule turtle typically feeds on plankton in zones with 30 meters of depth.

FIAES and FUNZEL reports that the nesting of turtles in El Salvador occurs all year round, although each species nests during a different period.

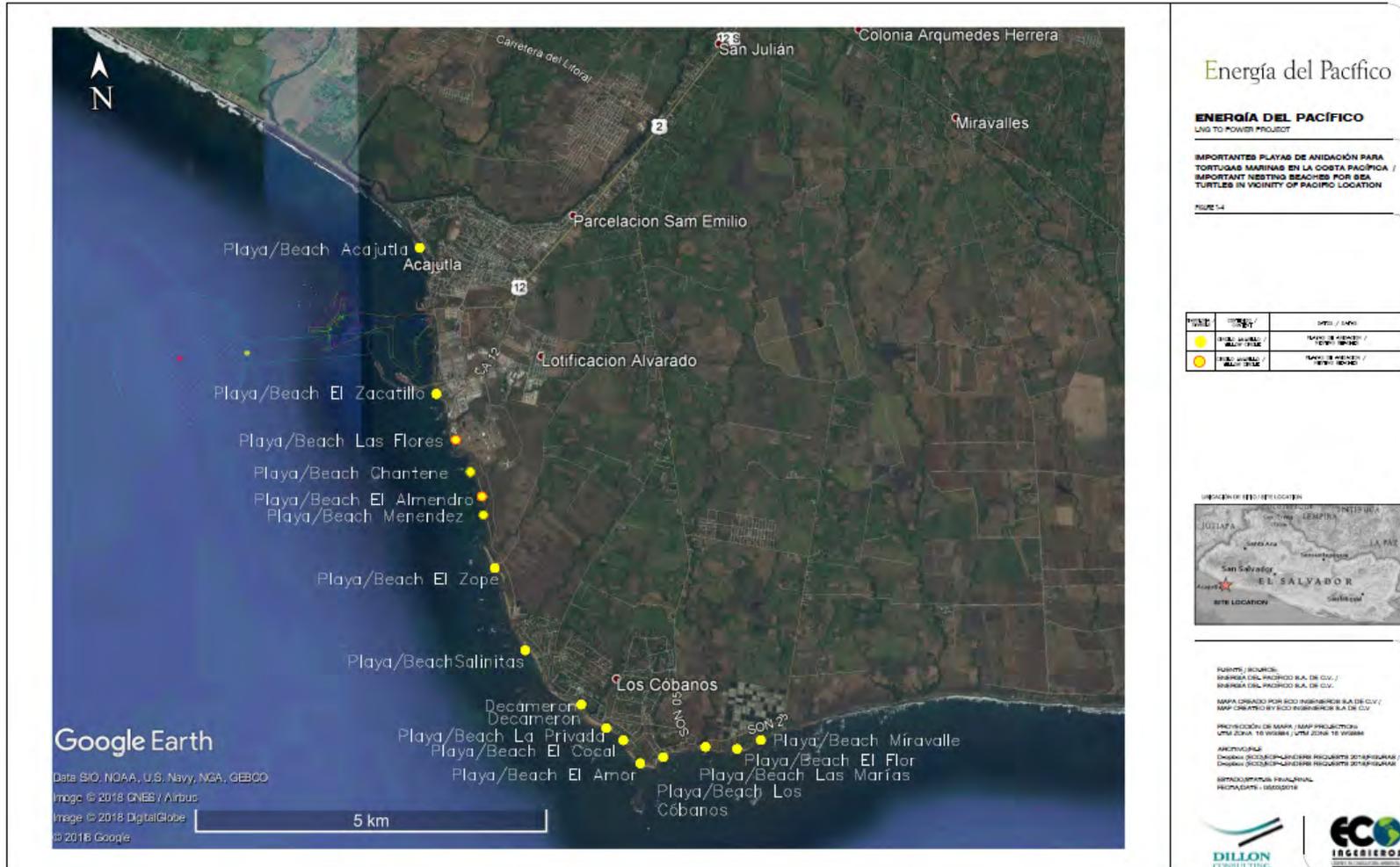
1. The hawksbill turtle begins its nesting season in May and in some places continues to arrive until October, the peak month for nesting is June.
2. The olive ridley turtle nests is from June until October and the peak for nesting is August and September.

3. The brown turtle has a nesting period from July to September and has the same peak as the olive ridley turtle

4. The baule turtle can be observed nesting in the months of October to March

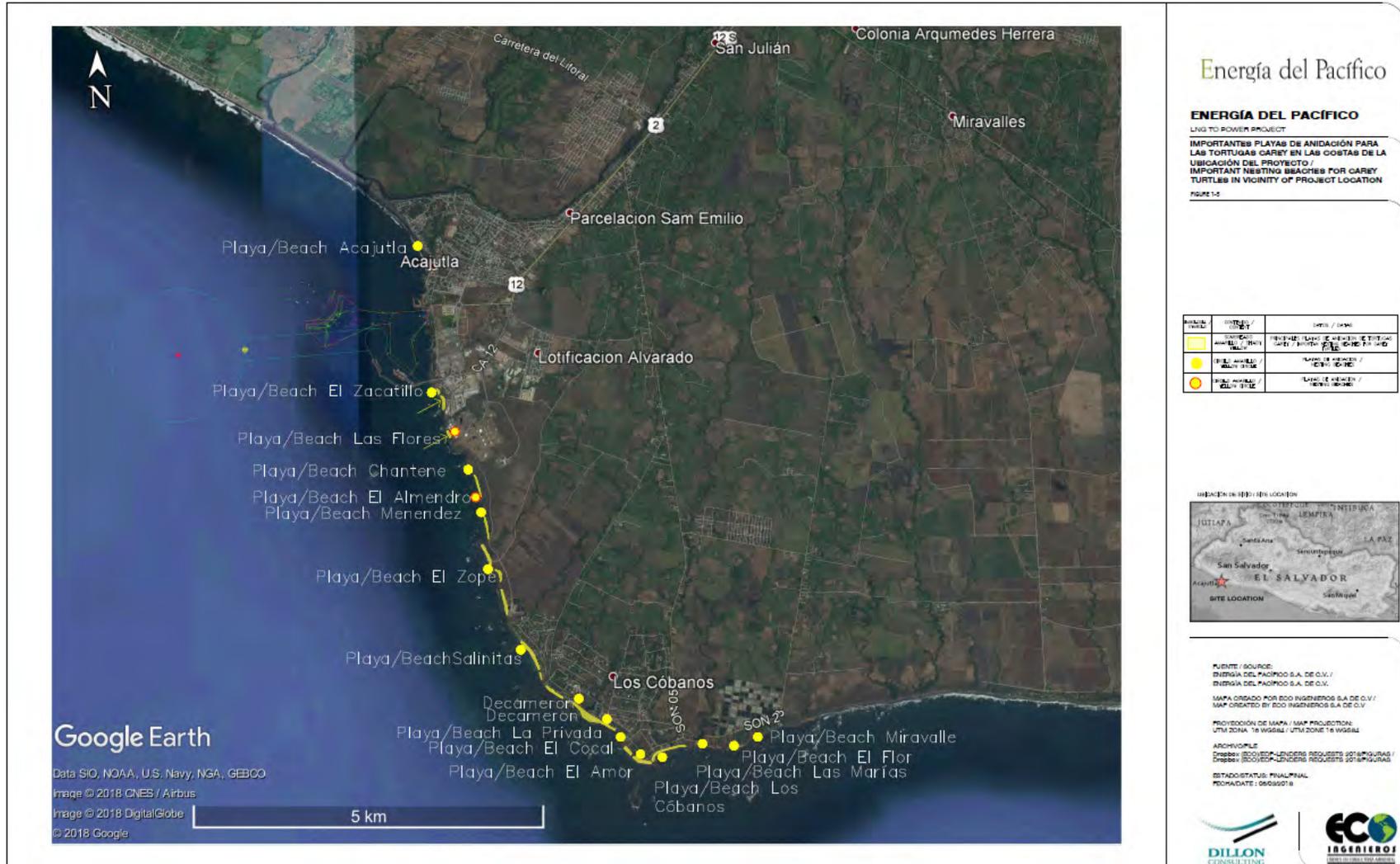
In recent years the authorities of the Ministry of Environment and Natural Resources (MARN) have carried out a series of actions to preserve the life of sea turtles in El Salvador to include the total and permanent ban on the use of products extracted from sea turtles. To enforce this, MARN works in conjunction with the National Civil Police's environmental division. Likewise, MARN and a group of organizations have created nurseries on several Salvadorian beaches where eggs are incubated and protected. The turtles are then released into their natural habitat after hatching.

Figure 1-4 Important nesting beaches for sea turtles in vicinity of project location



Source: MARN, 2018

Figure 1-5 Important nesting beaches for hawksbill turtles in vicinity of project location



Source: MARN 2018

Figure 1-6 details the occurrence and circulation of sea turtles in the project area and indirect zone of influence, according to personal observations during the research cruises URRACÁ (2001) and Miguel Oliver (2009).

During sampling in station 2, a juvenile of *Eretmochelys imbricata* (carey’s turtle) was observed on the surface. This coincides with previous observations from one of the consultants performing the present survey. On different occasions the circulation of sea turtles has been observed, particularly *Eretmochelys imbricata* mentioned, as well as *Lepidochelys olivacea* (golfiná’s turtle). During the survey in 2016 presented in the previous EIA two ridley turtles were reported, and also footprints of a baule turtle in Los Almendros beach. The first mentioned turtle is in danger of extinction and, the second threatened according to the list mentioned above.

During the survey for this project, upon returning to the vicinity of the CEPA-Acajutla dock, three Brown turtles (*Chelonia mydas agassizii*, an endangered species) could be observed at the following geographic coordinates: 13° 30’ 20.2”N, 89° 50’ 39.3”W. A hawksbill turtle was observed in the following location: 13° 33’ 55.6” N, 89° 50’ 38.8”W. Both positions are shown on the map in Figure 1-2.

The three species of sea turtles, already mentioned (Brown, Olive Ridley and Carey), circulate along the CEPA-Acajutla wharf, as well as in the surrounding areas to the northwest, west and southwest of the project area (Liles & Thomas, 2010). These were all observed during the survey.

In 2007, an inventory of nesting beaches was carried out, in which a total of 7,778 nesting turtles were counted on the coasts of the country; the most abundant was for the olive ridley with 82.23%, the brown 16.44%, the hawksbill 1.03% and the leatherback 0.29% (Vásquez - Jandres et al., 2009). For hawksbill turtles a study of nesting in Los Cobanos reported the data reported 79 egg nests in 14 beaches, with an average of 130.9 eggs by nest, as shown in Table 1-5. The same document reports 179 nest in the beaches in Bahía de Jiquilisco and 39 in Punta Amapala, La Unión area. There isn’t other recent document.

The same study reports

Nesting beach	BL	LN	ND	RC	Eggs per clutch			E	HS	EH
					Range	Mean	SD			
Las Flores	0.35	17	48.6	12	81-144	124.9	19.8	1499	55.4	830
Chantene	0.43	18	41.9	011	102-199	147.4	37.0	1621	51.9	841
El Almendro	0.34	10	29.4	8	90-156	129.8	20.3	1038	68.9	715

Table 1-5 Distribution of hawksbill turtle nesting density and reproductive output per beach in El Salvador in 2008.

Nesting beach	BL	LN	ND	RC	Eggs per clutch			E	HS	EH
					Range	Mean	SD			
					Menéndez	0.20	9			
El Zope	0.45	5	11.1	3	90-144	118.0	27.1	354	65.3	231
Salinitas	0.86	0	-	-	-	-	-	-	-	-
Decameron	0.78	3	3.9	0	-	-	-	-	-	-
La Privada	0.51	0	-	-	-	-	-	-	-	-
El Cocal	0.15	6	40.0	5	92-108	101.2	7.2	506	43.1	218
El Amor	0.28	1	3.6	0	-	-	-	-	-	-
Los Cóbano	0.57	0	-	-	-	-	-	-	-	-
Las Marías	0.39	3	7.7	3	123-192	153.0	35.4	459	75.6	347
El Flor	0.99	4	4.0	1	72	72.0	-	72	79.2	57
Miravalle	1.49	3	2.0	3	128-204	159.3	39.7	478	72.8	348
Overall	7.79	79	10.1	50	72-204	130.9	30.2	6543	58.5	3827

*Reproductive output data represent relocated clutches only. BL: beach length (km); LN: number of nests laid; ND: nesting density (nests km⁻¹); RC: number of relocated clutches; E: total number of eggs; HS: hatching success of eggs (%); EH: total number of emerged hatchlings. Los Cóbano: Los Cóbano Reef Marine Protected Area
Source: Hawksbill turtles *Eretmochelys imbricata* in El Salvador: nesting distribution and mortality at the largest remaining nesting aggregation in the eastern Pacific Ocean*

There is no available data regarding seasonal variation. FUNZEL-FIAES, MARN, local fisherman, and several publications, were consulted in regards possible numbers of turtles nesting in the Los Cobanos area in different periods. FUNZEL reported that on 2017 approximately 130,000 eggs were rescued by them in their sites in Los Cobanos, Barra de Santiago and Playa Dorada. No nesting beach in El Salvador has been monitored with the perseverance necessary during an adequate period of time to determine population changes during the last years.

El Salvador is the favourite nesting site for hawksbill sea turtles throughout the Pacific, according to the National Atmospheric and Oceanic Administration (NOAA) and the Carey Initiative of the Eastern Pacific ICAPO. The data that FIAES have collected since 2008 for El Salvador, indicates that the greatest concentration of these species can be found in the channels of the Bay of Jiquilisco, Usulután and in Maculís beach. According to the same source these populations stay very close to the coasts, they do not emigrate much and they remain in the same areas of forage. It is estimated that there are between 200 and 300 nesting female hawksbills between Mexico and Peru and of that total, 50% of all nesting turtles are concentrated in the 37 km of beaches in the Xirigualtique-Jiquilico Biosphere Reserve (Bahía de Jiquilisco) in El Salvador.

The main beaches for hawksbill turtle nesting are shown in Figure 1-6. The LNG to Power Project is not located in this priority area for hawksbill turtles as noted by MARN in the map of priority sites (See Figure 1-1). In the project area, the closest beaches for Hawksbill turtle is the beaches located south of CEPA Port, close to “Los Cobanos”, in the protected area, about 1.3 miles south.

In October 2017, about 300 to 400 specimens of turtles, (brown and olive ridleys) were found dead on the Salvadorian coasts. According to MARN when the turtles migrated, they encountered Tropical Storm Selma, which formed in the Pacific Ocean on October 27. The storm and the strong winds raised "sediments" and along with the increase of toxins caused the death of the turtles.

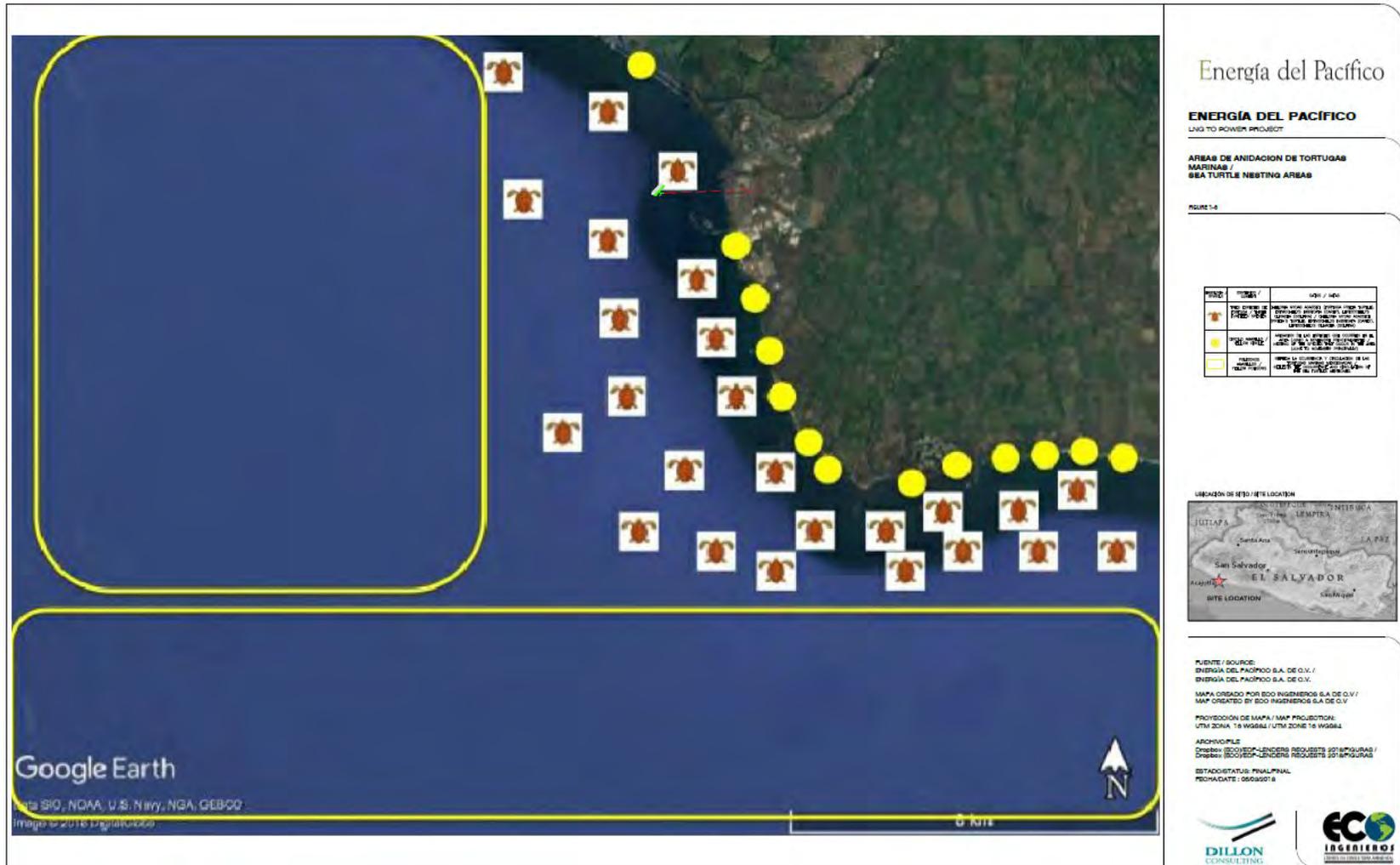
Reports from locals indicates that the turtles visits the beaches to the south of the CEPA Port, shown in Photograph 1-9, and marked in red in Figure 1-4 and with an arrow in Figure 1-5.

Photograph 1-9 Location of white sand beaches near the Las Flores beach, as alternative tourism sites and regulated use of turtle eggs.



Source: Consultan Team, 2018

Figure 1-6 Sea Turtle Nesting Areas



Source: Consultan Team, 2018

1.5 OYSTERS (PHYLLUM MOLLUSCA)

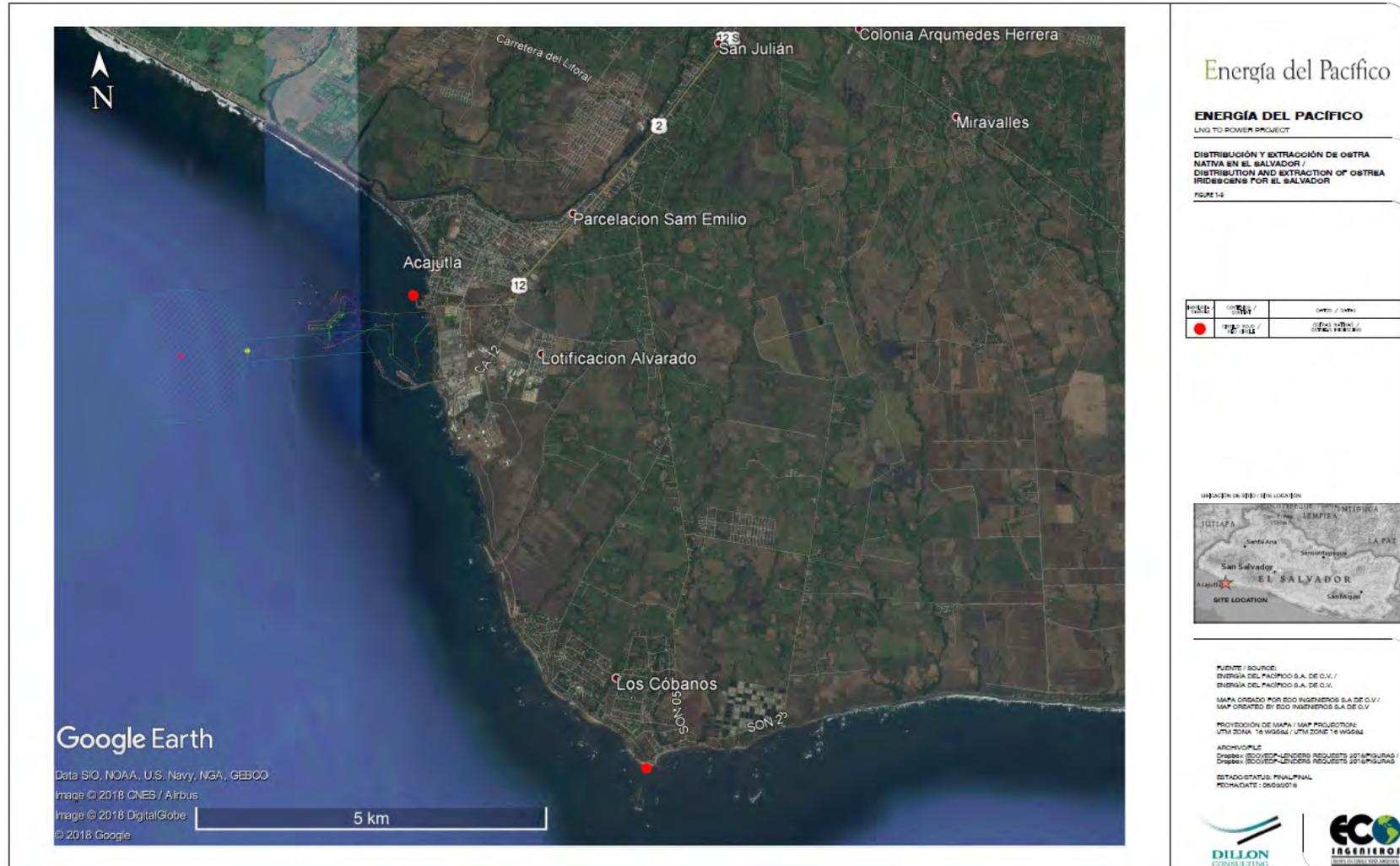
In El Salvador are reported 169 species of bivalves, included in 38 families, all belong to the Phylum Mollusca, class Bivalvia, family Ostreidae (MARN, 2009). There are three traditionally know areas of pressure for the extraction of the *Ostrea iridescens* species in the country, those are: stony areas of Acajutla rocky beach-the ANP of Los Cóbano, the rocky areas of the La Libertad coastline and the La Union bay. In Figure 1-7 the oyster sites in the vicinity of the Acajutla area are shown.

The oyster zones exist in Los Cobanos located to the south of the project in front of hotel decameron and nearby areas at the southeast of the same hotel. There are also oyster zones reported in Punta Remedios.

Local fishermen confirmed that commercial harvesting of stone oyster (*Striostrea prismatica*) banks occurs in crags and subtidal spurs located 270-300 meters north of the artisanal fishing dock of Acajutla, as shown in Figure 1-7, as was reported in the EIA, and such have been previously documented (Michel y Henry, 1997; Michel y Zengel, 1998). No other oyster banks were found in the Project area.

As mentioned in the EIA report from 2016, the densities currently found in the stones in the Oyster bank close to the project area are 1.5 ± 0.5 units / m^2 ; No record was found about the state of the main oyster extraction banks, that allowed comparison of their distribution and densities in these rocky sites. However, the sizes collected by the fishermen are of 9 ± 1 cm, considered very small by locals; it was reported that 10 years ago, in six hours, 30 dozen at least 15 cm in size were extracted from the oyster bank site near the Project and now they extract a maximum of 4 dozen (3.5 ± 0.5) with maximum sizes of 10 cm.

Figure 1-7 Distribution and extraction of *Ostrea Iridescens* for El Salvador



Source: MARN, 2018

1.6 CORAL REEF

El Salvador, despite being the smallest country in Central America has a wealth of marine coastal biodiversity. The Los Cóbános marine reef hosts a rich variety of species among which include the corals of the genera: *Porites*, *Pocillopora* and *Psammocora* which serve as a refuge for various species of fish. Coral reefs are scarce between Guatemala and El Salvador. These are diverse and large in Nicaragua to Panama.

In El Salvador, the best sample of this type of ecosystem is located off the coast of Los Cóbános, forming the only declared marine protected natural area in the Country, with an extension of 67.9km² of rocky reefs (MARN-TNC, 2011). The Los Cóbános Complex was declared the first marine-coastal Protected Natural Area in the Country on November 23, 2007.

The Los Cóbános area contains the only coral communities (*Porites lobata*, *Psammocora obtusangula* and *P. stellata*) in El Salvador, and they are poorly studied. It contains eight species of hard corals and several species of soft corals. The presence of other shallow rocky reefs has been identified, near El Pital in the Sierra del Bálsamo west of Playa Amapala and Maculis beach, and in different places in the Gulf of Fonseca, such as around the Chuchito islet, but these do not show the richness of species and not the extension of Los Cóbános (MARN - AECI, 2003).

In the project area coral reef are located as shown in Annex 1-5. Corals formations have been reported in sunken ships near the CEPA port.

In the case of octocoral species, El Salvador has important areas; these are the ANP of Los Cóbános, the rocky beaches and cliffs of the Department of La Libertad (between the Mizata beach and San Blas beach), the rocky beaches of the Department of the Union (between Playa Negra and El Maculís beach) and the islands of the Gulf of Fonseca (Meanguera and Pirigallo). As shown in Annex 1-6, with Los Cobanos as the most important.

For the Los Cobanos area, south of the project, octocorals were found at 30 m depth, with a genus *Muricea* (56 ind / m².) As for species, the greatest quantity was *M. appressa* (20 ind / m²) and *M. fruticosa* (20 ind / m²), the lowest density was in *M. purpurea* (4 ind / m²). (Source: J. Segovia-Prado 2012).

In addition, colonies of reef-building coral, particularly of the species *Porites lobata*, occur around the EDP project location (Molina, 1996; Reyes-Bonilla y Barraza, 2003). The other reef building species are

Psammocora stellata and *P. obtusangula* (López & Jiménez, 2008). The three-species considered endangered occur only in the protected natural area Los Cóbano Complex, as well as facilities approximately 1,200m south of the Port of Acajutla. As was presented in the EIA, soft corals may also be found in rocky areas in the zone located between the pipeline and the CEPA Port.

The complete list of species that may be found in Los Cobanos, is presented in the EIA report, and is included in Annex 1-7 and in Annex 1-8 the species of special concern and interest are presented.

1.7 Critical Habitat Evaluation

IFC PS6 (IFC 2012) defines critical habitat as areas with high biodiversity value that meet one or more of the following criteria:

- Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species
- Criterion 2: Endemic and/or restricted range species
- Criterion 3: Migratory and/or congregatory species
- Criterion 4: Highly threatened and/or unique ecosystems and
- Criterion 5: Key evolutionary processes

Other areas of high biodiversity value that do not fall within the five criteria can be classified as critical habitat under PS6. For example, certain protected areas can trigger a critical habitat designation under PS6 including but not limited to:

- IUCN Category 1 and 2 Protected Areas;
- Areas required for the reintroduction of CR and EN species and/or sites required by species during periods of stress such as flood, drought, fire, etc.;
- RAMSAR sites meeting Criteria 1 (Critically Endangered species only), 5 (regularly supports 20,000 or more waterbirds), and 6 (regularly supports 1 percent of the individuals of a population of one species or subspecies of waterbird);
- Key Biodiversity Areas designated for Critically Endangered species, endemic and restricted range species, and migratory species or species that form congregations;
- Important Bird Areas (IBAs) meeting Criteria A1 (Critically Endangered species only), A2 (restricted range species), and A4 (congregations);
- Ecosystems of known special significance to EN or CR species for climate adaptation purposes;
- Concentrations of Vulnerable (VU) species where there may be uncertainty regarding listing;
- Areas with high levels of species diversity (see GN56); and
- World Heritage Sites.

For the project offshore area of influence, we have evaluated if the site is classified as a critical habitat. The evaluation is described below.

The marine facility project site, along with its area of influence is a natural habitat. According to PS6, a natural habitat is: “areas composed of viable assemblages of plant and/or animal species of largely native

origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition."

The only feature in the area of influence for the marine facility that is not considered "natural" is the CEPA dock, and the sunken ships located between the pipeline route and the CEPA Dock. The sunken ships serve as an artificial habitat for corals.

1.7.1 Criterion 1

Criterion 1: Habitat of significant importance to Critically Endangered and or Endangered species. Habitat of significant importance to CR and or EN species. Also includes "refuge" sites, reintroduction sites, and sites with high scientific value.

Tier 1: Habitat required to sustain ≥ 10 percent of the global population of a CR or EN species/subspecies where there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species. Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.

Tier 2: Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally - important concentrations of a red-listed EN species where that habitat could be considered a discrete management unit for that species/ subspecies. Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. As appropriate, habitat containing nationally/regionally important concentrations of an EN, CR, or equivalent national/regional listing.

1.7.1.1 Criterion 1 Analysis

The location area of the "LNG to Power" Project is not located within any natural protected area or designated as an area of importance to critically endangered species, nevertheless it is close to two natural areas: "Barra de Santiago Natural Protected Area" and "Los C6banos Natural Marine Protected Area", located at 17 and 6 kilometers west and east of the Port of Acajutla, respectively. See Annex 1-9.

"Barra de Santiago Natural Protected Area" includes the largest extension of mangrove (2,868 ha.) and the best location of this type of habitat on the western side of the country. This mangrove area stands out for the variety of species of mangrove trees present (Rhizophora mangle, R. racemosa, Avicennia germinans, A. bicolor, Laguncularia racemosa and Conocarpus erectus.) and provides a high level of associated biological diversity.

“Los C6banos Natural Marine Protected Area” around the rocky reef of Los C6banos, stands out in the national scope both for the richness of its biodiversity and for its unique character, which includes eight species of hard corals and several species of soft corals, numerous species of marine invertebrates and an ichthyofauna especially varied.

With the project being located between these two important natural protected 6reas, some migratory species or turtles are expected to travel through the project site as they transit between these important 6reas.

Throughout the 2016 and 2018 marine surveys, only the following threatened and endangered species were registered within the project’s 6rea of influence, see Table 1-6.

Table 1-6 Critically Endangered and Endangered Species Reported In The Project Area						
FAMILY	CIENFIFIC NAME	COMMON NAME	MARN 2015	UICN (2017)	CITES	OBSERVED DURING SURVEY
Cheloniidae	<i>Eretmochelys imbricata</i>	Hawksbill turtle	Endangered	Critically Endangered	Appendice I	Station 2 (2018) and 13° 33' 55.6" N, 89° 50' 38.8" W (2018)
Clase Holothuroidea	<i>Isostichopus fuscus</i>	Sea cucumber	Threatened	Endangered	N/D	Close to sampling site M01 (2016)
Cheloniidae	<i>Chelonia mydas</i>	Brown Turtle (Green Turle in IUCN list)	Endangered	Endangered	Appendice I	13° 30' 20.2" N, 89° 50' 39.3" W (2018)
Balaenopteridae	<i>Balaenoptera musculus</i>	Blue whale	Endangered	Endangered	Appendice I	Reported in Los Cobanos area

Source: Consulting team, 2018

Information on the species observed and reported is detailed.

1. Hawksbill Turtles

The hawksbill moves close to the coast because they feed on sponges, jellyfish and algae that grow near the shore and so they are often seen near natural coral and rocky reefs. The hawksbill turtle begins its nesting season in May and in some places continues to arrive until October, the peak month when

nesting occurs in June. According to the gathered information, hawksbill turtles nest on the beaches south of the Cepa Port and in Los Cobanos area. The turtles have been known to move around the Project area, as was observed during the updated marine survey.

In the site of location of the FSRU, RCM and Pipeline the seabed is silt, with no habitat for the typical turtle food. As such turtles in the project area are likely to be migrants and not likely to spend significant time in the project area.

The nesting and feeding sites of this turtle are widely distributed on the beaches of the coast of El Salvador, nesting is reported in the beaches at the south of the CEPA Port. There is no report of turtles nesting on the beaches north of the CEPA port, close to the project site.

2. Brown Turtle

The brown turtle that feeds on seagrass and algae is not usually found too close to the shore. Nesting is reported in the beaches south of the project area, mainly in Los Cobanos. Nesting season is from July to September, with the peak in August and September. A specimen from this turtle was seen in open sea during the survey in 2016. As with the hawksbill turtle, the immediate project area does not provide a suitable food source for this turtle and its movements through the project area are for feeding from one area to another.

3. Sea Cucumber

The sea cucumber *Isostichopus fuscus* prefers rocky habitats, and coral habitats. It was observed during the survey in 2016, in sampling point M1, around 300m south from the projected pipeline alignment.

4. Blue Whale

No observations were made during the surveys. Observations have been reported in Los Cobanos area, but there is little information on specific areas. The whale feeds mostly on krill, and are expected to spend most of their time in deeper waters. Considering the limited water depth of the project location, blue whales are not expected.

Considering the observations made and available records, the project site does not meet Criterion 1 to be considered a critical habitat.

1.7.2 Criterion 2

Criterion 2: Habitat of significant importance to endemic and/or restricted-range species. Habitat of significant importance to endemic and/or restricted-range species.

Tier 1: Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species (e.g., a single-site endemic).

Tier 2: Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species, where data are available, and/or based on expert judgment.

1.7.2.1 Criterion 2 Analysis

No endemic species in the project site and its area of influence or habitats of endemic marine species were identified in the research conducted or from the observations and samples taken during the surveys.

1.7.3 Criterion 3

Criterion 3: Habitat supporting globally significant concentrations of migratory species and/or congregatory species. Habitat supporting globally significant concentrations of migratory species and/or congregatory species. Migratory species are defined as species “of which a significant portion of its members cyclically and predictably move from one geographical area to another.” Congregatory species form colonies for breeding or other purposes, move through “bottlenecks” where individuals become concentrated, may become largely concentrated in a single or few sites, or have “source populations” that contribute inordinately to recruitment elsewhere.

Tier 1: Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the species’ lifecycle where that habitat could be considered a discrete management unit for that species.

Tier 2: Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species’ lifecycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment.

For birds, habitat that meets BirdLife International’s Criterion A43 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance.

For species with large but clumped distributions, a provisional threshold is set at ≥ 5 percent of the global population for both terrestrial and marine species. Source sites that contribute ≥ 1 percent of the global population of recruits.

1.7.3.1 Criterion 3 Analysis

The whales and turtles identified that may be found in the project area are migratory species. The turtles are reported to use the beaches around Los Cobanos area, and have not been reported/observed in large quantities within the project area of influence. Whales, they tend to be observed in the open sea in deeper water and not in the project area.

1.7.4 Criterion 4

Criterion 4: Highly threatened and/or unique ecosystems. Highly threatened and/or unique ecosystems are defined in GN6, subnote GN90 as those (i) that are at risk of significantly decreasing in area or quality; (ii) with a small spatial extent; and/or (iii) containing unique assemblages of species including assemblages or concentrations of biome-restricted species. To be prioritized using factors similar to those used by the IUCN Red List of Threatened Species, such as long-term trend, rarity, ecological condition, and threat. Specifies that ecosystems must be “highly” threatened to be designated as critical habitat solely on the basis of ecological threat.

1.7.4.1 Criterion 4 Analysis

Two natural areas are found close to the project: “Barra de Santiago Natural Protected Area” and “Los Cóbános Natural Marine Protected Area”, located at 17 and 6 kilometers west and east of the Port of Acajutla, respectively.

Barra de Santiago Complex (11,519.00 ha.) was recently declared the first major wetland in the Country as a RAMSAR site. This mangrove stands out for the variety of species of mangrove trees present (Rhizophora mangle, R. racemosa, Avicennia germinans, A. bicolor, Laguncularia racemosa and Conocarpus erectus), the heights of its trees and the great associated biological diversity.

ANP Los Cobanos which is close to the Project area has some species of conservation interest and are found in Appendix 1-8. Species of special interest are: Pocillopora spp, Psamocora spp, Strombus galeatus, Epinephelus itajara, Rhincodon typus, Sphyrna lewini, Eretmochelys imbricata y Dermochelys coriácea.

The first 350 m of the pipeline route are rocky areas where there are species of interest, like sea cucumbers that are also found in Los Cobanos and other locations. This area is not a unique habitat and is not considered to meet criterion 4.

1.7.5 Criterion 5

Criterion 5: Areas associated with key evolutionary processes. Areas associated with key evolutionary processes are defined in GN6 subnote GN95, criterion is defined by: (i) the physical features of a landscape that might be associated with particular evolutionary processes; and/or (ii) subpopulations of species that are phylogenetically or morphogenetically distinct and may be of special conservation concern given their distinct evolutionary history. The latter includes evolutionarily significant units (ESUs) and Evolutionarily Distinct and Globally Endangered (EDGE) species.

Criteria now focuses instead solely on key evolutionary processes. Provides expanded but qualitative guidance on the specific habitat characteristics that contribute to evolutionary processes. Analytical protocol remains qualitative and focused on professional expertise and expert judgment.

1.7.5.1 Criterion 5 Analysis

This criterion is defined by the physical features of a landscape that might be associated with particular evolutionary processes, and/or subpopulations of species that are phylogenetically or morpho-genetically distinct and may be of special conservation concern given their distinct evolutionary history (IFC 2012b, paragraph GN95).

The project area does not provide a specific habitat that any species are dependant on and therefore does not meet Criterion 5.

1.7.6 Conclusion on critical habitat

Through the above analysis, it was determined that the project site (marine component) does not meet the criteria established in IFC's PS6. As such, it is not considered as critical habitat.

The presence of the floating FSRU-MCR and under seabed pipeline will not be a barrier for the movement of the marine species along the coastline. Along the pipeline route, the areas of rocky sea bottom and intermareal zone, which serves as more valuable habitat, will not be affected by the project as HDD will be used to install the pipeline through these areas.

Significant impact on the movement of turtles and their nesting in the area will also not be impacted. The nesting sites are outside the project area of direct and indirect influence, as they are located mainly in the area of Los C6banos and south of the CEPA wharf.

1.8 CONCLUSIONS

The EDP Project is located in an area already affected by industrial activities, with poor biodiversity. The surrounding areas, mainly Los Cobanos protected areas, is rich in biodiversity, including several species that are subject to protection at the national and international levels for their conservation. Los Cobanos is located in approximately six kilometres from the proposed project site.

Fish species reported in the project area are fish that commonly inhabit the Salvadoran coast. The project will occupy a very small footprint, that won't affect these species. In Station 1, fourteen species of fish associated with rocky bottoms of the eastern tropical Pacific Ocean was observed.

In Stations 2, 3 and 4, a total of five specimens of the species *Caranx caballus* were captured, including: *Anisotremus caesius*, *Cyclopsetta panamensis*, *Nematistius pectoralis*, *Oligoplites* sp., *Tylosurus* sp. and *Urotrygon* sp., which are associated with rocky or soft bottoms. None of the fish observed or captured is on the list of threatened or endangered species in El Salvador.

In the project area, during the 2018 survey, one juvenile and two adult hawksbill turtles, and a group of three brown turtles were observed. Two olive ridley turtles were observed in the 2016; reflecting that in the project area and surrounding area, these species moves around.

The country is of great importance for turtle nesting, having some of the most important beaches for nesting: El Almendros, Las Flores, and Los Cobanos that are located about 1.6 km south of the CEPA wharf. These beaches are identified as conservation priority areas. Los Cobanos is a site of great importance for the hawksbill turtle. Closer to the project location, there are small sandy beaches between the cliffs which could serve as turtle nesting sites. Local fishermen indicate that these beaches are not used for nesting by turtles, likely because of the human presence in the area and the frequent passage of vessels. The same applies to the beach in front of the City of Acajutla, where turtle nesting is rare. While turtles visit these beaches year round, the EDP project will not impact or disturb any of the turtle nesting beaches in the vicinity of the project.

There is the possibility of occurrence of adult crocodiles near the CEPA-Acajutla wharf, but they have not been observed to frequent the project area according to fishermen in the area.

Although no whales were observed during the trip, it is known from reports that humpback whales can be located more than 3 km west, north and south of the EDP project area. Bottlenose dolphins are also found in the general area. In the area of the project, the presence of whales is not expected very frequently.

The EDP project is located in a disturbed area affected by industrial activities and port vessel and fishing boat activities. Areas of importance to biodiversity in the general vicinity of the project, such as the protected area of Los Cobanos will not be affected by the project.

The complete impacts assessment is presented in the Modifications Report, prepared and presented to MARN on February 9th, 2018, with the revised Environmental Mitigation Program (EMP). No additional mitigation has been identified as needed by the information gathered in the present report.

As stated in the addendum documentation to the EIA report, marine habitat loss effects are reduced through the revised project design (use of a combination of HDD/ trenching for pipeline installation and use of a restricted catenary mooring (RCM) system instead of the marine terminal enclosure). Direct habitat loss will be minimal, only in the location of the PLEM and the anchors for the RCM system.

Also, as mentioned in the EIA, the pipeline construction using HDD could disturb a small area of habitat from drill head “day lighting” on the sea floor, fluid release during pipe installation, and from potential “frac-out” events. The sediment dispersion is not likely to affect areas with soft corals near the CEPA Port.

During operations, the sea water intake discharge will comply with a 5 degrees increase-decrease temperature limit at the point of discharge and the water intake velocity will not exceed 1 m / sec. The impact area of warm and cold water discharge is limited to the immediate area of the FSRU, and will not impact sites of biodiversity importance identified in this report.

Overall, marine habitat loss and impacts from the project are considered to be minimal and not significant.

There are no significant environmental impacts on marine biodiversity in the project area. The project is not located in an area where there are hard and soft corals. Impacts on, oyster beds and bottom benthos will be avoided through the use of HDD to install the pipeline.

Further, during project operations, pelagic species (turtles, cetaceans) will be able to avoid/swim around the permanent floating ship where the LNG will be stored and converted to gas. Noise emissions will be

minimal, and lighting will be according to Port rules and international standards. There are no coral reefs along the pipeline route, nor in the circulation zone of the project supply vessels.

Key mitigation measures presented in the revised EMP are:

For Construction Phase.

- Management of hazardous materials in construction of RCM and FSRU installation to avoid discharge of any material to the sea. Including procedures, storage, spill equipment and training.
- Measures during HDD drilling: Installation of a recycling system to separate water-clay and sediments. Use of material that does not affect wildlife. As well as volume monitoring and handling of accidental discharges.
- Lighting plan offshore during construction to avoid disruptions to the fauna.
- Measures to Reduce Turbidity and Oyster Biomonitoring.
- Marine wildlife rescue center.
- Corals monitoring, stony and soft corals

For Operations Phase.

- FSRU Lightning Plan during operations.
- Support of the marine wildlife rescue center.

1.9 RECOMMENDATIONS

MARN along with FIAES have established programs for conservation of turtles in the area, mainly in Los Cobanos, as explained in Annex 1-10. EDP has signed an agreement with FIAES, to provide funds for the compensation of tree loss, water usage and infiltration loss. There is an opportunity to make an approach with FIAES to request that the funds be used specifically in the protection of turtles in Los Cóbano.

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1.11 APPENDIX

Annex 1-1 Conservation status of marine coastal species

The table shows the coastal marine species with their threatened or endangered conservation status, according to MARN, 2015, OFFICIAL JOURNAL TOME No. 409 MINISTERIAL AGREEMENT No. 74. And the list of invertebrates of special interest (food and commercial) reported for the coastal-marine zone that have not yet been discussed nationally with regards to conservation status, due to lack of pertinent information of each of them.

FAMILY	CIENTIFIC NAME	COMMON NAME	MARN 2015	UICN (2017)	CITES (2017)
CORALES					
Anthipatidae	<i>Antipathes galapagensis sp.</i>	Coral Negro	Endangered	N/D	Appendice II
Pocilloporidae	<i>Pocillopora capitata</i>	Coral de Arrecife	Endangered	Least concern	Appendice II
Pocilloporidae	<i>Pocillopora damicornis</i>	Coral de Arrecife	Endangered	Least concern	N/D
Pocilloporidae	<i>Pocillopora effusus</i>	Coral de Arrecife	Endangered	Data deficient	N/D
Pocilloporidae	<i>Pocillopora elegans</i>	Coral de Arrecife	Endangered	Vulnerable	N/D
Poritidae	<i>Porites lobata</i>	Coral de Arrecife	Endangered	Near Threatened	N/D
Psammocoridae	<i>Psammocora obtusangula</i>	Coral	Endangered	Near Threatened	N/D
Psammocoridae	<i>Psammocora stellata</i>	Coral	Endangered	Vulnerable	N/D
Dendrophylliidae	<i>Cladopsammia eguchii</i>	Coral Copa	Endangered	N/D	Appendice II
Dendrophylliidae	<i>Tubastraea coccinea</i>	Coral Copa	Endangered	N/D	N/D
Rhizangiidae	<i>Astrangia sp.</i>	Coral Colonial	Endangered	Least concern	Appendice II
Rhizangiidae	<i>Oulangia bradleyi</i>	Coral Solitario	Endangered	N/D	N/D
Astrangiidae	<i>Phyllangia sp.</i>	Coral Rosado	Threatened	N/D	N/D
Orden Alcyonacea (varias Familias)	Todos los Corales Gorgónidos	Rudas de Mar, Plumas de Mar	Threatened	N/D	N/D
HOLOTUROIDEOS					

FAMILY	CIENFIFIC NAME	COMMON NAME	MARN 2015	UICN (2017)	CITES (2017)
Clase Holothuroidea (varias Familias)	Todas las especies que ocurren en El Salvador	Pepinos de Mar	Threatened	Least concern	N/D
Clase Holothuroidea	<i>Isostichopus fuscus</i>	Pepino de Mar	Threatened	Endangered	N/D
MOLUSCOS					
Muricidae	<i>Plicopurpura pansa</i>	Caracol Púrpura	Threatened		
Unionidae	<i>Nephronaias lempensis</i>	Almeja del Río Lempa	Endangered	N/D	N/D
Unionidae	<i>Nephronaias rowelii</i>	Almeja del Lago de Güija	Endangered	N/D	N/D
Mycetopodidae	<i>Mycetopoda subsinuata</i>	Almeja de Olomega	Endangered	N/D	N/D
Strombidae	<i>Lobatus galeatus</i>	Caracol Cambute	Endangered	N/D	N/D
PECES ESTUARINOS Y MARINOS					
Rhincodontidae	<i>Rhincodon typus</i>	Tiburón Ballena	Endangered	Endangered	Appendice II
Syngnathidae	<i>Hippocampus ingens</i>	Caballito de Mar	Endangered	Vulnerable	Appendice II
Narcinidae	<i>Diplobatis ommata</i>	Raya Eléctrica	Endangered	Vulnerable	Appendice II
Pristidae	<i>Pristis pristis</i>	Pez Sierra	Endangered	Critically Endangered	Appendice I
Serranide	<i>Epinephelus quinquefasciatus</i>	Mero Gigante	Endangered	Data Deficient	N/D
PLANTAS					
ALGAS MARINAS					
Gomontiaceae	<i>Monostroma sp</i>	Alga de manglar	Threatened	N/D	N/D
Rhodomelaceae	<i>Laurencia sp</i>	Alga marina	Threatened	N/D	N/D
REPTILES					
Cheloniidae	<i>Chelonia mydas</i>	Tortuga Prieta, Tortuga Negra, Morrocoyo	Endangered	Endangered	Appendice I
Cheloniidae	<i>Eretmochelys imbricata</i>	Tortuga Carey	Endangered	Critically Endangered	Appendice I
Cheloniidae	<i>Lepidochelys olivacea</i>	Tortuga Golfina,	Threatened	Vulnerable	Appendice I

FAMILY	CIENTIFIC NAME	COMMON NAME	MARN 2015	UICN (2017)	CITES (2017)
Dermochelyidae	<i>Dermochelys coriacea</i>	Tortuga Baule	Endangered	Vulnerable	Appendice I
MAMIFEROS MARINOS					
Balaenopteridae	<i>Balaenoptera edeni</i>	Ballena de Bryde	Threatened	Data deficient	Appendice I
Balaenopteridae	<i>Balaenoptera musculus</i>	Ballena azul	Endangered	Endangered	Appendice I
Balaenopteridae	<i>Balaenoptera physalus</i>	Ballena, Rascual común	Endangered	Endangered	Appendice I
Delphinidae	<i>Delphinus delphis</i>	Delfín común, Bufo	Threatened	Least concern	Appendice II
Delphinidae	<i>Globicephala macrorhynchus</i>	Ballena piloto	Threatened	Data deficient	Appendice II
Delphinidae	<i>Grampus griseus</i>	Delfín de Risso	Threatened	Least concern	Appendice II
Delphinidae	<i>Orcinus orca</i>	Orca	Threatened	Least concern	Appendice II
Delphinidae	<i>Pseudorca crassidens</i>	Falsa orca	Threatened	Least concern	Appendice II
Delphinidae	<i>Stenella attenuata</i>	Delfín manchado	Threatened	Least concern	Appendice II
Delphinidae	<i>Stenella coeruleoalba</i>	Delfín rayado	Threatened	Least concern	Appendice II
Delphinidae	<i>Stenella longirostris</i>	Delfín tornillo	Threatened	Least concern	Appendice II
Delphinidae	<i>Steno bredanensis</i>	Delfín de dientes rugosos	Threatened	Least concern	Appendice II
Delphinidae	<i>Tursiops truncatus</i>	Delfín nariz de botella	Threatened	Least concern	Appendice II
Eschrichtidae	<i>Eschrichtius robustus</i>	Ballena gris	Threatened	Least concern	N/D
Hyperoodontidae	<i>Mesoplodon peruvianus</i>	Ballena picuda pigmea	Threatened	Data deficient	Appendice II
Hyperoodontidae	<i>Mesoplodon sp.</i>	Ballena picuda	Threatened	Data deficient	Appendice II
Hyperoodontidae	<i>Ziphius cavirostris</i>	Ballena de Cuvier	Threatened	Least concern	Appendice II
Kogiidae	<i>Kogia sima</i>	Cachalote enano	Threatened	Data deficient	Appendice II
Physeteridae	<i>Physeter macrocephalus</i>	Cachalote	Endangered	Vulnerable	Appendice I

Source: MARN, 2016

Invertebrates of special interest (food and commercial) reported for the coastal-marine zone

PHYLLUM	CIENTIFIC NAME	COMMON NAME	MARN 2015	UICN (2017)	CITES (2017)
Moluscos	<i>Anadara grandis</i>	Casco de burro	N/D	N/D	N/D
	<i>Anadara similis</i>	Curil	N/D	N/D	N/D
	<i>Anadara tuberculosa</i>	Concha negra	N/D	N/D	N/D
Artrópodos	<i>Cardisoma crassum</i>	Tilhuacal	N/D	N/D	N/D
	<i>Macrobrachium tenellum</i>	Camarón de río	N/D	Least concern	N/D
	<i>Penaeus stylirostris</i>	Camarón blanco	N/D	N/D	N/D
	<i>Xiphopenaeus riveti</i>	Chacalín	N/D	N/D	N/D
	<i>Ucides occidentalis</i>	Punche	N/D	N/D	N/D
	<i>Callinectes spp.</i>	Jaiba	N/D	N/D	N/D

Source: MARN, 2016

Fish of special interest (food and commercial) reported for the coastal-marine zone

PHYLLUM	CIENTIFICO NAME	COMMON NAME	MARN 2015	UICN (2017)	CITES (2017)
Muraenidae	<i>Aetobatus narinari</i>	Raya gavilán	N/D	Near Threatened	N/D
Ariidae	<i>Arius guatemalensis</i>	Bagre	N/D	Least concern	N/D
	<i>Galeichthys jordani</i>	Bagre	N/D	N/D	N/D
Centropomidae	<i>Centropomus armatus</i>	Robalo	N/D	Least concern	N/D
	<i>Centropomus medius</i>	Robalo	N/D	Least concern	N/D
	<i>Centropomus robalito</i>	Robalito	N/D	Least concern	N/D
	<i>Centropomus nigrescens</i>	Robalito	N/D	Least concern	N/D
Serranidae	<i>Ephinephelus striatus</i>	Mero	N/D	N/D	N/D
Carangidae	<i>Caranx caninus</i>	Jurel	N/D	Least concern	N/D
Lutjanidae	<i>Hoplopagrus guntheri</i>	Pargo	N/D	Least concern	N/D
	<i>Lutjanus argentiventris</i>	Pargo	N/D	Least concern	N/D
	<i>Lutjanus guttatus</i>	Pargo	N/D	Least concern	N/D
Gerreidae	<i>Eucinostomus argenteus</i>	Mojarra	N/D	Least concern	N/D
Mugilidae	<i>Mugil curema</i>	Mugil	N/D	Least concern	N/D
Sphyraenidae	<i>Sphyraena ensis</i>	Barracuda	N/D	Least concern	N/D
Scombridae	<i>Scomberomorus sierra</i>	Macarela	N/D	Least concern	N/D

Source: MARN, 2016

Annex 1-2 Species of whales and dolphins reported in El Salvador

Nº	taxon	common name
	Delphinidae	
1	<i>Pseudorca crassidens</i>	fake orca
2	<i>Orcinus orca</i>	killer whale
3	<i>Globicephala macrorhynchus</i>	ballenato, "whale" pilot
4	<i>Grampus griseus</i>	Bufo, Risso's dolphin
5	<i>Steno bredanensis</i>	buefo, dolphin with rough teeth
6	<i>Tursiops truncatus</i>	buffalo, bottlenose dolphin
7	<i>Delphinus delphis</i>	dolphin, common dolphin
8	<i>Stenella attenuata</i>	Spotted dolphin
9	<i>Stenella coeruleoalba</i>	striped dolphin, striped dolphin
10	<i>Stenella longirostris</i>	dolphin screw
	Physeteridae	
11	<i>Physeteridae catadon</i>	sperm whale
12	<i>Kogia simus</i>	pygmy sperm whale
	Ziphiidae	
13	<i>Ziphius cavirostris</i>	whale, zifio, "whale" of Cuvier
14	<i>Mesoplodon densirostris</i>	whale, "whale" beaked
15	<i>Mesoplodon grayi</i>	whale beaked
16	<i>Mesoplodon peruvianus</i>	Peruvian zyphy, Lesser zyphy
17	<i>Berardius bairdii</i>	zifio, berardio of Baird
	Balaenopteridae	
18	<i>Balaenoptera musculus</i>	blue whale, giant whale
19	<i>Balaenoptera edeni</i>	whale, Bryde's whale
20	<i>Megaptera novaengliae</i>	humpback whale, whale, yubarta
	Eschrichtiidae	
21	<i>Eschrichtius robustus</i>	Gray whale

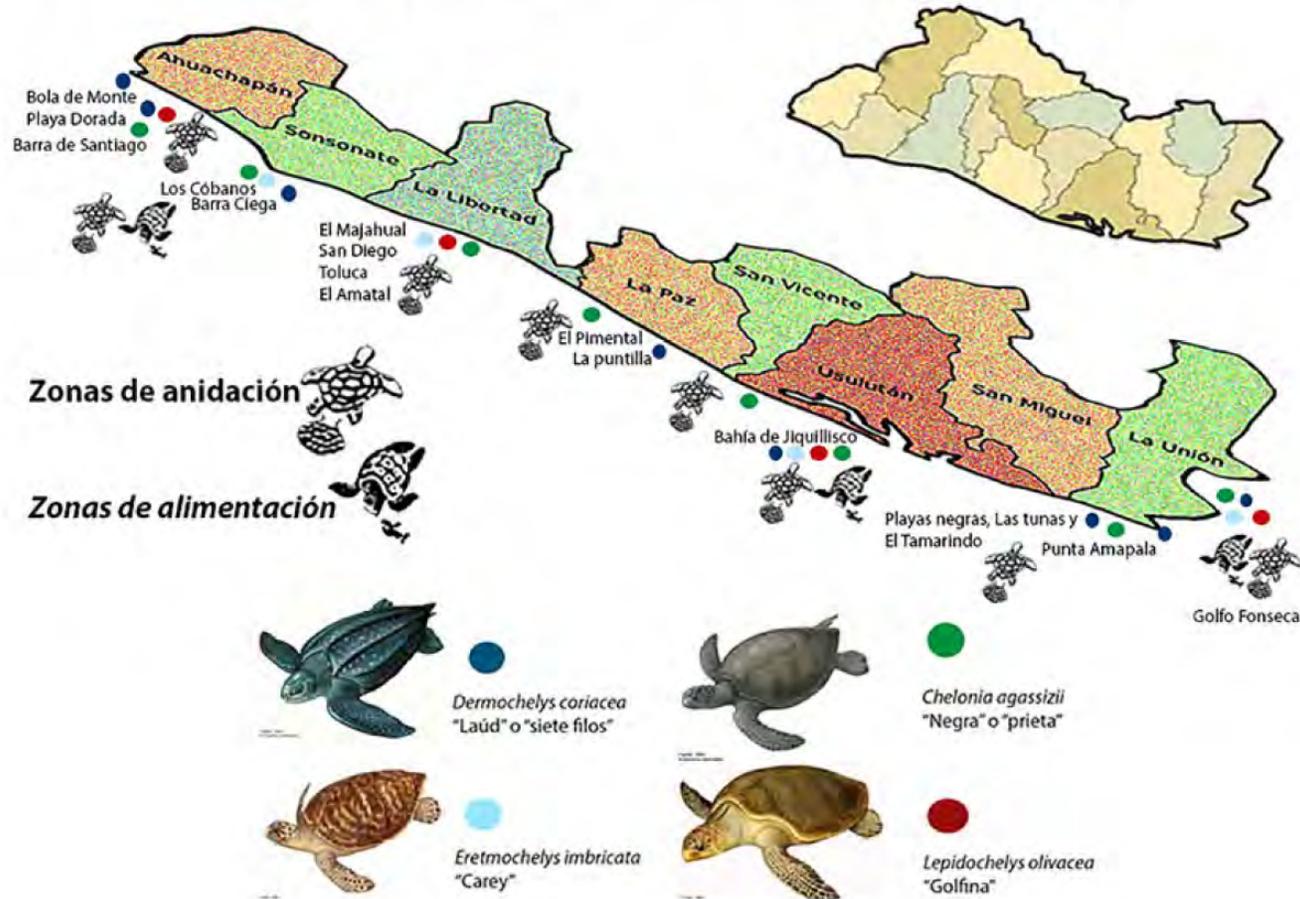
Source: FUNDARECIFE

Annex 1-3 Whale watching reported in front of Los Cobanos Beach

ESPECIE	DATE	COMMENTS	SOURCE
b. novaeangliae	1/26/2012	mother and son moving in open waters	MARN-FUNDARRECIFE/FIAES
b. novaeangliae	1/28/2012	mother and son moving in open waters	MARN-FUNDARRECIFE/FIAES
b. novaeangliae	11/27/2012	an adult mobilizing in open waters	MARN-FUNDARRECIFE/FIAES
b. novaeangliae	11/28/2013	Two adult mobilizing in open waters	MARN
b. novaeangliae	10/17/2014	An adult and a child	MARN
b. novaeangliae	10/12/2016	A dead adult	MARN
b. novaeangliae			
T. truncatus	1/26/2012	3 adults in open water	MARN/FUNDARRECIFE
T. truncatus	1/28/2012	5 adults in open water	MARN/FUNDARRECIFE
T. truncatus	11/27/2012	9 individuals observed swimming with 26 individuals of dolphin spotted in open waters video recorded in program trix tv	MARN/FUNDARRECIFE
T. truncatus	11/28/2012	8 individuals in open waters along with S. attenuata, moving south / east	MARN/FUNDARRECIFE
T. truncatus	12/17/2012	An individual swimming with 5 spotted dolphins in open water	MARN/FUNDARRECIFE
T. truncatus	10/12/2016	11 individuals were observed in open waters mixed with spotted dolphins	MARN/FUNDARRECIFE
S. attenuata	10/12/2016	11 individuals in open water in group with spotted dolphins	MARN
S. attenuata	1/17/2016	Approximately 9 individuals swimming with 2 bottlenose dolphins	Los Cobanos Turs
S. attenuata	12/30/2015	approximately 3 individuals, were mobilized at high speed in open waters together with bottlenose dolphins.	Los Cobanos Turs
S. attenuata	2/1/2015	4 adults swimming in a bottle with bottle nose	MARN
S. attenuata	1/26/2012	3 adults in open water	MARN
S. attenuata	1/28/2012	5 adults in open water with bottlenose dolphins	MARN/FUNDARRECIFE
S. attenuata	11/27/2012	26 individuals of spotted dolphins swimming in open waters	MARN/FUNDARRECIFE
S. attenuata	11/28/2012	9 individuals in open waters	MARN/FUNDARRECIFE
S. attenuata	12/17/2012	4 individuals in open waters	MARN/FUNDARRECIFE
S. coeruleoalba	2/2/2016	(mother and calf) appeared stranded on El Maguey beach, in the Los Cobanos Complex.	MARN
S. coeruleoalba	6/10/2012	An adult on beaches of the Anp Lo Cobanos	MARN, Melvin Castaneda
O. orca	10/2/2016	Four individuals observed and recorded on video by fishermen	MARN/FUNDARRECIFE

Source: FUNDARECIFE

Annex 1-4 Map of Nesting and Feeding Sites For Turtles



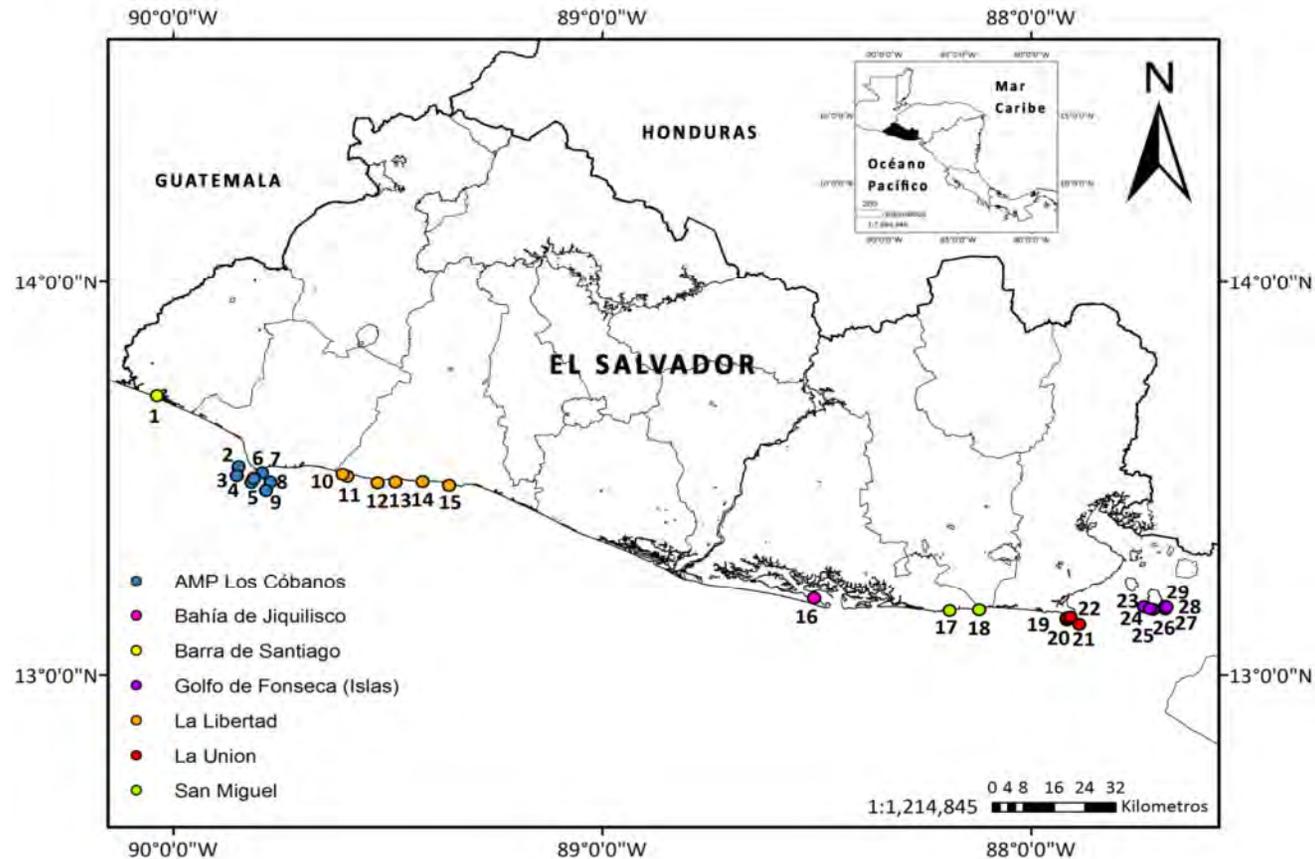
Source: Revista Bioma, año 2, No.23, ISSN 2307-0560, Sept 2012. Principales zonas de alimentación y anidación en El Salvador. Especies de tortugas marinas en común con México. Creación personal por Cristina Mota Rodríguez con datos de: MARN, 2014; CIT, 2012; Gaos *et al.*, 2010; Jiménez y Sánchez-Mármol, 2004; Márquez 1996 y <www.Funzel.org>. Imágenes de especies: Fernando Zeledón, tomadas de: <<http://darnis.inbio.ac.cr/ubis/FMPro?-DB=ubipub.fp3&-lay=WebAll&-error=norec.html&-Format=detail.html&-Op=eq&id=4134&-Find>>.

Annex 1-5 Area of Reef Coral formations



Source: MARN, 2018

Annex 1-6 Location of octocoral presence registration sites in El Salvador



1: Bocana Barra de Santiago (El Zapote), 2: Tres Cruces, 3: Mozorolo, 4: El Tesorito I, 5: Moronga, 6: USS Douglas, 7: Arco de la playa El Flor, 8: Punta de Monte, 9: Pargueta, 10: frente playa de Mizata, 11: frente bocana de Mizata, 12: La Tuzera, 13: La Perla, 14: Atami, 15: playa San Blas (USS San Blas), 16: Rampla El Chile, 17: Las Casitas, 18: El Chiquerón, 19, 20, 21, 22: playas Negra y Maculís, 23, 24: playa Majahual (isla Meanguera), 25, 26, 27, 28, 29: isla Pirigallo.

Fuente: J. Segovia-Prado 2012

Annex 1-7 Coral species reported in the NPA of Los C6banos

ORDER/FAMILY	COMMON NAME	STATUS CITES 2013
ORDER ANTIPATHARIA		
Family Antipathidae	<i>Antipathes galapagensis</i>	Appendix II
ORDER SCLERACTINIA		
Family Agariciidae	<i>Pavona gigantea</i>	Appendix II
Family Dendrophylliidae	<i>Cladopsammia egucii</i>	Appendix II
	<i>Tubastrea coccinea</i> (*)	Appendix II
Family Pocilloporidae	<i>Pocillopora capitata</i>	Appendix II
	<i>Pocillopora damicornis</i>	Appendix II
	<i>Pocillopora effusus</i>	Appendix II
	<i>Pocillopora elegans</i>	Appendix II
	<i>Pocillopora meandrina</i>	Appendix II
Family Poritidae	<i>Porites lobata</i>	Appendix II
	<i>Porites panamensis</i> (*)	Appendix II
Family Rhizangiidae	<i>Astrangia dentata</i>	Appendix II
	<i>Astrangia haimeii</i>	Appendix II
	<i>Oulangia bradleyi</i>	Appendix II
Family Siderastreidae	<i>Psammocora obtusangula</i> (*)	Appendix II
	<i>Psammocora stellata</i> (*)	Appendix II
ORDER ALCYONACEA		
Family Clavulariidae	<i>Carijoa multiflora</i>	
	<i>Carijoa riisei</i>	
Family Gorgonidae	<i>Leptogorgia alba</i>	
	<i>Leptogorgia cuspidata</i>	
	<i>Leptogorgia rigida</i>	
	<i>Pacificogorgia cairnsi</i>	
Family Plexauridae	<i>Muricea austera</i>	
	<i>Muricea appressa</i>	
	<i>Muricea appressa</i> var. <i>flavescens</i>	
	<i>Muricea fructicosa</i> var. <i>Miser</i>	
	<i>Muricea purpurea</i>	
	<i>Muricea squarrosa</i>	
	<i>Muricea tenella</i>	

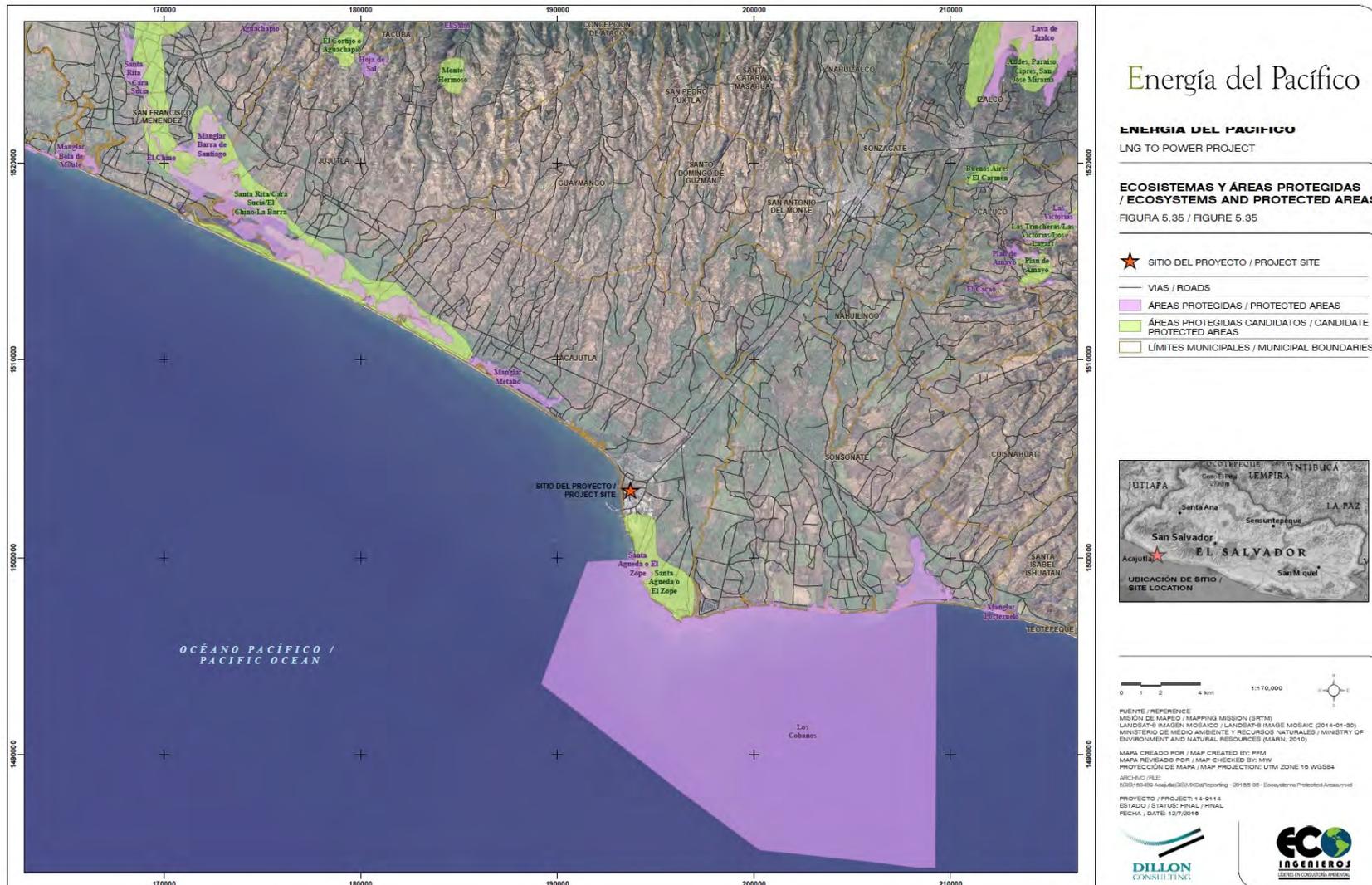
Source: Tejada 2005

Annex 1-8 Species of special concern and interest for the CA of Los C6banos

GROUP	FAMILY	SCIENTIFIC NAME	STATUS
Amphibians	Caeciliidae	<i>Dermophis mexicanus</i>	Threatened
	Plethodontidae	<i>Oedipina taylori</i>	Threatened
Reptiles	Cheloniidae	<i>Eretmochelys imbricata</i>	Endangared
	Colubridae	<i>Lampropeltis triangulum</i>	
	Colubridae	<i>Pliocercus elapoides</i>	Threatened
	Colubridae	<i>Scaphiodontophis annulatus</i>	Threatened
	Colubridae	<i>Sibon anthracops</i>	Threatened
	Crocodylidae	<i>Crocodylus acutus</i>	Endangared
	Elapidae	<i>Micrurus nigrocinctus</i>	Threatened
Birds	Alcedinidae	<i>Chloroceryle aenea</i>	Threatened
	Alcedinidae	<i>Megaceryle torquata</i>	Endangared
	Anatidae	<i>Cairina moschata</i>	Threatened
	Apodidae	<i>Panyptila cayennensis</i>	En Peligro
	Ardeidae	<i>Cochlearius cochlearius</i>	Threatened
	Ardeidae	<i>Nyctanassa violacea</i>	Threatened
	Burhinidae	<i>Burhinus bistriatus</i>	Threatened
	Caprimulgidae	<i>Chordeiles acutipennis</i>	Endangared
	Cardinalidae	<i>Passerina ciris</i>	Endangared
	Charadriidae	<i>Charadrius alexandrinus</i>	Endangared
	Charadriidae	<i>Charadrius vociferus</i>	Threatened
	Charadriidae	<i>Pluvialis squatarola</i>	Threatened
	Charadriidae	<i>Pluvialis dominica</i>	Endangared
	Ciconiidae	<i>Mycteria americana</i>	Threatened
	Frindillidae	<i>Euphonia affinis</i>	Threatened
	Laridae	<i>Chlidonias niger</i>	Threatened
	Laridae	<i>Gelochelidon nilotica</i>	Endangared
	Laridae	<i>Sterna dougallii</i>	Endangared
	Laridae	<i>Sternula antillarum</i>	Endangared
	Laridae	<i>Thalasseus maximus</i>	Threatened
	Nyctibiidae	<i>Nyctibius jamaicensis</i>	Threatened
	Picidae	<i>Campephilus guatemalensis</i>	Endangared
	Psittacidae	<i>Aratinga strenua</i>	Endangared
	Rallidae	<i>Gallinula chloropus</i>	Threatened
	Rallidae	<i>Laterallus ruber</i>	Endangared
	Rallidae	<i>Porphyrio martinica</i>	Threatened

Source: MARN, 2016

Annex 1-9 Natural Protected Areas and Project Location



Annex 1-10 Efforts In Conservation

The artificial incubation of eggs has contributed to increase populations, since incubation in situ is less successful due to natural predators such as ants, crabs and dogs.

In the different beaches of the Salvadorian coast, non-governmental and local organizations, with the support of the MARN, promote conservation activities and protection of sea turtles through incubation projects. In the Barra de Santiago incubation corral, managed by AMBAS (Association of Women of Barra de Santiago), for the period 2017, a total of 644 nests of the olive ridley and two nests of the brown were recorded, whose sizes are presented in **Table 1-7**. **Error! Reference source not found.**

Descriptive Statistics	Caparazon Length (CM)	Caparazon Width (CM)
<i>Average</i>	87.07	82.78
<i>Deviation</i>	5.07	4.57
<i>Maximum</i>	95	89
<i>Minimum</i>	80	75

Source: AMBAS, 2017.

The “Fondo Iniciativa para las Americas” (FIAES) Fund and the Zoological Foundation of El Salvador (Funzel) incubated 89,730 marine turtle eggs during the period 2016 to 2017. The NGO FUNZEL, oversees the care of artificial incubation facilities to attend to the eggs that the turtles place in the beaches of Cobanos, Playa Dorada and Barra Salada.

FUNZEL is a non-profit, non-governmental organization (1992) that seeks to raise awareness among the population about the importance of wildlife in El Salvador, fostering compliance with legal regulations, combating the illegal possession of wild animals, especially that are in danger and presenting economic alternatives for the populations that are dedicated to the illicit sale and trade. It works in support of the governing authorities to apply wildlife law and the international and regional agreements on the subject: MARN, MAG, CCAD, OSPESCA.

During 2009-2013, with the assistance of USAID funds, FUNZEL executed a Project directed to the Conservation of Sea Turtles in support of the MARN. It facilitated the creation and training of seven local Associations for the Conservation of Sea Turtles (ACOTOM), that are currently helping the nesting process of the four species that visit their coasts.

The objective of the FIAES-Funzel project was to promote the conservation of the four species of turtles that nest in the country, through the collection of eggs and the implementation of new compensation mechanisms and the establishment of sustainable economic activities as alternatives to the turtle egg trade. Sustainable activities included a bakery, a workshop screen printing, and training of locals in other trades.

FUNZEL maintains the management of turtle egg incubation pens, beach cleaning and environmental awareness work. Since 2009 about five million turtles, most of them of the species Golfina (*Lepidochelys olivacea*), were released at the sea by FUNZEL.

Turtles that appear injured or sick on the coasts of El Salvador already have a station where they can receive the first veterinary medical care for their recovery. It is the first, first aid station for these species inaugurated at San Blas Beach, La Libertad, about 80 kilometers from the project area.

This initiative was executed with funds donated by the Body Shop Foundation of the United Kingdom, a contact facilitated by the Ambassador of the United Kingdom in El Salvador, Bernhard Garside. The sea turtle station is equipped with two pools and basic veterinary medical equipment that will be used for the recovery and care of the species. It has an exploratory table and two rooms to host the technical staff in charge of the patients. This station has a capacity to tend to 2 - 4 specimens simultaneously.

Each year, FUNZEL, together with the Ministry of the Environment and Natural Resources, attend to an average of 9 to 12 marine turtles of the species Golfina (*Lepidochelys olivacea*), Carey (*Eretmochelys imbricata*) and Prieta (*Chelonia mydas*), and the olive ridley turtle at a higher rate.

In addition, FIAES promotes photographic exhibitions, culture and art as an environmental education strategy. The objective of this exhibition is to carry the message of awareness about the conservation of these species.

It is to be noted that use of turtle eggs in Las Flores beach continues, despite institutional and local efforts.