Deepwater Port License Application for the

Texas Gulf Terminals Project

Volume II – Environmental Evaluation (Public)

Section 6:
Commercial and Recreational Fisheries

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ACRONYMS AND ABBREVIATIONS

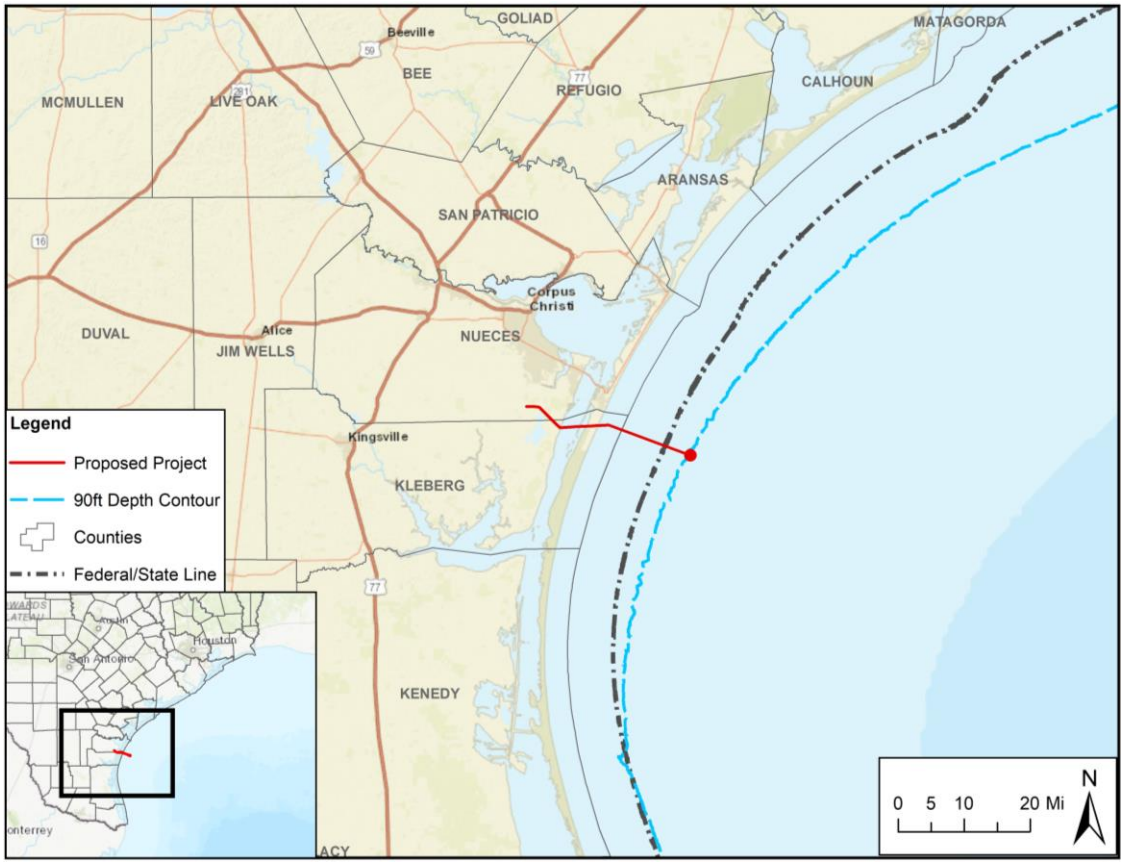
<	less than
ac	acre
Applicant	Texas Gulf Terminals Inc.
bbl	barrel(s)
BOEM	Bureau of Ocean Energy Management
bph	barrels per hour
CALM	Catenary Anchor Leg Mooring
CCSC	Corpus Christi Ship Channel
DWP	deepwater port
DWPA	Deepwater Port Act of 1974, as amended
DWPL	Deepwater Port License
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
e.g.	exempli gratia [Latin for '*for example*']
et al.	et alia [Latin for *'and others'*]
et seq.	et sequentes [Latin for *'and the following'*]
FMP	fishery management plan
ft.	feet
GMFMC	Gulf of Mexico Fishery Management Council
GOM	Gulf of Mexico
ha	hectare
HDD	Horizontal Directional Drilling
HSFCA	High Seas Fishing Compliance Act
IMO	International Maritime Organization
km	kilometer
m	meter
MARAD	Maritime Administration
MHT	mean high tide
mi	miles
MSFCMA	Magnuson Stevens Fishery Conservation and Management Act
nm	nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OCS	Outer Continental Shelf
OSTF	onshore storage terminal facility
PELM	pipeline end manifold
P.L.	Public Law
POCC	Port of Corpus Christi
Project	Texas Gulf Terminals Project
SPM	single point mooring
TPWD	Texas Parks and Wildlife Department
U.N.	United Nations
UNCLOS	United Nations Convention on the Law of the Sea

U.S.	United States [of America]
U.S.C.	United States Code
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
VLCC	very large crude carrier

PROJECT OVERVIEW

Texas Gulf Terminals Inc. (TGTI; also referred to as Applicant) is proposing to construct and operate a deepwater port (DWP), associated pipeline infrastructure, booster station, and an onshore storage terminal facility (OSTF), collectively known as the Texas Gulf Terminals Project (Project), for the safe, efficient and cost-effective export of crude oil to support economic growth in the United States of America (U.S.). The Applicant is filing this Deepwater Port License (DWPL) application to obtain a license to construct, own, and operate the Project pursuant to the Deepwater Port Act of 1974, as amended (DWPA), and in accordance with the U.S. Coast Guard (USCG) and the Maritime Administration's (MARAD) implementing regulations.

The Applicant is proposing to construct and operate the Project to allow direct and full loading of very large crude carriers (VLCC) at the DWP, via a single point mooring (SPM) buoy system. The proposed Project consists of the construction of a DWP, onshore and inshore pipeline infrastructure, offshore pipelines, and an OSTF. The proposed DWP would be positioned outside territorial seas of the Outer Continental Shelf (OCS) Mustang Island Area TX3 (Gulf of Mexico [GOM]), within the Bureau of Ocean Energy Management (BOEM) block number 823. The proposed DWP is positioned at Latitude N27° 28' 42.60" and Longitude W97° 00' 48.43", approximately 12.7 nautical miles (nm) (14.62 statute miles [mi]) off the coast of North Padre Island in Kleberg County, Texas. Refer to the Vicinity Map depicting the location of the proposed Project.



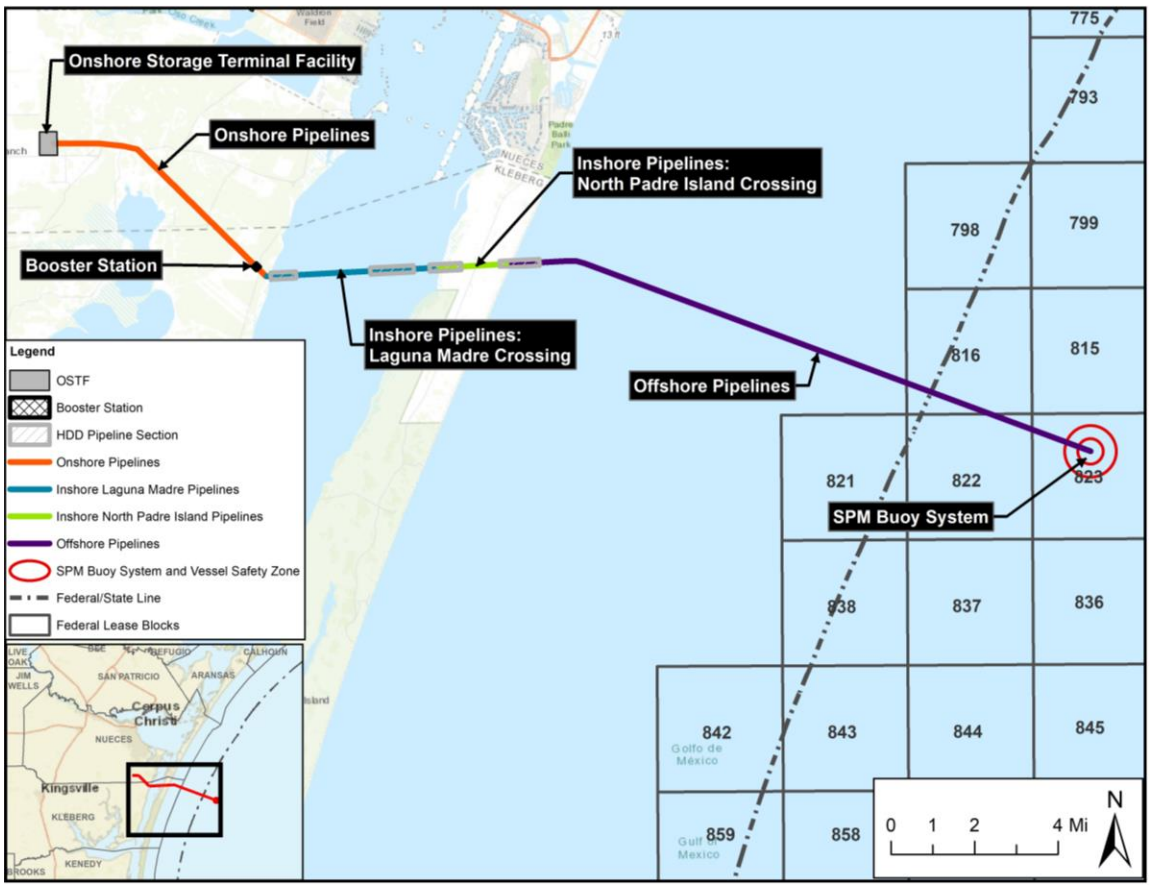
Vicinity Map

The proposed Project involves the design, engineering, and construction of a DWP, 26.81 miles of pipeline infrastructure, booster station, and an OSTF. For the purposes of this DWPL application, the proposed Project is described in three distinguishable segments by locality including "offshore", "inshore", and "onshore".

Onshore Project components includes an approximate 150-acre (ac) (60.7 hectares [ha]) OSTF, an 8.25 ac (3.3 ha) booster station, and approximately 6.36 mi of two (2) new 30-inch-diameter crude oil pipelines extending from the OSTF located in Nueces County, to the booster station located in Kleberg County, and continue to the landward side of the mean high tide (MHT) line of the Laguna Madre. The proposed OSTF will serve as the primary collection and storage terminal of crude oil to be directly pumped through the proposed pipeline infrastructure to the DWP. Outbound flow rates from the OSTF to the DWP are anticipated to be approximately 60,000 barrels per hour (bph).

Inshore components associated with the proposed Project are defined as those components located between the western Laguna Madre MHT line and the MHT line located at the interface of North Padre Island and the GOM; this includes approximately 5.74 mi of two (2) new 30-inch-diameter crude oil pipelines and an onshore block valve station located on North Padre Island. The onshore valve station will serve as the primary conjunction between the proposed onshore and offshore pipeline infrastructure.

Offshore components associated with the proposed Project include the DWP and offshore pipelines. Principle structures associated with the proposed DWP includes one SPM buoy system consisting of the SPM buoy, pipeline end manifold (PLEM), sub-marine hoses, mooring hawsers, and floating hoses to allow for the loading of crude oil to vessels moored at the proposed DWP. The proposed SPM buoy system will be of the Catenary Anchor Leg Mooring (CALM) type permanently moored with a symmetrically arranged six-leg anchor chain system extending to pile anchors fixed on the seafloor. Offshore pipeline infrastructure associated with the proposed Project consist of approximately 14.71 mi of two (2) new 30-inch-diameter pipelines extending from MHT line on North Padre Island to the SPM buoy system located at the proposed DWP. Refer to the Project Components Map below for a depiction of the location of the Project components discussed above.



Project Component Map

6.0 COMMERCIAL AND RECREATIONAL FISHERIES

In 2016 the Gulf of Mexico (GOM) provided just over 18 percent of the commercial fish landings in the continental U.S. (NMFS 2018). In addition, 33 percent of recreational fishing trips in the U.S. are to the Gulf coast (NMFS 2016). This section describes the existing fisheries resources and potential Project impacts on these resources, and is structured as follows:

Section 6.1 Applicable Laws and Regulations: Background on relevant regulatory laws for consideration;
Section 6.2 Existing Fishery Resources: Information on the framework of fishery resources in the Project vicinity;
Section 6.3 Federally Managed Fisheries: Information on the current status of federally managed fisheries in the Project vicinity;
Section 6.4 Environmental Consequences: An analysis of environmental consequences;
Section 6.5 Cumulative Impacts: An analysis of cumulative impacts;
Section 6.6 Mitigation Measures: Proposed mitigation measures;
Section 6.7 Summer of Potential Impacts: A summary of potential impacts; and
Section 6.8 References.

6.1 Applicable Laws and Regulations

Fishery laws in U.S. marine waters are typically a combination of international, federal, and state regulations that work in unison to protect and regulate fishery resources. The nation's premier fisheries law is the Magnuson Stevens Fishery Conservation and Management Act (MSFCMA). The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) has ocean stewardship responsibilities that are directed by many federal laws in addition to the MSFCMA, the Endangered Species Act, and the Marine Mammal Protection Act (addressed in Section 7.0). For instance, the Lacey Act prohibits fish or wildlife transactions and activities that violate state, federal, and Native American tribal or foreign laws. The Fish and Wildlife Coordination Act authorizes NOAA Fisheries to collect fisheries data for environmental decisions that affect living marine resources. Many other statutes, international conventions, and treaties also guide NOAA Fisheries activities.

6.1.1 International

As recognized and adopted by the U.S., the 1982 United Nations Convention on the Law of the Sea allowed for a change in strategy associated with the utilization of marine resources. This convention provided protections associated with the management of living marine resources within Exclusive Economic Zone (EEZ) as pertaining to straddling stocks (stocks that migrate between different EEZs), highly migratory species, marine mammals, as well as anadromous and catadromous species.

To further promote regulations established in the United Nations (U.N.) Convention on the Law of the Sea (UNCLOS), the U.S passed and implemented the High Seas Fishing Compliance Act in March of 1996 (61 U.S.C. 5501) (HSFCA). This act established a system of permitting, reporting, and regulation of vessels of the U.S. fishing on the high seas. 'High seas' are defined as the waters beyond the territorial sea or EEZ; or the equivalent, of any nation, to the extent that such territorial sea or EEZ (or the equivalent) is recognized by the U.S. More specifically, high seas are those extending beyond the EEZ, or seaward of 200 mi (322 kilometer [km]). Vessels regulated by this Act are described as U.S. vessels that are used, or intended for use, on the high seas for the purpose of the commercial exploitation of living marine resources as a harvesting vessel, mothership, or any other support vessel directly engaged in a fishing operation. Permitted vessels regulated under this Act are required to record all fishing efforts which occur on the high seas, including target species, equipment and gear used, dates, times, locations, and conditions under which fishing was conducted. Additionally, U.S. vessels are required to report all species caught, species retained, and amount retained and/or discarded including interactions with protected species such as turtles, marine mammals, and avian species.

6.1.2 Federal

The MSFCMA, Public Law (P.L.) 104-297, 16 U.S. Code (U.S.C.) 1801 et seq., established eight Fishery Management Councils responsible for protecting and managing certain fisheries within specific geographic jurisdictions. The councils are required to prepare fishery management plans (FMPs) to regulate commercial and recreational fishing. Marine fisheries in the Project area are under primary jurisdiction of the GOM Fishery Management Council (GMFMC), established under authority of the MSFCMA. The GMFMC works together with NOAA Fisheries to manage commercially and recreationally important marine fish stocks and to prepare FMPs for target species. The GMFMC and NOAA Fisheries manage fisheries within the federal waters of the Project area.

The GMFMC develops management measures through FMPs for key marine species, and the NOAA GOM Operations Branch puts in place the resulting regulations. GOM Branch staff also provide: guidance on fisheries management; assessment of the environmental impacts of proposed management measures; public education on fishery management issues; technical assistance and advice during preparation of FMPs; coordination of public review and comments during regulation development; and direction related to fishing closures in order to prevent overfishing if landings approach prescribed annual catch limits.

6.1.3 State

In Texas, commercial and recreational fishing is regulated by the Coastal Fisheries Division of the Texas Parks and Wildlife Department (TPWD). TPWD maintains regulatory authority of recreational fisheries, which includes fish and other aquatic organisms, habitat, and “users” of the fisheries. This applies to anglers, boaters, birdwatchers, and any other party that uses an aquatic resource (TPWD 2018a). Additionally, TPWD regulates commercial fishing which is defined as any activity that involves taking or handling fresh or saltwater aquatic resources/products for pay or purpose of barter, sale, or exchange. TPWD manages marine waters extending nine nautical mi (10 statute-mi) off the cost of Texas (TPWD 2018b). All waters beyond this boundary are considered federal waters (also known as the EEZ), where fishing is managed by the GMFMC and NOAA Fisheries. Fishing regulations within the EEZ are not always the same as those within bordering state waters.

6.2 Existing Fishery Resources

The marine habitats in the GOM, ranging from coastal marshes and estuaries to the deep-sea abyssal plain, support a diverse and abundant fish assemblage. The distribution of species is related to a variety of ecological factors, including salinity, primary productivity, and bottom substrate. These factors differ widely across the Gulf and between the inshore, nearshore, and offshore waters.

The Project will be located in both estuarine and offshore habitats. The Inshore pipelines will traverse the estuarine Laguna Madre between Padre Island and the shore of the mainland. The Offshore pipelines will begin at the seaward boundary of Padre Island and extend to the SPM buoy system at a depth of 93 feet (ft.) (28 meters [m]). Estuarine and estuarine-dependent species, as well as fishermen targeting those species, will be present in the Laguna Madre. Fish species likely to be found in the vicinity of the offshore Project components are characterized as demersal and coastal pelagic; however, certain life stages of estuarine and reef species will also be present in the vicinity of the offshore Project components. Reef species are generally associated with coral reefs or hard-bottom habitat. Demersal species are those that feed on or near the seafloor. Coastal pelagic species can be found from the shoreline to the shelf edge in open waters. Each fish assemblage is further discussed below.

6.2.1 Fish

6.2.1.1 Estuarine Fishes

Approximately 42 percent of U.S. estuaries are in the GOM (U.S. Environmental Protection Agency [USEPA] 1999). Consequently, many fishes and invertebrates found in shelf waters are dependent on, or make use of, estuaries at some point in their life cycle (BOEM 2017). Most fish reside in estuaries during the late larval/early juvenile stage of development, resulting in commercial and recreational fisheries being

estuarine-dependent (USEPA 1999). They tend to leave the estuaries as juveniles or subadults (once they are reproductive) and spawn at sea. Spawning activities typically are more concentrated in shallower waters during spring and summer, in response to warmer temperatures and variable salinity conditions. Eggs hatch in the waters of the open GOM, and the developing larvae become part of the offshore planktonic community. Under the influence of tides, currents, and winds, the young eventually arrive at the estuarine nursery grounds, where they feed, grow, and mature prior to migrating out to sea to repeat the spawning process. Most estuarine-dependent species grow rapidly and reach maturity in about one year; during that time, the young remain in the estuaries, taking advantage of the greater availability of food and protection that the estuarine habitats afford. They may remain in the estuary, migrate to sea to spawn (returning to the estuary between spawnings), or migrate from the shallow estuaries to spend the rest of their lives in the deeper waters of the GOM.

There is a nearly continuous estuarine ecosystem along the northern GOM coast, comprising 31 major estuarine systems (BOEM 2016). The inshore areas (landward of Padre Island) between Corpus Christi and Baffin Bays are part of the Coastal Bend Bays and Estuaries complex. The complex includes barrier islands, tidal marshes, seagrass meadows, open bays, oyster and serpulid worm reefs, wind tidal flats, and freshwater marshes. This estuarine complex (which includes the upper Laguna Madre) is estimated to include 40 percent of the seagrasses in Texas (Byrnes 2017).

Estuarine-dependent species constitute more than 95 percent of the commercial fishery harvests from the GOM (USEPA 1999). Several species known to occur in the estuarine Project area are economically important as commercially or recreationally targeted species. This includes Gulf menhaden (*Brevoortia patronus*), spotted sea trout (*Cynoscion nebulosus*), blue crab (*Callinectes sapidus*), brown shrimp (*Farfantepenaeus aztecus)*, gag (*Mycteroperca microlepis*), and red drum (*Sciaenops ocellatus*) (BOEM 2017, USEPA 1999).

6.2.1.2 Reef Fishes

Reef fishes are distributed widely in the GOM and occupy both pelagic and benthic habitats during their life cycle. Although juvenile and adult reef fish are typically demersal and associated with areas of higher relief (including artificial structures) on the continental shelf, several species can also be found over sand or soft-bottom substrates (e.g., juvenile red snapper [*Lutjanus campechanus]*) and in seagrass beds (e.g., juvenile snappers and groupers; GMFMC 2004). The importance of artificial reefs to fishes is discussed in Section 5, “Inshore and Offshore Aquatic Environment.”

A number of important reef fish species share the common life history characteristics of offshore spawning and transport of larvae inshore to settle in estuaries and seagrass meadows, where they spend the nursery phase, before recruiting to adult stocks offshore. Examples of estuarine-dependent reef fish are the gag and the grey snapper (*Lutjanus griseus*). Other reef fish species are considered non-estuary dependent such as the red snapper and wenchman (*Pristipomoides aquilonaris*), which remain offshore waters throughout their entire life cycle. Life histories for managed reef species that occur in the Project area are described in the Essential Fish Habitat Assessment, which can be referenced in Appendix G.

6.2.1.3 Demersal Fishes

The bottom-oriented, or demersal, fish fauna of the northwestern GOM are characterized by substrate composition and water depth (Gallaway 1981). Demersal fish assemblages are named by the dominant shrimp species found in the same sediment/depth regime. The dominant assemblages at the depths associated with the Project includes the white and brown shrimp assemblages.

The white shrimp (*Litopenaeus setiferus*) assemblage is found at depths of 0-66 ft. (0-20 m). It is dominated by drums (Sciaenids), with the Atlantic croaker (*Micropogonias undulatus*) being the dominant species. Other abundant species include the Atlantic cutlassfish (*Trichiurus lepturus*), silver seatrout (*Cynoscion nothus*), star drum (*Stellifer lanceolatus*), sand seatrout (*Cynoscion arenarius*), Atlantic threadfin (*Polydactylus octonemus*), and hardhead catfish (*Arius felis*). As these assemblages were specifically identified for areas north of Matagorda Bay, the relative abundance of these species may vary at the Project

site (Gallaway 1981). The brown shrimp assemblage is found at depths of 72 to 299 ft. (22 to 91 m) (Gallaway 1981). The brown shrimp assemblage consists of species such as the longspine porgy (*Stenotomus caprinus*), sea robins (Triglidae), and dwarf goatfish (*Upeneus parvus*) (Gallaway 1981). Phillips and James (1988) identify the highest density of demersal fishes on the Texas shelf at depths between 240 and 269 ft. (73 and 82 m). Similar to the white shrimp assemblage noted above, inshore Texas fisheries were noted as being dominated by Atlantic croaker, silver seatrout, and southern kingfish (*Menticirrhus americanus*) (Phillips and James 1988).

6.2.1.4 Coastal Pelagic Fishes

Coastal pelagic fish inhabit shelf waters of the GOM throughout the year. The distribution of most species depends on water column structure, which varies seasonally and spatially. These species can be divided into two groups: the large predatory species (e.g., mackerels, dolphinfish, jacks) and the smaller planktivorous species (Gulf menhaden, round scad [*Decapterus punctatus*], anchovies [Engraulidae]). Both groups form schools, undergo migrations, grow rapidly, mature early, and exhibit high fecundity. Spawning adults, eggs, and larvae occur over the continental shelf in pelagic waters; juveniles often occur in estuaries and coastal waters. Some species, such as Spanish mackerel (*Scomberomorus maculatus*), Gulf menhaden, anchovies, and herrings (Clupeidae), form large schools. Others, such as cobia (*Rachycentron canadum*), form small schools or travel singularly. The smaller coastal pelagic species often are preyed upon by the larger species, as well as by piscivorous (fish-eating) birds (BOEM 2017).

Some coastal pelagic species (especially Spanish sardine [*Sardinella aurita*], round scad, blue runner [*Caranx crysos]*, king mackerel [*Scomberomorus cavalla*], and cobia) show an affinity for vertical structure and often are observed around natural or artificial structures, where they are classified best as transients rather than true residents (BOEM 2017). Most of the large-bodied, predatory coastal pelagic species are important to commercial or recreational fisheries. King and Spanish mackerel, cobia, and jacks (Carangidae) are sought by the charter and recreational fisheries in the region. The major coastal pelagic families occurring in the waters covered by the proposed Project are presented in Table 6-1.

Table 6-1: Major Coastal Pelagic Families Occurring in the Vicinity of the Proposed Project

Family	Common Name	Trophic Level	
		Predatory	Planktivorous
Carcarhinidae	Requiem sharks	X	
Elopidae	Ladyfish	X	
Engraulidae	Anchovies		X
Clupeidae	Herring		X
Scombridae	Mackerel and tuna	X	
Carangidae	Jacks and Scads	X	
Mugilidae	Mullet		X
Pomatomidae	Bluefish	X	
Rachycentridae	Cobia	X	
Source: BOEM 2017.			

6.2.2 Crustaceans

Although many kinds of shrimp are found in the GOM, only those of the family Penaeidae are large enough to be considered seafood (TPWD 2010). Brown shrimp, white shrimp, and pink shrimp (*Farfantepenaeus duorarum*) make up the bulk of shrimp landings, with brown shrimp accounting for 80 percent of shrimp landings in Texas. Other shrimp of minor commercial value in the GOM are the seabob, (*Xiphopenaeus kroyeri*), the rock shrimp, (*Sicyonia brevirostris*), and a deep-water type called the royal red shrimp

(Pleoticus robustus) (TPWD 2010). The most economically important fisheries in the GOM include brown shrimp, white shrimp, and eastern oyster (*Crassostrea virginica*) (BOEM 2017).

Brackish wetlands, saline marsh, and inshore coastal areas provide habitat for shellfish in the GOM. Tides, lunar cycles, maturation state, and estuarine temperature changes influence life history strategies. Generally, individuals are six months old or less when they enter the extensive inshore and nearshore fishery, and it is rare for individuals to live longer than a year. Variation in salinity and temperature during the period of larval development are the primary causes of shellfish populations that vary year to year.

Brown shrimp have the greatest abundance in the central and western GOM. They are found in estuaries and offshore waters to depths of 361 ft. (110 m), although they are most common in water depths of 90 to 180 ft. (27 to 55 m; LDWF 2015). Species abundance and habitat requirements for the brown shrimp are separated by life stage. Post larvae and juveniles typically occur within estuaries, while adults occur outside of bay areas. In estuaries, brown shrimp post larvae and juveniles are associated with shallow vegetated habitats, but they also are found over silty sand and non-vegetated mud bottoms. The density of post larvae and juveniles is highest in marsh edge habitat and submerged vegetation, followed by tidal creeks, inner marsh, shallow open water, and oyster reefs (GMFMC 2004).

White shrimp are offshore and estuarine dwellers and are pelagic or demersal, depending on life stage. They are found in depths as great as 131 ft. (40 m) but are most commonly found at depths of 86 ft. (27 m). Spawning generally occurs at depths ranging from 30 to 112 ft. (9 to 34 m); however, spawning is most common at a depth of 89 ft. (27 m) in the GOM from Florida to Texas. The eggs are demersal and larval stages are planktonic; both occur in nearshore marine waters. Post larvae migrate through passes mainly from May-November with peaks in June and September. Migration occurs in the upper 7 ft. (2 m) of the water column at night and at mid-depths during the day. Post larval white shrimp become benthic upon reaching nursery areas in estuaries, where they seek shallow water with muddy-sand bottoms high in organic detritus or abundant marsh vegetation and develop into juveniles. Juveniles dwell within marsh edge microhabitats and feed on sand, detritus, organic matter, mollusk fragments, ostracods, copepods, insect larvae, and forams. Sub-adult white shrimp leave estuaries in late August and September on ebb tides during full moons. Adult shrimp inhabit nearshore GOM waters at depths of less than (<) 98 ft. (30 m) with soft mud or silt bottoms (GMFMC 2004).

Between 2010 and 2016, four species of crab and two species of lobster were subject to commercial fishing: Gulf stone crab (*Menippe adina*), golden crab (*Chaceon fenneri*), Atlantic horseshoe crab (*Limulus Polyphemus*), blue crab, Caribbean spiny lobster (*Panulirus argus*), and slipper lobsters (Scyllarids; NMFS 2018). Although there are relatively substantial fisheries for some of these species on the west coast of Florida, blue crab are the only commercially targeted crab species in the western Gulf states. Blue crabs generally range from shore to depths of 120 ft. (60 m), although they have been noted as occurring to depths of 298 ft. (90 m) (TPWD 2018c, Gulf States Marine Fisheries Commission 2015).

6.2.3 Bivalve Mollusks

Mussels, oysters, scallops, and clams are widespread throughout the GOM, inhabiting tidal to deepwater habitats. They are benthic organisms that live either in or on the substrate, where they filter water for food and aerate the sediments (Turgeon et al. 2009). Bivalves play an important role in the marine ecosystems by filtering the water, creating habitat for various species, and providing a food source for others (NOAA 2017).

The eastern oyster, an important commercial species, is found throughout the GOM in intertidal and subtidal areas with high salinities and moderate temperatures. Estuarine areas containing suitable substrate that are relatively calm, but with continuous water flow and low sedimentation, are ideal habitats for oysters. Oyster reefs in the northern GOM are most extensive in Louisiana and Florida, but also occur in the vicinity of the Project (Volume II Section 5: Inshore and Offshore Aquatic Environment).

6.3 Federally Managed Fisheries

As discussed in Volume II Section 7 and the EFH Assessment in Appendix G, commercial and recreational fisheries resources in federal waters of the GOM are managed by the GMFMC and NOAA Fisheries. Federal FMPs developed for the GOM include:

- Shrimp Fishery of the GOM, U.S. Waters;
- Red Drum Fishery of the GOM;
- Reef Fish of the GOM;
- Coastal Migratory Pelagic Resources in the GOM;
- Spiny Lobster in the GOM and South Atlantic;
- Coral and Coral Reefs of the GOM; and
- Highly Migratory Species.

These FMPs cover 40 stocks of managed species, about 20 percent of which are overfished (i.e., the stock size is below that which produces maximum yield on a continuing basis) and two species (the gray triggerfish and dusky shark) are undergoing overfishing (subject to fishing rates that do not produce the maximum sustainable yield over the long-term) (Karnauskas et al. 2017, 83 FR 9298). Continued fishing at the current levels may result in rapid declines in commercial landings and eventual failure of certain fisheries. However, management actions in the recent past (e.g., implementation of rebuilding plans, increased regulations, and identification of at-risk stocks) have led to a general decrease in the number of stocks that are overfished or are experiencing overfishing (Karnauskas et al. 2017). Corals and spiny lobster do not occur in the Project area and are not discussed further.

6.3.1 Commercial Fisheries

In 2016 the GOM provided just over 18 percent of the commercial fish landings in the continental U.S. (NMFS 2018). Between 2013 and 2016, the GOM's average annual commercial fishery landings were nearly 1.5 billion pounds (about 5.9 billion pounds total), valued about $950 million annually ($3.8 billion total). For this period, Gulf menhaden comprised the bulk of the commercial landings (over 4.3 billion pounds total) in the GOM; the annual average catch over this period was 1.1 billion pounds (over 74 percent of all landings) (NMFS 2018). Gulf menhaden are typically used as bait in other fisheries (versus for consumption) and are processed as fish meal for farm and aquaculture feed. Brown shrimp (6.8 percent), white shrimp (6.4 percent), and blue crab (3.4 percent) collectively comprised 16.7 percent of commercial landings for this time period.

Between 2013 and 2016, the commercial fisheries in Texas were dominated (by weight) by shellfish (shrimp, oyster, and crab), reef fish (snappers), and black drum. A list of commercially landed species in Texas during 2016 is provided in Volume II Section 11: Coastal Zone Uses, Recreation and Aesthetics. Shrimp are among the most economically important fisheries harvested in the GOM, with landings valued at $413 million in 2016 (NMFS 2018). The primary catches in Texas, and the GOM as a whole, comprise brown and white shrimp with some pink, rock, and seabob shrimp catches (NMFS 2018). The value of shrimp landings in 2016 exceeded that of all other fish or invertebrate species group in the GOM (NMFS 2018).

The eastern oyster (See Section 6.2), another important commercial species, is found in areas of high salinities and moderate temperatures throughout the GOM in intertidal and subtidal waters. Ideal conditions for oysters are estuarine areas containing suitable substrate that are relatively calm with continuous water flow and low sedimentation. In the northern GOM, oyster reefs are predominately located in Louisiana and Florida. However, oyster reefs are present in the Project area, in Corpus Christi and Matagorda Bays. The closest oyster reefs are on the shoreward side of Padre Island, about 2,150 ft. (655 m) north of the pipeline route's landfall. Additional information on commercial fishing in the Project area is provided in Volume II Section 9: Socioeconomics and Section 11: Coastal Zone Uses, Recreation and Aesthetics.

6.3.2 Recreational Fisheries

In the U.S, 33 percent of recreational fishing trips are to the Gulf coast (NMFS 2016). Over 144 million fish were caught by recreational anglers in the GOM in 2016. Spotted seatrout, gray snapper, red drum, sand seatrout, and red snapper were the most commonly caught non-bait species. Based on weight, the greatest harvests were of spotted seatrout, red snapper, red drum, king mackerel, Spanish mackerel, and striped mullet (*Mugil cephalus*). Of the 21 million recreational fishing trips taken to the GOM in 2016, 54 percent of the catch was from inland waters. Additional information on recreational fishing in the Project area is provided in Volume II Section 9: Socioeconomics and Section 11: Coastal Zone Uses, Recreation and Aesthetics.

TPWD estimates over 290 thousand marine recreation fishing trips are taken to the Upper Laguna Madre Bay System annually (Ropicki et al. 2016). About 7 percent of these recreational fishing trips were conducted from charter boats or guide service (2014 – 2015), and about 29 percent were from private boats (2013 - 2014). The remaining 64 percent of recreational fishing occurs onshore. These trips are predominately taken by residents of Texas (96 percent), who contribute 95 percent of the economic impacts. Characteristics of the recreational fisheries in the Project vicinity are also discussed in Volume II Sections 9 and 11.

6.4 Environmental Consequences

Significant impacts on the commercial and recreational fisheries resources identified above are those that measurably impact the ecological viability and sustainability of the resource. As proposed, the Project would include installation of approximately 26.8 mi (43.1 km) of dual, 30-inch-diameter pipeline and an offshore SPM buoy system located in 93 ft. (28 m) of water, within the Exclusive Economic Zone. Impacts on commercial and recreational fisheries would be limited to those components of the Project that are located in inshore (Laguna Madre) or offshore (seaward of North Padre Island) locations; those impacts are discussed below. Refer to Appendix A: Construction, Operation and Decommissioning Procedures, for a detailed description of techniques, procedures, and phases of the Project that were used to evaluated environmental consequences in the following sections.

Potential impacts to commercial and recreational fisheries resources can result from impacts to habitat that support species within a fishery, including essential fish habitat (EFH). Potential impacts from construction, operation, and decommissioning of the Project to fish (including ichthyoplankton) and shellfish are examined in Volume II Section 7: Wildlife and Protected Species. Impacts to EFH are provided in Volume II Section 7 and Appendix G. These impacts are not expected to be significant or result in a significant reduction in stock biomass for any commercially and/or recreationally important species that occur in the Project area. Impacts on commercial and recreational fishermen and fishing activities are discussed in Volume II Section 9: Socioeconomics and Section 11: Coastal Zone Uses, Recreation and Aesthetics.

6.4.1 Construction

Construction and installation of the Project components would likely result in a temporary and negligible to minor impact on commercial and recreational fisheries related to habitat modification. The SPM buoy system would permanently affect 130 sq. ft. (0.003 ac) of softbottom habitat and 760 ac of open water areas. The pipelines would affect a 14.0-mi-long (23 km), 36-ft.-wide corridor between the SPM buoy system and Padre Island, as well as a 2.05-mi-long (3 km), 15-ft.-wide corridor that would be trenched within Laguna Madre and the associated workspaces for barge operations and horizontal directional drilling (HDD) workspaces (see Appendix A); additional areas would be crossed via HDD to avoid or minimize impacts on the fisheries and their habitats. These installation activities would temporarily modify soft-bottom habitat (for the offshore pipelines) and soft-bottom and seagrass habitat (for the Inshore pipelines), causing localized sediment and turbidity, and increased noise. Although these activities may affect individual fish, they are unlikely to result in a measurable effect on the fisheries. Impacts to seagrass are discussed in Section 5.0 and impacts to wetlands are discussed in Section 4.0.

6.4.2 Operation

The safety zone established for the SPM buoy system and VLCCs would result in the loss of approximately 760 ac (307 hectares [ha])of the marine environment which would otherwise be available for fishing opportunities. However, the hard structures associated with the SPM buoy system would provide new structure for epifaunal colonization and fisheries recruitment over time; therefore, as the safety zones would prohibit fishing activities, this new habitat and faunal community would be protected from fishing pressures. Although the presence of the safety zones would not necessarily result in a measurable difference in fish populations, over the long-term it may result in larger, mature fish remaining in the system longer, and therefore producing a higher number of eggs over its lifespan. The Inshore and Offshore pipelines would be buried, and as such, there would be no impact on fisheries populations based on their presence during operations.

In the event that an inadvertent release of crude oil was to occur, safety measures would be implemented to ensure that the amount of oil released was restricted to the extent possible. A worst-case-scenario discharge volume had been calculated for the project and a Tactical Response Plan has been submitted as part of the DWPL application. The worst-case-scenario spill would be limited to 63,600 barrels (bbl) over a 10-day period. An Emergency Response Plan will be created for this Project under various modeled scenarios and trajectories. As discussed in Volume II Section 7: Wildlife and Protected Resources, in open, marine environments spills do not often result in direct mortality of juvenile and adult finfish. Therefore, significant adverse impacts on populations of recreationally and commercially important finfish are not likely in the event of an oil spill. Fish are less vulnerable to contamination than crustaceans or mollusks, and spills in shallow near-shore areas and confined waterbodies are more likely to result in contamination of shellfish and finfish that use these habitats (Law & Hellou 1999, International Maritime Organization [IMO] 1993, NOAA-ORR 2018). However, commercial and recreational fishing may sustain short-term, adverse effects in the event that a local fishery is closed by state or federal regulatory agencies following an oil spill. If an agency determines that fish and/or shellfish in the vicinity of a spill may be contaminated, the fishery would remain closed until testing indicates that the relevant resources are no longer contaminated (NOAA-ORR 2018). Because a fishery closure would be limited to the vicinity of the spill and would likely be short-term, and because of the large area of fishing grounds available in the GOM, impacts on commercial and recreational fishing in the event of a spill would be temporary and minor.

6.4.3 Decommissioning

At the end of its useful life, the Project components associated with the SPM buoy system would be disassembled and brought to shore and the offshore pipeline would be removed. The onshore and inshore pipelines would be abandoned in place, avoiding impacts on the fishing activities that would be associated with their removal. Once decommissioning is complete, the safety zone would no longer apply and activities that had been associated with the Project area prior to its construction would generally be allowed to resume. Potential impacts to commercial and recreational fisheries resulting from Project decommissioning are anticipated to be temporary and of minor significance.

6.5 Cumulative Impacts

Cumulative effects generally refer to impacts that are additive or synergistic in nature and result from the construction of multiple actions in the same vicinity and time frame. Cumulative impacts can result from individually minor, but collectively significant actions, taking place over a period of time. In general, small-scale projects with minimal impacts of short duration do not significantly contribute to cumulative impacts. Activities that could impact the aquatic environment in the Project area include offshore oil and gas exploration and production; waterway improvement projects, and marine traffic associated with the oil and gas industry, as well as recreation (see Volume II Introduction, Evaluation Framework, and Summary of Impacts). The onshore projects, and activities associated with each, would not impact commercial or recreation fishing activities. Although discharges and runoff from coastal facilities could affect the fisheries

themselves, it is anticipated that these activities would be conducted in accordance with applicable permits, such that impacts to the fisheries populations would not occur.

Cumulative impacts to the fisheries could be caused by projects located within the Western Planning Area of the GOM, as well as the adjacent state waters. These include channel improvement and maintenance projects, as well as minor coastal projects in and around Corpus Christi; oil and gas exploration activities; and recreational boating.

Channel maintenance and dredging activities, as well as the minor coastal improvement projects, have the potential to affect water and habitat quality in the immediate vicinity of the projects. These projects are generally short-term and their effects (turbidity and sedimentation, with the potential for limited habitat loss for new construction) would typically be limited to the area where dredging/construction takes place. As a result, the cumulative effects of construction of the Project, when considered with these projects would be negligible.

Offshore oil and gas exploration activities can include installation/removal of mooring platforms and laying of pipelines and associated anchoring activities, service vessel operations, supporting infrastructure discharges, and oil spills. The primary cumulative effect from exploration and production activities would be the installation of platforms and other permanent structures within designated fishing areas. The effect on both recreational and commercial fishing would be similar to that expected from placement of the proposed SPM buoy system and establishment of its safety zones. These activities would result in the potential loss/reduction of fishing areas, but also have the potential for a concurrent increase in fisheries productivity as a result of new structure (habitat) within the soft-bottom environments that are ubiquitous throughout the Western Planning Area. Further, in addition to widening the Corpus Christi Ship Channel (CCSC), the Port of Corpus Christi (POCC) Authority is also proposing to conduct ecosystem restoration to protected endangered species, wetlands, and seagrasses, which would result in beneficial impacts on fisheries populations through creation of additional nursery habitat. These impacts are considered to have long-term beneficial impacts on the fisheries populations, but given the size of the Western Planning Area, the overall benefit of habitat creation from these projects is anticipated to be minor.

Oil and gas exploration activities in the Western Planning Area have the potential for inadvertent releases of product, which could result in impacts on the local fisheries. Since the DWH oil spill, the federal government has reorganized the Minerals Management Service into BOEM (responsible for offshore energy leases) and the Bureau of Safety and Environmental Enforcement (responsible for safety and environmental enforcement relevant to offshore energy activity). The oil and gas industry has also developed standards to better prevent and respond to releases (American Petroleum Institute 2015). In the event of a spill, operators would be required to implement oil spill response procedures in accordance with applicable federal regulations to remove oil from the environment and mitigate impacts. Given the low probability of a spill associated with the proposed Project, and the implementation of federal regulations, the potential for cumulative impacts due to inadvertent releases of petroleum is unlikely and would be minor.

6.6 Mitigation Measures

Based on the Project location (away from unique fishing habitat) and design (minimal footprint), impacts to commercial and recreational fisheries would be negligible and no additional mitigation measures are proposed for the mitigation of impacts to commercial and recreational fisheries.

6.7 Summary of Potential Impacts

Based on the analysis presented in the sections above, potential impacts on commercial and recreational fisheries are summarized in the table below.

Table 6-2: Summary of Potential Impacts on Commercial and Recreational Fisheries

Project Phase	Impact	Duration	Significance	Mitigation
Construction	Habitat modification of soft-bottom and seagrass; increased sediment, turbidity, and noise; Reduction in fishable waters due to the presence of construction equipment and vessels	Temporary	Minor	N/A
Operation	Increased potential for inadvertent releases; reduction in fishable waters due to the operational safety zone around the SPM buoy system	Long-term	Minor	N/A
Decommissioning	Increased turbidity due to operation of construction equipment and vessels; reduction in fishable waters due to the presence of construction equipment and vessels	Temporary	Minor	N/A
Cumulative	Cumulative increase in discharges and runoff; and increased potential for inadvertent releases; beneficial impacts from creation of additional habitat	Long-term	Minor	N/A

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