BIOLOGICAL ASSESSMENT

for the

Annova LNG Brownsville Project

Docket No. CP16-480-000

Applicants:

Annova LNG Common Infrastructure, LLC;

Annova LNG Brownsville A, LLC;

Annova LNG Brownsville B, LLC; and

Annova LNG Brownsville C, LLC

Federal Energy Regulatory Commission

Office of Energy Projects
Washington, DC 20426

February 2019

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

Annova	Annova LNG Common Infrastructure, LLC; Annova LNG Brownsville A, LLC; Annova LNG Brownsville B, LLC; and Annova LNG Brownsville C, LLC
BA	biological assessment
BND	Brownsville Navigation District
BSC	Brownsville Ship Channel
CFR	Code of Federal Regulations
CKWRI	Caesar Kleberg Wildlife Research Institute
CONANP	The National Commission on Natural Protected Areas
DMPA	Dredged Material Placement Area
ECM	Environmental Compliance Manager
EEZ	Exclusive Economic Zone
ESA	Endangered Species Act of 1973, as amended
FERC	Federal Energy Regulatory Commission
FM	Farm-to-Market Road
FR	*Federal Register*
FWS	U.S. Fish and Wildlife Service
LANWR	Laguna Atascosa National Wildlife Refuge
LNG	Liquefied Natural Gas
LRGV	lower Rio Grande valley
LRGVNWR	Lower Rio Grande Valley National Wildlife Refuge
m^3	cubic meters
MOF	material offloading facility
NFPA	National Fire Protection Association
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
PCE	primary constituent element
PRICO	Poly Refrigerant Integrated Cycle Operation
Project	Annova LNG Brownsville Project
RESTORE Act	Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012
SH	State Highway
TAMUK	Texas A&M University-Kingsville
TxDOT	Texas Department of Transportation

1.0 INTRODUCTION

On July 13, 2016, Annova LNG Common Infrastructure, LLC; Annova LNG Brownsville A, LLC; Annova LNG Brownsville B, LLC; and Annova LNG Brownsville C, LLC (collectively Annova) filed an application with the Federal Energy Regulatory Commission (FERC), in Docket No. CP16-480-000, under Section 3(a) of the Natural Gas Act to construct and operate a liquefied natural gas facility referred to as the Annova Liquefied Natural Gas (LNG) Brownsville Project (Project) located on the south bank of the Brownsville Ship Channel (BSC) at approximate mile marker 8.2 in Cameron County, Texas.

Section 7 of the Endangered Species Act (ESA) requires federal agencies to consult with the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS), also known as National Oceanic and Atmospheric Administration (NOAA) Fisheries, to ensure that any action authorized, funded, or carried out by the agency would not jeopardize the continued existence of a federally listed threatened or endangered species or species proposed for listing, or result in the destruction or adverse modification of designated critical habitat. For actions involving major construction activities with the potential to affect listed species or critical habitats, the lead federal agency must prepare a biological assessment (BA) for those species that may be affected. The lead federal agency must submit its BA to the FWS and NMFS and request formal consultation if it is determined that the action may adversely affect a federally listed species under their jurisdiction. In response, the FWS and NMFS would issue a Biological Opinion as to whether or not the federal action would likely adversely affect or jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Based on our review of the Project and our consultation with the FWS and NMFS as well as other agencies, we have determined that federally listed species under FWS jurisdiction may be affected, and are submitting this BA to the FWS with a request of concurrence on our determinations of effect and to initiate formal consultation for species that may be adversely affected by the Project. We have determined that federally listed species under NMFS jurisdiction are not likely be adversely affected; therefore, this BA does not address species under NMFS jurisdiction.

2.0 CONSULTATION HISTORY

Annova consulted with representatives from the FWS Texas Coastal Ecological Services Field Office located in Corpus Christi, Texas. The FWS consultation history is summarized in appendix A.

3.0 PROPOSED ACTION

This section presents an overview of the Project, including the construction and operation procedures. The draft Environmental Impact Statement (draft EIS) issued on December 14, 2018, provides the detailed project description.

3.1 PROJECT OVERVIEW

Annova would construct the Project on approximately 731 acres of land obtained through a long-term lease with the Brownsville Navigation District (BND). The Project site (Figure 1-1) is an undeveloped parcel owned by the BND. The site is used to access BND-managed levees and for the placement of dredged material. The Project would include natural gas liquefaction facilities, storage, marine transfer equipment, and a dredged material placement area (DMPA).

The liquefaction facilities would be designed to receive 0.9 billion cubic feet per day of natural gas and liquefy it using the Black & Veatch Poly Refrigerant Integrated Cycle Operation (PRICO®) technology. Natural gas would be delivered to the site by an approximately 9-mile-long, 36-inch-diameter, third party-owned and operated, non-jurisdictional intrastate natural gas pipeline lateral. The natural gas would be treated, liquefied, and stored on-site in two single-containment storage tanks, each with a net capacity of approximately 160,000 cubic meters (m^3). The LNG would be moved using cryogenic piping from the storage tanks to the marine transfer facilities where it would be loaded onto LNG vessels at the berthing dock.

The facilities for the Project include the following major components:

- gas pretreatment facilities;
- liquefaction facilities (six liquefaction trains and six approximately 72,000 horsepower electric motor-driven compressors);
- LNG storage tanks;
- boil-off gas handling system;
- flare system;
- marine transfer equipment;
- control, administration, and support buildings;
- access road;
- fencing and barrier wall; and
- utilities (power, water, and communication).

Annova identified three non-jurisdictional facilities in its application that would be associated with the proposed Project: facilities required to interconnect the LNG terminal to the natural gas supply pipeline; an electrical transmission line and switch yard; and a potable waterline. The natural gas supply pipeline is also considered a non-jurisdictional facility. Annova has stated that this pipeline would be owned and operated by a third-party. However, Annova requested on November 20, 2018 that the U.S. Corps of Engineers (Corps) include the non-jurisdictional

Annova LNG Lateral Pipeline as part of its Permit Application No. SWG-2015-00110 As part of the Annova LNG Lateral Pipeline application, Annova included information on threatened and endangered species in its Threatened and Endangered Species Evaluation Report. This is attached as appendix C. The non-jurisdictional facilities are addressed in our cumulative effects analysis in section 6.0 of this BA.

3.2 CONSTRUCTION PROCEDURES

Annova estimates that approximately 491 acres of land would be affected by construction of the LNG terminal and marine facilities, and the temporary and permanent access roads. An additional 59 acres within the BSC would be affected by dredging. Assuming receipt of all certifications, authorizations, and necessary permits, Annova anticipates beginning construction activities in 2021 and placing the facilities into service in 2024. The total construction period would be about 48 months.

The following describes the general construction procedures proposed by Annova for the LNG terminal and marine facilities.

3.2.1 LNG Terminal Facilities

Construction would progress with clearing of vegetation and grading of the Project site. Clearing of vegetation would be limited to the areas necessary to accommodate the Project facilities. During construction, Annova would use areas within the Project site for equipment and materials laydown, contractor yard, soil stockpiling, soil borrow, and parking. Conventional mechanical earthmoving equipment such as scrapers, bulldozers, backhoes, excavators, and front-end loaders would be used.

The general construction process for aboveground facilities at the LNG facility would include the following activities:

- installation of piles and underground utilities during both the excavation and raising of the site elevation;
- foundation work in areas where the site elevation is raised, beginning in the LNG storage tank area and progressing outward to include process equipment sites;
- installation of major equipment, including process modules, and construction of the LNG storage tanks and installation of pipe racks;
- installation of process equipment, utility piping, and electrical instrumentation; and
- construction of buildings, including the control, maintenance, and administration buildings.

The major site components requiring pile foundations include process equipment, equipment and pipe rack modules, the LNG loading platform, and the LNG storage tanks. Following installation of the piles, installation of the LNG storage tank foundations would include installation of sand beds, formwork and reinforcement steel, settlement monitoring system, and pouring of the concrete slabs.

Construction of each of the two single-containment LNG storage tanks on the pile foundations would consist of installing the outer structural components and then the internal and outer accessories. The annular space between the inner and outer tank walls would be filled with insulation consisting of expanded perlite and resilient glass wool. Milled perlite would be thermally expanded on site. The temporary on-site perlite expansion would use a tractor-trailer-mounted mobile expander unit and a mobile delivery unit.

The LNG storage tanks would be hydrostatically tested with water being withdrawn from the BSC through a firewater pump intake structure. Upon completion of hydrostatic testing, the test water would be discharged back into the BSC at a rate of approximately 1.8 million gallons per day.

Annova would construct one new access road off State Highway (SH) 4 (Boca Chica Boulevard) that would be used for both construction and operation. Initially, an existing unpaved road would provide temporary access until construction of the permanent road is complete. Interior plant roads would also be used to access facility components.

The perimeter of the maintained LNG facilities would be surrounded by an approximately 7-foot-tall chain-link security fence with 1 foot of barbed wire at the top. This fence would prevent access to the facility except through a controlled gate. A second fence would be installed around the boundary of the real estate lease option agreement with the BND, which would consist of a smooth-wire boundary fence. The smooth wire boundary fence would have three strands of steel wire supported on steel T-posts (similar to cow fencing). The top wire would be approximately 42 inches above the ground.

Annova revised the site plan to include a wildlife corridor of undisturbed vegetation in the southwest side of the site, between the outer smooth wire boundary fence and the inner chain-link security fence, to allow for potential ocelot movement through the area. Annova proposes to install approximately 6,000 feet of barrier wall along the west edge of the inner security fence, between the maintained LNG facilities site and the wildlife corridor, to reduce light and noise impacts on wildlife using the corridor. The barrier wall would consist of posts drilled into the ground and approximately 25-foot-tall concrete panels between the posts. The barrier wall would include three-inch-high cut outs spaced along the base of the wall to allow for stormwater drainage. The locations of proposed fencing and the barrier wall are shown on figure 3-1.

Following construction, site restoration would include clean-up, grading to the final design elevations, installing permanent erosion control measures, and revegetation. Stabilization of disturbed areas would be in accordance with Annova's *Plan and Procedures*.

3.2.2 Marine Facilities

The marine berth would be constructed using both land-based excavation and dredging. Land-based excavation would remove the material to a depth of about -21 feet, at which point the earthen berm would be removed and the remainder of the berth would be dredged using a hydraulic cutter dredge.

The marine berth would also require installation of pilings. Pilings for the mooring dolphins and access trestle would be installed from land following land-based excavation but prior

to removal of the earthen berm. Pilings for the breasting dolphins would be installed using in-water equipment.

Figure 3-1 Project Area on Aerial Imagery

The marine off-loading facility (MOF) would be constructed on the west side of the marine berth. The MOF would include a retaining wall consisting of a combination of piles and steel sheet bulkhead. The MOF deck would consist of a series of driven piles.

Pilings for the LNG carrier loading platform would be installed following completion of dredging. Installation of berth piping, equipment, utility hookup, and commissioning of the loading system would follow pile installation.

Shoreline protection would be installed at the base of the steel sheet pile bulkhead wall for the MOF, the shoreline at each end of the marine berth, and the base of the LNG loading platform and breasting dolphin piles. The shoreline protection would consist of rock riprap armoring installed by crane or long-reach backhoe. The rock for the armoring would be delivered to the site by barge.

3.3 PROJECT OPERATIONS

Annova would operate and maintain its facilities in compliance with Title 49 Code of Federal Regulations (CFR) 193, 33 CFR 127, 40 CFR 68, National Fire Protection Association (NFPA) 59A, and other applicable federal and state regulations. Operation and maintenance would initially require about 115 personnel, which would increase to up to 165 personnel when fully operational. Early staffing plans assume that the liquefaction facility would operate 24 hours a day, 7 days a week. Operation of the Project would affect approximately 364 acres.

3.3.1 LNG Marine Traffic

Annova anticipates that it would load on average two to six LNG carriers per month when operating at full plant capacity, though the actual number of port calls would depend on future offtake agreements and the capacity of the specific vessels. At maximum output Annova would load up to 80 LNG carriers per year based on 138,000 m^3 vessels.

The LNG carriers would navigate through the Gulf of Mexico and the United States Exclusive Economic Zone (EEZ). The routes through the EEZ would use the designated fairways and typical vessel routes in order to avoid obstructions and to maximize efficiency, considering distance and currents. Once at the Project site, tugs would maneuver the vessel within the berthing area. Loaded LNG carriers would transit outbound along the reverse route described for inbound LNG carriers. During Project operation Annova would be responsible for maintenance dredging of its marine berth and associated turning basin. Material from maintenance dredging would be placed into the DMPA, referred to as DMPA 5A as described below.

3.3.2 Dredge Material Placement

Annova proposes to place hydraulically dredged material that is not used on the Project site into existing DMPA 5A which is owned by the BND. Alternatively, Annova would use the dredged material for off-site beneficial uses if feasible and practicable alternatives can be identified. DMPA 5A is approximately 704 acres in size and is located directly west of the Project site. DMPA 5A is surrounded by a containment dike with an average height of 6 feet above the existing grade and a length of about 21,690 linear feet. The site is used for placement of maintenance dredged material from the adjacent section of the BSC navigation channel.

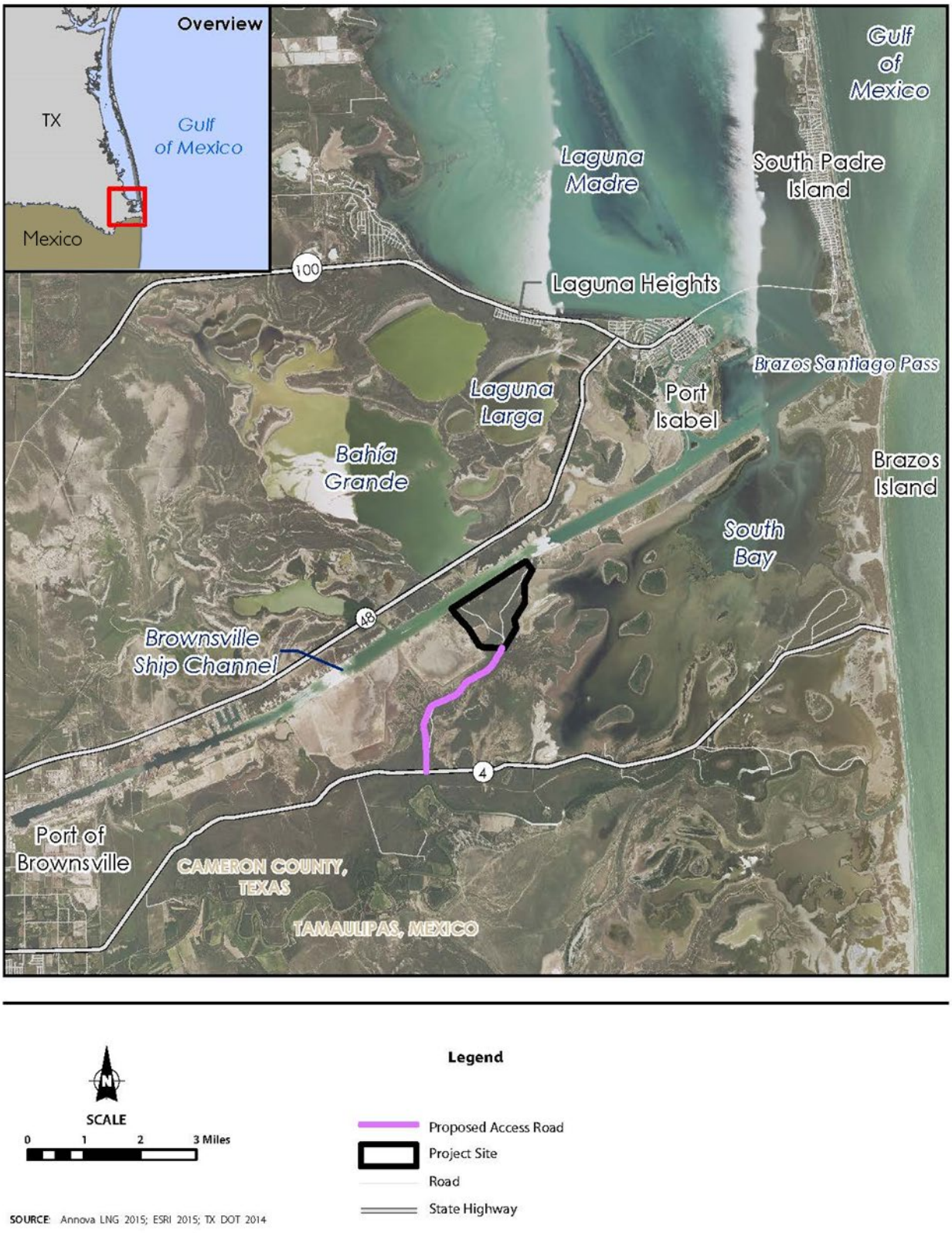


Figure 3-2 Project Location

3.3.3 Water Supply and Demand

During operation, the Project would use water to support operations, for drinking and sanitary purposes, and testing of fire water pumps. Annova would obtain water from the BND during operation. An on-site 250,000-gallon potable water storage tank would provide water necessary to conduct the monthly fire suppression system test. In an emergency, water would be withdrawn from the BSC.

3.3.4 Sanitary Waste

An on-site packaged sewage treatment plant would treat sanitary wastewater, which would discharge through the stormwater management system to the BSC. Sludge and solids would be directed to an on-site holding tank. Annova would contract with a sanitary waste contractor who would remove the contents of the holding tank as necessary and dispose of the contents at authorized disposal sites through the contractor's permits.

3.3.5 Ballast Water and Cooling Water

LNG carriers would arrive at the Project with empty cargo tanks and onboard ballast water to compensate for the empty tanks. Ballast water would be discharged as the LNG is loaded. Ballast discharge periods would vary, but vessels generally would discharge a volume equal to 10 percent of their LNG capacity each hour.

During arrival, loading, and departure from the berth, LNG carriers would draw water from the BSC to keep their main engines and auxiliary equipment cool and within prescribed operating temperatures. The cooling water intake rate and volume of water required for cooling the machinery varies depending on the type of vessel propulsion and the mode of operation.

3.3.6 Communication

The telecommunication systems for the Project would include a telephone exchange, radio system, computer network, plant telecommunications network, e-mail system, and closed-circuit television system. The Project design does not include communication towers.

3.4 ACTION AREA

The Action Area is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (50 CFR 402.02). In general, the Action Area encompasses the BSC between the Gulf of Mexico and the marine terminal. The Action Area is shown on figures 3-3 and 3-4 and described in further detail below.

3.4.1 Terrestrial Components of the Action Area

The terrestrial portion of the Action Area includes the following components, which are described in section 3.2 and shown on figure 3-3:

1. LNG terminal facilities; and
2. Access road.

3.4.2 Marine Components of the Action Area

The marine portion of the Action Area includes the following components, which are described in section 3.2 and shown on figure 3-3:

1. Marine docking terminal and turning basin (marine facilities); and
2. The BSC from the Project site eastward to the mouth of the BSC at Brazos Santiago Pass.

In addition, to include the effects of LNG carriers transiting the Gulf of Mexico as an indirect effect of the Project, the Action Area includes shipping routes throughout the Gulf of Mexico out to the EEZ (defined as 200 nautical miles). This portion of the Action Area is generally shown on figure 3-4.

Figure 3-3 Action Area—Terrestrial and Marine Components out to Gulf of Mexico at Brazos Santiago Pass

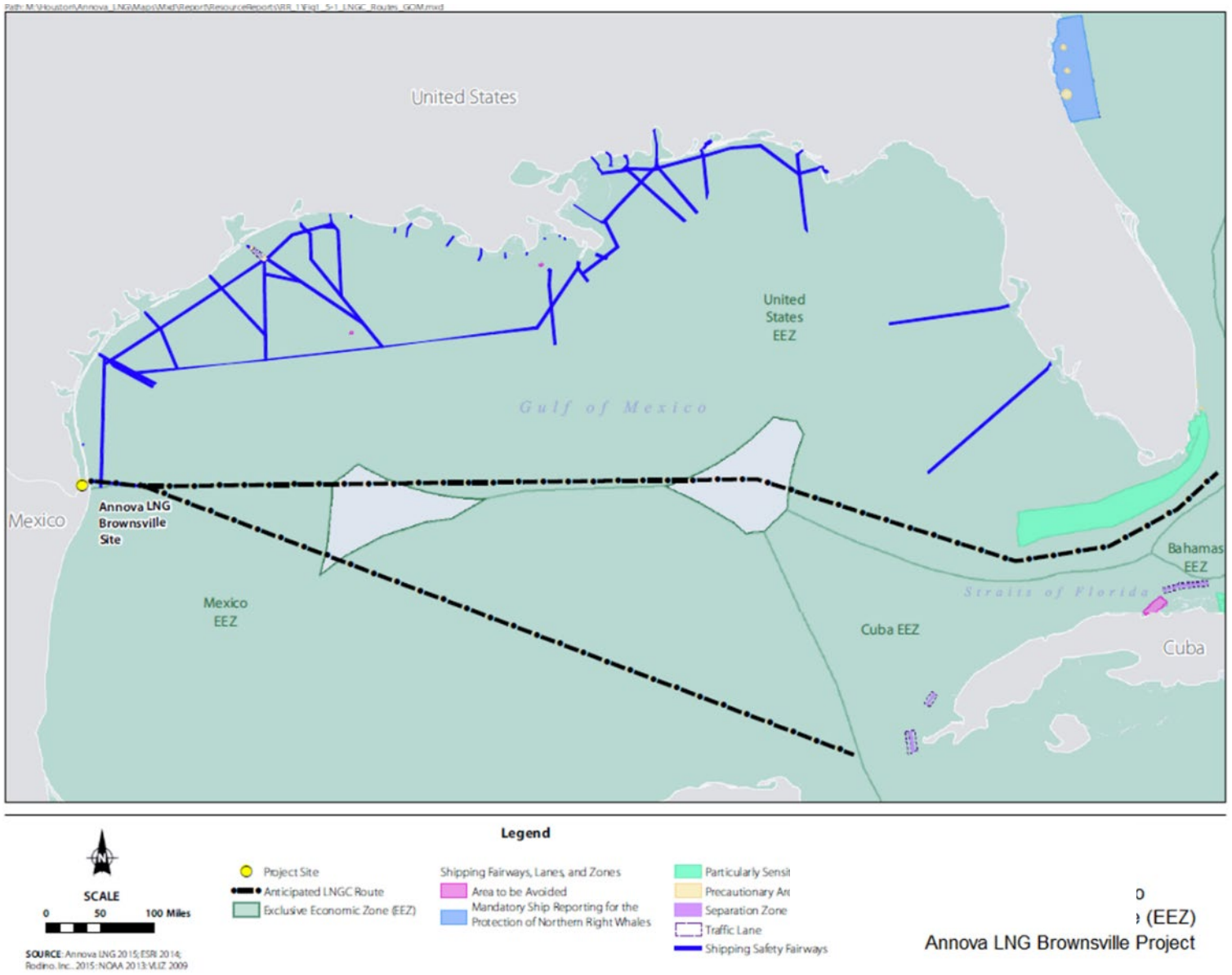


Figure 3-4 Action Area—Gulf of Mexico out to Exclusive Economic Zone

4.0 ENVIRONMENTAL BASELINE

4.1 ENVIRONMENTAL SETTING

The Action Area lies within the Rio Grande Delta region, a region that is characterized by a unique and complex array of landforms created over time by the interaction of sediment deposition and channelization of the Rio Grande, the hypersaline coastal system of the Laguna Madre, and aeolian processes (Griffith et al. 2007). The area includes flat coastal plains at or below 5 feet above sea level and scattered lomas (clay dunes) rising to nearly 25 feet above sea level. Low-lying tidal and non-tidal wetlands occur along the BSC and within depressions of various sizes and depths within the coastal plain. Unvegetated wind-tidal flats associated with South Bay occur within the eastern edge of the Project site. The region has a subtropical, subhumid, modified marine climate.

Lomas are unique features found in the coastal plains of eastern Cameron County that provide important habitat for protected species such as the ocelot and jaguarundi (FWS 2012), which are further discussed in section 5.0. Lomas are characterized as scattered clay dunes that formed by windblown saline clay particles originating from local salt flats that are largely barren of vegetation. Lomas typically range from 5 to 30 feet above mean high tide and from 10 to about 250 acres in size (USDA 1977). Vegetation communities on lomas range from dense mixed thornshrub communities or grassland habitats to nearly barren ground, depending on factors such as soil salinity (which varies from low to very high), erosion, and grazing pressure. Three loma systems are located within the current Action Area: Loma del Potrero Cercado (a large loma system with two distinct peaks), Loma del Divisadero, and the eastern portion of Loma de la Juaja. Loma del Potrero Cercado is located in the northern portion of the Project site, Loma del Divisadero is located in the southern portion of the Project site, and Loma de la Juaja is located along the proposed access road route near SH 4.

Outside the lomas, the Action Area consists of relatively flat coastal prairie that is typically 5 feet or less above sea level and is within the 100-year floodplain. Within the coastal prairie are scattered depressions of varying sizes. Within the Project site itself, large depressions up to nearly 40 acres in size occur within the coastal prairie and hold fresh to brackish water for some portion of the year based on plant species observed and review of aerial photography. Along the access road corridor, small (less than 0.5 acre), shallow, saline depressions and swales occur within the coastal prairie. Based on review of historic aerial photography, these depressions may have been influenced by the nearby estuary system; however, with improvements to the BSC and establishment of dredge material placement areas, they are now surrounded by upland areas. They are still located within the 100-year floodplain. The BSC itself contains deep water within the maintained navigation channel and shallow water outside the navigation channel.

The Project area landscape is a wind- and salt-dominated area, which influences the vegetative cover types present. Portions of the Project site subject to wind-driven extreme high tides support emergent herbaceous wetlands or unvegetated wind tidal flats because of high concentrations of salt. Open-water areas in the Project site are non-vegetated and do not provide adequate habitat for aquatic vegetation such as seagrass. Additionally, field surveys at the Project site did not indicate the presence of algal flats; however, algal flats are likely to occur during

periods of long-term standing water on mudflats. Wind tidal flats and algal flats provide important habitat for protected bird species such as the piping plover and red knot.

The habitats/vegetation communities within the Action Area have been generally categorized as open water in the BSC, unvegetated tidal and wind-tidal flats, various wetlands, herbaceous upland prairie, shrubland/ grassland, and dense thornshrub. Specific vegetation communities present in the Action Area are shown on figures 4.1-1a and 4.1-1b. The vegetation communities that would be affected by the Project are described in detail in the draft EIS.

The portion of the Action Area that extends into the Gulf of Mexico is confined to the designated shipping lanes where LNG carriers would navigate through the Gulf of Mexico and the United States EEZ, as described in section 3.3. The routes through the EEZ would use the designated fairways and typical vessel routes in order to avoid obstructions and to maximize efficiency, considering distance and currents (figure 3-4).

The current status of the federally listed threatened or endangered species as well as the candidate for federal listing within the Action Area are presented in the species subsections included in section 5.0.

4.2 SOUTH TEXAS COASTAL CORRIDOR

The Project area is located within a region considered by the FWS as being particularly important to the travel and dispersal of the ocelot. Within the region, the FWS has developed a strategic habitat conservation plan, referred to as the South Texas Coastal Corridor, which has a goal of creating a wildlife corridor connecting the Laguna Atascosa National Wildlife Refuge (LANWR) and the Lower Rio Grande Valley National Wildlife Refuge (LRGVNWR) (FWS 2015a).

Figure 4.2-1 shows the corridor that the FWS has identified as a focus for purchasing properties or obtaining easements within Cameron County to establish the South Texas Coastal Corridor (see "USFWS Refuge Acquisition Boundary" on figure 4.2-1). The acquisition of properties and easements within this corridor will eventually connect the main LANWR tracts, the Bahia Grande Unit of the LANWR, LRGVNWR units, and Boca Chica State Park, resulting in a contiguous conservation landscape (NFWF 2015). This conservation landscape, in turn, is linked to more than 2 million acres of private ranchland located north of the LANWR with the 1.3-million-acre Rio Bravo Protected Area, managed by The National Commission on Natural Protected Areas (known by its Spanish acronym CONANP) in coastal Mexico (NFWF 2015).

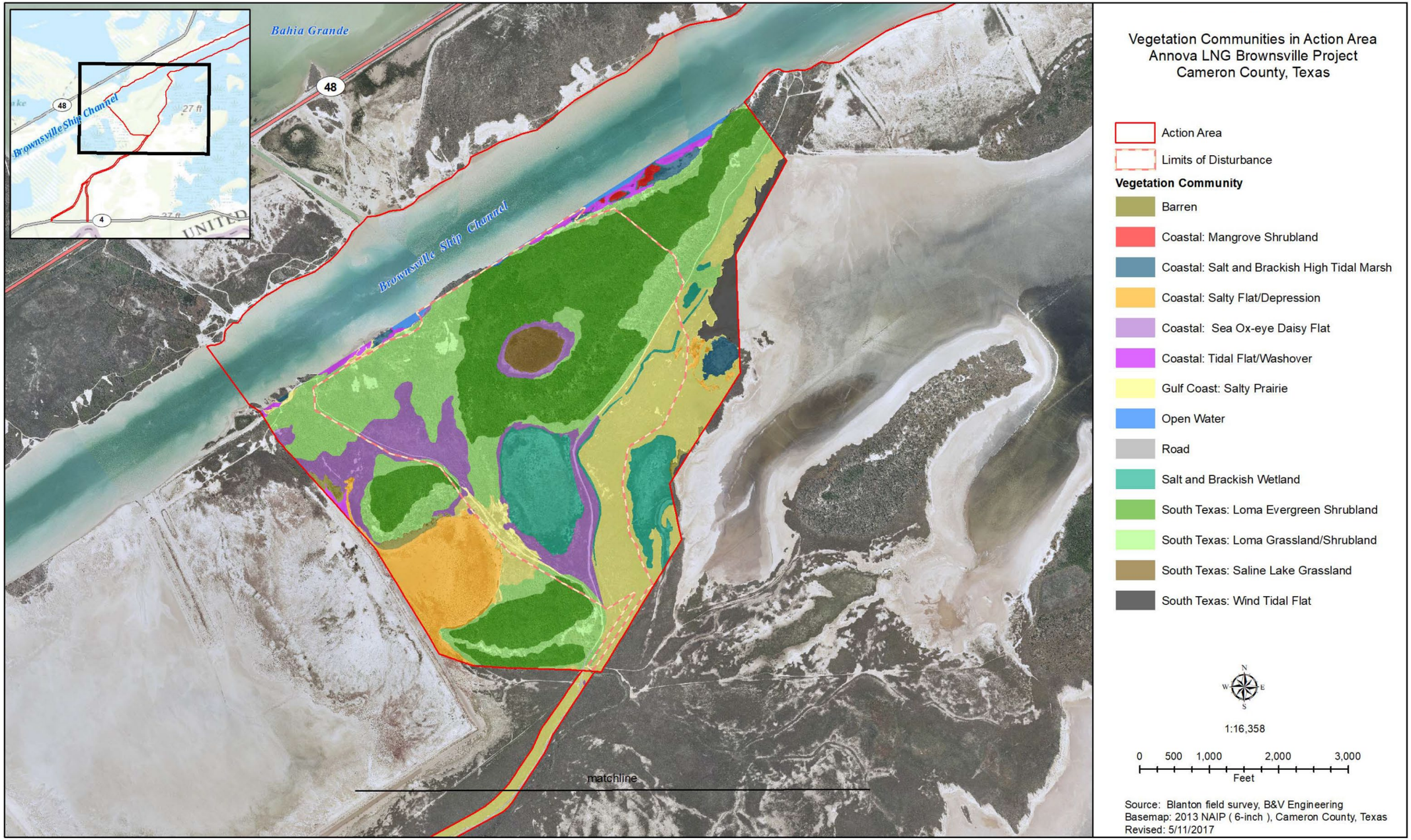


Figure 4.1-1a Vegetation Communities in Action Area

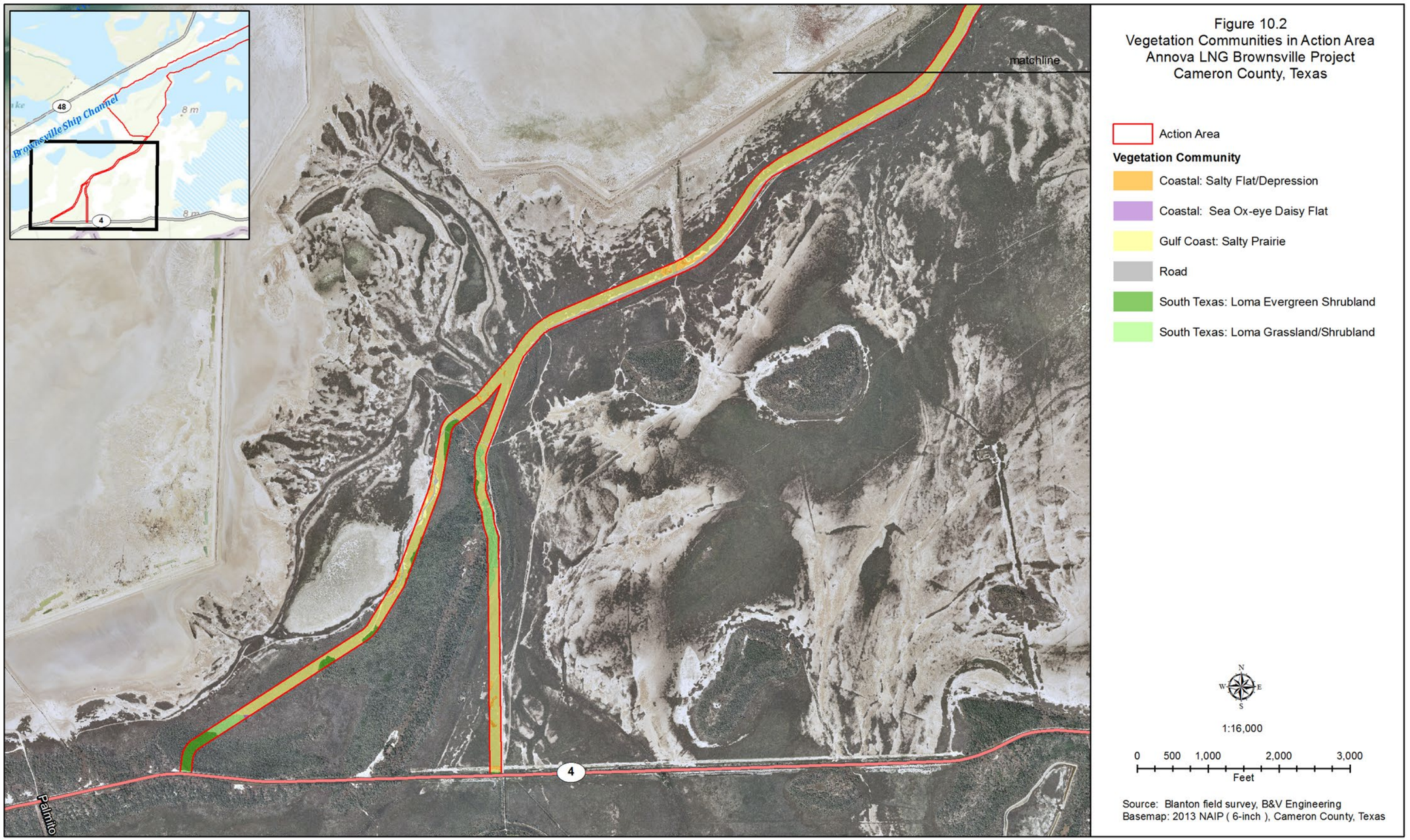
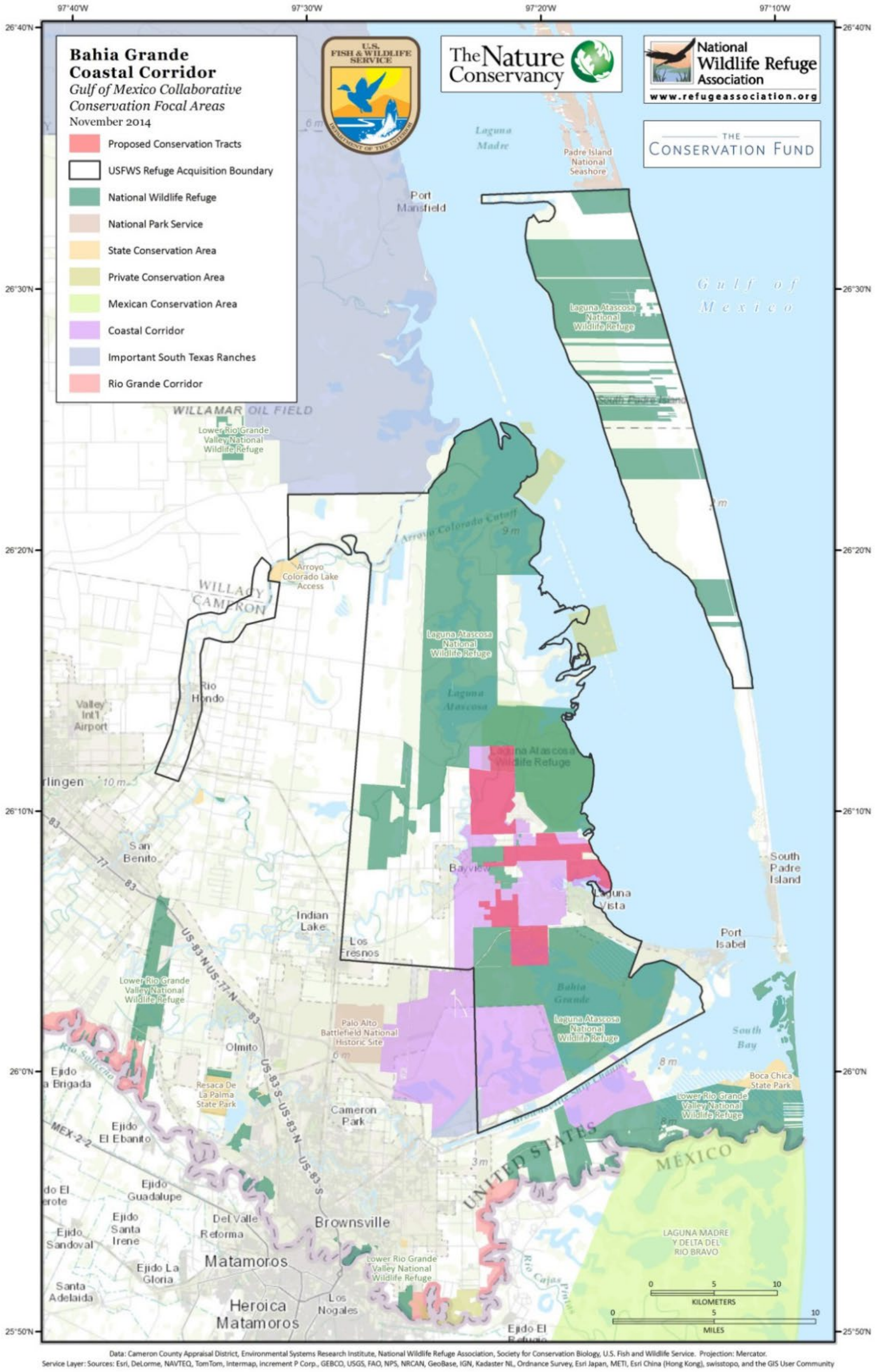


Figure 4.1-1b Vegetation Communities in Action Area



Source: BGCCP 2014

Figure 4.2-1 South Texas Coastal Corridor

5.0 STATUS OF THE SPECIES AND CRITICAL HABITAT

As previously indicated, this BA addresses species that are under the FWS jurisdiction. Nine federally listed threatened or endangered species, one proposed species, and one candidate for federal listing with FWS jurisdiction could occur in Cameron County, Texas (table 5-1). In addition, the FWS has designated critical habitat for the wintering piping plover in the Action Area.

TABLE 5-1

Listed, Proposed, and Candidate Species under FWS Jurisdiction with Potential to Occur in the Action Area (Cameron County, Texas)

Listed Species		Listing Status	FWS Critical Habitat Present
Common Name	Scientific Name		
Mammals			
West Indian manatee, Florida subspecies	*Trichechus manatus latirostris*	Threatened	No
Ocelot	*Leopardus pardalis*	Endangered	No
Gulf Coast jaguarundi	*Herpailurus yagouaroundi cacomitli*	Endangered	No
Birds			
Northern aplomado falcon	*Falco femoralis septentrionalis*	Endangered	No
Piping plover	*Charadrius melodus*	Threatened	Yes
Red-crowned parrot	*Amazona viridigenalis*	Candidate	No
Red knot	*Calidris canutus rufa*	Threatened	No
Whooping crane	*Grus Americana*	Endangered	No
Eastern black rail	*Laterallus jamaicensis jamaicensis*	Proposed Threatened	No
Flowering Plants			
South Texas ambrosia	*Ambrosia cheiranthifolia*	Endangered	No
Texas ayenia	*Ayenia limitaris*	Endangered	No

The FWS and NOAA Fisheries share jurisdiction of five federally listed sea turtles in Cameron County. NOAA Fisheries leads the conservation and recovery of sea turtles in the marine environment and FWS has the lead for the conservation and recovery of sea turtles on nesting beaches. There is no nesting habitat for sea turtles within the Action Area. Therefore, terrestrial impacts to sea turtles are not evaluated in this BA. We will coordinate with NOAA Fisheries separately regarding sea turtles in the marine environment, as warranted.

Species occurrences and designated critical habitat in the vicinity of the Action Area are depicted in figure 5-1. The following sections present the status of each listed species, the associated Project effects and conservation measures, and our determination of effects.

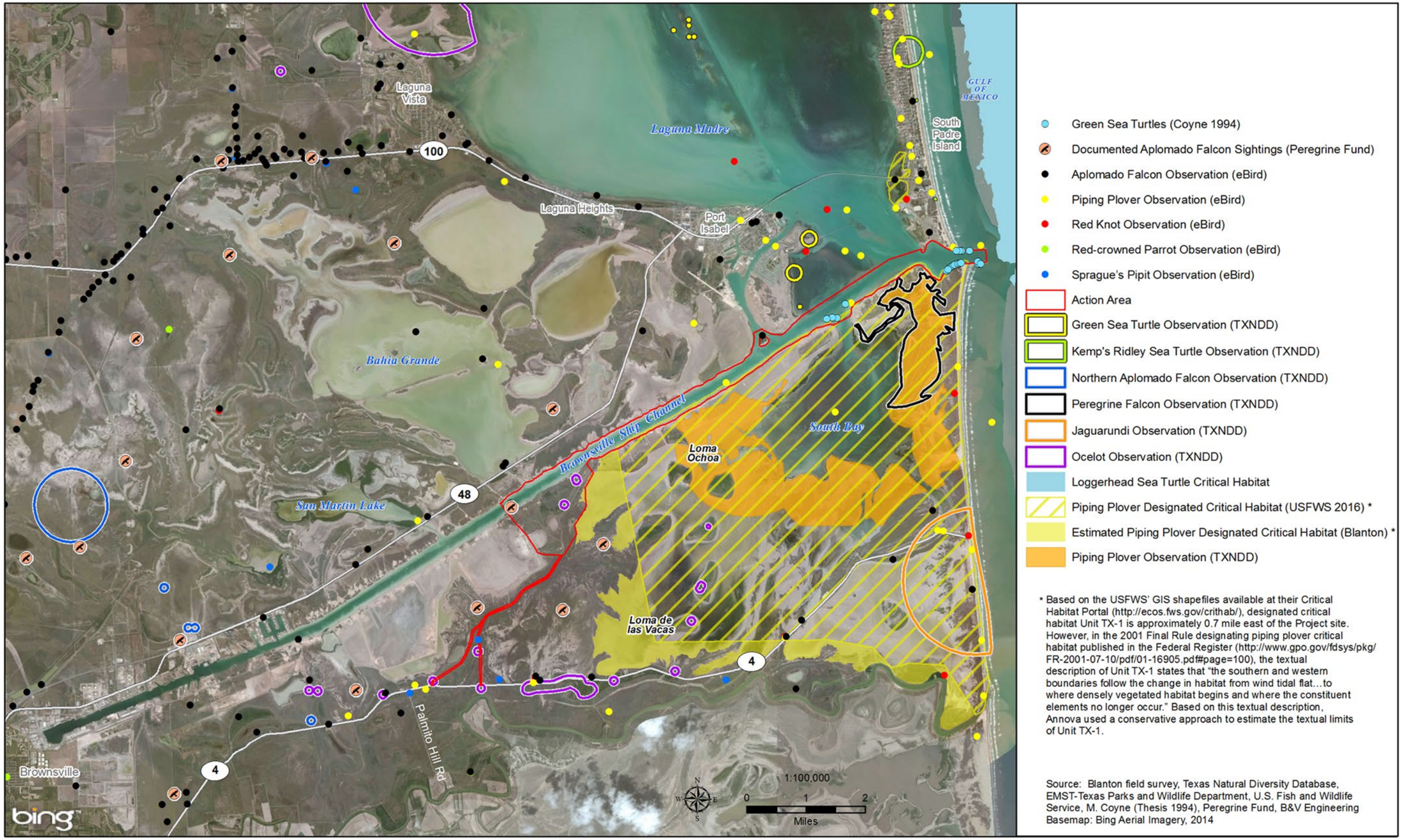


Figure 5-1 Species Occurrences and Designated Critical Habitat in the Vicinity of the Action Area

5.1 FLORIDA MANATEE

5.1.1 Species/Critical Habitat Description

Manatees are large, slow-moving herbivorous marine mammals that reach up to 12.8 feet in length. Manatees are adapted to a completely aquatic lifestyle with paddle-like forelimbs and no hind legs. A manatee's lungs extend the length of its body, which is important in controlling its position in the water column (FWS 2001). Critical habitat has been designated for the Florida manatee along the eastern, southern, and western coasts of Florida.

5.1.2 Distribution and Abundance

The Florida manatee (a subspecies of the West Indian manatee) ranges throughout the southeastern United States. (FWS 2007a and 2013a). During the warmer months, the Florida manatee may range as far north as Massachusetts and as far west as Texas; however, occurrences outside of the primary range are irregular (FWS 2007a and 2013a). Individuals commonly rest just below the surface in areas where seagrass or freshwater vegetation flourishes.

The Florida manatee is rare in Texas, but has been sighted in Corpus Christi Bay, Laguna Madre, Cow Bayou near Sabine Lake, Copano Bay, along Bolivar Peninsula, and at the mouth of the Rio Grande (Texas Tech University 1997). The occurrence of the manatee in the BSC is considered possible but unlikely. Sightings of manatees in the BSC have typically involved only a single animal that does not remain long in the vicinity.

5.1.3 Habitat

Manatees occur in coastal marine, brackish, and freshwater habitats. The Florida manatee is typically encountered in sea grass beds, canals, creeks, embayments, and lagoons near the mouths of rivers and sloughs. Habitat selection is influenced by food, water temperatures, and freshwater resources. Females with calves may select habitats based on ambient noise, currents, and increased amounts of forage (Gannon et al. 2007).

5.1.4 Life History

Manatees are opportunistic herbivores that feed on a wide variety of aquatic vegetation. In coastal areas, seagrasses appear to be a staple of their diet, with preferences for water hyacinth (*Eichhornia crassipes*), hydrilla (*Hydrilla verticillata*), and smooth cordgrass (*Spartina alterniflora*) (FWS 2001). Research has demonstrated site fidelity in manatees while, at the same time, individuals have been observed adjusting their behavior to take advantage of protected areas or changes in availability of resources (FWS 2001). Radio-tracking has provided evidence of seasonal migration, other long-distance movements, and local movement patterns. Many individuals consistently display the same movement pattern each year, in timing and distance moved as well as destinations (FWS 2001).

The Florida manatee occurs in loose-knit groups, but it is not gregarious by nature. Breeding and calving occurs year round (Davis and Schmidly 1994). Females reach maturity around age five, and typically produce one offspring after a gestational period of up to 14 months. Calves are dependent on the mother for up to two years. No long-term pair bond between males and females is reported, and males do not assist with rearing of offspring (FWS 2001).

5.1.5 Population Dynamics

The Florida manatee may live several decades in the wild. A The most recent population viability analysis for the Florida manatee concluded that this subspecies has a 0.42 percent chance of falling below the target population of 500 adults in the Gulf of Mexico within the next 100 years. Three factors contribute to maintaining such a low probability of population extinction: (1) current population size greater than 2,500; (2) high adult survival rates; and (3) estimated carrying capacity larger than current abundance estimates (Runge et al. 2007). These population trends support the recent downlisting of the Florida manatee from endangered to threatened.

5.1.6 Reasons for Listing/Threats to Survival

Although the initial decline of the Florida manatee populations was a result of overharvest, principal current threats include loss of warm water habitat, vessel strikes, and red tide (Runge et al. 2007). The manatee is also negatively impacted by hurricanes, habitat destruction (such as loss of seagrass), and other natural and human-made factors.

5.1.7 Recovery Efforts

The Florida manatee was listed previously as endangered, but was downlisted to threatened status on May 5, 2017, based on significant improvements in its population and habitat conditions (82 FR 64: 16668-16704). A review of research on the effectiveness of laws reducing boat speeds in areas of known manatee habitat indicated that reducing boat speeds in specific areas is an appropriate, reasonable, and defensible management action although more studies on the effectiveness of boat speed reduction are suggested (Calleson and Frohlich 2007).

5.1.8 Current Status in the Project Area

The Florida manatee is extremely rare in Texas waters; the most recent sightings are likely individuals migrating or wandering from Mexican waters. In May 2005, a live manatee appeared in the Laguna Madre near Port Mansfield. The occurrence of the Florida manatee in the Action Area would be considered a rare event.

5.1.9 Effects of the Action

Vessel Strikes

Vessel strikes are a leading cause of manatee mortality. However, the likelihood of a collision between a manatee and a vessel in the Action Area is exceedingly low. Few if any manatees are expected to occur in the BSC. Deep waters and the absence of seagrass beds make the BSC unsuitable for the Florida manatee. Any manatee that wandered into the channel would be unlikely to remain for long. Furthermore, vessel speed is restricted in the BSC, which would allow a manatee to take avoidance measures if a vessel approached too closely. Observers onboard vessels during construction and dredging would be alert to the presence of manatees and take preventive action, as described in NOAA Fisheries (2008). LNG carriers in transit in the open Gulf of Mexico are not expected to encounter manatees because the animals tend to remain in nearshore waters.

Noise

Construction and operation activities would increase noise levels in the Action Area and vibrations would occur during pile-driving activities. Although manatees are thought to have sensitive hearing, they appear relatively unresponsive to human noise (NoiseQuest 2015). This, coupled with the fact that occurrence of a Florida manatee would be rare and temporary, indicates that noise and vibration from the Project are not expected to affect this species. In addition, Annova would incorporate noise mitigation measures that would prevent animals from being exposed to noise levels above NOAA injury harassment thresholds (Level A) from vibratory and impact pile driving[1].

Ballast Water Discharge

No adverse effects on the Florida manatee are expected from ballast water discharge from LNG carriers in the BSC. Ballast water discharges would be expected to have minor, direct, and adverse impacts on water quality. However, discharges would be expected to dilute rapidly, and manatees are capable of moving away from discharges.

Turbidity

There is little evidence that turbidity affects West Indian manatees directly, indicating that individuals must have some level of tolerance and are able to feed in turbid conditions (Todd et al. 2015). Turbidity may cause sediments around seagrasses to become unconsolidated and suspended, reducing available food for the manatee (FWS 1999). No seagrass beds occur in the Project area in the BSC. The Project is expected to result in only minor, short-term increases in turbidities in the area of construction within the BSC and no impacts on food availability for the manatee are anticipated.

5.1.10 Determination of Effect

The Florida manatee is currently extremely rare in Texas waters, and the most recent sightings are individuals migrating or wandering from Mexican waters. Although there have been incidental sightings of individuals scattered along the Texas Gulf Coast, including a May 2005 record of a live manatee in the Laguna Madre near Port Mansfield, such sightings are rare. Furthermore, the BSC portion of the Action Area does not provide suitable habitat or foraging opportunities for the Florida manatee. Therefore, we have determined that constructing and operating the Project may affect **may affect, but is not likely to adversely affect,** the Florida manatee.

5.2 OCELOT

5.2.1 Species/Critical Habitat Description

The ocelot is a medium-sized, spotted cat, about 30 to 41 inches in length and weighing from 14 to 30 pounds (Campbell 2003). Its coat is grayish or buffy and is heavily marked with black spots, small rings, blotches, and short bars (Schmidly 2004). The ocelot has a long tail that

[1] On December 20, 2018, Annova filed its revised Marine Mammal Acoustic Analysis and Mitigation Plan

is ringed or marked with dark bars on the upper surface, parallel stripes running down the nape of the neck, large spots, and a short coat (Campbell 2003; Schmidly 2004).

5.2.2 Distribution and Abundance

The ocelot occurs from south Texas to South America (Navarro-Lopez 1985). It is estimated that about 80 ocelots remain in Texas, with the majority distributed in Cameron and Willacy Counties (Tewes and Everett 1986; Jackson et al. 2005; Haines et al. 2006a). Two verified breeding ocelot populations occur in the United States, one in Cameron County, Texas, at the Laguna Atascosa NWR and one in Willacy County, Texas, on private ranches (Tewes 2017). The LANWR population is the closest resident subpopulation to the Action Area, located about 11 miles north of the Action Area. However, in 1998 a dispersing male ocelot was captured, radio-collared, and tracked in dense thornshrub on lomas in and around the Action Area. Based on tracking, this ocelot eventually travelled north to the LANWR. According to a 2005 report (Haines et al. 2005a), the estimated number of breeding individuals in the LANWR population was 19 ocelots with a total population of 38 ocelots in Cameron County. More recent data indicates that the Cameron County population is estimated at 13 individuals (FWS 2013b).

5.2.3 Habitat

Ocelots prefer dense thornshrub and rocky areas (FWS 1990a, 2010a) and require large unbroken blocks of habitat for movement. The highest portions of the lomas in the Action Area support a dense and diverse thornshrub community, making the lomas preferred habitat for ocelots. Typical brush species in preferred ocelot habitat include granjeno (*Celtis ehrenbergiana* [*C. pallida*]), brasil (*Condalia hookeri*), desert yaupon (*Schaefferia cuneifolia*), wolfberry (*Lycium* spp.), lotebush (*Ziziphus obtusifolia*), althorn goatbush (*Castela erecta* [*C. texana*]), whitebrush (*Aloysia gratissima*), catclaw acacia (*Senegalia* [*Acacia*] *greggii*), blackbrush acacia (*Vachellia* [*Acacia*] *rigidula*), lantana (*Lantana* spp.), guayacan (*Guaiacum angustifolium*), cenizo (*Leucophyllum frutescens*), elbowbush (*Forestiera angustifolia*), and Mexican persimmon (*Diospyros texana*), with some interspersed trees such as honey mesquite (*Prosopis glandulosa)*, live oak (*Quercus virginiana*), Texas ebony (*Ebenopsis ebano*), and hackberry (C*eltis* spp.) (Campbell 2003).

As characterized by Dr. Michael Tewes and colleagues, south Texas ocelots depend on shrub canopy cover: *optimal* habitat has greater than 95 percent canopy cover of shrubs, while marginal, *sub-optimal* habitat has 75 to 95 percent canopy cover (Navarro-Lopez 1985; Laack 1991; Harveson et al. 2004). Habitat with less than 75 percent canopy cover is considered to be inadequate (Campbell 2003) and avoidance of this habitat by ocelots has been documented (Horne 1998; Harveson et al. 2004). Tracts of at least 100 acres of dense thornshrub with greater than 75 percent canopy cover, or 75 acres of brush interconnected with other dense brush patches by corridors, are preferred habitat for ocelots (Campbell 2003). Mean home range sizes for male and female ocelots from Cameron County are 4.1 and 2.5 square miles, respectively (Navarro-Lopez 1985; Laack 1991).

5.2.4 Life History

Ocelots are primarily nocturnal, normally beginning their activity at dusk when they commence their nightly hunt for rodents, rabbits, other small mammals, as well as birds, snakes,

and lizards (Schmidly 2004; Tewes and Schmidly 1987). Male ocelots sometimes conduct exploratory trips, or *sallies*, beyond their normal home range, likely in search of females in estrus (Campbell 2003). Young males may disperse several miles from their natal range in search of new territory (FWS 2010a).

Females prepare a den in dense brush, and one or two kittens are born sometime between late spring and December (Laack et al. 2005). Male ocelots play no role in raising or protecting their offspring. Age to maturity of free-ranging ocelots is believed to be about 1.5 to 2 years. In captivity, ocelots have reached ages of about 20 years. Typical ages of free-ranging ocelots are 4 to 5 years, with some wild individuals documented in Texas living to about 8 years of age (Campbell 2003; FWS 2010a).

5.2.5 Population Dynamics

There has been no dispersal documented between the breeding populations in Willacy County and Cameron County (Laack 1991). Genetic erosion in ocelots has been documented in LANWR, with ocelots having approximately half of the genetic diversity of ocelots in northern Mexico (Janecka et al. 2007). Ocelot genetic diversity is greater in Willacy County, and significant genetic differentiation exists between the Willacy and Cameron County populations, which also indicates a lack of breeding between the populations (Janecka et al. 2011).

A recent Population Viability Analysis for ocelots in Cameron County predicted a 65 percent probability of extinction within 100 years if no recovery strategies were used (Haines et al. 2005b). Vehicle-cat collisions represent 35 percent of ocelot mortalities (Haines et al. 2005b), and this effect is magnified as habitat fragmentation has increased and dispersing cats have had to travel further distances over roads to find new territories. Haines et al. (2005a) estimated transient ocelot annual survival rate at 57 percent, whereas resident ocelot survival was 87 percent, reflecting the inherent risk of habitat fragmentation and road mortality on dispersing cats.

5.2.6 Reasons for Listing/Threats to Survival

Historically, dense thornshrub habitat preferred by ocelots occurred throughout south Texas, but in the 20th century ocelot habitat was reduced to less than one percent of its former distribution by agricultural, suburban, and urban development (Tewes and Everett 1986; Grassman 2006). Fragmentation and loss of dense brush habitat, combined with vehicle road mortalities, are the greatest threats to ocelot persistence in south Texas (Haines et al. 2005a; FWS 2013b).

5.2.7 Recovery Efforts

The FWS issued a revised Ocelot Recovery Plan in July 2016 (FWS 2016a). Ocelot recovery efforts have included various research projects (Jackson et al. 2005; Shinn 2002) and long-term ecological research.

5.2.8 Current Status in Project Area

There have been documented sightings of ocelots in and around the Action Area (TPWD 2015). A single, radio-collared male ocelot was captured and tracked by Blanton & Associates biologists in April 1998 within and near the Action Area, and up to 8 miles north of the Action Area on private lands (TPWD 2015). This individual, a young male, was captured on an unnamed

loma located between SH 4 and the BSC approximately 2 miles from the Action Area. From April 29 to June 13, 1998, this ocelot traveled along lomas and brushy areas of SH 4 and the FWS Loma Ecological Preserve, including Loma del Portrero Cercado, and was last recorded 8 miles north of the Action Area near the LANWR.

Two Class II[2] sightings of ocelots southeast of Brownsville in 1988 and 1989 are reported in the Texas Natural Diversity Database (figure 5-1; TPWD 2015). In 1989, a road-killed ocelot was documented on SH 48 near San Martin Loma, and in 1992, an ocelot was reported on SH 48, 3 miles east of Farm-to-Market Road (FM) 100 (FWS 2013b). Multiple road mortality events have been recorded on roadways north of the Action Area including FM 106, FM 510, and near the Holly Beach area (FWS 2013b; Blanton & Associates 2004). Four ocelots have been documented as road mortalities on SH 100, with three killed during the past five years, approximately 7 miles north of the Action Area (Raymondville Chronicle News 2014). One of three known ocelot breeding subpopulations is located on LANWR, about 11 miles north of the Action Area.

Conversely, three additional surveys south of SH 100 in the vicinity of the Action Area (1985, 1990, and 2000-2001) failed to document this species (Tewes 2015; Shinn 2002). Annova conducted a camera-trapping survey for ocelots (and jaguarundis) on BND and private properties in the Project vicinity from January 2016 through January 2017. Over the course of the survey, 121 camera trap sets were installed in the survey area and operated for over 40,000 trap-nights. No ocelots (or jaguarundis) were documented during the camera-trapping survey.

The current size and distribution of loma thornshrub in the Action Area may support transient or resident ocelots. Moreover, the surrounding BND and FWS refuge properties outside the Action Area would likely provide additional protection and cover for this species. Given the past documented occurrences of ocelots in and around the Action Area, the proximity of a known ocelot subpopulation in LANWR, and the quality and quantity of dense thornshrub habitat within and around the Action Area, it is possible that ocelots occur in the Action Area.

5.2.9 Effects of the Action

Habitat Loss

The Project would result in the permanent loss of 130 acres of dense loma thornscrub habitat, which is considered preferred ocelot habitat. This includes Loma del Potrero Cercado within the site, which represents one of the 22 named lomas located in the vicinity of the Action Area (see figure 3-3). Loma del Divisadero and an unnamed smaller loma would be within the undisturbed travel corridor that Annova would maintain to the southwest of the site. The loss of about 130 acres of habitat within Loma del Potrero Cercado within the Project site would represent about 6 percent of the approximately 2,075 acres of named lomas in the immediate Project area shown on figure 3-3. This loss of habitat could affect overall ocelot fitness and would adversely affect ocelot movement and foraging behavior. In addition, the Project would also fragment ocelot habitat creating disjointed habitat patches and road barriers that would deter ocelot movement in the Action Area, and to and from Mexico. The FWS has indicated that the

[2] A Class II observation is one made by an observer that seems reliable or is experienced in the outdoors and accustomed to looking for details (i.e., biologist, trapper, bird watcher, game warden, or hunter) and includes a detailed description of the event.

Project would sever the remaining coastal ocelot corridor to the Rio Grande River and Mexico (FWS 2015b).

Human Disturbance

The Project would increase disturbance from human presence and result in a permanent disturbance to the Action Area. Many species are known to avoid areas of disturbance, thereby reducing or eliminating the habitat value of these areas. Disturbance effects from construction and operations include noise, visual stimuli, human activity, and pollution. These human activities in the Action Area would likely discourage ocelot use of the Action Area and result in avoidance or isolation, leading to modifications of normal behavior and inbreeding that may impact the fitness of affected individuals.

Noise

Construction and operation activities would increase noise levels in the Action Area (table 5.2.9-1). The greatest noise impacts would be during construction, especially pile driving; however, these impacts would be short-term. Ocelots, like most wild felids, would avoid noise if possible. Dr. Michael Tewes, the leading authority on ocelot biology in the U.S., states that ocelots can withstand a certain level of disturbance, including lights and noise, if they occupy extremely dense thornscrub habitat. However, Tewes notes that there is a threshold of light and noise that would likely negatively impact ocelot behavior. The value of this threshold is unknown, but it would probably require relatively less artificial light and noise to affect ocelot behavior if they occurred in open habitat during dispersal or transient movements, compared to dense thornscrub habitat of sufficient size (Tewes 2015). Ocelots could react to increased noise levels by becoming more alert, stopping foraging, altering travel routes, or becoming startled and fleeing the area, which may expose them to vehicular mortality (FWS 2013b). These noise impacts, especially impulsive noise such as pile driving during construction, would affect use by ocelots, if present.

TABLE 5.2.9-1

Predicted Changes to Property Boundary Sound Levels during Operation

Location	Time of Day	Existing Median Ambient Sound Level	Predicted Annova Project (only) Sound Level	Future Ambient Sound Level
Northeast Property Boundary	Daytime	45 dBA	57 dBA	57 dBA
	Nighttime	49 dBA		58 dBA
Southwest Property Boundary	Daytime	47 dBA	43 dBA	48 dBA
	Nighttime	54 dBA		54 dBA

dBA = A-weighted decibels

Lighting

Facility lighting could affect ocelot foraging and other behavior. Lighting could also increase avoidance and affect ocelot movement. As noted by conversation with Dr. Michael Tewes (May 18, 2015), ocelots would avoid artificial lighting.

Collisions

Increased project-related traffic could elevate the rates of stress, injury, and mortality experienced by ocelots. Vehicle collision is the leading cause of death of ocelots in Texas and

reducing road mortality is considered to be the single most important strategy in reducing the risk of ocelot extinction in the United States (Haines et al. 2006b).

Reduced Dispersal, Fragmentation, and Isolation

The Action Area is located within a region identified by the FWS as being particularly important to the travel and dispersal of the ocelot. This area is referred to by the FWS as the South Texas Coastal Corridor, as described in section 4.2. Habitat loss and fragmentation eliminates areas needed for ocelot breeding, feeding, and sheltering. Fragmentation could result in reduced dispersal and isolation. In a small population, inbreeding due to isolation and/or reduced dispersal could reduce fitness of individuals and loss of genetic variability which could reduce the ability of an animal to adapt to a changing environment (Lande 1988). Dispersal of cats may be temporarily affected by the Project, and the Project may preclude north-south movement and affect the ability of ocelots to use this area as a potential travel corridor.

5.2.10 Proposed Conservation Measures

Based on comments provided by the FWS, Annova incorporated several design changes to minimize potential impacts on ocelots. Additionally, Annova would implement numerous measures to further avoid and minimize impacts on ocelots. Lastly, Annova is also proposing several mitigation measures. These measures include:

- Annova is evaluating lands for purchase and placement into a conservation easement in the Project region to aid in ocelot conservation. Annova would transfer the land to the FWS, or provide funding for conservation lands that may benefit ocelots (and jaguarundis).
- Annova modified the Project layout to accommodate a wildlife corridor on the west side of the Project site, where existing dense thornshrub and other habitats would be avoided and preserved, and is proposing to protect the wildlife corridor with a conservation easement for the life of the Project. Annova would install a barrier wall along the southwest edge of the site between the LNG terminal facilities and the wildlife corridor to reduce light and noise impacts on wildlife.
- Annova is working with the BND to extend the duration of the existing Redhead Ridge Conservation Easement, a BND-owned conservation easement located on the north side of the BSC (Puerta de Trancas Loma). This conservation easement consists of a 1,000-foot-wide easement encompassing three tracts of land extending from the SH 48 southerly right-of-way line to the BSC.
- Annova would fund The Core Ocelot Program for Private Lands: Adaptive Research, Conservation and Recovery, a five-year program carried out by the Feline Research Program of the Caesar Kleberg Wildlife Research Institute (CKWRI) at Texas A&M University-Kingsville (TAMUK).
- Annova would fund two graduate student fellowships for adaptive research conducted by the CKWRI Feline Research Program at TAMUK, under the supervision of Dr. Michael Tewes.

- Annova is working to minimize the potential for wildlife collisions by incorporating wildlife crossings (culverts) and fencing into the main access road design, in consultation with the FWS. Annova would also mandate a speed limit of 25 miles per hour on the main access road and within the Project site.

- Annova would minimize the effects of lighting by evaluating lighting schemes to minimize effects of light on remaining habitats and minimizing lighting on the main access road to that needed to address safety concerns. Also, whenever possible, lights would be placed so they do not shine directly towards adjacent undisturbed habitats or the beach, and lighting would be extinguished upon completion of work in an area. Prior to construction, Annova will be required to file with the Secretary, for review and written approval by the Director of OEP, its Facility Lighting Plan for operation of the LNG terminal.

5.2.11 Determination of Effect

Ocelots have previously been documented in and around the Action Area. The current size and distribution of loma thornshrub in the Action Area would support any transient or resident ocelots, although surveys have only documented one transient individual. Moreover, the surrounding BND and FWS refuge properties outside the Action Area provide additional protection and cover for this species. Given the past documented occurrences of ocelots in and around the Action Area, the proximity of a known ocelot subpopulation in LANWR, and the quality and quantity of dense loma thornshrub habitat within and around the Action Area that would be lost, we have determined that constructing and operating the Project **may affect, and is likely to adversely affect** the ocelot.

5.3 GULF COAST JAGUARUNDI

5.3.1 Species/Critical Habitat Description

The jaguarundi is a small, long-tailed, short-legged, unspotted cat that can be described as weasel-like due to the flattened shape of its head and its manner of movement (Campbell 2003). There are two color phases: a grayish phase comprised of a salt-and-pepper gray that becomes more of a solid black in the winter, and a red phase with a reddish-brown body and brownish extremities and head (Schmidly 2004).

5.3.2 Distribution and Abundance

Currently, the known northern range limit of the jaguarundi is northern Mexico. A population exists in the state of Tamaulipas, Mexico, which borders the Texas counties of Cameron, Hidalgo, Starr, and Zapata (Caso 2007). Historically, the jaguarundi is known to have occurred in south Texas from trapping and road-kill reports; however, the last verified jaguarundi in Texas was an individual that was killed on SH 4 near FM 511 east of Brownsville in Cameron County in 1986 (Tewes and Grassman 2005; Grassman 2006; TPWD 2015). A jaguarundi sighting was reported 6 miles east of the Action Area in 1990 along the coastal dunes; however, this record

constitutes an unconfirmed Class II sighting (TPWD 2015).[3] Currently, there are no known populations of jaguarundi in Texas.

5.3.3 Habitat

Like the ocelot, jaguarundis prefer dense thornshrub (see ocelot habitat description in section 5.2.3) (FWS 1990a, 2013b). Although jaguarundis may be more tolerant of open area grasslands and pastures, large (greater than 100-acre) tracts of isolated dense brush or smaller tracts connected by brush corridors appear to be preferred habitat (TPWD 2013; Tewes and Grassman 2005).

5.3.4 Life History

Jaguarundis are unique among wild cats in that they are primarily active during the day (TPWD 2013; Campbell 2003; Tewes and Grassman 2005), although they will also hunt at dawn and dusk (Schmidly 2004). Jaguarundis forage mainly on the ground for birds, rodents, rabbits, and reptiles but have been seen climbing trees searching for prey (Tewes and Grassman 2005; TPWD 2013).

Relatively little is known about jaguarundi native breeding habits or life cycle. Jaguarundis are said to be solitary except during the mating season (November and December), and kits have been found in summer and winter (Campbell 2003; Schmidly 2004). Lifespan is thought to be up to 15 years. Research in northern Mexico suggests that jaguarundis den between March and August and produce two to four young (FWS 2013b).

5.3.5 Population Dynamics

Based on the natural history of this species, it is anticipated that the same ecological pressures that affect ocelot population dynamics apply to the jaguarundi as well. These pressures primarily include habitat loss, habitat fragmentation, and road mortality.

5.3.6 Reasons for Listing/Threats to Survival

Like the ocelot, habitat loss and fragmentation are thought to be the primary reasons for jaguarundi declines and eventual listing. The primary threats to jaguarundis are vehicle collisions and loss of thornshrub habitat (FWS 1990a).

5.3.7 Recovery Efforts

The jaguarundi recovery plan was published in 1990 (FWS 1990a). Given the similar habitat use, diet, and ecological requirements of jaguarundi and ocelots, jaguarundi habitat preservation/restoration, presence surveys, and other recovery efforts are typically dependent upon, and are a by-product of, concurrent ocelot recovery and survey efforts.

[3] Unconfirmed Class II sightings are considered to be reliable sightings for ocelot and jaguarundi without supporting evidence; however, this category likely contains errors, particularly for jaguarundi observations (Tewes and Everett 1986).

5.3.8 Current Status in Project Area

There are no documented occurrences of jaguarundi within the Action Area (TPWD 2015). The most recent confirmed documentation of a jaguarundi in the region is an individual that was killed on SH 4 near FM 511 east of Brownsville in Cameron County in 1986 (Tewes and Grassman 2005; Grassman 2006; TPWD 2015) (figure 5-1). Four independent surveys south of SH 100 in the vicinity of the Action Area (1985, 1990, 1998-2002, and 2000-2001) failed to document this species (Tewes 2015; Shinn 2002; Blanton & Associates 2003). There are no other confirmed sightings of jaguarundi in the United States, and it is unlikely that jaguarundi are currently present in Texas. As a viable jaguarundi population exists in Tamaulipas State, Mexico, and suitable habitat exists within the Action Area, the occurrence of the jaguarundi in the Action Area cannot be ruled out.

5.3.9 Effects of the Action

Habitat Loss

As discussed for the ocelot, pre-construction and construction activities would remove suitable jaguarundi habitat, which may decrease the effectiveness of habitat linkage within the coastal corridor and affect the ability of jaguarundis to use this area should they still exist in South Texas.

5.3.10 Human Disturbance

Human activities associated with the Project would discourage jaguarundi use of the Action Area, although use of the Action Area by jaguarundi is expected to be minimal to none regardless of the Project based on the absence of a known population in South Texas.

Noise

Construction and operation activities would increase noise levels in the Action Area, which would affect use by jaguarundis if present, as discussed for the ocelot.

Lighting

Like ocelots, jaguarundis would avoid artificial lighting.

Collisions

Vehicles collisions from Project traffic could affect jaguarundis, although the possibility is considered minimal given the absence of a known population of jaguarundis in South Texas. Construction of fencing and wildlife crossings along the access road and establishment of speed limits is expected to further reduce the possibility of vehicle collisions.

Reduced Dispersal, Fragmentation, and Isolation

As discussed above for the ocelot, the Action Area is within the South Texas Coastal Corridor, which has been identified by the FWS as being important to the travel and dispersal of the ocelot and possibly jaguarundi. If jaguarundis are present, they could be affected by the presence of the LNG facility and associated disturbances.

5.3.11 Proposed Conservation Measures

The conservation measures outlined for the ocelot would benefit the jaguarundi as well should the species occur in the Action Area. Annova has modified the Project layout to accommodate a wildlife corridor on the west side of the Project site and is proposing that the corridor be held as a conservation easement for the life of the Project.

5.3.12 Determination of Effect

The current size and distribution of loma thornshrub in and around the Action Area, and within the larger region, may support jaguarundis if they still exist in Texas, and the FWS typically treats the jaguarundi in a similar manner to the ocelot; therefore, we have determined that constructing and operating the Project **may affect, and is likely to adversely affect** the jaguarundi.

5.4 NORTHERN APLOMADO FALCON

5.4.1 Species/Critical Habitat Description

The northern aplomado falcon is a medium-sized falcon that ranges in length from 15 to 18 inches and in wingspan from 32 to 36 inches (Campbell 2003). This species is dark gray above, with a buffy white breast, rust-colored underparts, long banded tail, and a distinctive facial pattern. The facial pattern includes a black post-ocular stripe and a white or buffy stripe that extends back from the top of the eye and forms a narrow collar on the back of the head (Oberholser 1974).

5.4.2 Distribution and Abundance

Although it is difficult to precisely determine former abundance of the species in the United States, most observers in the latter half of the nineteenth century described northern aplomado falcons as fairly common (FWS 1990b). Dramatic decreases of the U.S. population of northern aplomado falcons occurred between 1890 and 1910 (Oberholser 1974). Until a pair of northern aplomado falcons that were bred in captivity nested in the Brownsville area in 1995, no nesting northern aplomado falcons had been reported in the United States since 1952 (FWS 1990b). Today, the U.S. population consists of two nesting subpopulations located along the Gulf Coast in South Texas, one aplomado falcon population is located on two islands near Rockport, Texas and the other population is near Brownsville, Texas. The northern aplomado falcon population near Brownsville extends from the Mexican border north through the LANWR (Hunt et al. 2013). Aplomado falcons are year-round residents in the vicinity of the Action Area.

5.4.3 Habitat

Northern aplomado falcon habitat is arid grassy plain with scattered honey mesquite and various yuccas and cacti (Oberholser 1974). Aplomado falcons are associated with plains or savannahs throughout their range, whether the moist coastal savannahs of eastern Mexico, the xeric Chihuahuan Desert, or the coastal prairies of south Texas (Burnham et al. 2002). Suitable nesting habitat in the Action Area includes Salty Prairie which contains scattered Spanish dagger (*Yucca treculeana*), honey mesquite trees, or other trees and tall shrubs. Documented bird releases and monitoring by The Peregrine Fund confirm individuals and breeding pairs using coastal grasslands, coastal dunes, and tidal flats within the Project vicinity for feeding, breeding, and sheltering (FWS 2013b).

5.4.4 Life History

The northern aplomado falcon hunts prey individually, in pairs, and in family groups (Burnham et al. 2002). Small birds and insects are common prey items pursued in low horizontal flight, though pursuit is readily continued on foot through trees, brush, or dense grass (FWS 1990b).

Northern aplomado falcons do not construct their own nests but appropriate stick platforms built by other raptors and corvids (Campbell 2003). In south Texas, nests have been found in trees, tall shrubs, and on artificial structures such as electric transmission poles. Surveys have also found northern aplomado falcons nesting on the ground (Burnham et al. 2002). Northern aplomado falcon nesting chronology is variable, with egg-laying recorded from January to September, although eggs are usually laid from March through May (FWS 2014a; Hector 1990). Incubation lasts about 31 to 32 days, and nestlings fledge at 32 to 40 days (Hector 1990). The northern aplomado falcon nesting season (egg-laying through fledging) in the Project vicinity could extend from March through August. Aplomado falcons usually lay two to three brown speckled eggs, and both parents provide incubation (Campbell 2003). Adult pairs are typically territorial and are found on their breeding territories throughout the year (Burnham et al. 2002).

5.4.5 Population Dynamics

It is believed that the decline in the U.S. northern aplomado falcon population is due to habitat destruction caused by agricultural development and channelization of once-permanent desert streams (Oberholser 1974). Extirpation of the species in the continental U.S. predated the use of industrial pesticides. Continued use of synthetic pesticides may contribute to survival pressure through habitat degradation (FWS 1990b) and eggshell thinning (Mora et al. 2008). Successful reintroduction efforts have resulted in the establishment of a stable population in South Texas.

5.4.6 Reason for Listing/Threat to Survival

Potential causes for northern aplomado falcon declines include widespread increases in brush encroachment and conversion of suitable habitat to agriculture regimes, poisoning of prairie dogs (*Cynomys* sp.), and degradation of potential habitat by prairie dogs (NatureServe 2015a). Some experts believe that the decline in the U.S. northern aplomado falcon population has been due to habitat destruction caused by agricultural development and channelization of once-permanent desert streams (Oberholser 1974).

5.4.7 Recovery Efforts

Reintroduction of the northern aplomado falcon into the United States began in the mid-1980s at the LANWR in south Texas. In conjunction with the FWS, the Peregrine Fund has raised and released northern aplomado falcons at the LANWR and other sites in Texas and New Mexico, with more than 1,500 captive-bred northern aplomado falcons having been released through the Northern Aplomado Falcon Restoration Project (Peregrine Fund 2012a). Within Texas, aplomado falcons have been reintroduced in two locations: coastal south Texas and the mountains of the Chihuahuan Desert in west Texas. The south Texas coastal population is divided into two subpopulations, one centered on the LANWR and one centered on a release site on Matagorda Island near Rockport, Texas (Hunt et al. 2013). In 2011, 44 northern aplomado falcon territories

were observed and surveyed by The Peregrine Fund, 34 of which were occupied: 14 at MINWR and 20 at LANWR (Peregrine Fund 2012b). The west Texas reintroductions have not resulted in establishment of a successful population.

To encourage private-sector involvement in the project, The Peregrine Fund in coordination with FWS drafted a Safe Harbor Agreement in 1997, which provides private landowners with protection from future restrictions placed on their land or practices due to the presence of northern aplomado falcons of their property (Curti and Jenny 2001). This agreement includes a programmatic incidental take permit and associated habitat conservation plan (FWS Permit No. PRT-814839, hence forth "the Permit"). The term of the Permit is from December 16, 1996, through December 31, 2095. As of December 17, 1997, the BND is a sub-permittee under the Permit because the Permit applies to a portion of land owned by the BND (see Northern Aplomado Falcon Cooperative Agreement included in appendix B).

As no northern aplomado falcon nests existed in the Action Area at the time BND became a sub-permittee under the Permit, any incidental take associated with the Project would be covered under the Safe Harbor Agreement. However, should the northern aplomado falcon begin nesting in the Action Area (or other portions of BND land) at any time in the future up to the expiration of the Permit and before the northern aplomado falcon is de-listed by the FWS, then the BND would be required to allow employees of The Peregrine Fund to survey for northern aplomado falcon nests and offspring in the Action Area in order to relocate them out of the Action Area prior to habitat removal.

5.4.8 Current Status in Project Area

The flat coastal prairie covering much of the Action Area provides suitable foraging habitat for northern aplomado falcons. Within these areas and along loma edges are suitable nesting sites as well, although no aplomado falcon nests have been documented in the Action Area. The nearest known nest site is within 1 mile of the Action Area. There are at least two artificial nest platforms on FWS property within 0.5 mile of the Action Area, but neither of those platforms are currently used by aplomado falcons. There are numerous documented sightings of aplomado falcons near the Action Area (figure 5-1; TPWD 2015, eBird 2015), and Blanton & Associates biologists observed aplomado falcons in the Action Area on three separate occasions during various field visits in 2014 and 2015. In addition, five aplomado falcon nestlings, a pair of adult falcons, and a female falcon were observed in 2011 and 2012 at two different nest structures in the Project vicinity (FWS 2013b).

5.4.9 Effects of the Action

Habitat Loss

In Cameron County, northern aplomado falcons are not only regularly observed over grassy plains but are also seen utilizing vegetated salt flats dominated by species such as sea ox-eye daisy (*Borrichia frutescans*), saltwort (*Batis maritima*), glasswort (*Salicornia depressa, S. bigelovii*), saltgrass (*Distichlis spicata*), and Carolina wolfberry (*Lycium carolinianum*). Land-clearing activities may negatively impact northern aplomado falcons, which rely on larger plants to perch and nest, such as yuccas. Loss of grasslands and yuccas may result in the loss of habitat for northern aplomado falcons in the Action Area. Vegetation communities in the Action Area,

including Coastal: Sea Ox-eye Daisy Flats, Gulf Coast: Salty Prairie, and South Texas: Loma Grassland/Shrubland, may support foraging, roosting, and sheltering aplomado falcons. Roughly 270 acres of potential northern aplomado falcon habitat would be removed for the construction and operation of the Project. After construction, the project areas that would not be maintained for operation would be re-vegetated with native plant species that are common in the Gulf Coast: Salty Prairie vegetation community.

Human Disturbance

The Project would increase disturbance from human presence during pre-, during, post-construction, and operation activities. Human Project-related disturbance may cause northern aplomado falcons to be flushed from the area and displaced, expend additional energy, and may interrupt foraging or and roosting. Northern aplomado falcons are expected to avoid areas where construction and operation activities occur.

Noise

Construction and operation activities would increase noise levels in the Action Area (table 5.2.9-1). High-noise events during construction such as pile driving may cause birds to demonstrate startle effects, engage in escape or avoidance behavior, flush or expend energy that may affect survival or growth, or spend less time engaged in necessary activities like feeding, preening, and caring for their young (NoiseQuest 2015). Noise generated during construction could deter aplomado falcons from foraging and roosting in the Action Area; however, this effect is anticipated to be temporary, and once the Project begins operation noise levels would be reduced and falcons are expected to return to the area.

Lighting

Some birds may be attracted to light, especially on overcast, foggy, or rainy nights, causing them to be disoriented and collide with buildings or other structures (FWS 2017). Attraction to artificial lighting could impact northern aplomado falcons if they collide with lighting structures or aboveground facilities at Project site. In addition, light from flare stacks could cause injury or disorientation. However, since this species is not nocturnal or migratory, lighting is expected to have no more than a minimal effect on northern aplomado falcons.

Collisions

Vehicles associated with the Project would drive on the new access road and within the Project site throughout construction and operation. An increase in vehicle numbers may result in a corresponding increase in avian mortality including aplomado falcons. Driving is already allowed in many areas in the Project vicinity on existing access roads and paths, along shorelines, and on mudflats. Aplomado falcons often pursue prey in low horizontal flight, and pursuit is readily continued on foot through trees, brush, or dense grass (FWS 1990b). In addition, surveys have found northern aplomado falcons nesting on the ground (Burnham et al. 2002). Direct mortality from construction equipment may occur if northern aplomado falcons do not disperse prior to equipment or vehicle use. There is also potential that northern aplomado falcons may collide with the flare stack structures or the flares. However, the potential for collisions with vehicles, equipment, and flares is expected to be low for aplomado falcons.

Reduced Dispersal, Fragmentation, and Isolation

The Project is not expected to result in habitat fragmentation for the northern aplomado falcon, and no effects on dispersal are anticipated.

5.4.10 Proposed Conservation Measures

Annova proposes to incorporate the following specific measures to avoid and minimize potential effects of the Project on the northern aplomado falcon:

- clearing of vegetation in suitable aplomado falcon nesting habitats would be scheduled from September through February, outside the nesting season for aplomado falcons, when possible;
- if vegetation clearing is conducted in suitable aplomado falcon nesting habitat during the nesting season (March through August), then a nest survey would be conducted prior to the proposed clearing; and
- if an active aplomado nest is found on the Project site, Annova in coordination with the BND would notify The Peregrine Fund and allow them to survey for nests/offspring in the Action Area in order to relocate them out of the Action Area prior to habitat removal.

5.4.11 Determination of Effect

Although northern aplomado falcons have been documented in and near the Action Area, no nests have been documented in the Action Area. This species is highly mobile and typically departs at the approach of humans. In addition, Annova would implement measures, including minimization of impacts on suitable nesting habitat as well as clearing outside the nesting season or otherwise conducting nest surveys prior to construction. Therefore, we have determined that constructing and operating the Project **may affect, but is not likely to adversely affect** the northern aplomado falcon.

5.5 PIPING PLOVER

5.5.1 Species/Critical Habitat Description

The piping plover is a small shorebird about 7 inches in length with a wingspan of approximately 15 inches (Campbell 2003). The piping plover has yellow or orange legs and a short, black-tipped, yellowish bill that appears black in winter (Oberholser 1974). Adults have a sandy brown or brown gray upper body with white undersides and, during the breeding season, have a black band on the fore-crown and one black breast band (Campbell 2003; Oberholser 1974).

The FWS designated 7,217 acres of the south Texas coast (i.e., Unit TX-1) as wintering piping plover critical habitat (65 FR 41782-41812). The boundaries of this unit include wind tidal flats that are infrequently inundated by seasonal winds and serve as preferred piping plover habitat. Based on the description of piping plover critical habitat, we have assumed that the Action Area includes a portion (13.4 acres) of the designated critical habitat (figure 5-1). This is approximately

0.2 percent of the critical habitat included in the 7,217-acre Unit TX-1 and 0.02 percent of the total piping plover critical habitat designated in Texas.

As outlined in the Final Rule (74[95] FR 23476-23600) designating critical habitat for wintering piping plovers, the primary constituent elements (PCE) for the piping plover wintering habitat are those habitat components that are essential for the primary biological needs of foraging, sheltering, and roosting, and only those areas containing these PCEs within the designated boundaries are considered critical habitat. The PCEs include intertidal beaches and flats (between annual low tide and annual high tide) and associated dune systems and flats above annual high tide. Important components of intertidal flats include sand and/or mud flats with no or very sparse emergent vegetation. In some cases, these flats may be covered or partially covered by a mat of blue-green algae. Adjacent non- or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting piping plovers, and are PCEs of piping plover wintering habitat. The boundaries of critical habitat Unit TX-1 include wind tidal flats that are infrequently inundated by seasonal winds and serve as preferred piping plover winter habitat. However, the densely vegetated upland habitat within this unit's boundary lacks PCEs and is excluded from the critical habitat designation (65 FR 41782-41812).

5.5.2 Distribution and Abundance

Piping plovers spend 3 to 4 months of the year on their breeding grounds in the northern United States and Canada and the remainder of the year on their wintering grounds. One of their primary wintering areas is the Texas coast, which is estimated to winter more than 35 percent of the known piping plover population (Campbell 2003). These plovers arrive in Texas between late July and late October and depart for their breeding grounds between early March and mid-May (Oberholser 1974).

Studies on piping plovers indicate that most of the northern United States and Canada breeding populations overwinter along the Gulf Coast and adjacent barrier islands (Campbell 2003). Historical records from the late 1800s indicate that estimated populations of piping plovers in the Great Lakes region ranged between 492 and 682 breeding pairs (FWS 2003). By the late 1970s, piping plovers were extirpated from Great Lakes beaches in Illinois, Indiana, New York, Ohio, Pennsylvania, and Ontario. In 1977 the Great Lakes population was estimated at 31 nesting pairs (FWS 2003). From 1984 to 2001, the Great Lakes piping plover population ranged from 12 to 32 breeding pairs, but in 2002 this population increased to 51 breeding pairs (FWS 2003).

5.5.3 Habitat

In Texas, habitat preferred by wintering piping plovers includes mud, sand, and algal flats as found on mainland or barrier island beaches. Such areas are periodically covered by water and then exposed by tides or wind (Campbell 2003). Vegetation communities in the Action Area including the Coastal: Salt and Brackish High Tidal Marsh, Coastal: Tidal Flat/Washover, and South Texas: Wind Tidal Flats may support foraging, roosting, and sheltering piping plovers in their winter range. In addition, the sparsely vegetated areas at DMPA 5A may provide suitable wintering habitat that could be used by the species.

5.5.4 Life History

Wintering piping plovers usually disperse to feed and are typically observed individually or in small flocks foraging or roosting on barrier islands and mainland beaches, sand, mud, algal flats, washover passes, salt marshes, and coastal lagoons (Oberholser 1974; FWS 2003). A common feeding trait is its habit of run-and-halt foraging wherein the plover sprints along the beach, stops suddenly to inspect the surrounding territory, and then sprints on (Oberholser 1974). Typical prey of the piping plover includes marine worms, flies, beetles, spiders, crustaceans, mollusks, and other small marine animals and their eggs and larvae (Campbell 2003).

5.5.5 Population Dynamics

There are currently three geographically distinct breeding subpopulations of piping plover: the Atlantic Coast, the Great Lakes, and the Northern Great Plains. All three subpopulations winter on the Atlantic, Gulf of Mexico, and Caribbean shorelines (FWS 2011), and could therefore occur on the winter habitat in the Action Area. However, migration patterns between breeding grounds and wintering grounds are poorly understood.

The species was nearly driven to extinction in the early 1900s, but the population recovered and peaked in the 1930s due to legislative protection (Haig and Oring 1985). Subsequent declines were due to human-based disturbances of breeding, as well as coastal and shoreline development that eradicated both breeding and wintering habitat. The Atlantic Coast subpopulation has more than doubled since 1986, reaching approximately 1,800 breeding pairs in 2010 (FWS 2011). The Great Lakes population increased roughly 10-fold to about 50 breeding pairs from 1983 to 2003 (FWS 2003).

5.5.6 Reasons for Listing/Threats to Survival

Habitat loss and human-based disturbance were cited as the reasons for listing the Great Lakes population as endangered, and all other populations as threatened (65 FR 41782-41812). Threats to piping plover include loss and degradation of habitat due to sand placement projects, sand mining, residential and commercial development, exotic and invasive vegetation, and seawall construction (74[95] FR 23476-23600).

5.5.7 Recovery Efforts

Recovery plans are in place for all three breeding populations (FWS 1988, 1996, 2003). In addition, critical wintering habitat units have been established on the Atlantic and Gulf coasts (65 FR 41782-41812; FWS 2003). Recovery plans involve efforts to determine population trends, protect breeding and wintering populations, develop habitat management plans, and increase public awareness of conservation efforts for the piping plover.

5.5.8 Current Status in Project Area

There are no documented occurrences of piping plover within the Action Area (figure 5-1; TPWD 2015, eBird 2015). There is one record of an occurrence of the species approximately 1.8 miles to the east of the Action Area near Brazos and Clark islands, south of the BSC (TPWD 2015). Piping plovers have also been documented 1.3 miles northwest of the Action Area, along the confluence of San Martin Lake and the BSC (figure 5-1; eBird 2015), as well as in unvegetated

flats along SH 4 and South Bay east of the Action Area (figure 5-1; TPWD 2015). As described above, Annova used a conservative approach to estimate the textual limits of Unit TX-1 and, as a result, assumes that the Action Area includes approximately 13.4 acres of Unit TX-1, as well as other suitable foraging habitat along the BSC (figure 5-1). This is approximately 0.2 percent of the critical habitat included in the 7,217-acre Unit TX-1 and 0.02 percent of the total piping plover critical habitat designated in Texas. Based on the presence of habitat and nearby records, piping plovers are expected to occur in the Action Area.

5.5.9 Effects of the Action

Habitat Loss

Suitable foraging, roosting, and sheltering habitat for wintering piping plovers occurs within the tidal flat habitats in the Action Area. Approximately 1 acre of suitable piping plover habitat along the BSC would be removed as a result of the Project to excavate the marine berth. In addition, dredging activities planned for the DMPA 5A site could modify potentially suitable habitat that currently exists for piping plovers due to modifications to the elevation and hydrology of the area. The Project has been designed to avoid the wind-tidal flats and piping plover designated critical habitat located on the east side of the Project site.

Human Disturbance

Increased human disturbance in the Project site may prevent piping plovers from using areas of wintering habitat directly adjacent to the Project site. However, this effect is expected to be minor given the large amount of habitat in the region. Human disturbance may cause overwintering piping plovers to be flushed from the area and displaced, expend additional energy, and may interrupt foraging or and roosting. Because piping plovers exhibit a high degree of fidelity to wintering areas, it is expected that birds in the vicinity of the Project site would be permanently displaced to nearby areas of suitable habitat, including nearby Laguna Atascosa NWR and Designated Critical Habitat Unit TX-1.

Noise

As discussed for northern aplomado falcons, noise levels during construction and operation of the Project are not expected to reach a level where birds would demonstrate startle effects. However, high-noise events during construction may cause birds to engage in escape or avoidance behavior, flush or expend energy that may affect survival or growth, or spend less time engaged in necessary activities like feeding and preening (NoiseQuest 2015). Noise generated during construction could deter piping plovers from foraging and roosting in the Action Area; however, this effect is anticipated to be temporary and once the Project begins operation noise levels would be reduced and piping plovers are expected to return to the area.

Lighting

Piping plovers could be affected by light emissions, particularly if they are migrating through the area at night or roosting in habitats in or adjacent to the Action Area. Similar to northern aplomado falcons, lighting associated with the Project, including flaring, could cause birds to be disoriented and collide with buildings or other structures. In addition, birds disoriented by lights can circle structures for extended periods of time, leading to exhaustion and reduced

fitness for migration which can lessen migration survival and decrease breeding season productivity (FWS 2017).

Collisions

Vehicles would generally be restricted to the main access road and roads within the Project site, minimizing the potential for collisions or creating ruts in piping plover habitat. However, ruts could be created along the BSC beach during construction activities. Piping plovers using ruts to rest would be susceptible to vehicle and/or equipment collisions during construction. In addition, there is potential that piping plovers may collide with the flare stack structures or the flares. These types of collisions would increase the rates of stress, injury, and mortality experienced by plovers.

Reduced Dispersal, Fragmentation, and Isolation

The Project is not expected to result in habitat fragmentation for the piping plover and no effects on dispersal of these species are anticipated. Permanent impacts to suitable habitat in the Action Area would be minor and there is abundant piping plover habitat located nearby.

5.5.10 Proposed Conservation Measures

Annova has attempted to site Project facilities to avoid the wind-tidal flats and designated critical habitat for piping plovers located on the east side of the Project site. Immediately prior to, during, and immediately following construction, Annova would have qualified biologists conduct surveys and monitoring for piping plovers in and immediately adjacent to the Project site during the months when overwintering piping plovers are expected to occur in Texas (i.e., from approximately July through May).

In addition, Annova has proposed a 145-acre wetland mitigation site at Little San Martin Lake which is located adjacent to the Bahia Grande (to the east) and San Martin Lake (to the west). Annova's mitigation plan for Little San Martin Lake would restore tidally influenced hydrology to Little San Martin Lake and two nearby basins as wells as the vegetated marsh present within the channels (Blanton & Associates 2017). The planned restoration and enhancement to Little San Martin Lake would create habitat that is suitable for piping plovers and red knots.

5.5.11 Determination of Effect

Although suitable piping plover habitat would be impacted as a result of the Project, only 1 acre of habitat would be removed and there is abundant high-quality wintering habitat in the vicinity of the Project site. Therefore, we have determined that constructing and operating the Project **may affect, but is not likely to adversely affect** the piping plover.

As noted above, the Project has been designed to avoid the wind-tidal flats and designated critical habitat located on the east side of the Project site. Therefore, we have determined that constructing and operating the Project **would not significantly destroy or adversely modify** piping plover critical habitat.

5.6 RED KNOT

5.6.1 Species/Critical Habitat Description

The red knot is a medium-sized shorebird about 9 to 11 inches in length with a wingspan of approximately 20 inches (FWS 2013c, 2014b, 2014c, 2015c). Red knots are bulky, with proportionately small heads, small eyes, short necks, and short legs. This species has dark gray to black legs and a short, straight, black bill. During the breeding season, the plumage is distinctive; the face, breast, and upper belly are a rich rufous-red, while the feathers of the lower belly and under the tail region are light-colored with dark flecks. Females are similar to males, though rufous colors are typically less intense. Non-breeding plumage is dusky gray above and whitish below.

5.6.2 Distribution and Abundance

Red knots make one of the longest distance migrations known in the animal kingdom, traveling approximately 30,000 kilometers (18,641 miles) between wintering grounds in southern South America and breeding areas within the Canadian Arctic (FWS 2014c). Wintering areas for the red knot include the Atlantic coasts of Argentina and Chile, the north coast of Brazil, the northwest Gulf of Mexico (particularly at Laguna Madre in south Texas), and the southeast U.S. (FWS 2014c). The Texas Gulf coast provides wintering habitat as well as spring and fall migration stopover areas for red knots (FWS 2014b).

5.6.3 Habitat

As discussed above, red knots breed in the Canadian Arctic in summers and spend winters in portions of South America and the Gulf of Mexico. Their wintering habitat along the Texas Gulf Coast is similar to piping plover habitat and includes barrier island beaches, exposed tidal flats, washover passes, and mud flats (Port Isabel Economic Development Corporation 2015). Red knots forage on beaches, oyster reefs, and exposed bay bottoms, and roost on high sand flats, reefs, and other sites protected from high tides (FWS 2014b). A study at Laguna Madre found that red knots prefer bay habitats when they are available, and are sensitive to high water levels in bays. In general, red knots are associated with lower sand flat habitats (FWS 2014c).

Vegetation communities in the Project area that may support foraging roosting, and sheltering red knots include Coastal Salt and Brackish High Tidal Marsh, Coastal Tidal Flat/Washover, and South Texas Wind Tidal Flats. In addition, as described above for the piping plover, suitable habitat for red knots may also be present within in sparsely vegetated areas present at DMPA 5A.

5.6.4 Life History

Migrating red knots can complete non-stop flights of 1,500 miles or more, converging on critical stopover areas to rest and refuel (FWS 2013c). A particularly reliable stopover area is Delaware Bay of Delaware and New Jersey, where the majority of red knots migrating north feed on the eggs of horseshoe crabs in May (FWS 2014c). Breeding chronology of red knots is poorly known. Red knots lay only one clutch per season; the usual clutch size is four eggs. Red knots generally nest in dry, slightly elevated tundra located inland but near arctic coasts, often on windswept slopes with little vegetation. Females are thought to leave the breeding grounds and start moving south soon after the chicks hatch in mid-July. Thereafter, parental care is provided

solely by the males, but about 25 days later (around August 10) males also abandon the newly fledged juveniles and move south. Not long after, they are followed by the juveniles (FWS 2014c). Recent information suggests that red knots may spend more than three-fourths of each year along the Texas coast, occurring from late July or early August to mid-May, from Matagorda Island south to the state of Tamaulipas in Mexico (FWS 2014c). In migration and wintering habitat, red knots feed on small invertebrates (mollusks, marine worms, and crustaceans) that live in mud of the intertidal zone (Audubon 2017).

5.6.5 Population Dynamics

Assessing the population size of a wide-ranging migratory species such as the red knot is difficult (FWS 2014c). The population of red knots for the period of the late 1980s to early 1990s was estimated at approximately 150,000 birds. Up to 2,838 red knots were reported along the Texas Gulf coast in 1999, although much lower counts have been reported from subsequent years. Red knot numbers appear to have stabilized in the past few years, but remain at low levels relative to earlier decades.

A consequence of the hemispheric migration and need for stopover of the red knot is its vulnerability to habitat disturbance, aberrations in weather, and availability of prey (FWS 2014c). The red knot population decline that occurred in the 2000s was caused primarily by reduced food availability from increased harvests of horseshoe crabs, exacerbated by small changes in the timing that red knots arrived at Delaware Bay (FWS 2013c).

5.6.6 Reasons for Listing/Threats to Survival

Three primary threats to the red knot include 1) range-wide habitat loss, primarily due to sea-level rise; 2) reduced food availability and timing mismatches during migration; and 3) increased predation by birds and mammals in the Arctic breeding grounds due to changes in vegetation and availability of other prey (e.g., lemmings and other rodents) (FWS 2013d, 2014b). Various additional factors, including coastal development and ocean acidification (which could affect prey populations), could exacerbate these primary threats and reduce the red knot's resiliency.

5.6.7 Recovery Efforts

The FWS has not developed a federal recovery plan for the threatened red knot.

5.6.8 Current Status in Project Area

There are no documented occurrences of red knot within the Action Area (figure 5-1; TPWD 2015, eBird 2015). Several sightings of this species are documented in proximity to the Action Area, with the closest one occurring approximately 1 mile southeast of the Action Area (figure 5-1; eBird 2015). The Action Area includes suitable habitat for red knots. As a result, red knots may at times occur in the Action Area.

Except for localized areas, there have been no long-term systematic surveys of red knots. Morrison et al. (2006) estimated only about 300 red knots wintering along the Texas coast, based on surveys in January 2003 (Niles et al. 2008). Higher counts of roughly 700 to 2,500 red knots have recently been made on Padre Island, Texas, during the month of October, which could include

wintering birds (Newstead et al. in press; Niles et al. 2009). Foster et al. (2009) found a mean daily abundance of 61.8 red knots on Mustang Island, based on surveys every other day from 1979 to 2007. Similar winter counts (26 to 120 red knots) were reported by Dey et al. (2011) for Mustang Island from 2005 to 2011. From 1979 to 2007, mean abundance of red knots on Mustang Island decreased 54 percent, but this may have been a localized response to increasing human disturbance, coastal development, and changing beach management practices (Newstead et al. in press; Foster et al. 2009) (i.e., it is possible these birds moved elsewhere in the region).

There are no current estimates for the size of the Northwest Gulf of Mexico wintering group as a whole (Mexico to Louisiana). The best available current estimates for portions of this wintering region are about 2,000 in Texas (Niles et al. 2012), or about 3,000 in Texas and Louisiana, with about half in each state and movement between them (FWS 2013c). During the migration period, although foraging red knots can be found widely distributed in small numbers within suitable habitats, birds tend to concentrate in those areas where abundant food resources are consistently available from year to year (Cohen et al. 2010; Niles et al. 2008; Smith et al. 2008; Botton et al. 1994).

Because wintering and migratory red knots concentrate in areas with abundant primary food sources, during winter and migration, red knots will travel along the northwest Gulf of Mexico where prey is abundant. The size of red knot groups near the Project site can be as large as several hundred individuals representing 20 to 50 percent of the Northwest Gulf of Mexico population.

Several areas in Texas have been identified as important wintering and migration stop over areas. These areas are important because they meet most of the habitat characteristics needed by red knots and have consistent red knot observations over several years. One of the important areas is the Boca Chica area (FWS 2013c), which is in the Project vicinity.

5.6.9 Effects of the Action

Habitat Loss

Red knot habitat is similar to that of piping plovers; therefore, the effects of habitat loss on red knots are the same as those discussed for the piping plover.

Human Disturbance

The effects of human disturbance on red knots are the same as those discussed for the piping plover.

Noise

The effects of noise on red knots are the same as those discussed for the piping plover.

Lighting

The effects of lighting on red knots are the same as those discussed for the piping plover.

Collisions

Red knots would be susceptible to the same types of potential collisions as discussed for piping plovers.

Reduced Dispersal, Fragmentation, and Isolation

As discussed for piping plovers, the Project is not expected to result in habitat fragmentation for the red knot, and no effects on dispersal of these species are anticipated.

5.6.10 Proposed Conservation Measures

As outlined in the conservation measures for piping plover, Annova has attempted to site Project facilities to avoid the wind-tidal flats located on the east side of the Project site. Immediately prior to, during, and immediately following construction, Annova would have qualified biologists conduct surveys and monitoring for red knots in and immediately adjacent to the Project site during the months when overwintering red knots are expected to occur in Texas (i.e., from approximately July through May).

5.6.11 Determination of Effect

Although suitable red knot habitat would be impacted as a result of the Project, only 1 acre of habitat would be removed and there is abundant high-quality wintering habitat in the vicinity of the Project site. Therefore, we have determined that constructing and operating the Project **may affect, but is not likely to adversely affect** the piping plover.

5.7 RED-CROWNED PARROT

5.7.1 Species/Critical Habitat Description

The red-crowned parrot is a 13-inch-long, non-migratory subtropical species with a red forehead and blue post-ocular stripes extending down the sides of the neck (TAMU AgriLife 2015). The outer-tail feathers have yellow tips. Females and immature parrots have less red on the crown.

5.7.2 Distribution and Abundance

The red-crowned parrot is native to northeastern Mexico, but populations there have declined significantly due to habitat loss. In addition, several introduced populations occur in urban areas of the United States, including the lower Rio Grande valley (LRGV) of Texas. However, evidence suggests populations in the LRGV consist, at least partly, of naturally occurring populations. Populations in Texas are stable or increasing, and some studies estimate that 50 percent of the entire population of the red-crowned parrot occurs in the United States (76[194] FR 62016-62034).

5.7.3 Habitat

The red-crowned parrot generally occurs in lush areas in arid lowlands and foothills, particularly tropical deciduous forest, gallery forests, evergreen floodplain forest, Tamaulipan thornscrub, and semi-open areas. In the LRGV of Texas, red-crowned parrots occur primarily in urban areas. Although little information on urban habitat use specific to the LRGV is available, in

cities where the species is introduced, red-crowned parrots reportedly prefer areas with large trees such as palms that provide both food and nesting sites (76[194] FR 62016-62034).

5.7.4 Life History

Red-crowned parrots are nonmigratory, but are apparently nomadic during the winter (nonbreeding) season when large flocks range widely to forage (76[194] FR 62016-62034). The red-crowned parrot usually forages in the crowns of trees, but will occasionally feed on low-lying bushes (76[194] FR 62016-62034). Foraging appears to be opportunistic and its diet includes a variety of seeds and fruits, and also buds and flowers. Red-crowned parrots nest in pre-existing tree cavities, including those created by other birds and those resulting from tree decay. Nesting occurs between March and August, and clutch size ranges from two to five eggs.

5.7.5 Population Dynamics

Historical numbers of red-crowned parrots are believed to have exceeded 100,000. The Mexico population in 1994 was estimated to be 3,000-6,500 birds. Numbers and trend of the species within the Texas are largely unknown, and speculative, with an estimated 50 percent of the range wide population (< 5,000 individuals) occurring in the United States (76[194] FR 62016-62034).

5.7.6 Reasons for Listing/Threats to Survival

Habitat loss and fragmentation have led to declines in this species (77[225] FR 69994-70060; 79[234] FR 72450-72497). Primary threats to the red-crowned parrot are logging operations and other development that removes nesting habitat. Collecting is a secondary threat (80 FR 80584-80614).

5.7.7 Recovery Efforts

The red-crowned parrot is currently a candidate species, and no federal recovery plan has been developed.

5.7.8 Current Status in Project Area

There are no documented occurrences of red-crowned parrots within the Project site (TPWD 2015). However, there are numerous recorded sightings in the vicinity of the Action Area. The closest documented recent sighting occurred approximately 2.3 miles west of the Project site near San Martin Lake, north of the BSC (eBird 2015). The Project site does not contain tropical deciduous forests and palm habitats which the parrot usually prefers. However, due to the foraging habits of the red-crowned parrot, this species may occasionally occur within the thornscrub or semi-open areas within Project site, although no suitable nesting habitat is present.

5.7.9 Determination of Effect

If red-crowned parrots are present at the Project site, they would likely relocate to nearby suitable habitat; therefore, we have concluded that constructing and operating the Project **would not contribute to a trend toward federal listing** of the red-crowned parrot.

5.8 WHOOPING CRANE

5.8.1 Species Description

Whooping cranes are very large, tall birds, weighing 15 pounds and reaching a height of approximately 5 feet (Cornell 2017). The birds are white with rust-colored accents on the head and lack feathers on both sides of the head. Whooping cranes have yellow eyes and long, black legs and bills (TPWD 2018). The feathers on the adult wingtips are black but are visible only in flight. Whooping cranes are omnivorous with a diet that includes invertebrates, small vertebrates, and plant material. The common name "whooping crane" most likely originated from the single-note guard call or its mating courtship display (Cornell 2017).

5.8.2 Distribution and Abundance

The whooping crane has three wild populations, including the Aransas-Wood Buffalo National Park population, which is the only remaining self-sustaining wild population. This population breeds at and near the Wood Buffalo National Park in Canada and winters in coastal marshes at the Aransas NWR on the southern coast of Texas near Rockport (FWS 2018a). However, the birds have been expanding their winter range possibly due to population increases, a decline in food source abundance and availability, and climate change (Lightfoot 2012). Migrations to Texas begin in mid-September, arriving around November and leaving the NWR in late March or early April.

There is also a small, captive-raised, non-migratory population in central Florida, and a small migratory population of whooping cranes that were introduced beginning in 2001 and migrate between Wisconsin and Florida (FWS 2018a).

5.8.3 Habitat

In Texas, habitat preferred by wintering whooping cranes includes estuarine marshes, shallow bays, and tidal flats. Whooping cranes may also spend time feeding in croplands during migration. Vegetative species dominating the marsh habitat includes, salt grass (*Distichlis littoralis* [SYN=*Monanthochloe littoralis*]), saltwort (*Batis maritima*), smooth cordgrass (*Spartina alterniflora*), glasswort (*Salicornia* spp.), and sea ox-eye, with Gulf cordgrass on the perimeter. Inland wintering habitat consists of gently rolling grasslands with live oak, red bay, and bluestem plants (Cornell 2017).

5.8.4 Life History

Whooping cranes can live up to 30 years in the wild (FWS 2018a). These birds mate for life, forming pairs at the age of 2 or 3 years (Cornell 2017). Courting pairs perform an elaborate, dance display in which they leap, flap their wings, toss their heads, and even fling feathers and grass. The mated pair shares brooding duties and generally one chick survives. It can leave the nest while quite young, but is still protected and fed by its parents. The hatchlings will stay with their parents throughout their first winter, and separate when the spring migration begins. The sub-adults form groups and travel together (TPWD 2018). Whooping cranes live and travel alone, in pairs, as families, or in small flocks of up to seven birds (Cornell 2017).

The Aransas-Wood Buffalo National Park population migrates 2,400 miles between Canada and Texas, stopping regularly along the way to feed and rest. The spring migration is usually completed in 2 to 4 weeks. Migration in the fall typically takes longer because the birds stop at staging grounds in Canada before reaching their wintering grounds (FWS 2007b).

Whooping cranes eat invertebrates, small vertebrates, and plant material, found on the ground and in shallow water. In Texas, they feed in brackish bays, marshes, salt flats, and flooded or burned uplands away from human disturbance, eating mostly blue crabs, clams, and other animal foods, along with some plant material such as wolfberry, cranberry, acorns, cordgrass, marsh onions, and prairie lily (Cornell 2017).

5.8.5 Population Dynamics

Whooping cranes were uncommon but widespread in nineteenth-century prairie marshes of the northern U.S. and southern Canada, and began disappearing with the arrival of agriculture and hunting. The establishment of the Migratory Bird Treaty Act, the Wood Buffalo National Park, and the Aransas NWR benefited whooping cranes (Cornell 2017). As of July 2010, the total wild population was estimated at 383 individuals (FWS 2018a).

The captive population contained 152 birds in July 2010. The total population of wild and captive whooping cranes in July 2010 was 535 (FWS 2018a).

5.8.6 Reasons for Listing/Threats to Survival

The biggest threats to the species are power lines, illegal hunting, and habitat loss. Whooping cranes are also susceptible to chemical spills and other petroleum-related contamination along the Gulf Coast (TPWD 2018).

5.8.7 Recovery Efforts

There is a recovery plan for the wild, captive, and introduced populations of whooping cranes. Recovery plans include the protection and enhancement of the breeding, migration, and wintering habitat for the Aransas-Wood Buffalo National Park population. In addition, recovery plans consist of reintroduction and establishment of self-sustaining wild flocks separate from the Aransas-Wood Buffalo National Park population (FWS 2007b).

5.8.8 Current Status in Project Area

The Aransas NWR is more than 80 miles northeast of the proposed Project, which coincides with the closest area of whooping crane critical habitat. Although the species is generally noted as potentially occurring only in counties north of the Project site, FWS staff have observed multi-year sightings near the proposed Rio Grande LNG Terminal site, located directly northeast of the Annova Project site, indicating a potential expansion of the species' range (FWS 2016b). Based on the presence of habitat and nearby sightings, whooping cranes may occasionally use the Action Area transiently while foraging during the winter.

5.8.9 Effects of the Action

Habitat Loss

If whooping cranes were present within suitable habitat during construction activities, the birds would be temporarily displaced to nearby habitat. Operation of the Project would result in the permanent conversion of potentially suitable habitat to developed land that whooping cranes would likely avoid in favor of quieter, undisturbed habitat in the adjacent lands. An estimated 51 acres of suitable whooping crane habitat would be permanently removed by the Project.

Human Disturbance

Increased human disturbance in the Project site may prevent whooping cranes from using areas of wintering habitat in or near the Project site. Although whooping cranes are expected to avoid human disturbance (FWS 2007b), Project activities could interrupt foraging or and roosting behavior. However, this effect is expected to be minor given the large amount of habitat in the region. In addition, the Action Area is located outside the migration corridor and south of the typical wintering grounds at the Aransas NWR; therefore, the incidental occurrence of whooping cranes in the Action Area would most likely be rare and temporary.

Noise

Noise generated during construction could deter whooping cranes from foraging and or roosting in the Action Area.tThis effect is anticipated to be temporary and once the Project begins operation, noise levels would be reduced. However, operation of the Project would include intermittent increases in noise levels during venting and flaring events which could deter use of the area by whooping cranes.

Lighting

Whooping cranes could be affected by light emissions, particularly if they are roosting in habitats in or adjacent to the Action Area. Similar to northern aplomado falcons, lighting associated with the Project, including flaring, could cause birds to be disoriented and collide with buildings or other structures. In addition, birds disoriented by lights can circle structures for extended periods of time, leading to exhaustion and reduced fitness for migration, which can lessen migration survival and decrease breeding season productivity (FWS 2017).

Collisions

There is potential that whooping cranes may collide with the flare stack structures or the flares. These types of collisions would increase the rates of stress, injury, and mortality experienced by the cranes.

Reduced Dispersal, Fragmentation, and Isolation

The Project is not expected to result in habitat fragmentation for the whooping crane, and no effects on dispersal of these species are anticipated. Permanent impacts to suitable habitat in the Action Area would be minor, and there is abundant whooping crane habitat located nearby.

5.8.10 Proposed Conservation Measures

Annova would attempt to limit vegetation clearing on the Project site to between September 1 through and February 28. In addition, Annova would also implement the FWS' recommendation that the construction cranes have the boom down when not in use and at night, to minimize impacts on migratory birds.

5.8.11 Determination of Effect

Although suitable wintering whooping crane habitat would be permanently impacted as a result of the Project, there is abundant high-quality habitat in the vicinity of the Project site. In addition, Annova would implement mitigation measures in accordance with FWS recommendations that would minimize the impacts to migratory birds (see section 4.6.1.2 of the DEIS). Therefore, we have determined that constructing and operating the Project **may affect, but is not likely to adversely affect** the whooping crane.

5.9 EASTERN BLACK RAIL

5.9.1 Species Description

The eastern black rail (*Laterallus jamaicensis jamaicensis*) is a small marsh bird that is one of four subspecies of black rail. Males and females are similar in size and adults are generally pale to blackish-gray, with a small blackish bill and bright red eyes. Upper tail feathers and remiges are dark gray to blackish with small white spots, sometimes washed with chestnut-brown. Not much is known about the diet of eastern black rails, but they are probably opportunistic foragers with a diet of small aquatic and terrestrial invertebrates, as well as small seeds. Foraging most likely occurs on or near the edges of stands of emerging vegetation, both above and below the high-water line (FWS 2018b).

5.9.2 Distribution and Abundance

The eastern black rail and is broadly distributed, living in salt and freshwater marshes in portions of the U.S., Central America, and South America. Partially migratory, the eastern subspecies winters in the southern part of its breeding range (FWS 2018b). Black rails are year-round residents along the upper and central Texas coast and rare migrants in the eastern third of the state. Eggs have been collected during the months of May and June in Texas (Oberholser 1974; Lockwood and Freeman 2004).

5.9.3 Habitat

Along portions of the Gulf Coast, eastern black rails can be found in higher elevation wetland zones with some shrubby vegetation. Impounded and unimpounded intermediate marshes (marshes closer to high elevation areas) also provide habitat for the subspecies. Inland coastal prairies and associated wetlands may also provide habitat for the bird but are largely uninvestigated.

There is less information for eastern black rail habitat in the winter range, but wintering habitat is presumably similar to breeding habitat since some sites in the southern portion of the breeding range are occupied year-round. Little is known about eastern black rails during migration, including migratory stopover habitat, but individuals seem to appear more frequently

in wet prairies, wet meadows, or hay fields during migration than during the breeding and wintering seasons (FWS 2018b).

5.9.4 Life History

Nests are placed in a well-concealed spot in the center of clumps of vegetation, at or near the upper limits of marsh plants. The female usually lays 6 (range 4-13) eggs in the nest. The eggs are incubated by both sexes for 19-20 days. The young birds require brooding by a parent for the first few days after hatching (Harrison 1979; Eddleman et al. 1994). The incubation and brood rearing by both sexes suggests the species is monogamous, but the duration of its pair bond and variations in its mating system are still unstudied. Adult survival appears to be high in stable habitats, despite predation by herons and other avian predators during extreme high tides (Eddleman et al. 1994).

5.9.5 Population Dynamics

The eastern black rail was first discovered in Jamaica in 1760 and formally classified in 1789. In 1838, John James Audubon announced the black rail as a bird of the United States. Audubon's account of the bird was based on specimens taken alive from meadows near Philadelphia, Pennsylvania, in 1836 (FWS 2018b).

Recent records from the northeastern coastal U.S. between 2010 and 2017 include reports of eastern black rails from both inland freshwater locations and coastal salt marsh; however, the total number of recent occurrences is low for this time. Historical sites north of Ocean County, New Jersey appear to be vacated. Between 2010 and 2017, there was a small number of eastern black rails recorded from Louisiana and Georgia. North Carolina presently shows a severe decline in the number of occupied sites, while South Carolina shows a limited distribution; Eastern black rail records from this time (2010 to 2017) appear to indicate steady populations occurred in Texas and Florida. However, recent observations show poor presence inland and an overall widespread reduction in utilized sites across coastal habitats (FWS 2018b).

5.9.6 Reasons for Listing/Threats to Survival

Numerous conservation challenges exist for the eastern black rail, including alteration of habitat by fire suppression, invasive species, sea-level rise, and human modifications. Changing temperatures also have affected the natural hydrology of wetlands and have contributed to mangrove encroachment into salt marsh habitat (FWS 2018b).

5.9.7 Recovery Efforts

Development of a recovery plan for the eastern black rail is underway. A Species Status Assessment will be developed as part of the recovery plan that will include an analysis of the species' historic and current conditions, future projections of population trends under varying threat conditions, and potential management regimes (FWS 2018b).

5.9.8 Current Status in Project Area

The eastern black rail is known to occur in coastal Cameron County, which is considered year-round habitat for the species, and the species is considered to potentially occur within interior portions of Cameron County (FWS 2018b). Habitat in the Project area that may support eastern

black rails year-round includes Coastal Salt and Brackish High Tidal Marsh. There are no documented occurrences of eastern black rails within the Project site, however, the Project site includes suitable habitat for eastern black rails.

5.9.9 Effects of the Action

Habitat Loss

Approximately 50.8 acres of suitable eastern black rail habitat would be permanently removed as a result of the Project, with another 2.2 acres temporarily affected. Although suitable eastern black rail habitat would be permanently affected as a result of the Project, there is abundant estuarine marsh habitat that would remain undisturbed in the vicinity of the Project site.

Human Disturbance

Human disturbance during construction and operation could cause eastern black rails in immediately adjacent areas to be flushed from the area and displaced. However, this effect is expected to be minor given the large amount of habitat in the region.

Noise

As discussed for northern aplomado falcons, noise levels during construction and operation of the Project are not expected to reach a level where birds would demonstrate startle effects. However, high-noise events may cause birds to engage in escape or avoidance behavior, flush or expend energy that may affect survival or growth, or spend less time engaged in necessary activities like feeding, preening, and caring for their young (NoiseQuest 2015). These noise impacts, especially impulsive noise such as pile driving, would affect use by eastern black rails; however, this effect is anticipated to be temporary lasting only during active construction, and once the Project begins operation noise levels would be reduced.

Lighting

As discussed previously, lighting associated with the Project, including flaring, could cause birds to be disoriented and collide with buildings or other structures at the Project site. In addition, birds disoriented by lights can circle structures for extended periods of time, leading to exhaustion and reduced fitness for migration, which can lessen migration survival and decrease breeding season productivity (FWS 2017). Eastern black rails could be affected by light from the Project, particularly if migrating through the area at night or roosting in habitats in or adjacent to the Project site.

Collisions

Direct mortality from collisions with vehicles or construction equipment may occur; however, the potential for collisions with vehicles and equipment is expected to be low for eastern black rails. Vehicles would generally be restricted to the access road and roads within the Project site, minimizing the potential for collisions. There is also potential that eastern black rails could collide with the flare stack structures or the flares. Although this occasional flaring could impact eastern black rail if present during the flaring event, we find that occasional flaring during operation would not substantially impact bird populations.

Reduced Dispersal, Fragmentation, and Isolation

The Project is not expected to result in habitat fragmentation for the eastern black rail and no effects on dispersal of these species are anticipated. Permanent impacts to suitable habitat in the Action Area would be minor, and there is abundant eastern black rail habitat located nearby.

5.9.10 Proposed Conservation Measures

As previously indicated, Annova has proposed measures to reduce nuisance lighting and has stated it would evaluate lighting schemes to reduce effects of light on adjacent undisturbed habitats and minimize lighting on the access road to that required to address safety concerns.

As discussed for the northern aplomado falcon, Annova anticipates that the use of gas flares would only occur intermittently. These types of collisions would increase the rates of stress, injury, and mortality experienced by birds. Although this occasional flaring could impact eastern black rail if present during the flaring event, we find that occasional flaring during operation would not substantially impact bird populations.

5.9.11 Determination of Effect

Although suitable eastern black rail habitat would be permanently affected as a result of the Project, there is abundant estuarine marsh habitat that would remain undisturbed in the vicinity of the Project site. Therefore, we have determined that constructing and operating the Project would result in **no effect** on this species.

5.10 SOUTH TEXAS AMBROSIA

5.10.1 Species/Critical Habitat Description

South Texas ambrosia, a member of the sunflower family (Asteraceae), is an erect, silver to grayish-green perennial herb that grows to 4 to 12 inches in height with leaves opposite below and alternate above (Correll and Johnston 1979). Male and female flowers occur on the same plant with male flowers arranged in heads along an elongated stem and female flowers found in clusters at the leaf bases (Poole et al. 2007).

The U.S. population of South Texas ambrosia was federally listed as endangered under the ESA in 1994 (59[163] FR 43648-43652). Critical habitat has not been designated for South Texas ambrosia.

5.10.2 Distribution and Abundance

South Texas ambrosia was known to occur historically in Tamaulipas State, Mexico and the LRGV including Cameron County (59[163] FR 43648-43652; FWS 2010a). In 1994, this plant was verified in eight locations in Nueces and Kleberg Counties, Texas (59[163] FR 43648-43652). Currently it is thought to be limited to six locations in these two counties, while its status in Mexico is unknown (FWS 2010a).

5.10.3 Habitat

South Texas ambrosia grows at low elevations in prairies or savannahs on heavy soils ranging from clay loams to sandy loams (59[163] FR 43648-43652). Associated native grass

species include Texas grama (*Bouteloua rigidiseta*), buffalograss (*Bouteloua* [*Buchloe*] *dactyloides*), Texas wintergrass (*Nasella* [*Stipa*] *leucotricha*), and tobosa (*Pleuraphis* [*Hilaria*] *mutica*). Native woody plant associates include honey mesquite, huisache (sweet acacia; *Vachellia* [*Acacia*] *farnesiana*), huisachillo (Schnaffer's wattle; *V. [A.] schaffneri*), brasil, granjeno, and lotebush.

5.10.4 Life History

South Texas ambrosia forms restricted, often close-spaced colonies from spreading rhizomes. A single plant may be represented by hundreds of clonal stems (Correll and Johnston 1979). Flowering occurs in late summer and early fall.

5.10.5 Population Dynamics

South Texas ambrosia has occurred in Cameron, Jim Wells, Kleberg, and Nueces counties, Texas, as well as in Tamaulipas State, Mexico. As of 2010, the species had been eliminated from all but six sites in Kleberg and Nueces Counties, while the status in Mexico was unknown (FWS 2010a). At that time, the number of individual plants was in the thousands.

5.10.6 Reasons for Listing/Threats to Survival

Habitat loss and fragmentation have led to declines in this species. Coastal prairie habitat supportive of this species in Cameroun County has been virtually eradicated (FWS 2010a).

5.10.7 Recovery Efforts

A recovery plan is under development for South Texas ambrosia (FWS 2010a).

5.10.8 Current Status in Project Area

There are no documented occurrences of South Texas ambrosia within the Action Area (TPWD 2015), and there are currently no known populations of South Texas ambrosia in Cameron County. A habitat assessment of the Action Area identified portions of the Action Area that may provide suitable habitat for this species. However, no South Texas ambrosia individuals or populations were found during presence-absence surveys conducted in the Action Area in 2015. Based on the habitat assessment and these surveys, there is no evidence that South Texas ambrosia occurs in the Action Area.

5.10.9 Effects of the Action

There are no documented occurrences of South Texas ambrosia within the Action Area (TPWD 2015), and there are currently no known populations of South Texas ambrosia in Cameron County. A habitat assessment of the Action Area identified portions of the Action Area that may provide suitable habitat for this species; however, no South Texas ambrosia individuals or populations were found during presence-absence surveys conducted in the Action Area in 2015.

5.10.10 Recommended Determination of Effect

Based on the habitat assessment and survey, there is no evidence that South Texas ambrosia occurs in the Action Area. Therefore, it is anticipated that the Project would have **no effect** on South Texas ambrosia.

5.10.11 Proposed Conservation Measures

Because it was determined that the Project would have no effect on South Texas ambrosia, there are no conservations measures proposed for this species.

5.11 TEXAS AYENIA

5.11.1 Species/Critical Habitat Description

Texas ayenia, a member of the chocolate family (Sterculiaceae), is a small shrub that can attain heights in excess of 4.5 feet with coarsely toothed, ovate-shaped leaves clustered at nodes (Poole et al. 2007). The small, five-petaled flowers of this plant can be green, pink, or cream colored and are found clustered in the upper leaves. The fruit is a hairy, rounded, five-lobed capsule about 0.25 inch in diameter with short, curved prickles.

The U.S. population of Texas ayenia was federally listed as endangered under the ESA in 1994 (59[163] FR 43648-43652). Critical habitat has not been designated for Texas ayenia.

5.11.2 Distribution and Abundance

Texas ayenia historically occurred in the contiguous LRGV counties of Cameron, Hidalgo, and Willacy in Texas. Between 1992 and 2001, five extant Texas ayenia populations were discovered in Cameron, Hidalgo, and Willacy Counties, Texas, and these populations have been monitored periodically. Recent reconnaissance surveys found that Texas ayenia at these locations only appeared viable where it received irrigation. In Mexico, Texas ayenia may persist in the states of Coahuila and Tamaulipas States (59[163] FR 43648-43652; Poole et al. 2007; NatureServe 2015b).

5.11.3 Habitat

Texas ayenia occurs at low elevations in dense, relatively moist, subtropical riparian woodlands and at the edge of thickets located on well-drained, calcareous, sandy clay loam soils (59[163] FR 43648-43652; Poole et al. 2007). Known locations of Texas ayenia in the LRGV are associated with two soil types: sandy clay loam (Hidalgo Series) and fine sandy loam (Willacy Series). This plant is associated with the Texas Ebony-Anacua plant community, which includes such other species as coma (saffron plum; *Sideroxylon celastrinum* [*Bumelia celastrina*]), brasil, mesquite, lotebush, granjeno, lime prickly-ash (*Zanthoxylum fagara*), and snake-eyes (*Phaulothamnus spinescens*).

5.11.4 Life History

Herbarium specimens and observations of Texas ayenia in Texas indicate that wild plants flower most often in June, July, September, October, and November. Contreras-Arquieta (2005) documented flowering of Texas ayenia in Tamaulipas State, Mexico during the months of March, April, May, and August, but did not observe the plants in other months. Texas ayenia plants in seed-increase plots and landscapes at Santa Ana NWR that received no supplemental water exhibited a bimodal phenology. The more consistent and prolific flowering and fruiting lasts from September through November; flowers and capsules may also be observed from May to June following significant rainfall. This pattern coincides with the prevailing bimodal rainfall pattern in the LRGV, in which the highest amounts of rainfall occur from late August to early November,

with a secondary maximum in May and June. During seasons when there has been little or no precipitation, Texas ayenia plants do not flower. Therefore, reproduction appears to be stimulated primarily by rainfall (FWS 2014d).

5.11.5 Population Dynamics

Texas ayenia is only known from Cameron, Hidalgo and Willacy counties, Texas, and in Coahuila and Tamaulipas States, Mexico (FWS 2010b). It requires riparian habitat and is drought intolerant. Known examples of the plant in the U.S. are currently exceedingly rare; occurrences in Mexico are on the order of hundreds or thousands of individuals. Recent surveys of select previously known reference populations in south Texas were unable to locate any individuals. The species may have one or two remnant individuals in Texas.

5.11.6 Reasons for Listing/Threats to Survival

Texas ayenia is an exceedingly rare species with few known occurrences at the time of listing (59[163] FR 43648-43652). It is susceptible to human disturbance, invasive species, and drought. Habitat loss and conversion to agriculture from native woodland and brush within its historical range are the primary reasons for this species' decline.

5.11.7 Recovery Efforts

The current recovery plan (FWS 2014d) involves habitat conservation, public awareness, plant surveys, and seed collection.

5.11.8 Current Status in Project Area

Texas ayenia is an extremely rare plant that is known to be associated with sandy loams, fine sandy loams, and clays of the Hidalgo, Willacy, Mercedes, and Raymondville soil series, which occur in Cameron County but not in the Action Area (Poole et al. 2007; 59[163] FR 43648-43652; FWS 2014d). Lomas in the Action Area have mature thornshrub cover on clay loam soils, which may support Texas ayenia (figures 4.1-1a and 4.1-1b). However, tolerance for saline soils is not documented. The closest known population of Texas ayenia is approximately 30 miles to the northwest of the Action Area (FWS 2010b; TPWD 2015). No Texas ayenia individuals or populations were found during presence-absence surveys conducted in the Action Area in 2015. Based on the habitat assessment and survey, there is no evidence that Texas ayenia occurs in the Action Area.

5.11.9 Effect of the Action

Lomas in the Action Area have mature thornshrub cover on clay loam soils, conditions that may support Texas ayenia. However, tolerance for saline soils by this species is not documented. The closest known population of Texas ayenia is approximately 30 miles to the northwest of the Action Area (FWS 2010b; TPWD 2015). No Texas ayenia individuals or populations were found during presence-absence surveys conducted in the Action Area in 2015.

5.11.10Determination of Effect

Based on the habitat assessment and survey, there is no evidence that Texas ayenia occurs in the Action Area. Therefore, it is anticipated that the Project would have **no effect** on Texas ayenia.

5.11.11Proposed Conservation Measures

Because it was determined that the Project would have no effect on Texas ayenia, there are no conservations measures proposed for this species.

5.12 ADDITIONAL CONSERVATION MEASURES

In addition to the species-specific conservation measures described in section 5.0, Annova would also incorporate a number of general conservation measures into the Project design, construction, and operation in order to minimize the potential effects of the Project on federally listed threatened and endangered species.

- Cleaning of equipment and vehicles at designated locations prior to entry into the Project site to prevent importation and of non-native or noxious plant species;
- The Environmental Compliance Manager (ECM) would be responsible for overseeing compliance with the conservation measures and any other required terms and conditions resulting from consultation between the FERC and the FWS. The ECM would have stop-work authority should a violation of these requirements occur, and would also have the authority to stop work before a violation or issue occurs in cases where a violation/issue is imminent.
- Environmental monitors would be on-site as needed during construction activities that may result in the direct take of endangered species, including initial clearing of the Project site, dredging within the BSC, and pile-driving within and adjacent to the BSC.
- Wildlife crossings along the main access road would be monitored periodically using trail cameras to see which, if any, are used by endangered species.
- Annual reports would be submitted to FWS that describe the progress on implementation of conservation recommendations and reasonable and prudent measures that have been accomplished for the life of the Project.
- Annova would require that construction, operations, and maintenance personnel report any dead, injured, or sick individual of any federally listed threatened or endangered species to the FWS Law Enforcement Office in McAllen, Texas (phone: 956-686-8591) or the FWS Ecological Services Office at the Santa Ana NWR (956-784-7500). The person making the discovery would be responsible for ensuring that evidence intrinsic to the specimen is not unnecessarily disturbed.
- Sightings of healthy ocelots or jaguarundis along the main access road or within the Project site would be reported immediately to the Ocelot Recovery Team Leader (Hilary Swarts: 956-245-9445).

- The speed limit along the main access road and in the Project site would be 25 miles per hour, and the speed limit would be mandated, with strict internal repercussions. Construction, operations, and maintenance personnel would be educated on the potential for vehicle collisions with wildlife, particularly ocelots, jaguarundis, and other endangered species.
- Annova would coordinate with the Texas Department of Transportation (TxDOT) regarding funding the installation of "Watch Out for Ocelots/Jaguarundis" or "Watch Out for Wildlife" signs along SH 4. The number and placement of the signs would be determined by Annova in coordination with TxDOT and the FWS.

5.13 SUMMARY OF DETERMINATION OF EFFECTS

Table 5.13-1 summarizes the determinations of effect for all federally listed or candidate species under FWS jurisdiction.

TABLE 5.13-1

Federally Listed, Proposed, and Candidate Species Potentially Occurring in Cameron County, Texas

Listed Species					
Common Name	Scientific Name	Listing Status	Jurisdiction	Project Component	Determination a/
Mammals					
Florida manatee	*Trichechus manatus latirostris*	Threatened	FWS	Marine facilities	NLAA
Ocelot	*Leopardus pardalis*	Endangered	FWS	LNG facilities and Main Access Road	LAA
Gulf Coast jaguarundi	*Herpailurus yagouaroundi cacomitli*	Endangered	FWS	LNG facilities and Main Access Road	LAA
Birds					
Northern aplomado falcon	*Falco femoralis septentrionalis*	Endangered	FWS	LNG facilities and Main Access Road	NLAA
Piping plover	*Charadrius melodus*	Threatened	FWS	LNG facilities and Main Access Road	NLAA
Red-crowned parrot	*Amazonia viridgenalis*	Candidate	FWS	LNG facilities and Main Access Road	Would not contribute to a trend toward federal listing
Red knot	*Calidris canutus rufa*	Threatened	FWS	LNG facilities and Main Access Road	NLAA
Whooping crane	*Grus Americana*	Endangered	FWS	LNG facilities and Main Access Road	NLAA
Eastern black rail	*Laterallus jamaicensis jamaicensis*	Proposed Threatened	FWS	LNG facilities and Main Access Road	NE
Flowering Plants					
South Texas ambrosia	*Ambrosia cheiranthifolia*	Endangered	FWS	No evidence of occurrence	NE
Texas ayenia	*Ayenia limitaris*	Endangered	FWS	No evidence of occurrence	NE
Critical Habitat					
Piping Plover Critical Habitat					Would not significantly destroy or adversely modify

TABLE 5.13-1

Federally Listed, Proposed, and Candidate Species Potentially Occurring in Cameron County, Texas

Listed Species					
Common Name	Scientific Name	Listing Status	Jurisdiction	Project Component	Determination a/

a/ Determinations: NLAA = may affect but is not likely to adversely affect; LAA = likely to adversely affect; NE = no effect because the species is not expected to occur in the Project vicinity

6.0 CUMULATIVE EFFECTS

Cumulative effects, as assessed under the ESA, include the effects of *future state, tribal,* local, or private actions that are reasonably certain to occur in the Action Area. Future federal actions that are unrelated to the proposed action are not considered in assessing cumulative effects under the ESA because they require separate consultation pursuant to Section 7 of the ESA (FWS and NOAA Fisheries 1998). Also, past and present impacts are considered part of the environmental baseline.

This section provides an analysis of cumulative effects of the Project on those species that may be affected by the Project (see summary in table 5.13-1: northern aplomado falcon, piping plover, red knot, ocelot, and jaguarundi. Species on which the Project would have no effect (eastern black rail and flowering plants) are not discussed in this section.

6.1 ACTIONS CONSIDERED

Table 6.1-1 lists the activities that are located in or partially in the Action Area and identifies whether the activity is considered in this cumulative analysis. As shown in table 6.1-1, a total of 11 reasonably foreseeable activities occur in the Action Area; however, 8 of those activities are future federal actions unrelated to the Project and require separate Section 7 ESA consultation. As a result, this cumulative effects analysis includes 3 activities (Activities #1, #2, and #3 in table 6.1-1).

TABLE 6.1-1

Reasonably Foreseeable Future Activities in the Action Area

Activity #	Activity	Activity Category	Considered in Cumulative Effects Analysis?	Reason a/
1	Natural Gas Interconnection	Nonjurisdictional Facility	Yes	A
2	South Texas Electric Cooperative Transmission Line	Nonjurisdictional Facility	Yes	A
3	Potable Water Supply Pipeline	Nonjurisdictional Facility	Yes	A
4	Rio Grande LNG	LNG Facility	No	B
5	Texas LNG	LNG Facility	No	B
6	Bahia Grande Estuary Channel Widening	Dredging	No	B
7	Brazos Island Harbor Channel Improvement Project	Dredging	No	B
8	Maintenance Dredging, BSC	Dredging	No	B
9	Maintenance Dredging, Port Isabel	Dredging	No	B
10	Maintenance Dredging, Gulf Intracoastal Waterway	Dredging	No	B
11	Bend Easing BSC Improvement (also known as "Laguna Madre Channel Bend Easing")	Dredging	No	B

a/ Reason why activity was considered or was not considered in cumulative effects analysis:

A = Activity is a future non-federal action that is reasonably foreseeable; therefore, it is included in the cumulative effects analysis.

B = Activity is a future federal action that is unrelated to the Project and requires separate Section 7 ESA consultation; therefore, it is not included in the cumulative effects analysis.

6.2 ASSESSMENT OF CUMULATIVE EFFECTS

Each of the future non-federal actions considered in this section is located near the terrestrial portion of the Action Area. No activities considered in this analysis are within the marine portion of the Action Area (e.g., the BSC and Gulf of Mexico).

The three actions considered in the cumulative effects analysis are nonjurisdictional facilities (table 6.1-1). Activity #1 is the nonjurisdictional Natural Gas Interconnection, which occurs within the Project boundary and is included in the Project's impacts; it would not have impacts in addition to the Project.

Activities #2 and #3 are linear infrastructure that include an overhead transmission line and underground water supply pipeline, respectively. Portions of these two utilities are expected to occur within the Action Area along the Project's main access road and in a portion of the Project site. These actions are expected to result in clearing, grading, and other construction activities that could result in the removal of vegetation, alteration of wildlife habitat, and displacement of wildlife. In addition, these activities would temporarily increase noise, vehicle traffic, and human disturbances in the Action Area during construction. Typically, after overhead transmission lines and underground pipelines are constructed, the rights-of-way are restored and revegetated, and they have a relatively small area of permanent impact. In addition, transmission lines and pipelines typically have low disturbance during operation. Long-term impacts to important habitats may occur if the utilities are installed through stands of dense thornshrub that provide habitat for the ocelot and jaguarundi and take many years to establish. Typically, routing and construction of linear infrastructure is flexible and can avoid sensitive habitats. The overhead transmission line also has the potential to result in bird strikes or electrocution (for larger birds), but collision with transmission lines or other infrastructure and electrocutions have not been cited as a threat to aplomado falcons, piping plovers, or red knots (FWS 1990b, 2003, 2014b).

Because the nonjurisdictional facilities are expected to result in relatively small permanent impacts in the Action Area, the cumulative effect of these activities, in combination with the Project, is not expected to jeopardize the continued existence of the northern aplomado falcon, piping plover, red knot, ocelot, or jaguarundi.

7.0 REFERENCES

Audubon (National Audubon Society). 2017. Guide to North American Birds. Red Knot *Calidris canutus*. Website: http://www.audubon.org/field-guide/bird/red-knot. Accessed December 2017.

BGCCP (Bahia Grande Coastal Corridor Project). 2014. RESTORE Act Bucket 2 Round 1 November 2014, Council Member Proposal–State of Texas, The Bahia Grande Coastal Corridor Project. Website: http://www.restorethegulf.gov/sites/default/files/Bahia%20Grande%20Coastal%20Corridor.pdf.

Blanton & Associates, Inc. 2003. Annual trapping surveys – 1998-2002 for the endangered ocelot and jaguarundi, Port of Brownsville proposed international crossing.

Blanton & Associates. 2004. Road ecology, management, and conservation for ocelots along transportation corridors.

Blanton & Associates. 2017. Draft Conceptual Mitigation Plan. Annova LNG Brownsville Project, Cameron County, Texas. U.S. Army Corps of Engineers Project Number: SWG-2015-00110. Prepared by Blanton & Associates, Inc. October.

Botton, M.L., R.E. Loveland, and T.R. Jacobsen. 1994. Site selection by migratory shorebirds in Delaware Bay, and its relationship to beach characteristics and abundance of horseshoe crab (*Limulus polyphemus*) eggs. *Auk* 111:605-616.

Burger, J. 1981. Effect of human activity on birds at a coastal bay. *Biological Conservation* 21:231-241.

Burnham, W., J. P. Jenny, W. R. Heinrich, G. Hunt, A. B. Montoya, B. D. Mutch, and C. E. Sandfort. 2002. Proposal: restoration of the northern aplomado falcon in New Mexico. The Peregrine Fund. Boise, Idaho.

Calleson, C., and R. K. Frohlich. 2007. Slower boat speeds reduce risks to manatees. *Endangered Species Research* 3:295–304.

Campbell, L. 2003. Endangered and threatened animals of Texas, their life history and management. Texas Parks and Wildlife Division. Austin. 127 pages.

Caso, A. 2007. Research Associate. Texas A&M University-Kingsville. Personal communication to Lon Grassman (B&A).

Cohen, J.B., S.M. Karpanty, J.D. Fraser, and B.R. Truitt. 2010. The effect of benthic prey abundance and size on red knot (*Calidris canutus*) distribution at an alternative migratory stopover site on the US Atlantic Coast. Journal of Ornithology 151:355-364.

Contreras-Arquieta, A. 2005. Section 6 Project E-34: Status, distribution and conservation of three species of rare plants of the Lower Rio Grande in Mexico. Final Report. Pronatura Noreste a.c. Monterrey, Nuevo León. 101 pp + 7 appendices.

Cornell Lab of Ornithology. 2017. Whooping Crane. Website: https://www.allaboutbirds.org/guide/Whooping_Crane

Correll, D.S., and M.C. Johnston. 1979. Manual of the vascular plants of Texas. University of Texas at Austin. 1881 pp.

Curti, M., and P. Jenny. 2001. A partnership to restore the aplomado falcon. Endangered Species Bulletin Vol. XXVI, No. 1. Available at http://www.fws.gov/endangered/bulletin/2001/09/22-23.pdf.

Davis, W.B., and D.J. Schmidly. 1994. The mammals of Texas online edition. University of Texas Press. Austin, Texas. http://www.nsrl.ttu.edu/tmot1/Default.htm

Dey, A., L. Niles, H. Sitters, K. Kalasz, and R.I.G. Monison. 2011. Update to the status of the red knot *Calidris canutus* in the Western Hemisphere, April, 2011, with revisions to July 14, 2011. Unpublished report to New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Endangered and Nongame Species Program.

eBird. 2015. Range and Point Maps. Website: http://ebird.org/ebird/map.

Eddleman, W.R., R.E. Flores, and M. Legare. 1994. Black Rail (*Laterallus jamaicensis*), version 2.0. *The Birds of North America* (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. Website: https://doi.org/10.2173/bna.123

FAA (Federal Aviation Administration). 2013. Draft Environmental Impact Statement, Texas SpaceX Launch Site Draft EIS. Volumes 1 and 2.

Foster, C., A. Amos, and L. Fuiman. 2009. Trends in abundance of coastal birds and human activity on a Texas barrier island over three decades. *Estuaries and Coasts* 32:1079-1089.

FWS (U.S. Fish and Wildlife Service). 1988. Recovery Plan for Piping Plovers of the Great Lakes and Northern Great Plains (*Charadrius melodus*). Atlantic Coast Population. Hadley, Massachusetts. 258 pp.

FWS. 1990a. Listed Cats of Texas and Arizona Recovery Plan (With Emphasis on the Ocelot). Albuquerque, New Mexico.

FWS. 1990b. Northern Aplomado Falcon Recovery Plan. Prepared by Dean P. Keddy Hector, Department of Biology, Southwest Texas State University, for U.S. Fish and Wildlife Service, Region 2. Albuquerque, New Mexico. June.

FWS. 1996. Piping plover (*Charadrius melodus*). Atlantic Coast population. Revised recovery plan. Region 5.

FWS. 1999. South Florida multi-species recovery plan. West Indian manatee. U.S. Fish and Wildlife Service, Southeast Region, Atlanta, GA.

FWS. 2001. *Florida Manatee Recovery Plan (Trichechus manatus latirostris). Third Revision*. Retrieved from Atlanta, GA: http://www.fws.gov/northflorida/Manatee/Documents/ Recovery%20Plan/MRP-start.pdf.

FWS. 2003. Recovery plan for the Great Lakes piping plover (*Charadrius melodus*). Ft. Snelling, Minnesota.

FWS. 2007a. West Indian Manatee (*Trichechus manatu*s) 5-Year Review: Summary and Evaluation (pp. 86). Southeast Region, Jacksonville Ecological Services Office and Caribbean Field Office.

FWS. 2007b. International Recovery Plan. Whooping Crane (*Grus Americana*). Third Revision. Website: https://www.fws.gov/uploadedFiles/WHCR%20RP%20Final%207-21-2006.pdf

FWS. 2010a. South Texas ambrosia (*Ambrosia cheiranthifolia*). 5-year review: summary and evaluation. Corpus Christi Ecological Services Field Office.

FWS. 2010b. Texas ayenia (Tamaulipan kidneypetal) *Ayenia limitaris* Cristóbal. 5-year review: summary and evaluation. U.S. Fish and Wildlife Service. Corpus Christi Ecological Services Field Office. Corpus Christi, Texas.

FWS. 2011. Abundance and productivity estimates – 2010 update: Atlantic Coast piping plover population. Sudbury, Massachusetts. 4 pp.

FWS. 2012. Lower Rio Grande Valley Wildlife and Habitat. Website: http://www.fws.gov/refuge/Lower_Rio_Grande_Valley/wildlife_habitat.html (Accessed November 2017).

FWS. 2013a. Florida Manatee Recovery Facts. Website: http://www.fws.gov/northflorida/ Manatee/manatee-gen-facts.htm (Accessed May 3, 2017).

FWS. 2013b. Final Biological and Conference Opinion on the Effects to the Endangered Ocelot (*Leopardus pardalis*), Endangered Gulf Coast Jaguarundi (*Herpailurus yagouraroundi cacomitli*), Endangered Northern Aplomado Falcon (*Falco femoralis septentrionalis*), Endangered Kemp's Ridley Sea Turtle (*Lepidochelys kempii*), Endangered Hawksbill Sea Turtle (*Eretmochelis imbricata*), Endangered Leatherback Sea Turtle (*Dermochelys coriacea*), Threatened Green Sea Turtle (*Chelonia mydas*), Endangered Loggerhead Sea Turtle (*Caretta caretta*), Endangered Piping Plover (*Charadrius melodus*) and its Critical Habitat, and Proposed Issuance of Federal Aviation Administration Launch License Authorizing SpaceX to Launch Falcon 9 and Falcon Heavy Orbital Vertical Launch Vehicles and a Variety of Reusable Suborbital Launch Vehicles from Private Property, Boca Chica, Cameron County, Texas. Consultation No. 02ETCC00-2012-F-0186. December 18, 2013. Website: https://www.faa.gov/about/office_org/ headquarters_offices/ast/environmental/nepa_docs/review/launch/spacex_texas_launch_s ite_environmental_impact_statement/media/Final_BO_FAA_SpaceX_sm.pdf .

FWS. 2013c. Rufa red knot (*Calidris canutus rufa*). Northeast Region, Hadley, Massachusetts. Available at: www.fws.gov/northeast/redknot/pdf/ redknotBWFactsheet.092013.pdf.

FWS. 2013d. Endangered and threatened wildlife and plants; Proposed threatened species status for the rufa red knot (*Calidris canutus rufa*); Proposed rule. Federal Register 78:60024-60098.

FWS. 2014a. Northern aplomado falcon (*Falco femoralis septentrionalis*) 5-year review: summary and evaluation. USFWS New Mexico Ecological Services Field Office, Albuquerque, NM. August 26, 2014. Website: http://ecos.fws.gov/docs/five_year_review/ doc4436.pdf. Accessed May 2015.

FWS. 2014b. Rufa red knot background information and threats assessment. *Supplement to* Endangered and threatened wildlife and plants; final threatened status for the rufa red knot (*Calidris canutus rufa*). New Jersey Field Office, Pleasantville.

FWS. 2014c. Rufa red knot background information and threats assessment. *Supplement to* Endangered and threatened wildlife and plants; final threatened status for the rufa red knot (*Calidris canutus rufa*). New Jersey Field Office, Pleasantville.

FWS. 2014d. Recovery Plan for the Tamaulipan Kidneypetal (Texas ayenia; *Ayenia limitaris*). U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

FWS. 2015a. National Wildlife Refuge System: Cooperative Recovery Initiative. Website: http://www.fws.gov/refuges/whm/cooperativeRecoveryInitiative.html.

FWS. 2015b. Letter from FWS Corpus Christi Office of the Texas Coastal Ecological Service Field Office to Edward Miller, P.E., Annova LNG, LLC regarding Consultation No. 02ETCC00-2015-TA-0317. May 20.

FWS. 2015c. The rufa red knot (*Calidris canutus rufa*). Website: http://www.fws.gov/ northeast/redknot/.

FWS. 2016a. Recovery plan for the ocelot (*Leopardus pardalis*), first revision, July 2016. U.S. Fish and Wildlife Service, Southwest Region, Albuquerque, New Mexico.

FWS. 2016b. Personal Communication, inter-agency meeting with FWS, TPWD, and the RG Developers. Corpus Christi, Texas. March 3, 2016.

FWS. 2017. Threats to Birds. Collisions. Website: https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds/collisions.php. Accessed December 2017.

FWS. 2018a. Whooping Crane (*Grus Americana*). ECOS Environmental Conservation Online System. Website: http://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B003

FWS. 2018b. Eastern black rail (*Laterallus jamaicensis jamaicensis*). Website: https://www.fws.gov/southeast/wildlife/birds/eastern-black-rail/#diet-section

FWS and NOAA Fisheries (U.S. Fish and Wildlife Service and National Marine Fisheries Service). 1998. Endangered species consultation handbook. Procedures for conducting consultation and conference activities under Section 7 of the Endangered Species Act.

Gannon, J. G., K. M. Scolardi, J. E. Reynolds, III, J. K. Koelsch, and T. J. Kessenich. 2007. Habitat selection by manatees in Sarasota Bay, Florida. *Marine Mammal Science* 23(1):133-143.

Grassman, L.I. 2006. Wild cats of Texas. Wildlife. Houston Zoo, Fall, p. 6.

Griffith, G., S. Bryce, J. Omernik, and A. Rogers. 2007. Ecoregions of Texas. Project report to Texas Commission on Environmental Quality. AS-199 (12/07). 125 pp.

Haig, S.M., and L.W. Oring. 1985. Distribution and Status of the Piping Plover Throughout the Annual Cycle. *Journal of Field Ornithology* 56(4):334–345.

Haines, A.M., M.E. Tewes, and L.L. Laack. 2005a. Survival and sources of mortality in ocelots. *Journal of Wildlife Management* 69(1):255–263.

Haines, A.M., M.E. Tewes, L.L. Laack, W.E. Grant, and J. Young. 2005b. Evaluating recovery strategies for an ocelot (*Leopardus pardalis*) population in the United States. *Biological Conservation* 126:512–522.

Haines, A.M., J.E. Janecka, M.E. Tewes, L.I. Grassman, and P. Morton. 2006a. The importance of private lands for ocelot *Leopardus pardalis* conservation in the United States. *Oryx* 40(1):90–94.

Haines, A.M., M.E. Tewes, L.I. Grassman, and J.E. Janecka. 2006b. Identifying culvert sites to reduce ocelot vehicle collisions. *Wild Cat News* 2:27–32.

Harrison, H.H. 1979. *A Field Guide to Western Birds' Nests.* Houghton Mifflin, Boston, MA.

Harveson, P.M., M.E. Tewes, G.L. Anderson, and L.L. Laack. 2004. Habitat use by ocelots in south Texas: implications for restoration. *Wildlife Society Bulletin* 32:948–954.

Hector, D.P. 1990. Northern Aplomado Falcon recovery plan. Albuquerque, NM: United States. Fish and Wildlife Service.

Horne, J.S. 1998. Habitat partitioning of sympatric ocelot and bobcat in southern Texas. MSc Thesis, Texas A&M University-Kingsville, Kingsville, TX.

Hunt, W. Grainger, Jessi L. Brown, Tom J. Cade, John Coffman, Marta Curti, Erin Gott, William Heinrich, J. Peter Jenny, Paul Juergens, Alberto Macías-Duarte, Angel B. Montoya, Brian Mutch, and Cal Sandfort. 2013. Restoring Aplomado Falcons to the United States. *Journal of Raptor Research* 47(4):335-351.

Jackson, V.L., L.L. Laack, and E.G. Zimmerman. 2005. Landscape metrics associated with habitat use by ocelots in south Texas. *Journal of Wildlife Management* 69:733–738.

Janecka, J.E., C.W. Walker, M. E. Tewes, A. Caso, L.L. Laack, and R. L. Honeycutt. 2007. Phylogenetic relationships of ocelot (*Leopardus pardalis albescens*) populations from the Tamaulipan Biotic Province and implication for recovery. *The Southwestern Naturalist* 52:89-96.

Janecka, J.E., M.E. Tewes, L.L. Laack, L.I. Grassman, Jr., A.M. Haines, D.B. Shindle, B.W. Davis, W.J. Murphy, and R.L. Honeycutt. 2011. Reduced genetic diversity and isolation of remnant ocelot populations occupying a severely fragmented landscape in southern Texas. *Animal Conservation* 1–12.

Laack, L.L. 1991. Ecology of the ocelot (*Felis pardalis*) in south Texas. MSc Thesis, Texas A&I University, Kingsville, TX.

Laack, L.L., M.E. Tewes, A.H. Haines, and J.H. Rappole. 2005. Reproductive life history of ocelots (*Leopardus pardalis*) in southern Texas. *Acta Theriologica* 50:505–514.

Lande, R. 1988. Genetic and demography in biological conservation. *Science* 241(4872):1455–1460.

Lightfoot, S. 2012. Strange year for whoopers. *Texas Parks and Wildlife Magazine*. Website: http://www.tpwmagazine.com/archive/2012/may/scout2_whoopers/

Lockwood, M. W. and B. Freeman. 2004. The TOS handbook of Texas birds. Texas A&M University Press, College Station.

Mora, M.A., C. Baxter, J.L. Sericano, A.B. Montoya, J.C. Gallardo, and J.R. Rodriguez-Salazar. 2008. PBDEs, PCSs, and DDE in eggs and their impacts on aplomado falcons (*Falco femoralis*) from Chihuahua and Veracruz, Mexico. *Environmental Pollution* 159:3422–3438.

Morrison, R.I.G., B.J. McCaffery, R.E. Gill, S.K. Skagen, S.L. Jones, W. Gary, C.L. Gratto-Trevor, and B.A. Andres. 2006. Population estimates of North American shorebirds. *Wader Study Group Bull.* 111:67–85.

NatureServe. 2015a. Explorer. Website: http://explorer.natureserve.org/index.htm.

NatureServe. 2015b. Explorer, An Online Encyclopedia of Life: *Ayenia limitaris*. Website: http://explorer.natureserve.org/servlet/NatureServe?sourceTemplate=tabular_report.wmt&loadTemplate=species_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=151636&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=151636&offPageSelectedElType=species&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=151636. Accessed April 2017.

Navarro-Lopez, D. 1985. Status and distribution of the ocelot (*Felis pardalis*) in south Texas. MSc Thesis, Texas A&I University, Kingsville, TX.

Newstead, D.J., L.J. Niles, R.R. Porter, A. D. Dey, and J. Burger. [in press]. Geolocation reveals mid-continent migratory routes and Texas wintering areas of red knots (*Calidris canutus rufa*). *Wader Study Group Bulletin*.

NFWF (National Fish and Wildlife Foundation). 2015. Gulf Environmental Benefit Fund. Texas: Bahia Grande Conservation Corridor – Boswell-Jenkins Tract Acquisition. Available at

http://www.nfwf.org/gulf/Documents/tx-boswell%20jenkins-15.pdf. Accessed January 2016.

Niles, L.J., H.P. Sitters, A.D. Dey, P.W. Atkinson, A.J. Baker, K.A. Bennett, R. Carmona, K.E. Clark, N.A. Clark, and C. Espoza. 2008. Status of the red knot (*Calidris canutus rufa*) in the Western Hemisphere. *Studies in Avian Biology* 36:1–185.

Niles, L.J., H.P. Sitters, D. Newstead, J. Sitters, A.D. Dey, and B. Howe. 2009. Shorebird project on the gulf coast of Texas: Oct 3-11, 2009. Unpublished report. Website: http://www.sfu.ca/biology/wildberg/4WHSG/WHSGProgramFinal.pdf

Niles, L.J., J. Burger, R.R. Porter, A.D. Dey, S. Koch, B. Harrington, K. Iaquinto, and M. Boarman. 2012. Migration pathways, migration speeds and non-breeding areas used by northern hemisphere wintering red knots *Calidris canutus* of the subspecies *rufa*. *Wader Study Group Bulletin* 119:195–203.

NOAA Fisheries (National Oceanic and Atmospheric Administration, National Marine Fisheries Service). 2008. Vessel strike avoidance measures and reporting for mariners. NOAA Fisheries Service. Website: http://sero.nmfs.noaa.gov/protected_resources/section_7/guidance_docs/documents/copy_of_vessel_strike_avoidance_february_2008.pdf.

NoiseQuest. 2015. What does noise affect? Wildlife section. Website: http://www.noisequest.psu.edu/noiseeffects-wildlife.html. Accessed January 2016.

Oberholser, H.C. 1974. *The Bird Life of Texas.* 2 Volumes. University of Texas Press: Austin.

Peregrine Fund. 2012a. Aplomado falcon restoration. Website: http://www.peregrinefund.org/projects/aplomado-falcon.

Peregrine Fund. 2012b. 2011 Aplomado falcon territory occupancy survey summary - South Texas. Website: http://blogs.peregrinefund.org/article/711.

Poole, J.M., W.R. Carr, D.M. Price, and J.R. Singhurst. 2007. *Rare Plants of Texas.* Texas A&M University Press. College Station, Texas.

Port Isabel Economic Development Corporation. 2015. Community Profile-Environmental and Natural Resources. Website: http://portisabel-texas.com/edc/communityprofile/environmentalnaturalresources/.

Raymondville Chronicle News. 2014. Fourth ocelot killed on Highway 100. July 23, 2014. Website: http://www.raymondville-chronicle.com/news/2014-07-23/News/Fourth_ocelot_ killed on_Highway_100.html.

Runge, M.C., C.A. Sanders-Reed, C.A. Langtimm, J.A. Hostetler, J. Martin, C.J. Deutsch, and G.L. Mahon. 2007. Status and threats analysis for the Florida manatee *(Trichechus manatus latirostris).* U.S. Geological Survey Open-File Report 2007-1086. 34 pp.

Schmidly, D.J. 2004. *The Mammals of Texas.* Revised edition. Texas Parks and Wildlife Department. University of Texas Press, Austin, Texas.

Shinn, K.J. 2002. Ocelot distribution in the Lower Rio Grande Valley National Wildlife Refuge. MS Thesis. University of Texas-Pan American. Edinburg, Texas. 85 pp.

Smith, F.M., A.E. Duerr, B.J. Paxton, and B.D. Watts. 2008. An investigation of stopover ecology of the red knot on the Virginia barrier islands. Center for Conservation Biology Technical Report Series, CCBTR-07-14, College of William and Mary, Williamsburg, VA, Website: http://www.deg.virginia.gov/Portals/0/DEQ/CoastalZoneManagement/task10-02-06a.pdf.

TAMU (Texas A&M University) AgriLife. 2015. The Texas breeding bird atlas. Website: http://txtbba.tamu.edu/species-accounts/crowned-parrot/

Tewes, M.E. 2012. East Wildlife Foundation committed to ocelot research. *Texas Wildlife.* February 36-37.

Tewes, M.E. 2015. Personal communication from Dr. Michael Tewes to Dr. Lon Grassman, B&A, December 17, 2015.

Tewes, M.E. 2017. Clinging to Survival in the Borderlands. *The Wildlife Professional* (September/October): 26–29. Website: http://www.eastfoundation.net/media/46869/twp-ocelot-article.pdf

Tewes, M.E., and D.D. Everett. 1986. Status and distribution of the endangered ocelot and jaguarundi in Texas. In Cats of the World: Biology, Conservation, and Management. National Wildlife Federation. Washington, D.C.

Tewes, M.E., and L.I. Grassman, Jr. 2005. Jaguarundi: mysterious valley cat. Caesar Kleberg News. p 7.

Tewes, M.E., and D.J. Schmidly. 1987. The neotropical felids: jaguar, ocelot, margay, and jaguarundi. Pages 703–705 in: *Wild Furbearer Management and Conservation in North America* (M. Novak, J. Baker, M. E. Obbard and B. Malloch, eds.). Ministry of Natural Resources, Ontario.

Texas Tech University. 1997. The Mammals of Texas – Online Edition. Website: http://www.nsrl.ttu.edu/tmot.htm.

Todd, Victoria L., Ian B. Todd, Jane C. Gardiner, Erica C. N. Morrin, Nicola A. MacPherson, Nancy A. DiMarzio, and Frank Thomsen. 2015. A review of impacts of marine dredging activities on marine mammals. *ICES Journal of Marine Science* 72 (2): 328–340.

TPWD (Texas Parks and Wildlife Department). 2013. Jaguarundi. Website: http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_bk_w7000_0013_jaguarundi.pdf.

TPWD. 2015. Texas Natural Diversity Database (TXNDD). Received December 29, 2015.

TPWD. 2018. Whooping Crane (*Grus Americana*). Website: http://tpwd.texas.gov/huntwild/wild/species/whooper/

USDA (U.S. Department of Agriculture). 1977. Soil survey of Cameron County. USDA Soil Conservation Service in cooperation with Texas Agricultural Experiment Station. 92 pp.

APPENDIX A

Summary of FWS Consultation

TABLE A-1

Summary of FWS Consultation History

Date	Type of Meeting or Correspondence	Summary of Meeting or Correspondence
12/4/2014	Meeting	Annova met with FWS representatives to introduce the Project, share the list of agencies to be contacted and the preliminary Project schedule, and discuss regional and local environmental issues.
3/27/2015	Letter	Annova submitted an informal endangered species consultation letter to FWS.
5/8/2015	Meeting/Site Visit	Annova met with FWS representatives and conducted a site visit. Discussion topics included site selection and facility layout, supporting infrastructure, and potential conservation measures. FWS expressed concerns with the Project site, including ocelot and other species habitat, the wildlife corridor, and direct and indirect impacts from noise, lighting, and traffic.
5/14/2015	Letter	Annova provided maps to the FWS showing the preliminary Project layout in relation to vegetation communities and water resources, which were requested during the May 8, 2015, site visit.
5/20/2015	Letter	The FWS responded to the informal consultation letter and stated that they had significant environmental concerns regarding the Project. FWS provided comments detailing the need for more specific Project impact, siting, and mitigation information.
6/16/2015	Email	Annova provided maps to the FWS showing the current Project layout in advance of a June 25, 2015 meeting.
6/25/2015	Meeting	Annova met with FWS representatives to review current plans for the Project and discuss potential ocelot conservation measures.
7/14/2015	Letter	Annova responded to the FWS' letter of May 20, 2015. The purpose of this letter was to clarify some of the information provided in the May 20, 2015 letter from FWS, and to update Project information previously provided.
9/15/2015	Meeting	Annova met with FWS representatives at Santa Ana National Wildlife Refuge (NWR) to discuss the latest Project layout and receive input from the FWS. The latest Project layout involved the site being shifted to the east based on FWS' comments in a previous meeting. Annova and FWS also discussed conservation strategies and the potential for a new access road location that would minimize impacts to potential cat habitat.
9/30/2015	Email	Annova provided maps to FWS representatives that showed additional property owned by the BND and leased to FWS. It was agreed that this additional property would be transferred from FWS to Annova to allow Annova to shift the facility layout east and widen the proposed wildlife corridor on the west side of the Project site, as requested by FWS. Annova requested that the FWS review these maps and provide comment.
10/5/2015	Email	Annova followed up to the email correspondence dated September 30, 2015 and requested that FWS representatives reply with any questions/concerns or confirm that FWS was in agreement with Annova's Project layout.
10/12/2015	Letter	Annova submitted a letter to the FWS proposing an ocelot and jaguarundi survey in and around the Project site.
10/13/2015	Email	The FWS responded to Annova's email dated October 5, 2015, and confirmed that the FWS was in agreement with Annova's proposal to shift the facility layout east and widen the proposed wildlife corridor on the west side of the Project site. The FWS also asked what type of vegetation was present in the temporary spoil storage area in the southwest corner of the Project site.
10/15/2015	Email	Annova responded to the FWS email dated October 13, 2015, and provided a map that showed the temporary spoil storage area in relation to vegetation communities. This email stated that the temporary spoil storage area is not a loma, and the vegetation within the area is Sea Ox-eye Daisy Flat and Salt and Brackish Wetland.
10/20/2015	Conference Call	The FWS, FERC, and Annova participated in a conference call to discuss the Section 7 process under the ESA as well as outline the roles of each entity during this process.

TABLE 3.1-1 (continued)

Summary of FWS Consultation History

Date	Type of Meeting or Correspondence	Summary of Meeting or Correspondence
11/13/2015	Letter	The FWS responded to Annova's letter dated October 12, 2015 and stated that the FWS does not believe surveys are necessary and that company resources could be better expended offsetting potential Project effects on ocelot and jaguarundi recovery. The FWS also stated that the proposed ocelot/jaguarundi survey is not necessary for the endangered species consultation.
11/20/2015	Letter	The FWS provided comments to FERC on the Annova LNG Brownsville Project Docket PF15-15 Draft Resource Reports.
12/2/2015	Meeting	Annova met with FWS representatives to provide a status report on Project activities. Discussion included the assessment of baseline conditions in the expanded study area, analysis of three access road alternatives, routing of the linear infrastructure, potential plans for and concerns regarding the coastal cat corridor, and the importance of corridor linkages on both sides of the BSC.
12/4/2015	Letter	Annova responded to the FWS letter dated November 13, 2015, and reiterated Annova's interest in proceeding with an ocelot and jaguarundi trapping survey. Annova also requested access to the FWS' refuge lands to conduct the survey.
1/7/2016	Letter	The FWS responded to Annova's letter dated December 4, 2015, and reiterated that the FWS still does not believe surveys are necessary. The FWS also stated that the results of the survey would not affect the outcome of the ESA consultation or conservation and/or monitoring requirements. Further, the Refuge would not issue a special use permit to conduct surveys on its property.
1/8/2016	Letter	Annova responded to the FWS letter dated January 7, 2016, and provided a modified proposal to conduct an ocelot and jaguarundi survey on property owned or controlled by the Port, State of Texas, and other private properties in the Project vicinity. Annova also stated that they do not anticipate that the survey results would change their informal consultation or their current expectations for avoidance, minimization, or conservation measures, although it may confirm their approach.
1/12/2016	Email	Annova emailed the FWS regarding plans to begin surveys for ocelot and jaguarundi in and around the project area on private, BND, and State lands. The proposed survey would utilize live trapping and camera trapping and begin January 14, 2016.
1/13/2016	Email	The FWS responded to Annova's email of January 12, 2016, and provided survey approval for ocelot/jaguarundi surveys on non-FWS land. In the interest of individual cat safety, the FWS did not approve the live-trapping portion of the proposed survey plan.
1/20/2016	Conference Call	Annova briefed the FERC management team and cooperating agencies regarding the status of their environmental and engineering design process, as well as agency coordination.
2/4/2016	Site Visit	FERC coordinated site visit.
3/2/2016	Conference Call	Annova briefed FERC environmental staff and cooperating agencies regarding the status of their environmental and engineering design process, as well as their ongoing agency coordination efforts.
3/30/2016	Meeting	Representatives from the FWS, BND, and Annova met to discuss the status of the Project. Specifically, Annova's environmental objectives that were pertinent to this meeting were identified as (1) avoid and minimize impacts to dense thornshrub communities and (2) preserve wildlife travel linkages within the South Texas Coastal Corridor. Modifications of the Project to meet these objectives were discussed.
4/13/2016	Conference Call	Annova briefed FERC environmental staff and cooperating agencies regarding the status of their environmental and engineering design process, as well as their ongoing agency coordination efforts.
4/14/2016	Email	Annova provided the FWS with an overview map and Universal Transverse Mercator location data of the ocelot camera trapping survey locations.
5/26/2016	Letter	The FWS updated FERC on progress with Annova in Project planning and endangered species conservation.
5/27/2016	Email	The FWS emailed Annova requesting maps showing the original and revised project layouts. Annova provided the requested map

TABLE 3.1-1 (continued)

Summary of FWS Consultation History

Date	Type of Meeting or Correspondence	Summary of Meeting or Correspondence
9/22/2016	Meeting	Annova met with FWS representatives to discuss Project, the forthcoming biological assessment, wildlife travel corridor, Redhead Ridge Conservation Easement, other potential conservation easements, ocelot camera survey results to date, use of the existing FWS access road, wetland mitigation, Project schedule, and FWS comments on Resource Reports.
10/10/2016	Email	Annova emailed the FWS meeting notes from the 9/22/2016 meeting and requested comments.
10/17/2016	Letters/Email	Annova emailed two letters to the FWS: Letter 1 requested specific guidance from FWS on: (1) the appropriate process and documentation to gain authorization for Project use and improvement of the existing access road on FWS property as a permanent access road; and (2) on the process to transfer and receive credit for a proposed conservation easement in exchange for use of the road. Letter 2 requested specific guidance from the FWS on the appropriate process and documentation for the transfer of, and receipt of credit for: (1) the Project's proposed Western Wildlife Corridor; and (2) the BND Redhead Ridge Conservation Easement.
10/21/2016	Email	Annova requested the FWS confirm receipt of the 10/17/2016 letters and provide a timeline for receiving feedback from regional office staff.
11/7/2016	Email	Annova requested the FWS provide a timeline for receiving feedback on the 10/17/2016 letters.
11/7/2016	Email	The FWS responded to Annova's email of November 7, 2016, and stated that regional office staff had been contacted but that FWS had higher priorities to address.
11/7/2016	Phone call	Phone call with the FWS confirming closing of public access road to Project site.
12/1/2016	Email	Annova requested the FWS provide a timeline for receiving feedback on the 10/17/2016 letters.
12/2/2016	Email	The FWS responded to Annova's email of December 2, 2016, and stated that a response to Annova's request would be provided soon after January 1, 2017. The FWS also requested information that would be used to initiate the right-of-way process with the Realty Division in Albuquerque as soon as the FERC permit is approved.
1/24/2017	Email	Pat Clements (FWS) provided comments and recommendations on the May 2016 SSAR and draft agenda for a meeting to discuss the comments.
1/31/2017	Meeting	Annova met with FWS representatives to discuss FWS' comments and recommendations on the SSAR. Also discussed were Project updates, cumulative impacts assessments, and use of the existing access road across FWS property.
3/8/2017	Permit Application	Annova filed a Special Use Permit Application to conduct environmental and topographic surveys along the existing access road off SH 4, the first half mile of which is on FWS refuge property.
3/9/2017	Email	Annova sent FWS representatives: (1) a contact report summarizing the January 31, 2017 meeting; (2) the cumulative impacts analysis from the July 2016 application and the supplemental cumulative impacts analysis submitted in January 2017; and (3) a response to FWS' question about how funding the 5-year program and graduate fellowships at Caesar Kleberg Wildlife Research Institute would advance recovery goals of the Ocelot Recovery Plan.
3/9/2017	Email	Annova sent FWS representatives the cumulative impacts analysis on the ocelot movement corridor.

APPENDIX B

Northern Aplomado Falcon Cooperative Agreement

APLOMADO FALCON COOPERATIVE AGREEMENT

This agreement is made this 17 day of Dec, 1997, between The Peregrine Fund, a Pennsylvania non-profit corporation with its address at 5666 West Flying Hawk Lane, Boise, Idaho 83709 and the Brownsville Navigation District (the Cooperator), with its address at 1000 Foust Road, Brownsville, TX 78521, pursuant to authority conferred by Permit No. PRT-814839, **Exhibit A**, issued pursuant to section 10(a)(1)(B) of the Endangered Species. Act of 1973, 16 U.S.C. 1539(a)(1)(B), is entered into to release and manage the aplomado falcon, *Falco femoralis*, on lands owned by the Cooperator.

The Cooperator agrees to permit the release and management of aplomado falcons for the duration of this Agreement on the Cooperator's property (the Property), described on **Exhibit B** attached hereto. The Cooperator further agrees to permit The Peregrine Fund and its representatives the right of access to the Property for the purposes of releasing and managing aplomado falcons. The Cooperator agrees to maintain on the Property, the baseline responsibilities as identified in the document titled *Habitat Conservation Plan for the Reintroduction of the Aplomado Falcon into South Texas*, June 1996, **Exhibit C**, and clarified in correspondence dated May 8, 1997 to Dr. William Burnham, President of The Peregrine Fund, from Dr. Jamie Rapport-Clark, Assistant Director, Ecological Services, United States Fish and Wildlife Service, **Exhibit D**. The status of aplomado falcons on Port Property as of the date of this agreement is the single nesting pair as described in **Exhibit E** — *Port of Brownsville Report on Surveys for the Northern Aplomado Falcon* prepared by Blanton & Associates, Inc., December 1998.

The following information, excerpted from **Exhibit D**, is incorporated into this Agreement to clarify the relationship between this Agreement and federal actions which may require review under Section 7 of the Endangered Species Act.

> "Before entering into a Safe Harbor Agreement, the Service must conduct an intra-Service section 7 review. During that process, the Service must determine that future property use changes within the enrolled property and incidental take above the established baseline conditions will neither jeopardize listed species of fish and wildlife or plants nor destroy or adversely modify critical habitat present at the time of signing the Agreement. If a future federal nexus to the enrolled property prompts the need for section 7 review and take of listed species above the baseline conditions is likely, the Service will issue a non-jeopardy biological opinion and an incidental take statement to the Federal action agency. As required by section 7 and its implementing regulations the Service will also provide the Federal action agency with reasonable and prudent measures. Those measures will only require implementation of the same terms and conditions provided to the participating landowner in his/her Safe Harbor permit (i.e., notify the Service prior to any "take" and allow for the translocation of potentially affected individuals out of harms way by the Peregrine Fund). This approach is warranted and consistent with section 7 consultation procedures because the effects of any incidental take above the established baseline conditions would have been previously considered during the Service's intra-agency section 7 review for the proposed Agreement."

In consideration of the foregoing, The Peregrine Fund has issued to the Cooperator a "Certificate of

Inclusion" as authorized by Permit No. PRT-814839. Said certificate authorizes the Cooperator, or its successors and assigns, upon execution of this Agreement, to carry out any activity on the property that will or may result in the incidental taking of aplomado falcons or their habitat, subject to the conditions of the Habitat Conservation Plan (HCP), Exhibit C, attached hereto and made a part hereof for all purposes.

This Agreement shall be effective for so long as Permit No. PRT-814839 shall remain in full force and effect, and may be amended at any time in writing by mutual agreement of the parties. Notwithstanding the foregoing, this Agreement may be terminated by the Cooperator by giving 30 days' advance written notice to The Peregrine Fund. Such termination shall not affect the Cooperator's rights under the Certificate of Inclusion.

The Cooperator guarantees that it is the owner of the property and is authorized to enter into this agreement. In the event that the Cooperator sells, leases, or assigns part or all of the property, it shall inform The Peregrine Fund and shall take such steps necessary to inform the purchaser, lessee or assignee of the existence of this Agreement.

The Peregrine Fund assumes no jurisdiction or obligation over the property for the purpose of controlling trespass, controlling or eradicating noxious weeds, granting rights-of-way, and other incidents of ownership.

The Peregrine Fund and Cooperator shall indemnify, defend and hold the other harmless from and against any claim for demand for loss, liability, or damage, including claims for property damage, personal injury or death, arising out of any accident on the property from and against all actions, suits, damages and claims by whomsoever brought or made by reason of the non-observance or non-performance of any of the terms, covenants and conditions of this Agreement or the rules, regulations, ordinances and laws of the federal, state, municipal or county governments.

Agreed and accepted:

COOPERATOR

BY: _____ 12/17/97
(Signature) (Date)

TITLE: Mario Villarreal, Chairman of the Board

The Peregrine Fund

BY: _____ 1/12/98
(Signature) (Date)

TITLE: J. Peter Jenny, Vice President

CERTIFICATE OF INCLUSION

THE SOUTH TEXAS SAFE HARBOR PROGRAM

NORTHERN APLOMADO FALCON RESTORATION PROJECT

This certifies that the Brownsville Navigation District is a subpermittee under Permit No. PRT-814839, effective on December 17, 1997 and expiring on December 31, 2095, issued to The Peregrine Fund under that authority of 10(a)(1)(B) of the Endangered Species Act of 1973, as amended, 16 U.S.C. 1539(a)(1)(B). Said permit authorizes certain activities by participating landowners (cooperators) as part of a habitat conservation plan to restore the endangered northern aplomado falcon *Falco femoralis septentrionalis*. Pursuant to that permit and this certificate, the owners of the above described property are authorized to engage in any activity on said property that may result in the incidental taking of northern aplomado falcons, subject only to the terms and conditions of said permit and the aplomado falcon management agreement entered into between The Peregrine Fund and Brownsville Navigation District on this tenth day of July, 1997.

State of Wyoming)
) ss
County of Sheridan

The Peregrine Fund — 12-17-1997 Date

Witness my hand and official seal.

CINDY L. PILCH - Notary Public
County of Sheridan State of Wyoming
My Commission Expires June 2, 2001

Cindy L. Pilch
Notary Public

My Commission Expires 6-2-2001

APPENDIX C

Threatened and Endangered Species Evaluation for the non-jurisdictional Annova LNG Lateral Pipeline

THREATENED AND ENDANGERED SPECIES EVALUATION

ANNOVA LNG LATERAL PIPELINE

CAMERON COUNTY, TEXAS

PREPARED FOR

ECOLOGY AND ENVIRONMENT, INC.

PREPARED BY

Blanton & Associates, Inc.
ENVIRONMENTAL CONSULTING • PLANNING • PROJECT MANAGEMENT
5 LAKEWAY CENTRE COURT, SUITE 200
AUSTIN, TEXAS 78734
512-264-1095
BLANTONASSOCIATES.COM

NOVEMBER 2018

Table of Contents

Appendices

Tables

1.0 INTRODUCTION

Annova LNG Common Infrastructure, LLC (Annova) is evaluating a new natural gas pipeline, the Annova LNG Lateral, that will supply natural gas to the Annova LNG Brownsville Project. A third party contractor will build, own, and operate the Annova LNG Lateral. The pipeline will be approximately 9 miles long and will interconnect with the Valley Crossing Pipeline System. **Figure 1** (all figures are in **Appendix A**) provides the proposed pipeline route.

In August 2018, Blanton & Associates, Inc. (B&A) conducted a background review and an on-site habitat assessment along the Annova LNG Lateral route to evaluate the potential for the proposed pipeline construction to directly or indirectly affect federally listed threatened or endangered species, as identified under the Endangered Species Act, or to directly or indirectly destroy or adversely modify critical habitat. The survey corridor for the habitat assessment was generally 300 feet wide, as shown on **Figures 2** and **3**. This report provides the results of the threatened and endangered species evaluation. Section 2.0 describes the methods used for mapping vegetation in the survey corridor, conducting presence/absence surveys for federally listed plant species, and evaluating potential effects on federally listed threatened or endangered species. Section 3.0 describes the baseline environmental conditions in the survey corridor, and Section 4.0 provides a review of federally listed threatened or endangered species of potential occurrence in Cameron County and results of the habitat assessment. Finally, Section 5.0 summarizes the anticipated effects of the Annova LNG Lateral pipeline on the federally listed threatened or endangered species. **Appendix B** contains representative photographs of the vegetation communities in the survey corridor.

2.0 METHODS

2.1 Vegetation Mapping and Habitat Assessment

B&A mapped and described vegetation communities that are present in the survey corridor based on nomenclature established by the Texas Parks and Wildlife Department's (TPWD's) Ecological Mapping System of Texas (EMST). The EMST is the product of the Texas Ecological Systems Classification, which is a cooperative effort between TPWD and private, state, and federal partners to produce a new land classification map for Texas (Elliott et al. 2014). The EMST was developed by modeling vegetation types based on land cover classes and abiotic variables (including soil datasets, geographic location, land position, percent slopes, and solar insolation), coupled with field sampling to assess the accuracy of the modeled vegetation types. EMST vegetation types were mapped at 10-meter resolution and, overall, 398 types were mapped across the state. Following the mapping efforts, general descriptions of the vegetation types were developed. The Texas Vegetation Classification Project: Interpretative Booklet for Phase 3 (Ludeke et al. 2010) includes descriptions of mapped vegetation types in Cameron County.

B&A initially reviewed the EMST database to identify the vegetation communities that have been previously mapped in the survey corridor through remote sensing. B&A then conducted an on-site survey in August 2018 to verify and/or revise the remote sensing data to develop site-specific vegetation/wildlife habitat maps for the survey corridor. B&A also prepared a site-specific description of the vegetation/wildlife habitats present in the survey corridor. The purpose of preparing site-specific maps and

descriptions was to more accurately describe the survey corridor than could be accomplished through remote sensing.

During the field investigations, each vegetation/wildlife habitat was mapped, given a name (using the EMST system as a guideline), and described based on the dominant plant species observed. The results of the vegetation mapping are provided in Section 3.2 below. B&A also evaluated the vegetation communities in relation to habitat preferences for federally listed threatened and endangered species of potential occurrence in Cameron County, as identified by the U.S. Fish and Wildlife Service's (USFWS') species list for Cameron County (USFWS 2018a, 2018b) and the National Marine Fisheries Service's (NMFS') species list for Texas (NMFS 2018), to determine which vegetation communities provide potential habitat for listed species.

2.2 Presence/Absence Survey for Federally Listed Plant Species

In addition to the vegetation mapping described above, B&A reviewed available aerial imagery, U.S. Geological Survey (USGS) 7.5-minute topographic quadrangles, Natural Resources Conservation Service (NRCS) soil data for Cameron County (NRCS 2018), and TPWD's Natural Diversity Database (TXNDD) (TPWD 2018) to identify habitats that may support federally listed plant species (Texas ayenia [*Ayenia limitaris*] and/or South Texas ambrosia [*Ambrosia cheiranthifolia*]) within the survey corridor. Subsequently, a presence/absence survey was conducted by qualified botanists and biologists within habitats that could support these plant species. Prior to the presence/absence surveys, a known plant population of Texas ayenia was visited to ensure plant identification during surveys. Surveys were conducted in August 2018.

2.3 Evaluation of Potential Effects on Federally Listed Threatened or Endangered Species

B&A evaluated the anticipated effect of the proposed pipeline construction on federally listed species based on the results of the habitat assessment and presence/absence survey, review of designated critical habitat maps, known occurrences of listed species in the vicinity of the survey corridor, and evaluation of anticipated disturbances associated with the proposed pipeline construction. Section 4.0 below provides a review of federally listed threatened or endangered species of potential occurrence in Cameron County and results of the habitat assessment, and Section 5.0 summarizes the anticipated effects of the proposed pipeline construction on listed species.

3.0 ENVIRONMENTAL BASELINE

This section provides an overview of the survey corridor (Section 3.1) and describes the site-specific vegetation communities/wildlife habitats that were mapped in the survey corridor (Section 3.2).

3.1 Survey Area Overview

The survey area addressed in this report encompasses approximately 356 acres and generally includes a 300-foot-wide corridor along the 9-mile pipeline route, as well as a 300-foot-wide corridor along approximately 1 mile of proposed pipe stringing area for a proposed horizontal directional drill (HDD) operation under the Brownsville Ship Channel (BSC) (**Figures 2** and **3**). The proposed pipeline route

crosses mostly low-elevation coastal plains (5 feet or less above sea level), with higher elevations occurring along both sides of the BSC and on two lomas (clay dunes) that occur in the survey corridor. The western 1.8 miles of the pipeline route (north of SH 48) crosses undeveloped land but is collocated with the recently constructed Valley Crossing Pipeline. The next 4.2 miles of the route crosses SH 48, the BSC, and lands on either side of the BSC that have been heavily disturbed by past and ongoing dredged material placement. The eastern 3 miles crosses coastal prairie that is less disturbed but has been affected by development of adjacent dredged material placement areas (DMPAs). All land within the survey corridor is owned by the Brownville Navigation District (BND).

The survey corridor is located within the South Laguna Madre watershed (8-digit Hydrologic Unit Code [HUC] 12110208), and more specifically within the Bahia Grande-Brownsville Ship Channel sub-watershed (12-digit HUC 121102080900). The major water features in the area are the BSC, San Martin Lake, and Bahia Grande, which are all tidally influenced waters connected to the Laguna Madre. The Rio Grande also flows about 2 miles south of the survey corridor. Storm water runoff in the survey corridor generally drains to San Martin Lake, the BSC, or low-lying areas that are adjacent to DMPA levees and are poorly drained.

Four soil types are mapped within the survey corridor (U.S. Department of Agriculture Soil Conservation Service [USDA SCS] 1977, NRCS 2018) (**Figure 4**). **Table 1** provides brief descriptions of these soil types.

Table 1. Soils Mapped in the Survey Corridor

Soil Series	General Description and Location
Lomalta clay (LM)	Very deep, poorly drained, very slowly permeable soils located in scattered areas of flat coastal plain in the survey corridor
Point Isabel clay loam (PO)	Deep, well drained, calcareous soil located on upland lomas
Sejita silty clay loam (SE)	Deep, well drained, calcareous soil within the level coastal prairie in the survey corridor
Twinpalms-Yarborough complex (USX)	Silty and clayey material that has been excavated from canals, ditches, lagoons and bays; within the survey corridor, occurs where dredged material from ship channel excavation has been deposited along the north and south sides of the BSC

Source: USDA SCS 1977, NRCS 2018

3.2 Vegetation/Wildlife Habitats

The vegetation in the survey corridor was divided into 12 separate communities. Each vegetation community was named using the EMST classification system as a guideline (Ludeke et al. 2010), although the names diverged from the vegetation types listed in the EMST system for the Cameron County region to reflect vegetation communities observed within the survey corridor. **Figures 5.1** through **5.8** show the extent of each vegetation/wildlife habitat in the survey corridor. **Table 2** lists the vegetation/wildlife habitats and provides the acreage of each in the survey corridor.

Table 2. Vegetation/Wildlife Habitats in the Survey Corridor

Vegetation/Wildlife Habitat Type	Acreage in Survey Corridor	Percent of Survey Corridor
Barren	69.4	19.5%
Coastal: Mangrove Shrubland	2.1	0.6%
Coastal: Salt and Brackish High Tidal Marsh	0.2	< 0.1%
Coastal: Salty Flat/Depression	89.1	25.1%
Coastal: Unvegetated Flat/Washover	40.1	11.3%
Freshwater Wetland	0.6	0.2%
Gulf Coast: Salty Prairie	121.4	34.1%
Open Water	6.6	1.9%
South Texas: Disturbance Grassland/Shrubland	12.5	3.5%
South Texas: Loma Evergreen Shrubland	8.9	2.5%
South Texas: Loma Grassland/Shrubland	3.7	1.0%
Transportation	0.9	0.3%
Total	**355.5**	**100%**

As seen in **Table 2**, the most common vegetation communities in the survey corridor are Gulf Coast: Salty Prairie, Coastal: Salty Flat/Depression, Barren, and Coastal: Unvegetated Flat/Washover. Together, these four communities account for approximately 90 percent of the survey corridor. The following sections describe each of the 12 vegetation/wildlife habitats identified in the survey corridor in alphabetical order (**Table 2**). Representative photographs of the vegetation/wildlife habitats are provided in **Appendix B**.

3.2.1 Barren

Within the survey corridor, barren areas include heavily disturbed areas that support little to no vegetation, mainly due to human activity (**Photo 1**). These areas include active DMPAs, unpaved roads, and other disturbed areas (**Figures 5.1** through **5.8**). Approximately 69.4 acres of the survey corridor are categorized as "barren."

3.2.2 Coastal: Mangrove Shrubland

The Coastal: Mangrove Shrubland vegetation community includes four wetland areas along the BSC and near SH 48 that are dominated by black mangroves (*Avicennia germinans*), along with varying amounts of emergent wetland species such as glassworts (*Salicornia depressa* and *S. bigelovii*), saltwort (*Batis maritima*), sea blite (*Suaeda linearis*), seashore saltgrass (*Distichlis spicata*), shoregrass (*D. littoralis*), sea ox-eye daisy (*Borrichia frutescens*), Carolina wolfberry (*Lycium carolinianum*), and salt-marsh bulrush (*Schoenoplectus robustus*) (**Figures 5.2** and **5.4**, **Photo 2**). The mangrove wetlands appear to be supported by tidally influenced water table and washover from the BSC and runoff from SH 48. Approximately 2.1 acres of Coastal: Mangrove Shrubland vegetation are in the survey corridor.

3.2.3 Coastal: Salt and Brackish High Tidal Marsh

The Coastal: Salt and Brackish High Tidal Marsh vegetation community includes one narrow wetland area located along the normal tide line on the south side of the BSC (**Figure 5.2**, **Photo 3**). This wetland is dominated by glassworts, sea purselane (*Sesuvium potrulacastrum*), and saltwort, with some mangrove

shrubs also present. Approximately 0.2 acre of Coastal: Salt and Brackish High Tidal Marsh vegetation is in the survey corridor.

3.2.4 Coastal: Salty Flat/Depression

The Coastal: Salty Flat/Depression vegetation community includes most of the emergent wetlands in the survey corridor and is generally dominated by halophytic (salt-loving) plant species characteristic of high salt marsh. Most of the emergent wetlands are located in the western portion of the survey corridor (north of SH 48) and the eastern portion of the survey corridor (**Figures 5.1, 5.2, 5.6,** and **5.8**). The emergent wetlands are dominated by glassworts, saltwort, sea blite, seashore saltgrass, shoregrass, sea ox-eye daisy, Carolina wolfberry, and salt-marsh bulrush (**Photo 4**). The wetlands are generally connected to the BSC and Little San Martin Lake but appear to receive tidal water only during very high tides or storm tides. Approximately 89.1 acres of Coastal: Salty Flat/Depression vegetation are located in the survey corridor.

3.2.5 Coastal: Unvegetated Flat/Washover

The Coastal: Unvegetated Flat/Washover community consists of largely unvegetated areas located along the south side of the BSC (near the high tide elevation and in areas that are periodically washed over by ship wakes), as well as in remnant flats adjacent to DMPA levees that appear to receive tidal water only at high tides and/or through tidally influenced water table (**Figures 5.2** through **5.6**, **Photos 5** and **6**). The unvegetated flats/washover areas contain less than 5 percent vegetative cover. No algae mats were observed in any of the flats during the August 2018 field investigation, and based on review of aerial photography from multiple years, the flats do not appear to support algae growth. The Coastal: Unvegetated Flats/Washover community covers approximately 40.1 acres of the survey corridor.

3.2.6 Freshwater Wetland

One freshwater wetland is located in a manmade drainage ditch located between SH 48 and the BSC (**Figure 5.2**, **Photo 7**). The drainage ditch appears to receive flows from a small wastewater treatment plant located on the west side of the survey corridor near SH 48, and carries the flows to the BSC. The wetland within the ditch is dominated by southern cattail (*Typha domingensis*), with some ditch segments containing varying levels of water. Approximately 0.6 acre of freshwater wetland is located in the survey corridor.

3.2.7 Gulf Coast: Salty Prairie

The Gulf Coast: Salty Prairie (**Photo 8**) is a dominant vegetation community in the survey corridor, encompassing approximately 121.4 acres and occurring in much of the flat uplands within the survey corridor (**Figures 5.1** through **5.8**). The Salty Prairie vegetation community contains many of the halophytic plant species present in the Salty Flat/Depression community; however, glassworts and sea blite disappear from this community, saltwort abundance decreases, and other species increase with elevation, including leatherleaf (*Maytenus phyllanthoides*), tornillo (*Prosopis reptans*), camphor daisy (*Rayjacksonia phyllocephala*), Texas pricklypear (*Opuntia engelmannii* var. *lindheimeri*), seashore dropseed (*Sporobolus virginicus*), and whorled dropseed (*S. pyramidatus*), with scattered honey mesquite (*Prosopis glandulosa*) and Spanish dagger (*Yucca treculeana*).

3.2.8 Open Water

The only Open Water habitat in the survey corridor is the BSC, which the proposed pipeline crosses near the west end (**Figure 5.2**, **Photo 9**). The BSC is a federal navigation channel maintained by the USACE and Port of Brownsville, and areas of shallower water adjacent to the navigation channel are periodically disturbed by ships and other vessels in the channel. As a result, none of the open water area associated with the BSC supports seagrass or oyster beds. Approximately 6.6 acres of Open Water habitat associated with the BSC is within the survey corridor. The proposed pipeline would be installed under the BSC by HDD.

3.2.9 South Texas: Disturbance Grassland/Shrubland

The South Texas: Disturbance Grassland/Shrubland vegetation community occurs in areas along the BSC where dredged material has been deposited in the past (**Figures 5.2** through **5.5**, **Photo 10**). This vegetation type includes a variety of species, depending on location. Common plant species observed include honey mesquite, white leadtree (*Leucaena leucocephala*), povertyweed (*Baccharis neglecta*), lotebush (*Ziziphus obtusifolia*), granjeno (*Celtis pallida*), Texas pricklypear, guineagrass (*Urochloa maxima*), buffelgrass (*Pennisetum ciliare*), silver bluestem (*Bothriochloa laguroides*), King Ranch bluestem (*B. ischaemum*), whiplash pappusgrass (*Pappophorum vaginatum*), camphor daisy, tornillo, sea ox-eye daisy, seashore dropseed, and Matamoros saltbush (*Atriplex matamorensis*). Approximately 12.5 acres of South Texas: Disturbed Grassland/Shrubland vegetation occurs in the survey corridor.

3.2.10 South Texas: Loma Evergreen Shrubland

The South Texas: Loma Evergreen Shrubland vegetation community occurs on a loma located at the south end of the HDD pullback area south of the BSC (**Figure 5.3**; **Photo 11**). This community is characterized as dense thornshrub vegetation that contains a diverse assemblage of shrub species. Shrub species observed within the community included Texas ebony (*Ebenopsis ebano*), granjeno, lime prickly-ash (*Zanthoxylum fagara*), honey mesquite, desert yaupon (*Schaefferia cuneifolia*), lotebush, coma (*Sideroxylon celastrinum*), cenizo (*Leucophyllum frutescens*), coyotillo (*Karwinskia humboldtiana*), Texas lantana (*Lantana horrida*), Berlandier fiddlewood (*Citharexylum berlandieri*), Spanish dagger, elbowbush (*Forestiera angustifolia*), and goatbush (*Castela texana*). Approximately 8.9 acres of South Texas: Loma Evergreen Shrubland habitat are located within the survey corridor.

3.2.11 South Texas: Loma Grassland/Shrubland

The South Texas: Loma Grassland/Shrubland vegetation community is limited primarily to the edge of a loma at the east end of the pipeline and consists of a matrix of shrub and grassland species (**Figure 5.8**, **Photo 12**). Common species observed include honey mesquite, Spanish dagger, Berlandier fiddlewood, Texas pricklypear, lotebush, tasajillo, tornillo, leatherleaf, hierba del soldado (*Waltheria indica*), camphor daisy, big sacaton (*Sporobolus wrightii*), buffelgrass, whiplash pappusgrass, and silver bluestem. Approximately 3.7 acres of South Texas: Loma Grassland/Shrubland are located within the survey corridor.

3.2.12 Transportation

The Transportation land cover type is mapped where the survey corridor crosses SH 48 and accounts for approximately 0.9 acre of the survey corridor (**Figure 5.2**).

4.0 SPECIES REVIEW AND HABITAT ASSESSMENT

Based on a review of the USFWS' species list for threatened, endangered, and candidate species in Cameron County (USFWS 2018a, 2018b) and the NMFS' species list for threatened, endangered, and candidate species in Texas (NMFS 2018), there are 21 federally listed threatened or endangered species and one candidate for federal listing that could be present in the survey corridor (**Table 3**). The USFWS has also designated critical habitat for the wintering piping plover (*Charadrius melodus*) in Cameron County, but not within the survey corridor (USFWS 2018c). No designated or proposed critical habitat for other species occurs in the survey corridor. The following sections describe the results of the on-site habitat assessment and impact evaluation for each species listed in **Table 3**.

Table 3. Federally Listed and Candidate Species with Potential to Occur in Cameron County, Texas

Species	Listing Status[1,2]	Brief Description of Suitable Habitat	Habitat Present
Birds			
Northern aplomado falcon *Falco femoralis septentrionalis*	E	Forages on grassy plains and vegetated salt flats; typically nests in scattered shrubs or trees	Yes
Piping plover *Charadrius melodus*	T	Intertidal beaches with sparsely vegetated or unvegetated mud and sand flats	Yes
Red-crowned parrot *Amazonia viridgenalis*	C	In Texas, large trees and urban areas	No
Red knot *Calidris canutus rufa*	T	Beaches, tidal sand and mud flats, washover areas	Yes
Mammals			
Ocelot *Leopardus pardalis*	E	Dense thornshrub habitats	Yes
Gulf Coast jaguarundi *Herpailurus yagouaroundi cacomitli*	E	Dense thornshrub habitats	Yes
West Indian manatee *Trichechus manatus*	E	Marine, estuarine, and freshwater environments	Yes
Fin whale *Balaenoptera physalus*	E	Deep offshore waters	No
Humpback whale *Megaptera novaeangliae*	E	Deep offshore waters	No
Sei whale *Balaenoptera borealis*	E	Deep offshore waters	No
Sperm whale *Physeter macrocephalus*	E	Deep offshore waters	No
Reptiles			
Green sea turtle *Chelonia mydas*	T	Marine and estuarine habitats; nests on open beaches	Yes
Hawksbill sea turtle *Eretmochelys imbricata*	E	Marine and estuarine habitats; nests on open beaches	Yes

Table 3. Federally Listed and Candidate Species with Potential to Occur in Cameron County, Texas

Species	Listing Status[1,2]	Brief Description of Suitable Habitat	Habitat Present
Kemp's ridley sea turtle *Lepidochelys kempii*	E	Marine and estuarine habitats; nests on open beaches	Yes
Leatherback sea turtle *Dermochelys coriacea*	E	Deeper marine habitats; nests on open beaches	No
Loggerhead sea turtle *Caretta caretta*	T	Marine and estuarine habitats; nests on open beaches	Yes
Flowering Plants			
South Texas ambrosia *Ambrosia cheiranthifolia*	E	Prairies and savannas on heavy soils	Yes
Texas ayenia *Ayenia limitaris*	E	Riparian woodlands and edges of thickets	Yes
Corals			
Boulder star coral *Orbicella franksi*	T	Reefs in shallow to deep water	No
Elkhorn coral *Acropora palmata*	T	Reefs and hard-bottom habitats in turbulent, shallow water	No
Lobed star coral *Orbicella annularis*	T	Reefs in shallow to deep water	No
Mountainous star coral *Orbicella faveolata*	T	Reefs in shallow to deep water	No

[1] E = Endangered; T = Threatened; C = Candidate for Federal Listing
[2] Sources: NMFS 2018, USFWS 2018a, USFWS 2018b

4.1 Northern Aplomado Falcon

In the southwestern U.S., prime northern aplomado falcon (*Falco femoralis septentrionalis*) habitat is arid grassy plain with scattered honey mesquite and various yuccas and cacti (Oberholser 1974). Aplomado falcons are associated with plains or savannahs throughout their range, whether the moist coastal savannas of eastern Mexico, the xeric Chihuahuan Desert, or the coastal prairies of south Texas (Burnham et al. 2002). In Cameron County, northern aplomado falcons are not only regularly observed over grassy plains but are also seen utilizing vegetated salt flats dominated by species such as sea ox-eye daisy, saltwort, glasswort, shoregrass, and Carolina wolfberry. In south Texas, nests have been found in Spanish dagger, honey mesquite, Texas ebony, and on artificial structures such as electric transmission poles. Surveys have also found northern aplomado falcons nesting on the ground (Burnham et al. 2002).

No critical habitat has been designated by the USFWS for the northern aplomado falcon. The nearest recorded observation according to TXNDD data is located approximately 0.2 mile south of the survey corridor near SH 4 (**Figure 6**; TPWD 2018); there are also multiple recorded observations of northern aplomado falcons in or near the survey corridor in the eBird database (eBird 2018). The salty prairie, salt flats, and grassland/shrubland habitats in the survey corridor provide foraging habitat for the northern aplomado falcon (**Figures 5.1 through 5.8**), but suitable nesting sites are limited due to the absence of trees, shrubs, and Spanish dagger plants in most of the corridor. The proposed pipeline construction would temporarily impact aplomado falcon habitat during construction; therefore, it is anticipated that the pipeline construction may affect, but is not likely to adversely affect, the northern aplomado falcon.

4.2 Piping Plover

Piping plovers do not nest in Texas but overwinter on the Texas coast and can be found in Texas during most months of the year. Habitats preferred by wintering piping plovers include mud, sand, and algal flats found on mainland or barrier island beaches. Such areas are periodically covered by water and then exposed by tides or wind (Campbell 2003). The habitat components that are essential for piping plovers include intertidal beaches and flats (between annual low tide and annual high tide) and associated dune systems and flats above annual high tide, all with no or very sparse emergent vegetation. In some cases, these flats may be covered or partially covered by a mat of blue-green algae (USFWS 1996).

According to TXNDD for Cameron County, the nearest piping plover observation occurs approximately 2.3 miles northwest of the survey corridor (TPWD 2018). Multiple piping plover observations have been recorded in the vicinity of the survey corridor, the nearest being approximately 0.2 mile from the survey corridor near SH 48 (**Figure 6**; eBird 2018). Other observations have been recorded from SH 4 south of the survey corridor (eBird 2018). Although there is no record of occurrence within the survey corridor, the unvegetated flats/washover areas along the BSC and DMPAs provide foraging habitat for wintering piping plovers. The proposed pipeline construction would temporarily impact potential piping plover habitat; therefore, it is anticipated that the pipeline construction may affect, but is not likely to adversely affect, the piping plover.

Critical habitat has been designated for the piping plover throughout the Texas Gulf coast, including wind-tidal flats associated with South Bay east of the survey corridor (USFWS 2009); however, no designated critical habitat occurs within the survey corridor (USFWS 2018c). Therefore, the proposed pipeline would not significantly destroy or adversely modify designated critical habitat.

4.3 Red-Crowned Parrot

The red-crowned parrot (*Amazonia viridgenalis*) is currently a candidate species with no federal protection under the Endangered Species Act, but is considered in this report in the event listing occurs or becomes imminent. Red-crowned parrots are native to northeastern Mexico, but the species is regularly observed in the lower Rio Grande valley (LRGV) (eBird 2018). In Mexico, red-crowned parrots inhabit tropical lowland forests, Tamaulipan thornscrub, and open areas (USFWS 2011). In Texas, the species occurs primarily in urban areas in the LRGV and has been observed roosting in large, thick, leafy trees and breeding in pre-existing cavities of trees including palms (USFWS 2011, Burgess 2006). Red-crowned parrots are nomadic during the winter (non-breeding season) traveling up to tens of kilometers to forage (USFWS 2011).

The TXNDD has no record of observations in the survey corridor or the vicinity (TPWD 2018), although red-crowned parrots have been observed at a location 0.6 mile south of the survey corridor near SH 4 on multiple occasions (**Figure 6**; eBird 2018). As no suitable habitat for the species occurs within the survey corridor, the proposed pipeline construction is expected to have no impact on the red-crowned parrot.

4.4 Red Knot

Red knots (*Calidris canutus rufa*) make one of the longest distance migrations known in the animal kingdom, traveling approximately 30,000 kilometers (18,641 miles) between wintering grounds and

breeding areas (USFWS 2014b). The Texas Gulf coast provides wintering habitat as well as spring and fall migration stopover areas for red knots (USFWS 2014a). Their wintering habitat along the Texas Gulf coast is similar to piping plover habitat and includes barrier island beaches, exposed tidal flats, washover passes, and mud flats (Port Isabel Economic Development Corporation 2015). Red knots forage on beaches, oyster reefs, and exposed bay bottoms, and roost on high sand flats, reefs, and other sites protected from high tides (USFWS 2014a). A study at Laguna Madre found that red knots prefer bay habitats when they are available and are sensitive to high water levels in bays. In general, red knots are strongly associated with lower sand flat habitats (USFWS 2014b).

The TXNDD data for Cameron County shows no recorded observations of red knots in the survey corridor. Multiple red knot observations have been recorded within 2 miles of the survey corridor, with the nearest observation being 0.6 mile south of the survey corridor near SH 4 (**Figure 6**; eBird 2018). Although there is no record of occurrence within the survey corridor, the unvegetated flats and washover areas along the BSC and DMPAs provide potential habitat for the red knot. The proposed pipeline construction would temporarily impact potential red knot habitat; therefore, it is anticipated that the pipeline construction may affect, but is not likely to adversely affect, the red knot.

4.5 Ocelot

Within Texas, ocelots prefer dense thornshrub and rocky areas typical of the Tamaulipan Biotic Province (USFWS 1990, 2010a). Typical brush species include granjeno, brasil (*Condalia hookeri*), desert yaupon, wolfberry (*Lycium* spp.), lotebush, althorn goatbush, whitebrush (*Aloysia gratissima*), catclaw acacia (*Acacia greggii*), blackbrush acacia (*Vachellia rigidula*), lantana (*Lantana* spp.), guayacan (*Guaicum angustifolium*), cenizo, elbowbush, and Mexican persimmon (*Diospyros texana*), with some interspersed trees such as honey mesquite, live oak (*Quercus virginiana*), Texas ebony, and hackberry (C*eltis* spp.) (Campbell 2003).

The ocelot is widely distributed from south Texas to South America (Navarro-Lopez 1985). It is estimated that about 80 ocelots remain in Texas, with the majority distributed in Cameron and Willacy Counties (Tewes and Everett 1986, Jackson et al. 2005, Haines et al. 2006). Three known breeding populations represent an estimated one-third of the total ocelot population in Texas: one located at Laguna Atascosa National Wildlife Refuge (LANWR) in Cameron County, and two in Willacy County on the Yturria Ranch and East El Sauz Ranch (Laack 1991, Tewes 2011, Tewes 2012). The LANWR population is the closest resident subpopulation to the survey corridor and is located about 11 miles north of the survey corridor. However, in 1998 a dispersing male ocelot was captured, radio-collared, and tracked by B&A biologists in dense thornshrub on lomas in and around the survey corridor.

Review of TXNDD data shows two elements of occurrence that extend into the survey corridor (**Figure 6**; TPWD 2018). These observations are found on a loma on the southern end of the survey corridor where the proposed HDD pullback area is located. Other ocelot observations are located in the vicinity of the proposed pipeline and are shown on **Figure 6**. Based on the habitat assessment, the area of dense thornshrub (i.e., South Texas: Loma Evergreen Shrubland) associated with the loma at the south end of the HDD pullback area provides potential habitat for ocelots. The proposed pipeline construction, including HDD

pullback area, will be designed to prevent clearing of dense thornshrub habitats. As such, it is anticipated that the proposed pipeline construction may affect, but is not likely to adversely affect, the ocelot.

4.6 Gulf Coast Jaguarundi

Currently, the known northern range limit of the Gulf Coast jaguarundi (*Herpailurus yagouaroundi cacomitli*; henceforth, jaguarundi) is northern Mexico and there are no known populations in Texas. However, the species is included on USFWS lists for Cameron County and is, therefore, addressed in this report. Like the ocelot, jaguarundis prefer dense thornshrub, a component of the Tamaulipan biotic province (USFWS 1990, 2013). Although jaguarundis may be more tolerant of open area grasslands and pastures, large (greater than 100-acre) tracts of isolated dense brush or smaller tracts connected by brush corridors appear to be important habitat (TPWD 2013, Tewes and Grassman 2005).

Review of TXNDD data shows the nearest jaguarundi observation is approximately four miles southwest of the survey corridor and was recorded in 1986 (TPWD 2018). The most recent TXNDD observation recorded of a jaguarundi is from 1992. No recent sightings of the species have been recorded in or near the survey corridor. However, based on the habitat assessment, the area of dense thornshrub (i.e., South Texas: Loma Evergreen Shrubland) associated with the loma at the south end of the HDD pullback area provides potential habitat for jaguarundis. The proposed pipeline construction, including HDD pullback area, will be designed to prevent clearing of dense thornshrub habitats. As such, it is anticipated that the proposed pipeline construction may affect, but is not likely to adversely affect, the jaguarundi.

4.7 West Indian Manatee

West Indian manatee (*Trichechus manatus*) abundance along the Texas coast is extremely limited. The Texas Marine Mammal Standing Network has recovered fewer than 10 manatees along the Texas coast since 1980 (Houston Chronicle 2012). This species is found in marine, estuarine, and freshwater environments and feeds opportunistically on a wide variety of plants, including submerged, floating, and emergent vegetation. Although West Indian manatees could occur in the BSC, the occurrence of a manatee in the BSC would be considered a rare event. In addition, the proposed pipeline would be installed under the BSC by HDD. Therefore, the proposed pipeline construction is expected to have no effect on the West Indian manatee.

4.8 Whales

Four listed whale species are identified by the NMFS as occurring in Texas coastal waters: fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), sei whale (*Balaenoptera borealis*), and sperm whale (*Physeter macrocephalus*). These four species are generally restricted to deeper offshore waters. Fin whales occur in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes, and less commonly in the tropics (NOAA 2018a). Humpback whales are found in high-latitude feeding grounds in the summer; they migrate to calving grounds in subtropical or tropical waters in the winter. Calving grounds are commonly near offshore reef systems, islands, or continental shelves. Sei whales prefer subtropical to subpolar waters on the continental shelf edge and slope worldwide. They are usually observed in deeper waters of oceanic areas far from the coastline. Sperm whales spend most of their

time in deep waters (up to approximately 2,000 feet deep) and are uncommon in the surface or higher depths unless resurfacing to breath and recover from dives (NOAA 2018b). As there is not suitable habitat for these species in the survey corridor, the proposed pipeline construction is expected to have no effect on the four species of whales.

4.9 Sea Turtles

Five listed sea turtle species are identified by the NMFS as occurring in Texas coastal waters: green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*). Four of these species, green sea turtles, hawksbill sea turtles, Kemp's ridley sea turtles, and loggerhead sea turtles regularly utilize shallow bays, estuaries, inlets, and shoals with an abundance of seagrasses and algae during the non-breeding season. Hawkbill sea turtles also occupy different habitats during different stages of their lifecycle, typically frequenting shallow coastal area, lagoons, and oceanic islands seldom in water deeper than 65 feet (NMFS and USFWS 1993). They are also known to inhabit mangrove-fringed bays. Loggerhead sea turtles also utilize a variety of environments including brackish water of coastal lagoons and river mouths; mud bottoms of sounds, bays, and estuaries; and the often turbid, detritus-laden, muddy-bottomed bays and bayous of the northern Gulf of Mexico. During migration these species can be found in deep waters.

Leatherback sea turtles migrate farther and venture into colder water than all other sea turtles, routinely traveling between boreal, temperate, and tropical waters (NMFS and USFWS 1992). Adults are highly migratory and are thought to be the most pelagic of all sea turtles, typically only moving into coastal waters during the reproductive season or, occasionally, in pursuit of concentrations of jellyfish (NMFS and USFWS 1992).

Green sea turtles, hawksbill sea turtles, Kemp's ridley sea turtles, and loggerhead sea turtles may occasionally occur within the BSC, and green sea turtles and Kemp's ridley sea turtles have been observed in the BSC (**Figure 6**). Leatherback sea turtles, since they are more adapted to deep water habitats, are not expected to occur in the survey corridor. Although potential habitat for four sea turtle species occurs in the BSC, the proposed pipeline would be installed under the BSC by HDD; therefore, the proposed pipeline construction is expected to have no effect on sea turtle species.

4.10 South Texas Ambrosia

South Texas ambrosia grows at low elevations in prairies or savannas on heavy soils ranging from clay loams to sandy loams (USFWS 1994). Associated native grass species include Texas grama (*Bouteloua rigidiseta*), buffalograss (*Bouteloua dactyloides*), Texas wintergrass (*Nassella leucotricha*), and tobosa (*Hilaria mutica*). Native woody plant associates include honey mesquite, huisache (*Vachellia farnesiana*), huisachillo (*V. schaffneri*), brasil, granjeno, and lotebush. South Texas ambrosia was known to occur historically in Tamaulipas State, Mexico, and in the LRGV, including Cameron County (USFWS 1994, 2010b). In 1994, this plant was verified in eight locations in Nueces and Kleberg Counties, Texas (USFWS 1994). Currently it is thought to be limited to six locations in these two counties, while its status in Mexico is unknown (USFWS 2010b).

There are no documented occurrences of South Texas ambrosia within the survey corridor (TPWD 2018), and there are currently no known populations of South Texas ambrosia in Cameron County. A habitat assessment of the survey corridor identified limited areas that may provide suitable habitat for this species. However, no South Texas ambrosia individuals or populations were found during surveys. Based on the habitat assessment and survey, South Texas ambrosia is not expected to occur in the survey corridor, and the proposed pipeline construction is expected to have no effect on South Texas ambrosia.

4.11 Texas Ayenia

Texas ayenia occurs at low elevations in dense, relatively moist, subtropical riparian woodlands and at the edge of thickets located on well-drained, calcareous, sandy clay loam soils (USFWS 1994, Poole et al. 2007). Known locations of Texas ayenia in the LRGV are associated with two soil types: sandy clay loam (Hidalgo Series) and fine sandy loam (Willacy Series). This plant is associated with the Texas Ebony-Anacua plant community, which includes such other species as coma, brasil, honey mesquite, lotebush, granjeno, lime prickly-ash, and snake-eyes (*Phaulothamnus spinescens*).

There are no documented occurrences of Texas ayenia within the survey corridor, and the closest known population of Texas ayenia is approximately 6 miles southwest of the survey corridor (TPWD 2018). A habitat assessment of the survey corridor identified limited areas that may provide suitable habitat for this species. However, no Texas ayenia individuals or populations were found during surveys. Based on the habitat assessment and survey, Texas ayenia is not expected to occur in the survey corridor, and the proposed pipeline construction is expected to have no effect on Texas ayenia.

4.12 Corals

Four listed coral species are identified by the NMFS as occurring in Texas coastal waters: elkhorn coral (*Acropora palmata*), boulder star coral (*Orbicella franksi*), lobed star coral (*O. annularis*), and mountainous star coral (*O. faveolata*). These species are reef-building corals that occur on reefs or other hard substrates at varying water depths (NMFS 2014, NOAA 2018c). The distribution of these species is limited to portions of the Gulf of Mexico; the BSC does not provide suitable habitat for these species. Therefore, there is no suitable habitat for coral species in the survey corridor, and the proposed pipeline construction is expected to have no effect on the four listed coral species.

5.0 SUMMARY OF ANTICIPATED EFFECTS ON FEDERALLY LISTED SPECIES

Table 4 summarizes the anticipated effects of the proposed pipeline construction on federally listed or candidate species. It is anticipated that the proposed pipeline ***may affect, but is not likely to adversely affect,*** the northern aplomado falcon, piping plover, red knot, ocelot, and jaguarundi. The proposed pipeline is expected to have ***no effect*** on the remaining federally listed species. The proposed pipeline is expected to have ***no impact*** on the red-crowned parrot, which is a candidate for federal listing.

As noted above, the survey corridor does not contain designated critical habitat for the piping plover; therefore, the proposed pipeline is ***not expected to significantly destroy or adversely modify*** piping plover critical habitat.

Table 4. Anticipated Effects to Federally Listed Species

Species	Listing Status[1]	Brief Description of Suitable Habitat	Habitat Present	Anticipated Effect Determination	Rationale for Determination
Birds					
Northern aplomado falcon *Falco femoralis septentrionalis*	E	Forages on grassy plains and vegetated salt flats; typically nests in scattered shrubs or trees	Yes	May Affect, Not Likely to Adversely Affect	Suitable habitat present, but habitat impacts would be temporary
Piping plover *Charadrius melodus*	T	Intertidal beaches with sparsely vegetated or unvegetated mud and sand flats	Yes	May Affect, Not Likely to Adversely Affect	Suitable wintering habitat present, but habitat impacts would be temporary
Red-crowned parrot *Amazonia viridgenalis*	C	In Texas, large trees and urban areas	No	No Impact	No suitable habitat is present
Red knot *Calidris canutus rufa*	T	Beaches, tidal sand and mud flats, washover areas	Yes	May Affect, Not Likely to Adversely Affect	Suitable wintering habitat present, but habitat impacts would be temporary
Mammals					
Ocelot *Leopardus pardalis*	E	Dense thornshrub	Yes	May Affect, Not Likely to Adversely Affect	Suitable dense thornshrub habitat is present but would be avoided by construction
Gulf Coast jaguarundi *Herpailurus yagouaroundi cacomitli*	E	Dense thornshrub	Yes	May Affect, Not Likely to Adversely Affect	Suitable dense thornshrub habitat is present but would be avoided by construction
West Indian manatee *Trichechus manatus*	E	Marine, estuarine, and freshwater environments	Yes	No Effect	No impacts to BSC
Fin whale *Balaenoptera physalus*	E	Deep offshore waters	No	No Effect	No suitable habitat is present
Humpback whale *Megaptera novaeangliae*	E	Deep offshore waters	No	No Effect	No suitable habitat is present
Sei whale *Balaenoptera borealis*	E	Deep offshore waters	No	No Effect	No suitable habitat is present
Sperm whale *Physeter macrocephalus*	E	Deep offshore waters	No	No Effect	No suitable habitat is present
Reptiles					
Green sea turtle *Chelonia mydas*	T	Marine and estuarine habitats; breeds on open beaches	Yes	No Effect	No impacts to BSC
Hawksbill sea turtle *Eretmochelys imbricata*	E	Marine and estuarine habitats; breeds on open beaches	Yes	No Effect	No impacts to BSC
Kemp's ridley sea turtle *Lepidochelys kempii*	E	Marine and estuarine habitats; breeds on open beaches	Yes	No Effect	No impacts to BSC
Leatherback sea turtle *Dermochelys coriacea*	E	Deeper marine habitats; breeds on open beaches	No	No Effect	No suitable habitat is present
Loggerhead sea turtle *Caretta caretta*	T	Marine and estuarine habitats; breeds on open beaches	Yes	No Effect	No impacts to BSC

Table 4. Anticipated Effects to Federally Listed Species

Species	Listing Status[1]	Brief Description of Suitable Habitat	Habitat Present	Anticipated Effect Determination	Rationale for Determination
Flowering Plants					
South Texas ambrosia *Ambrosia cheiranthifolia*	E	Prairies and savannas on heavy soils	Yes	No Effect	Potential habitat is limited and species was not found during surveys
Texas ayenia *Ayenia limitaris*	E	Riparian woodlands and edges of thickets	Yes	No Effect	Potential habitat is limited and species was not found during surveys
Corals					
Boulder star coral *Orbicella franksi*	T	Reefs in shallow to deep water	No	No Effect	No suitable habitat is present
Elkhorn coral *Acropora palmata*	T	Reefs and hardbottom habitats in turbulent, shallow water	No	No Effect	No suitable habitat is present
Lobed star coral *Orbicella annularis*	T	Reefs in shallow to deep water	No	No Effect	No suitable habitat is present
Mountainous star coral *Orbicella faveolata*	T	Reefs in shallow to deep water	No	No Effect	No suitable habitat is present

[1] E = Endangered; T = Threatened; C = Candidate for Federal Listing
Sources: NMFS 2018, USFWS 2018a, USFWS 2018b

6.0 LITERATURE CITED

Burgess, H. H. 2006. Red-crowned parrot. The Texas Breeding Bird Atlas, Texas A&M AgriLife Extension. Available at https://txtbba.tamu.edu/species-accounts/red-crowned-parrot/. Accessed August 2018.

Burnham, W., J. P. Jenny, W. R. Heinrich, G. Hunt, A. B. Montoya, B. D. Mutch, and C. E. Sandfort. 2002. Proposal: restoration of the northern aplomado falcon in New Mexico. The Peregrine Fund. Boise, Idaho.

Campbell, L. 2003. Endangered and threatened animals of Texas, their life history and management. Texas Parks and Wildlife Division. Austin.

eBird. 2018. eBird: An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available at https://ebird.org/map/. Accessed August 2018.

Elliott, L. F., D. D. Diamond, C. D. True, C. F. Blodgett, D. Pursell, D. German, and A. Treuer-Keuhn. 2014. Ecological Mapping Systems of Texas: Summary Report. Texas Parks & Wildlife Department, Austin, Texas.

Haines, A. M., J. E. Janecka, M. E. Tewes, L. I. Grassman, and P. Morton. 2006. The importance of private lands for ocelot *Leopardus pardalis* conservation in the United States. Oryx 40(1):90-94.

Houston Chronicle. 2012. Rare manatee sighting in Galveston. October 15, 2012. http://www.chron.com/news/houston-texas/article/Rare-manatee-sighting-in-Galveston-3924028.php.

Jackson, V. L., L. L. Laack, and E. G. Zimmerman. 2005. Landscape metrics associated with habitat use by ocelots in south Texas. Journal of Wildlife Management 69:733-738.

Laack, L. L. 1991. Ecology of the ocelot (*Felis pardalis*) in south Texas. MSc Thesis, Texas A&I University, Kingsville, TX.

Ludeke, K., D. German, and J. Scott. 2010. Texas Vegetation Classification Project: Interpretative Booklet for Phase 3. Texas Parks and Wildlife Department and Texas Natural Resources Information System.

Navarro-Lopez, D. 1985. Status and distribution of the ocelot (*Felis pardalis*) in south Texas. MSc Thesis, Texas A&I University, Kingsville, TX.

National Marine Fisheries Service (NMFS). 2014. Endangered and Threatened Wildlife and Plants: Final Listing Determinations on Proposal to List 66 Reef-Building Coral Species and To Reclassify Elkhorn and Staghorn Corals. Federal Register Vol. 79, No. 175, pp. 53852-54123.

_____. 2018. Texas' threatened and endangered species and critical habitat designations. NOAA Fisheries Southeast Region Protected Resources Division. Available at http://sero.nmfs.noaa.gov/protected_resources/section_7/threatened_endangered/Documents/texas.pdf. Accessed August 2018.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1992. Recovery plan for leatherback turtles in the U.S. Caribbean, Atlantic and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C.

_____. 1993. Recovery plan for hawksbill turtles in the U.S. Caribbean Sea, Atlantic Ocean, and Gulf of Mexico. National Marine Fisheries Service, St. Petersburg, Florida.

National Oceanic and Atmospheric Administration (NOAA). 2018a. Species directory: Fin Whale. Available at https://www.fisheries.noaa.gov/species/fin-whale#overview. Accessed August 2018.

_____. 2018b. Species directory: Sperm Whale. Available at https://www.fisheries.noaa.gov/species/sperm-whale. Accessed August 2018.

_____. 2018c. Species directory: Elkhorn Coral. Available at https://www.fisheries.noaa.gov/species/elkhorn-coral#overview. Accessed August 2018.

Natural Resources Conservation Service (NRCS). 2018. United States Department of Agriculture. Web Soil Survey. Available at http://websoilsurvey.nrcs.usda.gov/. Accessed August 2018.

Oberholser, H. C. 1974. The bird life of Texas. 2 Volumes. University of Texas Press. Austin.

Poole, J. M., W. R. Carr, D. M. Price, and J. R. Singhurst. 2007. Rare Plants of Texas. Texas A&M University Press. College Station, Texas.

Port Isabel Economic Development Corporation. 2015. Community Profile-Environmental and Natural Resources. Available at http://portisabel-texas.com/edc/community-profile/environmentalnaturalresources/.

Tewes, M. E. 2011. Frank Daniel Yturria Endowed Chair for Wild Cat Studies. Texas A&M University Kingsville. Personal communication to Rick Phillips (B&A).

_____. 2012. East Wildlife Foundation committed to ocelot research. Texas Wildlife. February 36-37.

Tewes, M. E., and D. D. Everett. 1986. Status and distribution of the endangered ocelot and jaguarundi in Texas. In Cats of the World: Biology, Conservation, and Management. National Wildlife Federation. Washington, D.C.

Tewes, M. E., and L. I. Grassman, Jr. 2005. Jaguarundi: mysterious valley cat. Caesar Kleberg News. p 7.

Texas Parks and Wildlife Department (TPWD). 2013. Jaguarundi. Available at http://www.tpwd.state.tx.us/publications/pwdpubs/media/ pwd_bk_w7000_0013_jaguarundi.pdf.

_____. 2018. Texas Natural Diversity Database (TXNDD) data for Cameron County. Received June 27, 2018.

U.S. Department of Agriculture Soil Conservation Service (USDA SCS). 1977. Soil survey of Cameron County, Texas. Texas A&M University. College Station, Texas, USA.

U.S. Fish & Wildlife Service. 1990. Listed cats of Texas and Arizona recovery plan (With Emphasis on the Ocelot). Albuquerque, New Mexico.

_____. 1994. Endangered and threatened wildlife and plants: determination of endangered status for the plants *Ayenia limitaris* (Texas ayenia) and *Ambrosia cheiranthifolia* (South Texas ambrosia). Federal Register 59(163):43648-43652.

_____. 1996. Piping Plover (*Charadrius melodus*) Atlantic Coast Population Revised Recovery Plan. Division of Ecological Services Northeastern Regional Office. Hadley, Massachusetts.

_____. 2009. Endangered and threatened wildlife and plants: revised designation of critical habitat for the wintering population of the piping plover (*Charadrius melodus*) in Texas. Federal Register 74(95):23476-23600.

_____. 2010a. Draft ocelot (*Leopardus pardalis*) recovery plan, First Revision. U.S. Fish and Wildlife Service, Southwest Region, Albuquerque, New Mexico.

_____. 2010b. South Texas ambrosia (*Ambrosia cheiranthifolia*). 5-year review: summary and evaluation. Corpus Christi Ecological Services Field Office.

_____. 2011. Endangered and threatened wildlife and plant; red-crowned parrot. Notice of 12-month finding. Federal Register 76(194):62016-62034.

_____. 2013. Gulf Coast Jaguarundi recovery plan (*Puma yagouaroundi cacomitli*). Albuquerque, New Mexico.

_____. 2014a. Endangered and threatened wildlife and plants; threatened species status for the rufa red knot. Final Rule. Federal Register 79(238):73706-73748.

_____. 2014b. Rufa red knot background information and threats assessment. *Supplement to* Endangered and threatened wildlife and plants; final threatened status for the rufa red knot (*Calidris canutus rufa*). New Jersey Field Office, Pleasantville.

_____. 2018a. Species list for Cameron County, Texas. Information for Planning and Consultation (IPaC). Available at https://ecos.fws.gov/ipac/. Accessed August 2018.

_____. 2018b. Species by County Report for Cameron County, Texas. Environmental Consultation Online System (ECOS). Available at https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=48061. Accessed August 2018.

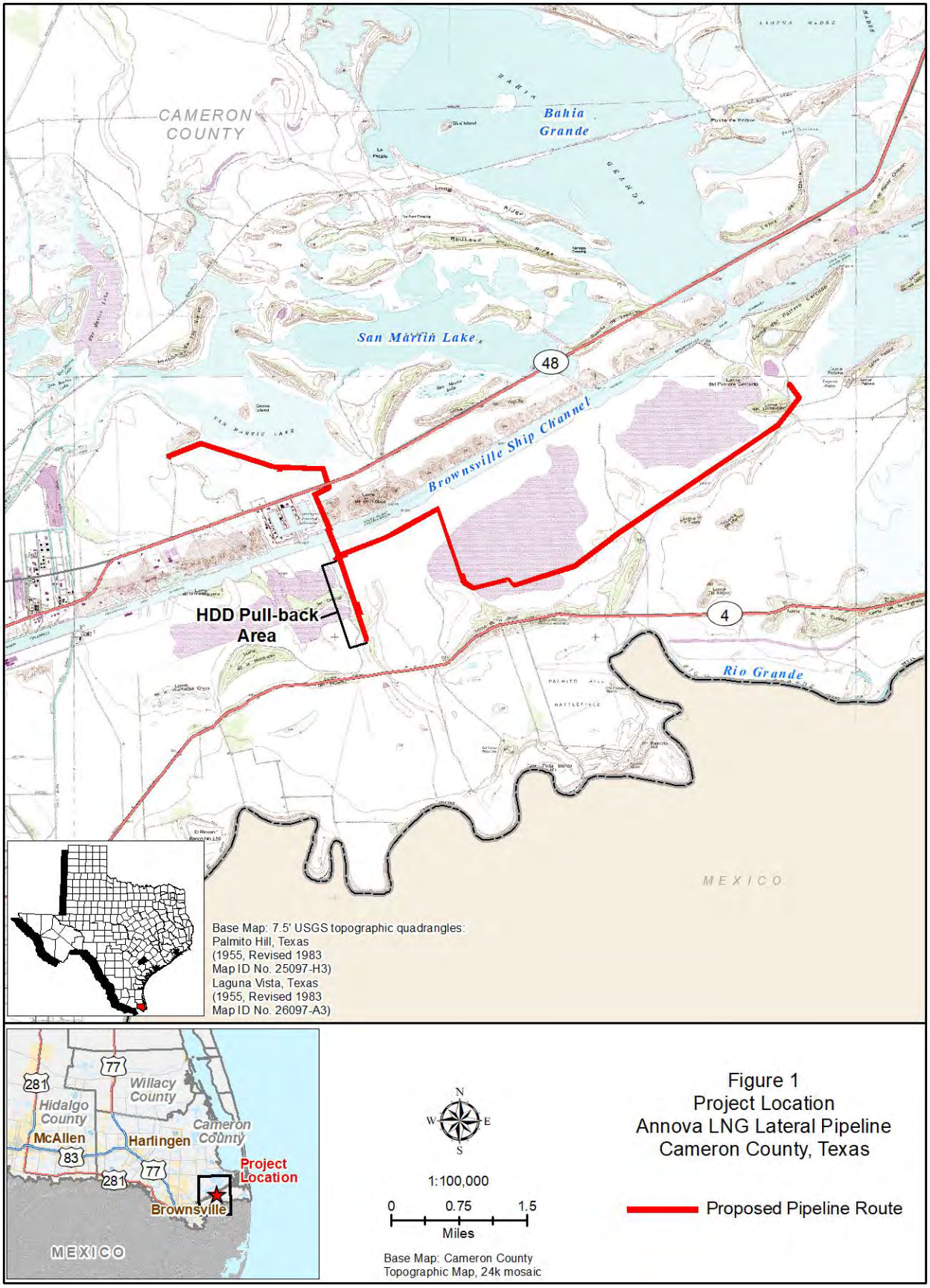
_____. 2018c. USFWS Threatened & Endangered Species Active Critical Habitat Report: Online Mapper. ECOS. Available at https://ecos.fws.gov/ecp/report/table/critical-habitat.html. Accessed August 2018.

U.S. Geological Survey (USGS). 2010a. 7.5-minute Topographic Map of Palmito Hill, Texas. United States Department of the Interior.

_____. 2010b. 7.5-minute Topographic Map of Laguna Vista, Texas. United States Department of the Interior.

APPENDIX A

Figures


CAMERON COUNTY
Bahia Grande
San Martin Lake
48
Brownsville Ship Channel
HDD Pull-back Area
4
Rio Grande
MEXICO
Base Map: 7.5' USGS topographic quadrangles:
Palmito Hill, Texas
(1955, Revised 1983
Map ID No. 25097-H3)
Laguna Vista, Texas
(1955, Revised 1983
Map ID No. 26097-A3)
77
281
Willacy County
Hidalgo County
Cameron County
McAllen
Harlingen
83
77
281
Project Location
Brownsville
MEXICO
N
W
E
S
1:100,000
0
0.75
1.5
Miles
Base Map: Cameron County
Topographic Map, 24k mosaic
Figure 1
Project Location
Annova LNG Lateral Pipeline
Cameron County, Texas
Proposed Pipeline Route

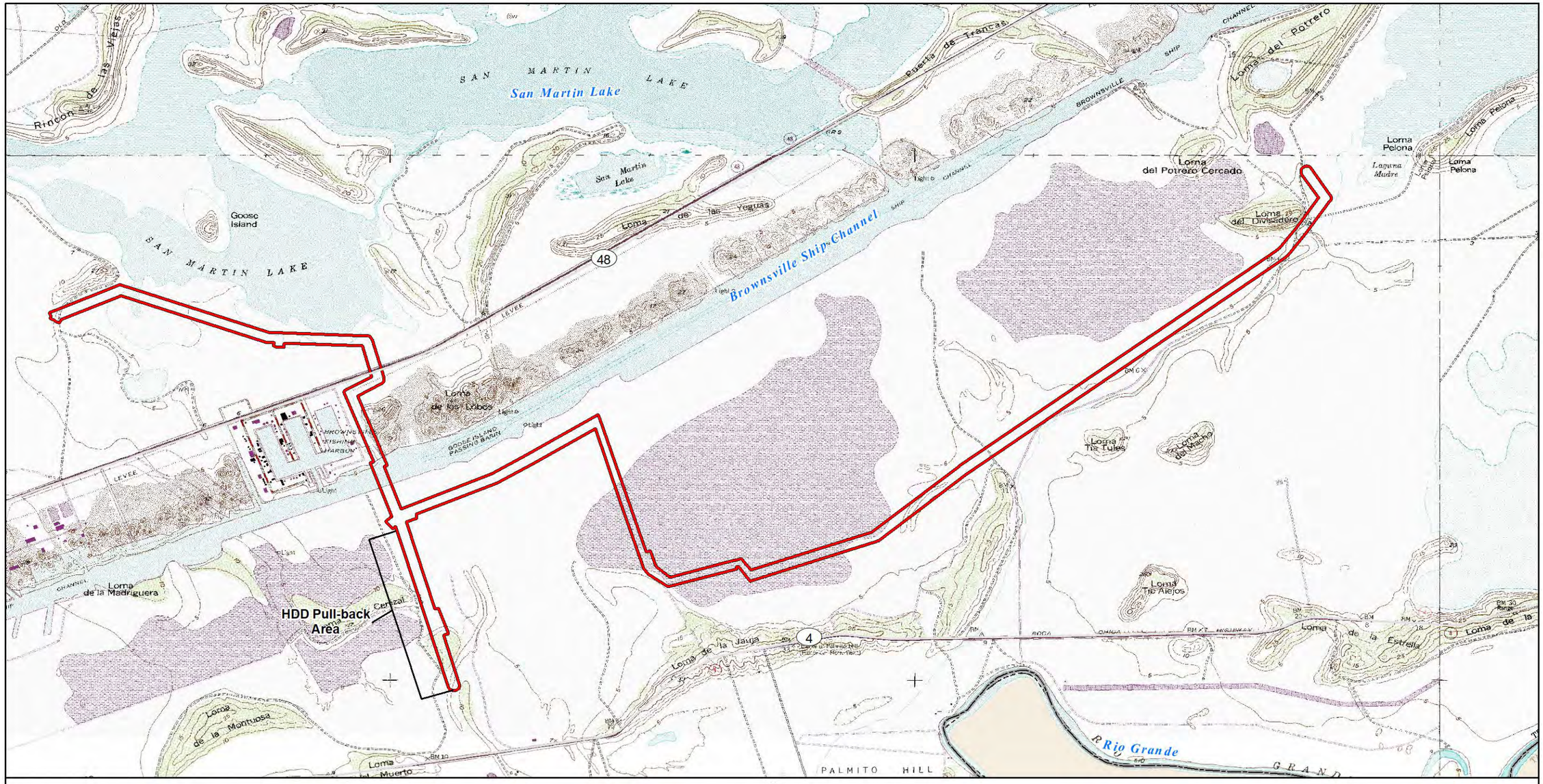


Figure 2
Survey Corridor on Topographic Base
Annova LNG Lateral Pipeline
Cameron County, Texas

Figure 3
Survey Corridor on Aerial Imagery Base
Annova LNG Lateral Pipeline
Cameron County, Texas

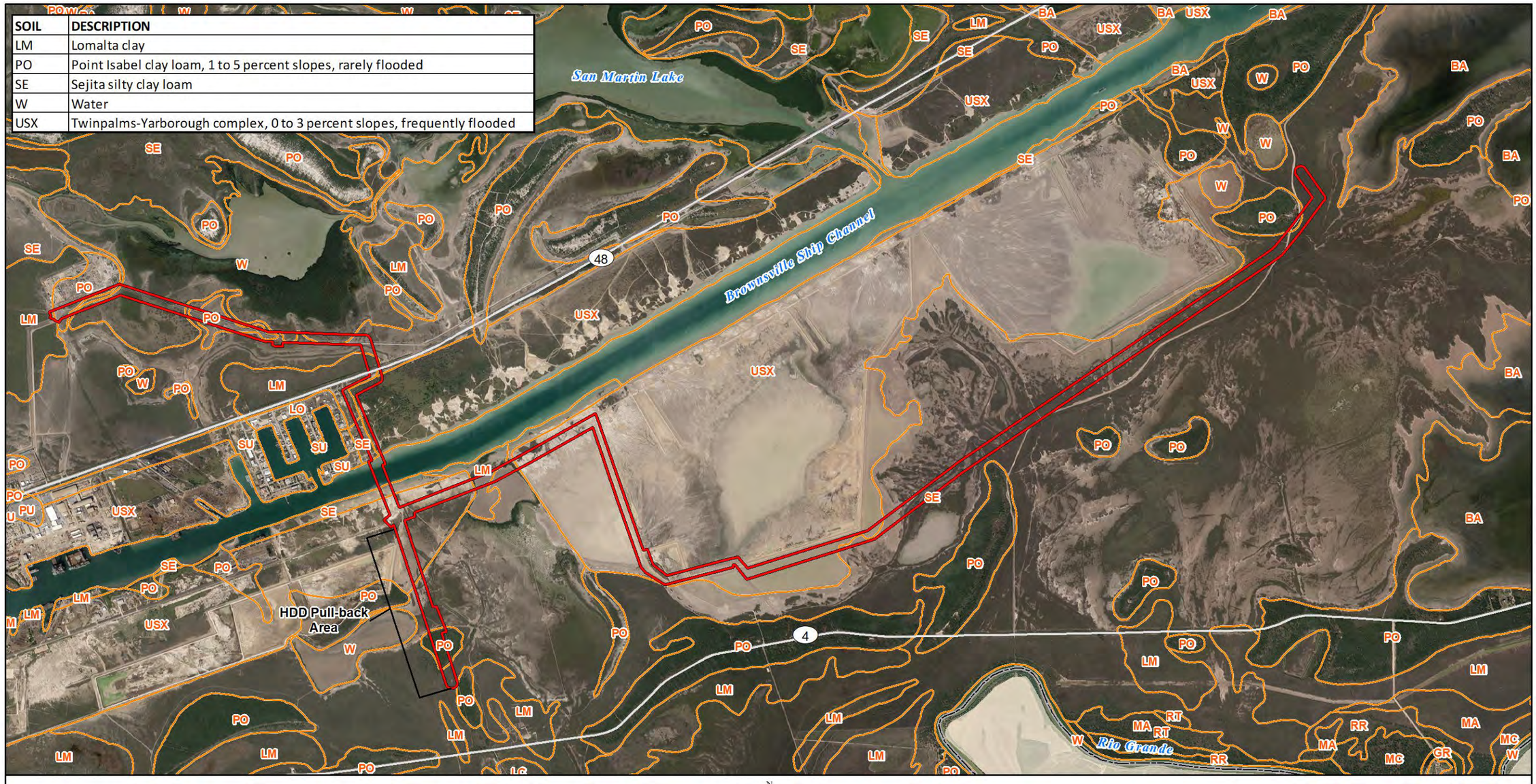


Figure 4
Soils
Annova LNG Lateral Pipeline
Cameron County, Texas

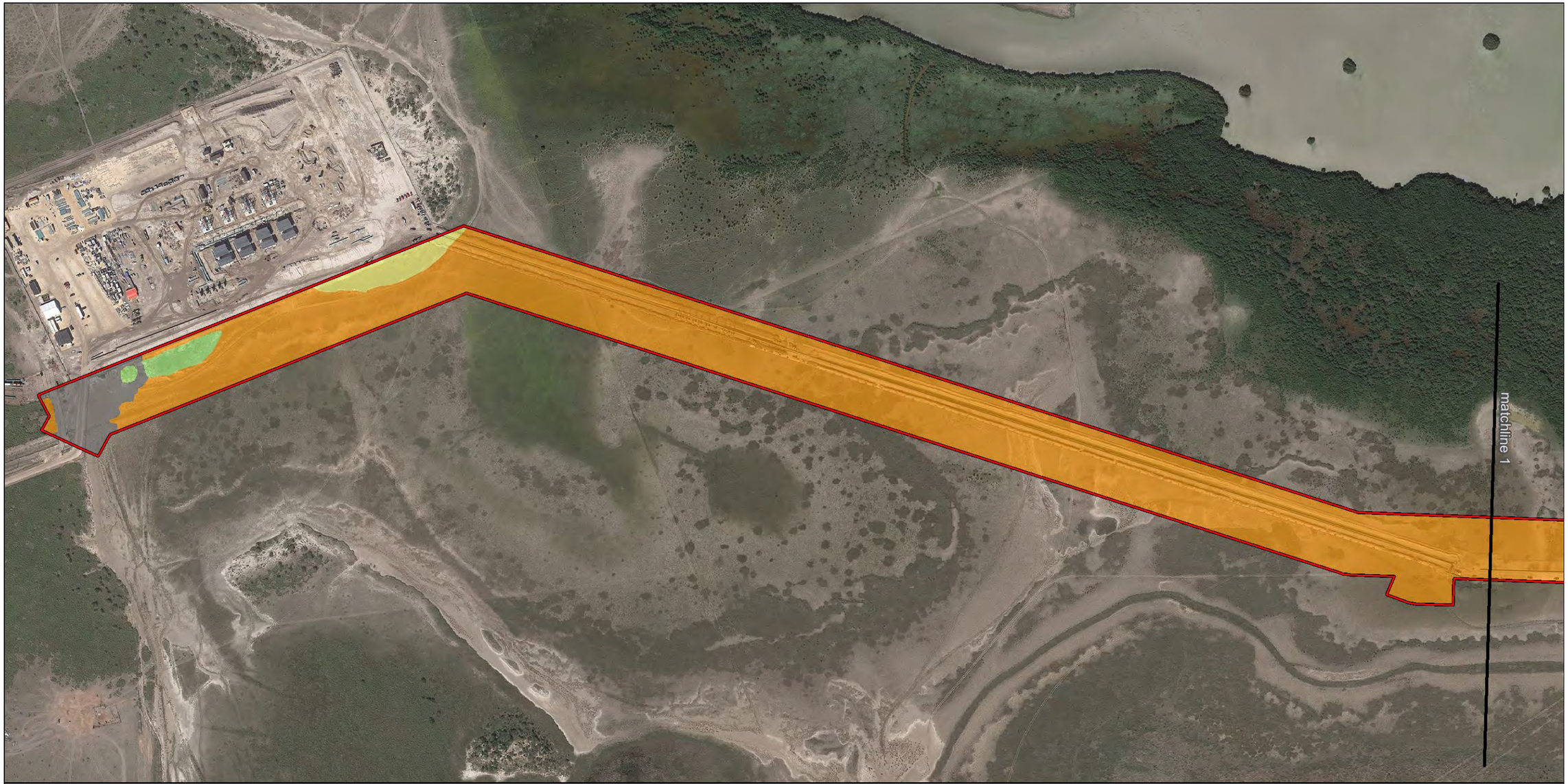


Figure 5.1
Vegetation/Wildlife Habitats
Annova LNG Lateral Pipeline
Cameron County, Texas

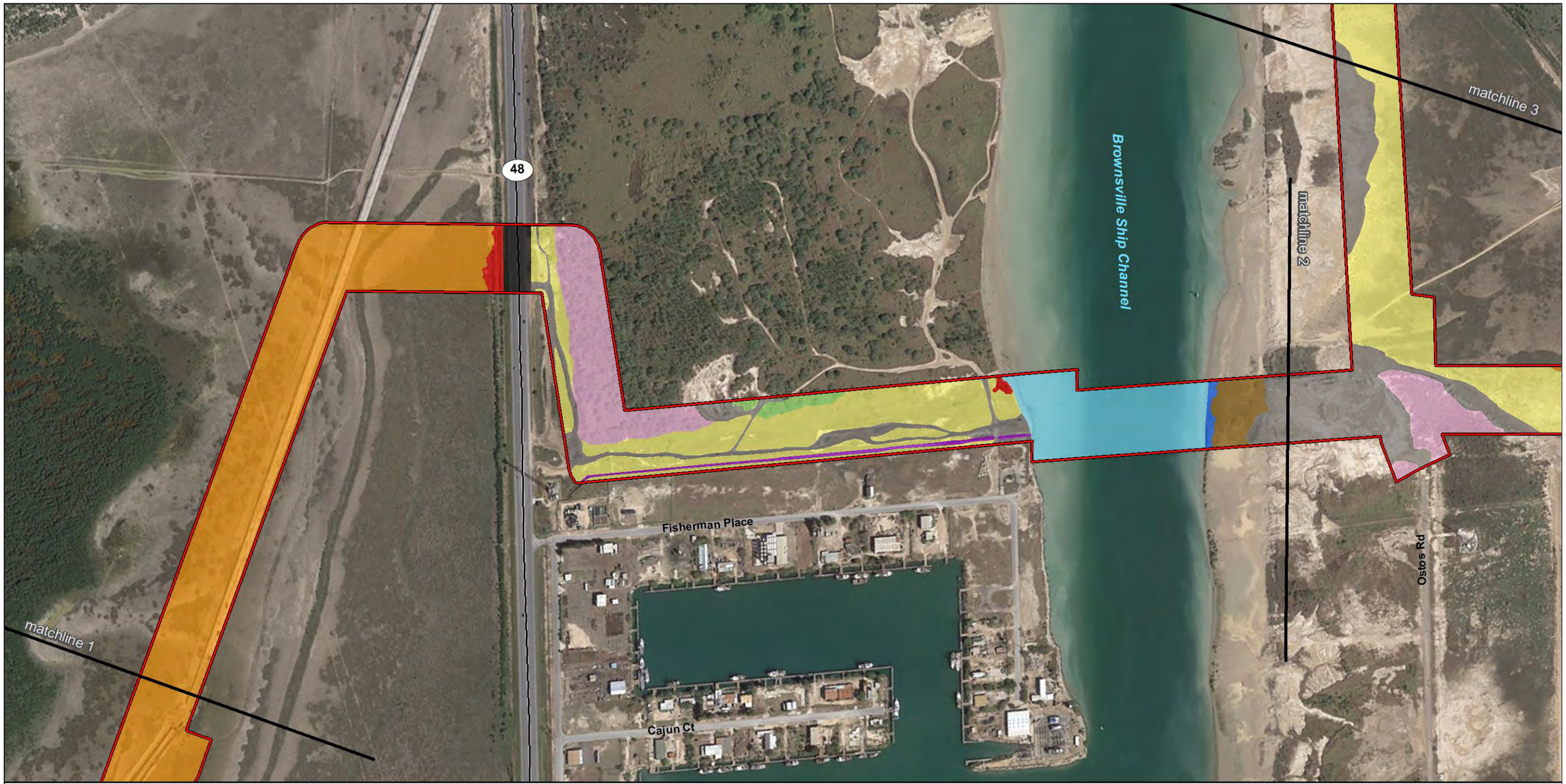


Figure 5.2
Vegetation/Wildlife Habitats
Annova LNG Lateral Pipeline
Cameron County, Texas

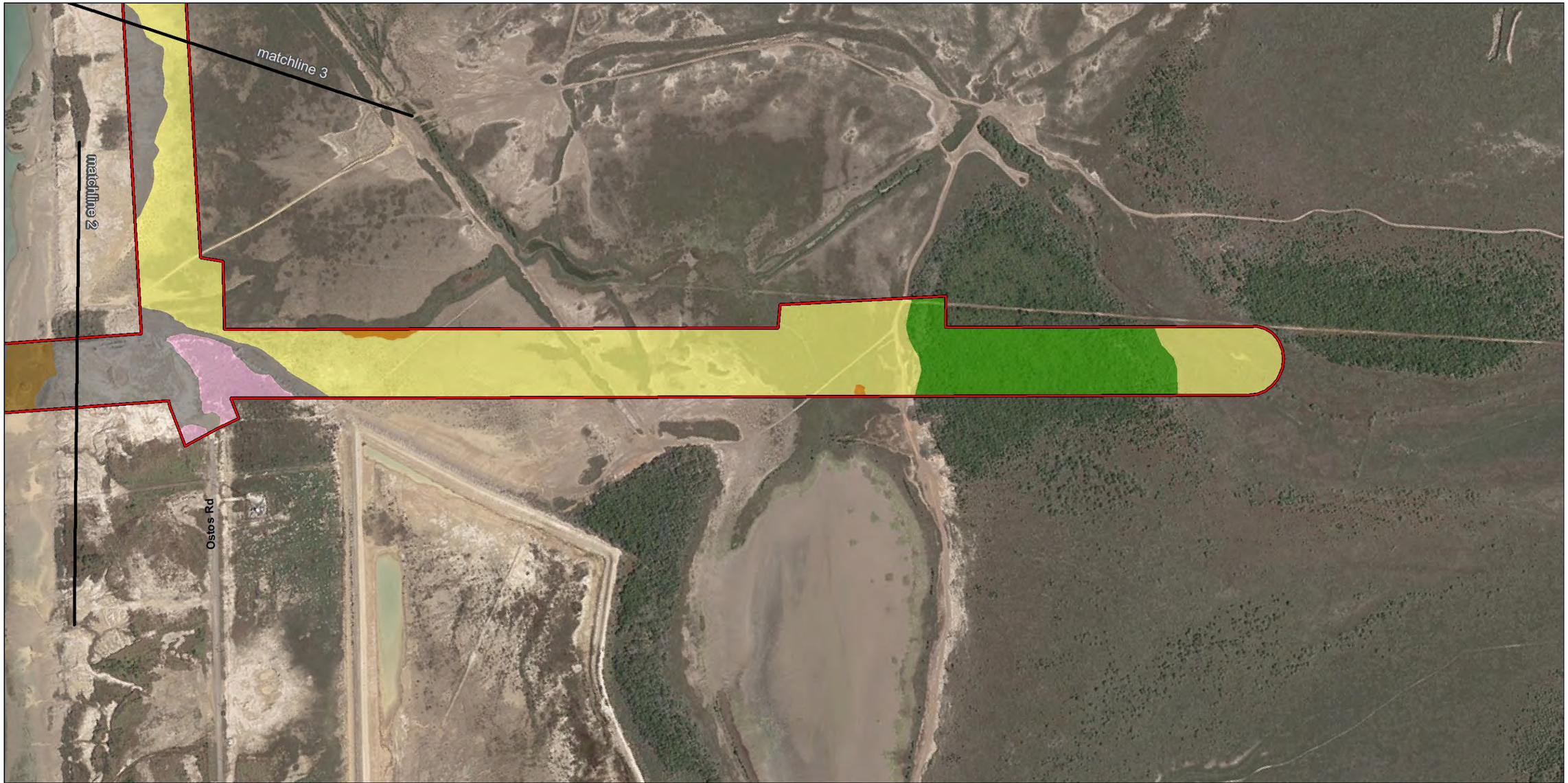


Figure 5.3
Vegetation/Wildlife Habitats
Annova LNG Lateral Pipeline
Cameron County, Texas

Figure 5.4
Vegetation/Wildlife Habitats
Annova LNG Lateral Pipeline
Cameron County, Texas

Figure 5.5
Vegetation/Wildlife Habitats
Annova LNG Lateral Pipeline
Cameron County, Texas

matchline 5

matchline 6

1:6,000

0 250 500

Feet

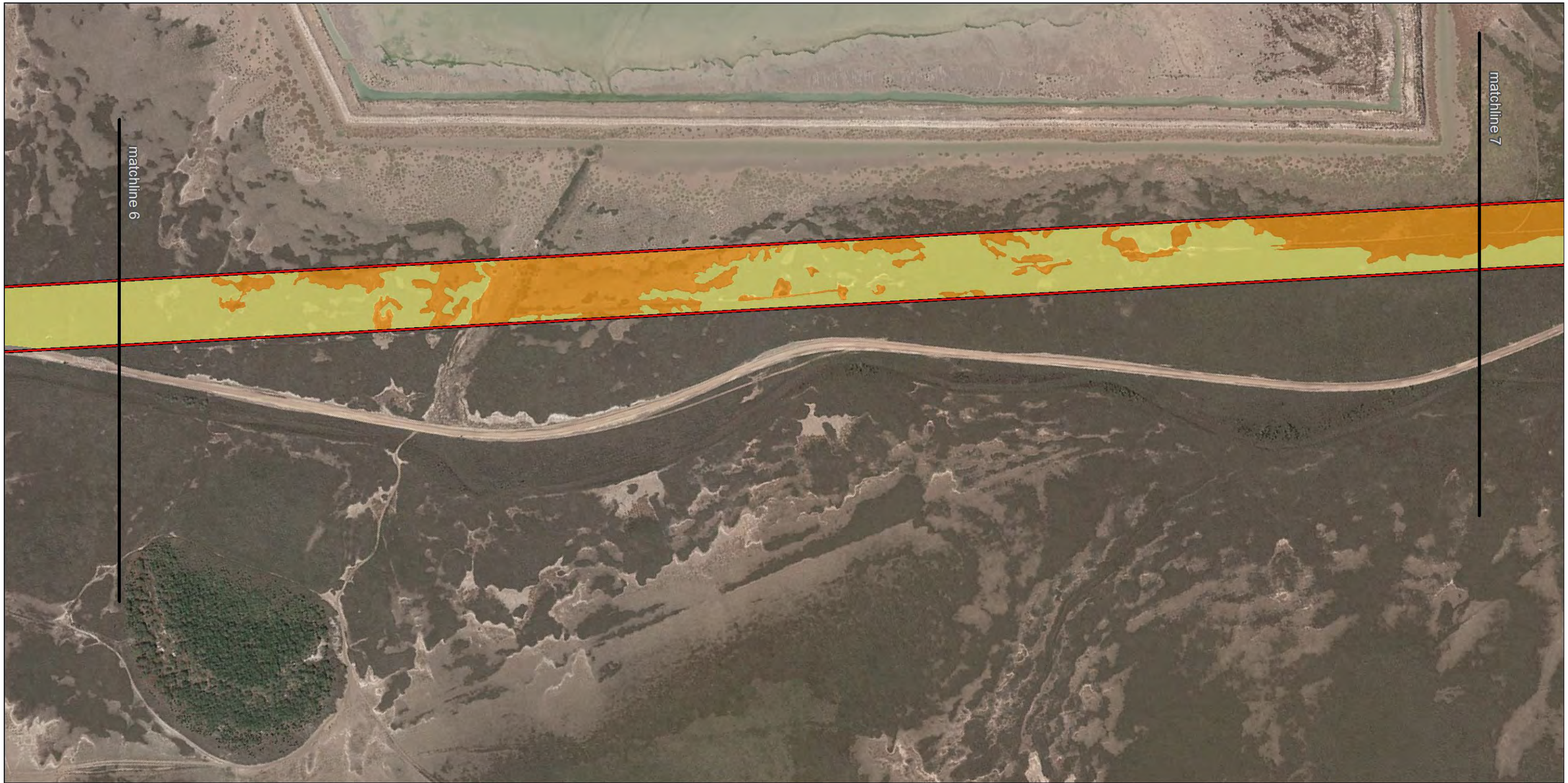
Base Map: Google Imagery, 2017

Survey Corridor (300'ft)

Vegetation/Wildlife Habitat

- Barren
- Coastal: Mangrove Shrubland
- Coastal: Salt and Brackish High Tidal Marsh
- Coastal: Salty Flat/Depression
- Coastal: Unvegetated Flat/Washover
- Freshwater Wetland
- Gulf Coast: Salty Prairie
- Open Water
- South Texas: Disturbance Grassland/Shrubland
- South Texas: Loma Evergreen Shrubland
- South Texas: Loma Grassland/Shrubland
- Transportation

Figure 5.6
Vegetation/Wildlife Habitats
Annova LNG Lateral Pipeline
Cameron County, Texas



1:6,000
0 250 500
Feet

Base Map: Google Imagery, 2017

Survey Corridor (300'ft)

Vegetation/Wildlife Habitat

- Barren
- Coastal: Mangrove Shrubland
- Coastal: Salt and Brackish High Tidal Marsh
- Coastal: Salty Flat/Depression
- Coastal: Unvegetated Flat/Washover
- Freshwater Wetland
- Gulf Coast: Salty Prairie
- Open Water
- South Texas: Disturbance Grassland/Shrubland
- South Texas: Loma Evergreen Shrubland
- South Texas: Loma Grassland/Shrubland
- Transportation

Figure 5.7
Vegetation/Wildlife Habitats
Annova LNG Lateral Pipeline
Cameron County, Texas

Figure 5.8
Vegetation/Wildlife Habitats
Annova LNG Lateral Pipeline
Cameron County, Texas

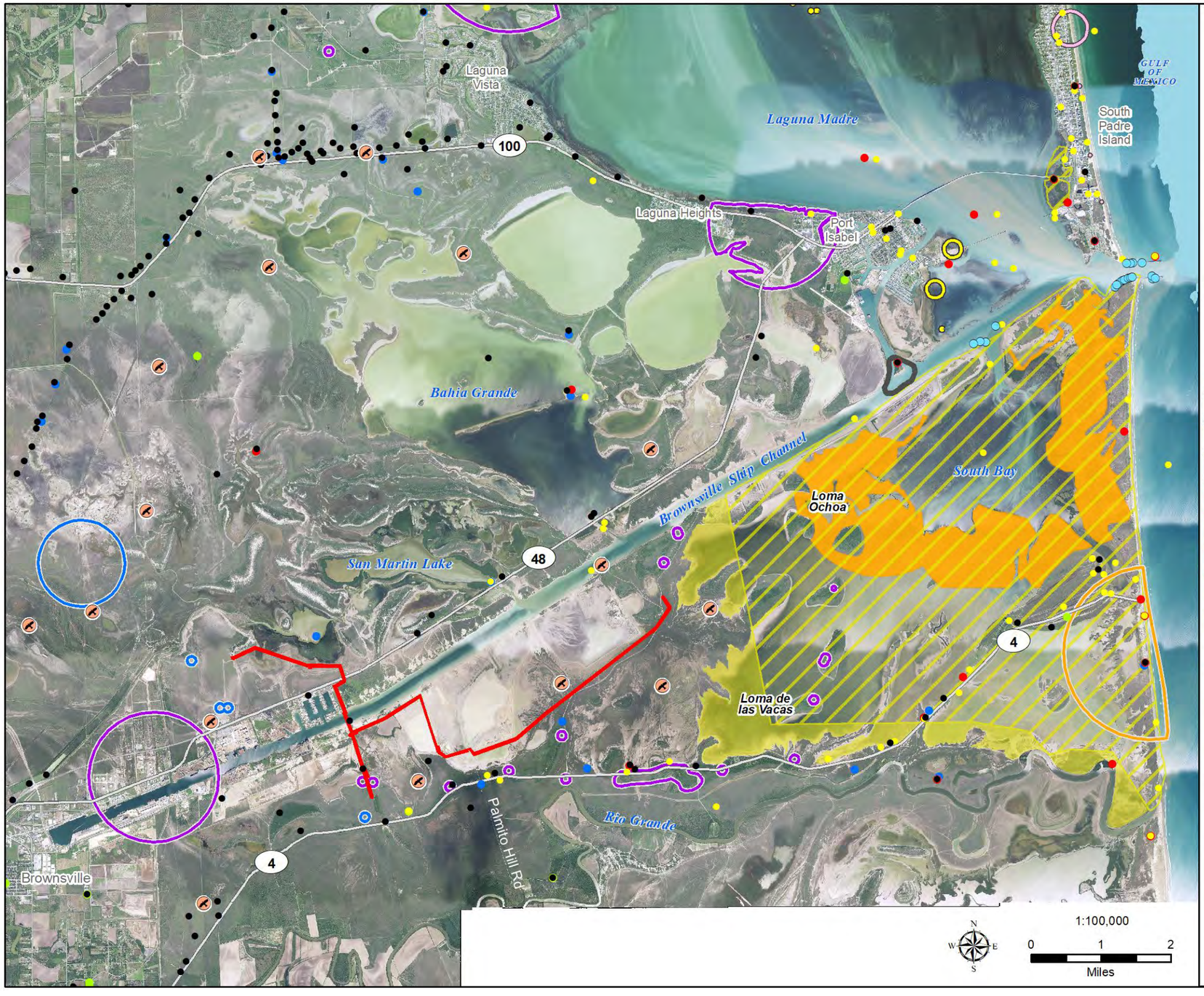


Figure 6
Occurrences and Designated Critical Habitat
in the Vicinity of the Action Area
Annova LNG Lateral Pipeline
Cameron County, Texas

- Green Sea Turtles (Coyne 1994)
- Documented Aplomado Falcon Sightings (Peregrine Fund)
- Aplomado Falcon Observation (eBird)
- Piping Plover Observation (eBird)
- Red Knot Observation (eBird)
- Red-crowned Parrot Observation (eBird)
- Sprague's Pipit Observation (eBird)
- Proposed Natural Gas Pipeline
- Rookery
- Green Sea Turtle Observation (TXNDD)
- Kemp's Ridley Sea Turtle Observation (TXNDD)
- Northern Aplomado Falcon Observation (TXNDD)
- Jaguarundi Observation (TXNDD)
- Ocelot Observation (TXNDD)
- Loggerhead Sea Turtle Critical Habitat
- Piping Plover Designated Critical Habitat (USFWS 2016) *
- Estimated Piping Plover Designated Critical Habitat (Blanton) *
- Piping Plover

* Based on the USFWS' GIS shapefiles available at their Critical Habitat Portal (http://ecos.fws.gov/crithab/), designated critical habitat Unit TX-1 is approximately 0.20 mile east of the Pipeline terminus. However, in the 2001 Final Rule designating piping plover critical habitat published in the Federal Register (http://www.gpo.gov/fdsys/pkg/FR-2001-07-10/pdf/01-16905.pdf#page=100), the textual description of Unit TX-1 states that "the southern and western boundaries follow the change in habitat from wind tidal flat…to where densely vegetated habitat begins and where the constituent elements no longer occur." Based on this textual description, Blanton and Associates used a conservative approach to estimate the textual limits of Unit TX-1.

Source: Texas Natural Diversity Database, EMST-Texas Parks and Wildlife Department, U.S. Fish and Wildlife Service, M. Coyne (Thesis 1994), Peregrine Fund
Basemap: NAIP Aerial Imagery, 2016

APPENDIX B

Representative Photographs

Photo 1. Representative photo of Barren area within an active DMPA

Photo 2. Representative photo of Coastal: Mangrove Shrubland vegetation in the survey corridor

Photo 3. Photo of Coastal: Salt and Brackish High Tidal Marsh vegetation on the south side of the BSC

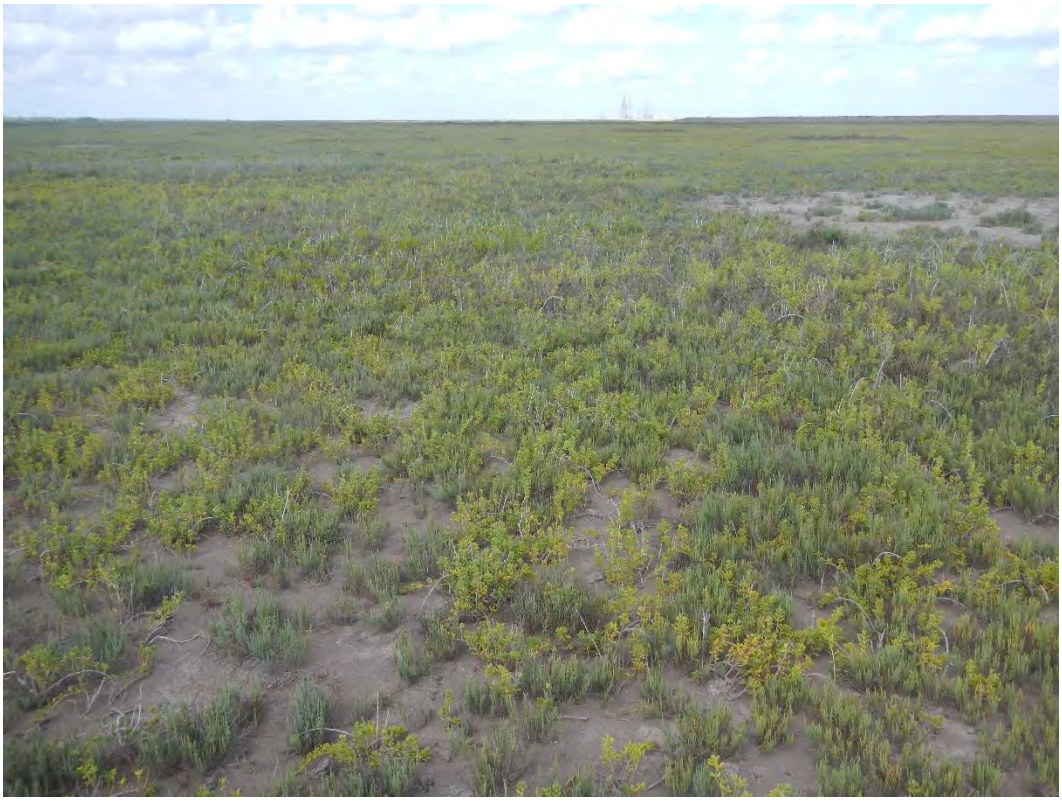


Photo 4. Representative photo of Coastal: Salty Flat/Depression vegetation

Photo 5. Representative photo of Coastal: Unvegetated Flat/Washover area along BSC

Photo 6. Representative photo of Coastal: Unvegetated Flat/Washover area along DMPAs in eastern portion of survey corridor

Photo 7. Representative photo of Freshwater Wetland vegetation in drainage ditch

Photo 8. Representative photo of Gulf Coast: Salty Prairie vegetation

Photo 9. Representative photo of Open Water (BSC, north side)

Photo 10. Representative photo of South Texas: Disturbance Grassland/Shrubland vegetation

Photo 11. Representative photo of South Texas: Loma Evergreen Shrubland vegetation

Photo 12. Representative photo of South Texas: Loma Grassland/Shrubland vegetation