Endangered Species Act Biological Evaluation

Flint Hills Resources Corpus Christi, LLC
Corpus Christi, Texas

In Support of West Refinery Domestic Crude Project Permit Application

Prepared for
Flint Hills Resources

February 2014

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Abbreviations and Acronyms

BACT	Best Available Control Technology
bbl	barrels
BE	Biological Evaluation
CCR	Continuous Catalytic Regeneration
CO	Carbon monoxide
CO_2e	Carbon dioxide equivalent; metric used to compare emissions of different GHGs
C.F.R.	Code of Federal Regulations
DDS	distillate desulfurizer
DHT	distillate hydrotreating unit
dscf	dry standard cubic foot (air flow)
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESL	Effects Screening Levels used by TCEQ air permitting
FCCU	fluid catalytic cracking unit
FHR	Flint Hills Resources Corpus Christi, LLC
ft	feet
GHG	Greenhouse gases
GWP	global warming potential
GOHT	gas oil hydrotreating unit
gpd	gallons per day
gpm	gallons per minute
gr	grain or grains
H_2S	Hydrogen sulfide
HAP	Hazardous air pollutant
I-37	Interstate Highway 37
in	inch
km	kilometer
LDAR	leak detection and repair
m	meter
mi	miles
MMBtu/hr	One million British thermal units per hour
MSA	Magnuson-Stevens Fishery Conservation and Management Act

MSS	maintenance, startup and shutdown
NAAQS	National Ambient Air Quality Standard
NHT	Naphtha Hydrotreater
NMFS	National Marine Fisheries Service
NO_X	Nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NSR	New Source Review
NWI	National Wetland Inventory
PAH	polycyclic aromatic hydrocarbon
$PM/PM_{10}/PM_{2.5}$	Particulate matter / PM less than 10 microns in size / PM less than 2.5 microns in size
ppmv	parts per million by volume
PSD	Prevention of Significant Deterioration
psia	pounds per square inch, absolute
PTE	Potential to emit
Region 6	USEPA; encompasses Arkansas, Louisiana, New Mexico, Oklahoma, Texas and 66 Tribes
scf	standard cubic foot (air flow)
SCR	selective catalytic reduction
SER	significant emission rate for GHG PSD applicability
SO_2	sulfur dioxide
SIL	Significant Impact Level for PSD Class II areas
SIP	State Implementation Plan
TCEQ	Texas Commission on Environmental Quality
TPDES	Texas Pollutant Discharge Elimination System
tpy	tons per year
TPWD	Texas Parks and Wildlife Department
TXNDD	Texas Natural Diversity Database
UDEX	Universal Dow Extraction
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
$\mu g/m^3$	microgram per cubic meter
VOC	Volatile organic compound

Executive Summary

Flint Hills Resources Corpus Christi, LLC (FHR) is proposing modifications to its West Refinery (the Project) located in Corpus Christi, Nueces County, Texas (Figure 1). The proposed modifications require a permit under the U.S. Environmental Protection Agency (USEPA) Greenhouse Gas (GHG) Prevention of Significant Deterioration (PSD) Program pursuant to the federal Clean Air Act (CAA). Section 7(a)(2) of the Endangered Species Act (ESA), 16 U.S.C. § 1536(a)(2), and its implementing regulations at 50 C.F.R. Part 402, requires USEPA to consult, as appropriate, with the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS), or both under certain circumstances, to ensure that USEPA's issuance of the GHG PSD permit is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species, or result in the destruction or adverse modification of such species' designated critical habitat. Though not required by Section 7(a)(2), USEPA also voluntarily considers unlisted candidate species in its Section 7 consultation process. This Biological Evaluation (BE) provides the information necessary to support USEPA's obligations under ESA Section 7(a)(2).

Existing Site and Project Description

In 1981, the West Refinery was purchased from Sun Oil Company, and has since 2002 operated under the name of Flint Hills Resources. Today, the West Refinery has a capacity of about 230,000 barrels per day of crude oil and supplies fuels for major Texas markets such as San Antonio, Austin, and the Dallas-Fort Worth area. In addition, the plant produces various commodity chemicals that are important building blocks for a myriad of household products (FHR 2013a).

The West Refinery is located approximately 13 kilometers [km] (8 miles [mi]) northwest of downtown Corpus Christi and is situated among developed industrial land uses associated with the Port of Corpus Christi Inner Harbor. The Port includes many large industrial developments, dredge disposal areas, a railway system, and an industrial ship channel. The Interstate 37 (I-37) highway corridor is located 300 meters (m) (1,000 feet [ft]) south of the West Refinery with multiple residential clusters located farther south of the highway corridor. Immediately to the north of the West Refinery is the Viola Turning Basin, which is the westernmost end of the Inner Harbor. Just to the north of the Viola Turning Basin is the Nueces River and Nueces Bay, which serve as the border between Nueces County, in which the Project is located, and San Patricio County. The Nueces Delta, immediately north of the Nueces River in San Patricio County, is sparsely populated and undeveloped (Figure 1). The West Refinery is wholly

located within the Texas Coastal Zone (or Coastal Zone Management Area) for purposes of the Coastal Zone Management Act, 16 U.S.C. § 1461, *et seq.*

FHR proposes changes to the West Refinery to meet the objective of increasing the refinery's domestic crude oil processing capabilities. The Project would also modestly increase the total crude processing capacity at the West Refinery. There are no external linear facilities associated with the Project (*e.g.*, no external pipelines or power lines). With the exception of a parking area to be constructed south of the main refinery operations (Figure 2), the proposed modifications associated with the Project will occur within the existing fence line of the refinery, and within the existing equipment, operations, and maintenance areas of the existing facility (Figure 3).

The Project—including construction of the new emission units, changes to existing emission units, and emissions from upstream and downstream affected units will not trigger federal PSD for any non-GHG new source review-regulated pollutants. When considering just the Project emissions, the Project is below the PSD significance thresholds for carbon monoxide (CO), particulate matter (PM), sulfur dioxide (SO_2), and hydrogen sulfide (H_2S) emissions (*i.e.*, the Project will not result in a significant emissions increase for these pollutants). When considering contemporaneous increases and decreases under the second step of the PSD applicability analysis, the Project will cause a *net* emissions *decrease* for oxides of nitrogen (NO_X), PM smaller than 10 microns (PM_{10}), PM smaller than 2.5 microns ($PM_{2.5}$), and volatile organic compounds (VOC) emissions, as well as CO, PM, and SO_2. In fact, the overall Project will result in decreased emissions of non-GHG pollutants, with the exception of ammonia. Therefore, non-GHG pollutants associated with construction of new emission units and changes to existing emission units are subject only to Texas minor new source review (NSR) requirements.

Increases in GHG emissions are estimated at approximately 360,000 tpy CO_2e compared to the PSD significance threshold of 75,000 tpy. The increase occurs as a result of construction of new sources and changes to or increased utilization of various existing emission sources. For more information, refer to Section 3.1 for Affected Emission Unit Descriptions.

Identification of the Action Area

The "action area" bounds the scope of the analysis of effects of the action, (USFWS-NMFS 1998 at 4-15), and so defining the "action area" is the first step in the Section 7 effects analysis process. USFWS regulations define an "action area" as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 C.F.R. § 402.02). "Direct effects" are defined as those "direct or immediate effects of the Project on the species or its habitat"

(USFWS-NMFS 1998 at 4-26). "Indirect effects" are defined as those effects that "are caused by or result from the proposed action, are later in time, and are reasonably certain to occur" (*Id.* at 4-29). Further, "[i]ndirect effects may occur outside of the area directly affected by the action" (*Id.*). FHR identified the Action Area for the Project using the following step-wise approach.

First, FHR established a Preliminary Action Area based on the potential direct effects of the Project. The potential direct effects from the Project include the immediate potential effects of construction and operation of the Project (*e.g.*, ground or habitat disturbance, potential direct effects on listed species, noise, light, and intrusion of construction equipment or permanent structures into airspace.)

Second, FHR assessed the potential indirect effects from the Project of the following: (1) air emissions; (2) water intake and consumption; (3) storm and process wastewater discharges; and (4) changes to marine vessel traffic.

1. For air emission-related potential indirect effects, FHR conducted air dispersion modeling for criteria pollutants and pollutants for which Texas has established Effects Screening Levels (ESLs). The air dispersion modeling results show that neither PSD Significant Impact Levels (SILs) nor ESLs were exceeded at any modeling receptor outside the Preliminary Action Area.

2. For water intake and consumption, additional water for the Project will be obtained from the City of Corpus Christi municipal water system, so it is not reasonably foreseeable that additional water intake or consumptive use will cause potential indirect effects.

3. For storm water discharges, the potential increase in storm water runoff associated with the Project is expected to be insignificant and will be incorporated into the existing storm water handling systems. As a result, it is not reasonably foreseeable that storm water associated with the Project will cause potential indirect effects. For process wastewater discharges, the results of a water quality analysis indicate that any potential increases in concentration, loading, and temperature are small, will not degrade water quality according to Texas water quality guidance, and are within water quality standards. Biomonitoring data from 2012 and 2013 indicates that the current effluent is not toxic to sensitive aquatic species, and because the additional water discharges from the Project are relatively small and similar in chemistry to the existing wastewater, the Project is not expected to have an effect on aquatic life. As a result, it is not reasonably foreseeable that Project wastewater discharges will cause potential indirect effects.

4. For changes to marine vessel traffic, FHR concluded that there will be no increase in barge shipments per month associated with the Project, and it is not reasonably foreseeable that there would be a decrease in barge shipments per month due to the Project.

Third and finally, FHR determined the final Action Area. FHR determined that in the absence of any potential indirect effects outside the Preliminary Action Area from air emissions, water intake and consumption, storm and process wastewater discharges, and changes in vessel traffic, the final Action Area should not be expanded beyond the Preliminary Action Area. The Action Area is therefore defined as follows: (1) the area encompassing the existing equipment, operations, and maintenance activities footprint of the existing refinery; (2) in accordance with EPA instructions, the specific locations of process and storm water outfalls (*i.e.*, Outfalls 001, 005, and 008) and the 200-foot regulatory mixing zone for Outfall 001 (as defined in TPDES Permit No. WQ 0000531000); and (3) the new parking lot that will support construction of the Project (Figure 4).

Federally-Listed Threatened and Endangered Species

There are sixteen federally-listed threatened and endangered species and three candidate species in Nueces County, Texas according to the USFWS and the Texas Parks and Wildlife Department (TPWD) Annotated List of Rare Species (Table ES-1). While the USFWS county list data indicates that these species have been identified for Nueces County, no critical habitat or suitable habitat for these species is located within the Action Area. The National Oceanic and Atmospheric Administration (NOAA) Fisheries website (NOAA 2013) was reviewed for listings of additional endangered marine species and five whale species are identified for the state of Texas (Table ES-1). However, all five whale species are considered deepwater species unlikely to be found in harbor areas or in shallow coastal bays and estuaries (NOAA, 2003; NOAA, 2008). Overall, a total of 21 federally-listed threatened and endangered species and 3 candidate species are identified for this Project.

Based on the records in the Texas Natural Diversity Database (TXNDD, 2013) managed by TPWD, none of the federally-listed species has been recorded within the Action Area. The closest recorded species occurrence is located about 7 km (4 mi) southwest of the Action Area (Figure 5). The closest recorded marine species occurrence is approximately 14 km (8.5 mi) to the east of the Project in Corpus Christi Bay near the mouth of the Inner Harbor (Figure 5).

Using the USFWS Environmental Conservation Online System (ECOS) Critical Habitat Data (2013a) and the NOAA Fisheries Critical Habitat mapping (NOAA, 2014), no critical habitat was identified in the Action Area. The closest critical habitat area is designated on the narrow peninsula between Corpus

Christi Bay and Nueces Bay, approximately 15 km (9 mi) to the east/northeast of the Project (Figure 6). The closest designated critical habitat for a marine species (hawksbill sea turtle) is some 3,200 km (1,900 mi) to the east and south of the Project near Santo Domingo in the Dominican Republic (location not shown due to the large distance of the Project from the designated critical habitat).

No potential habitat for identified federally-listed species was identified within the Action Area, however potential foraging habitat for green sea turtles (*Chelonia mydas),* Kemp's ridley sea turtles (*Lepidochelys kempii)* and loggerhead sea turtles (*Caretta caretta*) was identified as potentially present in the vicinity of Outfall 001, which is a subsurface storm water and wastewater discharge into the Viola Turning Basin. Nevertheless, there are several reasons why the likelihood of occurrence of these species, or any other sea turtle species, decreases with distance upstream of the confluence of the Inner Harbor with Corpus Christi Bay such that it is not reasonably foreseeable that these species would be present near Outfall 001. First, the quality and abundance of forage in the Viola Turning Basin would reasonably be inferior to neighboring ecosystems (e.g., no seagrass beds; Figure 7**)**, such as Nueces and Corpus Christi Bays. Second, the distance a sea turtle would have to travel amidst heavy marine vessel traffic to reach Outfall 001 would be a significant deterrent. Third, the existing dock facility traffic near Outfall 001 would be a deterrent for these species. Nevertheless, USEPA has concluded that the presence of all five sea turtle species cannot be ruled out in the Inner Harbor and the Viola Turning Basin. Additionally, no effects from the Project are reasonably foreseeable near Outfall 001. Specifically, while process wastewater discharges associated with the Project are estimated to increase some parameter concentrations and loading, they will meet water quality standards, will be within acceptable load limits (TCEQ 2010), and will not be acutely or chronically toxic to aquatic life. Nevertheless, USEPA has concluded that any increase in wastewater discharge, parameter concentrations or loadings may cause an effect. Because of USEPA's conclusions, FHR conservatively concludes that the Project may affect but is not likely to adversely affect green sea turtles, hawksbill sea turtles (*Eretmochelys imbricata),* Kemp's ridley sea turtles, leatherback sea turtles (*Dermochelys coriacea*) and loggerhead sea turtles. Any effects would be discountable or insignificant.

The whooping crane (*Grus americana*) is a species of interest for the Project because of the recently expanded whooping crane migratory corridor (Figure 8). Although the Action Area is located within the migratory corridor, the probability that a whooping crane would be present within the Action Area is very low because there is no habitat or source of food within the Action Area. The Project will, however, require the use of tall construction equipment such as construction cranes, and some construction related equipment will extend to 100 m (300 ft) or more above the ground and may have the potential to affect the whooping crane. FHR will include, as part of the Project, best practices for tall construction

equipment that include reducing equipment and construction crane height if practicable when that equipment is not in use and marking all equipment above 15 m (50 ft) tall, including construction cranes, with flagging and/or lighting at their maximum height (see additional discussion in Section 5.4.3.2). Therefore, FHR concludes that the Project may affect but is not likely to adversely affect the whooping crane, and any effects would be discountable or insignificant.

The West Indian manatee (*Trichechus manatus*) is also a species of interest for the Project because of previous sightings in the Corpus Christi area.[1] The Action Area includes Outfall 001, which is a subsurface storm water and wastewater discharge into the Viola Turning Basin, and the associated 200-foot regulatory mixing zone. The manatee is not expected to be present near Outfall 001 because there is no suitable habitat or food (*i.e.*, no seagrass beds) within the Viola Turning Basin **(**Figure 7**)**. While a transient manatee might be attracted to warm water discharges in the Inner Harbor in the winter, the Project itself is not considered a warm water attractant as it would only increase the temperature of the wastewater discharge at Outfall 001 by up to 2 degrees Fahrenheit, a change that will be within the variability of temperatures exhibited by the current discharge and be imperceptible within the Viola Turning Basin. The distance the manatee would travel amidst heavy marine vessel traffic to reach Outfall 001 would also be a significant deterrent to its presence, as would the existing dock facility traffic near Outfall 001. Finally, while process wastewater discharges associated with the Project are estimated to increase some parameter concentrations and loading, they will meet water quality standards, will be within acceptable load limits (TCEQ 2010), and will not be acutely or chronically toxic to aquatic life. Therefore, no indirect effects from wastewater discharges are reasonably foreseeable. The available information could support a determination that the Project will have no reasonably foreseeable effect on West Indian manatees. However, because warm water discharges along the length of the Inner Harbor, including Outfall 001, could act as attractants to West Indian manatees, FHR voluntarily concludes that the Project may affect but will not adversely affect the manatee, and that any effect would be discountable or insignificant.

[1] The West Indian manatee is listed as an endangered species under the Endangered Species Act. *See* 50 C.F.R. § 17.11(h), and is therefore subject to ESA Section 7 consultation with USFWS. While the West Indian manatee is also a marine mammal protected under the Marine Mammal Protection Act of 1972, 16 U.S.C. § 1361, *et. seq.*, Section 1362(12) vests authority over marine mammals other than the order Cetacea and the order Pinnipedia (other than walruses) with USFWS. *See also* NOAA FISHERIES, ENDANGERED AND THREATENED MARINE MAMMALS: LIST OF MAMMAL SPECIES UNDER NMFS' JURISDICTION, http://www.nmfs.noaa.gov/pr/species/esa/mammals.htm (last visited Sep. 24, 2013) (noting list of cetaceans and pinnipeds, and noting USFWS jurisdiction over manatees). Accordingly, the National Marine Fisheries Service plays no jurisdictional role under Section 7 consultations for the West Indian manatee.

Conclusions

The potential for effects related to the Project is limited to the area of construction, operation, and maintenance-related potential direct effects. This area of potential direct effects was not extended to account for indirect effects because: (1) modeling results indicate that air concentrations are less than the respective SIL or ESL at all receptors beyond the area of potential direct effects; (2) water quality and temperature impacts are not reasonably foreseeable as a result of water intake and consumption; (3) water quality impacts are not reasonably foreseeable from storm water or process water discharges; and (4) there are no reasonably foreseeable changes to marine vessel traffic.

FHR has conservatively concluded that effects within the Action Area are limited to potential effects on the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, whooping crane and the West Indian manatee. The Project may affect but is not likely to adversely affect these species because of the low probability of occurrence and in the case of the whooping crane, because of implementing best practices for construction equipment as set forth in more detail in Section 5.4.3.2. For the 5 sea turtle species, the whooping crane and for the West Indian manatee, any effects would be discountable or insignificant.

EPA's action in issuing a GHG PSD permit to FHR for the Corpus Christi West Refinery Domestic Crude Project in Nueces County, Texas may affect but is not likely to adversely affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, whooping crane and West Indian manatee. EPA's action will have no effect on other federally-listed threatened or endangered species or their designated critical habitat or candidate species for Nueces County for purposes of Section 7 of the ESA because no designated critical habitat is within the Action Area and it is not reasonably foreseeable that any other federally-listed threatened, endangered, or candidate species would be present within the Action Area of the Project (Table ES-1).

Table ES-1 Potential for Effects to Federal Threatened and Endangered Species Listed for Nueces County, Texas

Common Name[1]	Scientific Name	Federal Listing Status[2]	Preferred Habitat	Effects Determination
Reptiles				
Green Sea Turtle	*Chelonia mydas*	E, T	Seagrass beds associated with larger coastal bodies of water and inland marine habitats	No documented occurrence or seagrass habitat in Action Area. Nearest seagrass habitat is approximately 9 miles east of the Project in Corpus Christi Bay near the mouth of the Inner Harbor. USEPA concludes that the presence of this species in the Viola Turning Basin cannot be ruled out. FHR therefore conservatively concludes this species may incidentally occur near Outfall 001 and the Project may affect but is not likely to adversely affect this species and any effects would be discountable or insignificant.
Hawksbill Sea Turtle	*Eretmochelys imbricata*	E	Clear off-shore waters near coral reefs	No documented occurrence or coral reef habitat in Action Area; nearest deep sea coral is approximately 23 miles to the north and east of the Project in lower Redfish Bay. USEPA concludes that the presence of this species in the Viola Turning Basin cannot be ruled out. FHR therefore conservatively concludes this species may incidentally occur near Outfall 001 and the Project may affect but is not likely to adversely affect this species and any effects would be discountable or insignificant.
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E	Larger coastal bodies of water and inland marine habitats	No documented occurrence or habitat in the Action Area. USEPA concludes that the presence of this species in the Viola Turning Basin cannot be ruled out. FHR therefore conservatively concludes the species may incidentally occur near Outfall 001 and the Project may affect but is not likely to adversely affect this species and any effects would be discountable or insignificant.

Common Name[1]	Scientific Name	Federal Listing Status[2]	Preferred Habitat	Effects Determination
Leatherback Sea Turtle	*Dermochelys coriacea*	E	Primarily an open ocean dweller that only enters coastal water during nesting season	No documented occurrence or habitat in Action Area; primarily a pelagic species and not expected to be present in the Action Area. USEPA concludes that the presence of this species in the Viola Turning Basin cannot be ruled out. FHR therefore conservatively concludes the species may incidentally occur near Outfall 001 and the Project may affect but is not likely to adversely affect this species and any effects would be discountable or insignificant.
Loggerhead Sea Turtle	*Caretta caretta*	T	Larger coastal bodies of water and inland marine habitats	No documented occurrence or habitat in the Action Area. USEPA concludes that the presence of this species in the Viola Turning Basin cannot be ruled out. FHR therefore conservatively concludes the species may incidentally occur near Outfall 001 and the Project may affect but is not likely to adversely affect this species and any effects would be discountable or insignificant.
Mammals				
Gulf Coast Jaguarundi	*Herpailurus (=Felis) yagouaroundi cacomitli*	E	Thick brush.	No documented occurrence or habitat in Action Area; no effect.
Ocelot	*Leopardus (=Felis) pardalis*	E	Dense, thorny, low brush composed of spiny hackberry, lotus bush, and black brush.	No documented occurrence or habitat in Action Area; no effect.

Common Name[1]	Scientific Name	Federal Listing Status[2]	Preferred Habitat	Effects Determination
West Indian Manatee	*Trichechus manatus*	E	Shallow tropical and subtropical coastal waters with abundant areas of sea grass.	No documented occurrence or habitat in the Action Area; the Project is not a warm water attractant by itself, but there is a very low potential for a manatee to be present near Outfall 001 in the winter because existing warm water discharges in the Inner Harbor may eventually attract it to the Viola Turning Basin. No effects are reasonably foreseen because there is no increase in marine vessel traffic associated with the Project; wastewater discharge associated with the Project will be within permitted limits and meet water quality standards and chemical load threshold; and biomonitoring data indicates the current discharges from Outfall 001 are not acutely or chronically toxic and the Project is not expected to have an effect on future toxicity tests. Despite evidence of "no reasonably foreseeable effect," FHR voluntarily concludes, based on the potential for a manatee to be attracted to warm water discharges in the Inner Harbor and reach the Viola Turning Basin, that the Project may affect but is not likely to adversely affect the manatee and any effects are expected to be discountable or insignificant.
Red wolf	*Canis rufus*	E*	Extensive bottomland forest and swamps.	No documented occurrence or habitat in Action Area; no effect.
Blue Whale	*Balaenoptera musculus*	E	Deepwater ocean habitat off the continental shelf	No documented occurrence or habitat in Action Area; a deepwater ocean species that is not reasonably expected to be present in the Action Area; no effect.
Finback Whale	*Balaenoptera physalus*	E	Deepwater ocean habitat off the continental shelf	No documented occurrence or habitat in Action Area; a deepwater ocean species that is not reasonably expected to be present in Action Area; no effect.
Humpback Whale	*Megaptera novaeangliae*	E	Deepwater ocean habitat off the continental shelf	No documented occurrence or habitat in Action Area; a deepwater ocean species that is not reasonably expected to be present in the Action Area; no effect.
Sei Whale	*Balaenoptera borealis*	E	Deepwater ocean habitat off the continental shelf	No documented occurrence or habitat in Action Area; a deepwater ocean species that is not reasonably expected to be present in the Action Area; no effect.

Common Name[1]	Scientific Name	Federal Listing Status[2]	Preferred Habitat	Effects Determination
Sperm Whale	*Physeter macrocephalus*	E	Deepwater ocean habitat off the continental shelf	No documented occurrence or habitat in Action Area; a deepwater ocean species that is not reasonably expected to be present in Action Area; no effect.
Birds				
Piping Plover	*Charadrius melodus*	T/E	Large open flats or sandy areas.	No documented occurrence or habitat in Action Area; no effect.
Northern Aplomado Falcon	*Falco femoralis septentrionalis*	E	Open grassland or savannah habitat with scattered trees or shrubs.	No documented occurrence or habitat in Action Area; no effect.
Whooping Crane	*Grus Americana*	E	Salt flats or open expanses of herbaceous wetland.	No documented occurrence or habitat in Action Area; the probability of a whooping crane being present in the Action Area is very low. Tall construction equipment may present obstacles to a whooping crane; therefore, the Project may affect but is not likely to adversely affect the whooping crane, and any effects are expected to be discountable or insignificant.
Eskimo curlew	*Numenius borealis*	E*	Grasslands are used for resting and feeding on the travel route between South America and the Arctic	No documented occurrence or habitat in Action Area; no effect.
Fish				
Smalltooth Sawfish	*Pristis pectinata*	E**	Shallow coastal waters of tropical seas and estuaries.	No documented occurrence or habitat in Action Area; no effect.
Plants				
Slender Rush-Pea	*Hoffmannseggia tenella*	E	Clayey soil of blackland prairies and creek banks in association with short and midgrasses.	No documented occurrence or habitat in Action Area; no effect.
South Texas Ambrosia	*Ambrosia cheiranthifolia*	E	Open grasslands or savannas on soils varying from clay loams to sandy loams.	No documented occurrence or habitat in Action Area; no effect.

Common Name[1]	Scientific Name	Federal Listing Status[2]	Preferred Habitat	Effects Determination
Candidate Species				
Red Knot	*Calidris canutus rufa*	C	Intertidal, marine habitats, especially near coastal inlets, estuaries, and bays.	No documented occurrence or habitat in Action Area; no effect.
Sprague's Pipit	*Anthus spragueii*	C	Well-drained, open grasslands and fields.	No documented occurrence or habitat in Action Area; no effect.
Yellow-billed Cuckoo	*Coccyzus americanus*	C	Riparian habitat; cottonwoods and willows, with dense understory	No documented occurrence or habitat in Action Area; no effect.

* USFWS does not list this species. Identified as federally-listed for Nueces County by the Texas Parks and Wildlife Department.
** NOAA Fisheries does not list this species. Identified as federally-listed for Nueces County by the Texas Parks and Wildlife Department.
(1) Source of information for species in Nueces County (Online query of USFWS Nueces County List, originally accessed November 2012; most recently accessed September 2013).
(2) Endangered (E), Threatened (T), or Candidate (C) Species.

1.0 Introduction and Purpose

FHR is proposing modifications to its West Refinery in Corpus Christi, Nueces County, Texas. The West Refinery is located approximately 13 kilometers (km) (8 miles [mi]) northwest of downtown Corpus Christi at the far west end of the Port of Corpus Christi Inner Harbor (Inner Harbor), an area primarily developed with industrial land uses associated with the Port (Figure 1).

Pursuant to Section 7 of the Endangered Species Act (ESA) 1973, as amended, this Biological Evaluation (BE) has been prepared to determine whether the issuance of a GHG PSD permit for the Project by USEPA Region 6 may affect federally-listed species, candidate species, or designated critical habitat, and to provide the information necessary to support USEPA's obligations under ESA Section 7(a)(2).

2.0 Statutory and Regulatory Overview

2.1 Environmental Protection Agency Regulations and Standards

USEPA has approved the State of Texas' State Implementation Plan (SIP) with respect to the issuance of NSR/PSD air permits for non-GHG emissions. Texas' SIP does not include provisions for issuing GHG PSD permits, and USEPA has not delegated the authority to Texas to issue such permits under 40 C.F.R. § 52.21. Consequently, USEPA is the permitting authority in Texas for the issuance of GHG PSD permits.

FHR has applied for a GHG PSD permit from USEPA under 40 C.F.R. § 52.21. This federal air quality permit would authorize GHG emissions associated with the construction and operation of the proposed Project. The proposed Project will not trigger federal PSD for any non-GHG NSR-regulated pollutants.

ESA Section 7(a)(2), and its implementing regulations at 50 C.F.R. Part 402, requires USEPA to consult, as appropriate, with USFWS or NMFS, or both under certain circumstances, to ensure that USEPA's issuance of a GHG PSD permit is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species or result in the destruction or adverse modification of such species' designated critical habitat.

2.2 Endangered Species Act

Section 7(a)(2) of the ESA, and its implementing regulations at 50 C.F.R. Part 402, requires federal agencies, in consultation with the USFWS or the NMFS, or both under certain circumstances, to ensure that actions the federal agency authorizes, funds or carries out (*e.g.*, USEPA's issuance of a GHG PSD permit) are not likely to jeopardize the continued existence of federally-listed threatened or endangered species or result in the destruction or adverse modification of designated critical habitat of such species.

The USFWS and NMFS have authority to determine which species are eligible for listing as "endangered" or "threatened." Endangered is defined as "any species which is in danger of extinction throughout all or a significant portion of its range" (16 U.S.C. § 1532(6); 50 C.F.R. § 424.02(e)). "Threatened" is defined as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C. § 1532(20); 50 C.F.R. § 424.02(m)). The USFWS has authority for land and freshwater species while the NMFS has

authority for marine and "anadromous" species. The NMFS has jurisdiction over 94 listed species, including marine mammals and marine turtles.[2]

The primary purpose of this BE is to determine the potential effects to any threatened and endangered species that are known to be present or have the potential to be present in the Action Area (defined in Section 4.0). The effects analysis addresses the potential for direct and indirect effects from the Project and its interrelated and interdependent activities using the best available scientific and commercial data available. FHR has not identified any actions that are interrelated or interdependent with the Project.

The conclusion from this BE establishes one of three categories of possible effect levels for each federally-listed threatened and endangered species consistent with guidelines provided in 50 C.F.R. Part 402. USFWS and NMFS guidance provides for the following possible determinations for a species:

- **No effect.** A "no effect" determination is the appropriate conclusion when the action agency determines its proposed action will not affect a listed species or designated critical habitat. "No effect" determinations do not require written concurrence from USFWS/NMFS.
- **May affect, not likely to adversely affect.** A "may affect, not likely to adversely affect" determination is the appropriate conclusion when a proposed action may pose any effects on listed species or designated critical habitat, but where those effects on listed species are expected to be discountable, insignificant, or completely beneficial. Beneficial effects have contemporaneous positive effects without any adverse effects to the species or habitat. Insignificant effects relate to the size of the effects and should not reach the scale where take occurs. Discountable effects are those that are extremely unlikely to occur. This conclusion is usually reached through the informal consultation process, and written concurrence from USFWS/NMFS exempts the proposed action from formal consultation. The concurrence by USFWS/NMFS completes the informal consultation.
- **May affect, likely to adversely affect.** A "may affect, likely to adversely affect" determination is the appropriate conclusion when a proposed action may pose any effects on listed species or designated critical habitat, where those effects to listed species are adverse,

[2] The West Indian manatee is listed as an endangered species under the Endangered Species Act. *See* 50 C.F.R. § 17.11(h), and is therefore subject to ESA Section 7 consultation with USFWS. While the West Indian manatee is also a marine mammal protected under the Marine Mammal Protection Act of 1972, 16 U.S.C. § 1361, *et. seq.*, Section 1362(12) vests authority over marine mammals other than the order Cetacea and the order Pinnipedia (other than walruses) with USFWS. *See also* NOAA FISHERIES, ENDANGERED AND THREATENED MARINE MAMMALS: LIST OF MAMMAL SPECIES UNDER NMFS' JURISDICTION, http://www.nmfs.noaa.gov/pr/species/esa/mammals.htm (last visited Sep. 24, 2013) (noting list of cetaceans and pinnipeds, and noting USFWS jurisdiction over manatees). Accordingly, the National Marine Fisheries Service plays no jurisdictional role under Section 7 consultations for the West Indian manatee.

and the adverse effect is not discountable, insignificant, or beneficial. Section 7 of the ESA requires that the federal action agency request initiation of formal consultation with USFWS/NMFS when a “may affect, likely to adversely affect” determination is made (USFWS, 2012a). The formal consultation is further described in guidance from the USFWS/NMFS (USFWS-NMFS 1998).

3.0 Project Description

3.1 Project Purpose and Process

FHR proposes to expand the West Refinery's domestic crude oil processing capabilities and modestly increase the total crude processing capacity with the modifications to existing equipment and the addition of new equipment. Information from the GHG PSD Permit Application and the Non-GHG Permit Application is summarized as follows.

FHR is proposing to construct the following new emission units:

- A new process unit called the Saturates Gas (Sat Gas) Plant No. 3, including a new hot oil heater and equipment piping fugitive components. The new hot oil heater will be equipped with selective catalytic reduction (SCR) to reduce NO_X emissions and a catalyst bed to reduce carbon monoxide (CO) and VOC emissions.
- A new cooling tower in the Mid-Plant area.
- New equipment piping fugitive components in several existing process units.
- Two new internal floating roof tanks.

FHR is proposing changes to existing emission units:

Changes to CCR Hot Oil Heater and NHT Charge Heater

- Increase in permitted firing duty of the CCR (Continuous Catalytic Reformers) Hot Oil Heater.
- Installation of SCR on the CCR Hot Oil Heater and NHT Charge Heater to reduce NO_X emissions from the heaters.
- A decrease in the maximum hourly SO_2 allowable emission rate for the CCR Hot Oil Heater and the NHT Charge Heater as a result of decreasing the maximum sulfur content in the fuel gas from 10 gr/100 dscf to 7.2 gr/100 scf based on fuel gas sampling.
- A decrease in the CO allowable emission rates for the CCR Hot Oil Heater and the NHT Charge Heater as a result of the new CO concentration limit of 50 ppmv (at 3% O2) in the exhaust.

Changes to Marine Terminal/Marine Vapor Combustor

- Increase in permitted annual loading rate of naphtha and gasoline into ships and barges at the marine terminal.
- Incorporation of PBR Registration Nos. 103051 and 103706, which were associated with the Marine Vapor Combustor (EPN VCS-1).
- Decrease in the annual benzene loading rate from 18,250,000 bbl/yr to 4,000,000 bbl/yr.
- A decrease in the permitted hourly loading rate of several of the materials loaded at the marine terminal where emissions are controlled by the Marine Vapor Combustor.
- Removal of "Penexate" as an authorized material loaded at the marine terminal since this material is no longer produced at the refinery.
- Revising the method for calculating the NO_X and CO allowable emission limits for the Marine Vapor Combustor to be based on the firing capacity of the Marine Vapor Combustor rather than the heat content of the vapors routed to the combustor.
- Revising the method for calculating the hourly VOC emission rate from the Marine Vapor Combustor based on the maximum emission rate from any one material rather than the summation of multiple materials.
- A decrease in the fuel sulfur content of the natural gas combusted in the Marine Vapor Combustor to more accurately reflect supplier specifications and sampling. The hourly sulfur content is being decreased from 6 gr/100 scf to 5 gr/100 dscf based on supplier specifications, and the annual sulfur content is being decreased from 10 gr/100 dscf to 0.5 gr/100 dscf based on sampling.
- Revising the method for calculating crude oil emissions from the marine vapor combustor to be based on AP-42, Equation 5.2-1 rather than AP-42, Equations 5.2-2 and 5.2-3.
- An increase in the control efficiency and a decrease in the NO_X and CO emission factors at the Marine Vapor Combustor based on recent stack test data.
- Inclusion, for the first time, of PM, PM_{10}, $PM_{2.5}$, and H_2S emission rate limits applicable to the Marine Vapor Combustor.

Changes to Other Existing Emission Units

- Implementation of annual flange/connector monitoring in some of the process units to reduce VOC emissions.
- An increase in permitted throughputs for storage tanks and increase in true vapor pressures of materials stored in some tanks.

- Inclusion, for the first time, of H_2S emission rate limits applicable to crude oil storage tanks.
- Revising the calculation method for all pollutants for the API Separator Flare (EPN V-8) based on the measured flow rate and composition of the vent gas stream routed to the flare rather than the calculated (using AP-42 emission factors) stream flow rate and composition.
- Conversion of the current Gas Oil Hydrotreating Unit (GOHT) to a Distillate Hydrotreating Unit (DHT).
- An increase in annual MSS (Maintenance, Startup, and Shutdown) emissions as a result of new equipment being installed.
- Physical changes to the Sulfur Recovery Complex to reduce its processing rate. As part of this, FHR is proposing to shutdown Sulfur Recovery Unit (SRU) No. 1.
- Operation of the fluid catalytic cracking unit (FCCU) Catalyst Regenerator in full burn to reduce CO emissions.
- Treatment of the Mid-Plant fuel gas system to reduce the amount of sulfur in the fuel gas prior to combustion in the heaters utilizing this fuel gas system, which would reduce SO_2 emissions from heaters.

In addition, there will be increases in actual emissions for some emission units as a result of increased utilization or debottlenecking.

There are no external linear facilities (*e.g.*, pipelines, power lines, or rail lines) related to the proposed Project. Some new piping will be installed in an existing pipe rack that connects the West Crude Area with the Mid-Plant Area. Raw materials will be delivered to the West Refinery, and products will be distributed, using existing infrastructure. The proposed Project is independent of any other projects that may be under consideration along the Inner Harbor.

The following provides more detailed information about the Project and associated emission units and process-related changes.

CCR/NHT Units

The Continuous Catalytic Regeneration (CCR) and Naphtha Hydrotreater (NHT) Units are existing process units at the West Refinery currently authorized by TCEQ Permit No. 8803A. FHR is proposing process changes in the CCR and NHT Units that require an increase in the firing duty of the CCR Hot Oil Heater (39BA3901) from 90 MMBtu/hr (HHV) to 123.6 MMBtu/hr (HHV) and the installation of new equipment piping components in the CCR and NHT Units. FHR is installing a SCR system to reduce NO_X emissions from the NHT Charge Heater (39BA3900) and the CCR Hot Oil Heater. These two

heaters share a common stack (EPN JJ-4), and the SCR system will be installed after the emissions from the two heaters are combined.

FHR is reducing the CO allowable emission limit of the CCR Hot Oil Heater and NHT Charge Heater based on 50 ppmv (at 3% O2) in the exhaust. FHR is reducing the hourly SO_2 allowable emission limit for both heaters as a result of decreasing the maximum sulfur content in the fuel gas from 10 gr/100 dscf to 7.2 gr/100 scf based on fuel gas sampling. FHR is proposing an LDAR (leak detection and repair) program to reduce fugitive emissions of VOC from new equipment piping components at these units. Last, FHR is proposing annual instrument monitoring for all new and existing gas/vapor and light liquid flanges/connectors at these units.

General Process Description. The purpose of the NHT Unit is to remove sulfur, nitrogen and saturate olefins catalytically from the naphtha feed to the CCR unit. Hydrotreating removes impurities from a petroleum fraction by contacting the stream with hydrogen in the presence of a catalyst at high temperatures and pressures. The CCR Unit converts naphtha to aromatics consisting primarily of benzene, toluene, and xylene. Aromatics are produced by the dehydrogenation of naphthenes and cyclization of paraffins. The dehydrogenation process also produces a hydrogen by-product. The aromatic compounds are then separated and further processed in other units. Hydrogen is consumed as fuel gas or used as feed to other units.

DHT Unit (Previously GOHT Unit)

The Gas Oil Hydrotreater (GOHT) Unit is an existing unit at the West Refinery currently authorized by TCEQ Permit No. 8803A. FHR is converting the existing GOHT Unit to the Distillate Hydrotreater (DHT) Unit. The proposed Project will require installation of new equipment piping components in the DHT Unit. There are no proposed physical changes or changes in method of operation for the DHT Stripper Reboiler (37BA2). However, as a result of this Project, the reboiler could potentially run at a higher duty and experience an increase in actual emissions of all pollutants except SO_2 above past actual emissions. The increased actual emissions will be below the currently authorized allowable emission rates. Therefore, FHR is not proposing any increases in the current allowable emission rates.

FHR is proposing an LDAR program to reduce fugitive emissions of VOC from new equipment piping components at the DHT Unit. FHR is proposing annual instrument monitoring for all new and existing gas/vapor and light liquid flanges/connectors at the DHT Unit. FHR is also proposing an emission reduction project that will reduce the sulfur content of the fuel gas prior to combustion in the DHT Charge Heater (37BA1) and the DHT Stripper Reboiler (37BA2). Therefore, these two heaters will see a

reduction in actual SO_2 emissions from past actual emission levels. FHR is proposing to decrease the SO_2 allowable emission limit for these two heaters to reflect the emission reduction project.

General Process Description. The DHT Unit removes sulfur from a mixed distillate feed consisting of naphtha, gas oil, light cycle oil, and diesel to produce a diesel fuel product meeting the EPA requirements for sulfur content.

Mid Crude Unit

The Mid Crude Unit is an existing unit at the West Refinery currently authorized by TCEQ Permit No. 8803A. The Project will require the installation of new equipment piping components in the Mid Crude Unit. FHR is not proposing any physical changes or changes in the method of operation for the Mid Crude Charge Heater or the Mid Crude Vacuum Heater and, based on a process engineering analysis, these emission units are not considered downstream or upstream sources affected by the Project.

FHR is proposing an LDAR program to reduce fugitive emissions of VOC from new equipment piping components. FHR is proposing annual instrument monitoring for all new and existing gas/vapor and light liquid flanges/connectors. FHR is also proposing an emission reduction project which will reduce the sulfur content of the fuel gas prior to combustion in the Mid Crude Charge Heater (42BA1) and the Mid Crude Vacuum Heater (42BA3). Therefore, these two emission units will see a reduction in actual SO_2 emissions from past actual emission levels. FHR is proposing to decrease the SO_2 allowable emission limit for these two emission units to reflect the emission reduction project.

General Process Description. The Mid Crude separates crude oil into fractions by distillation and steam stripping using the differences in boiling ranges to effect the separation. Distillate fractions produced by the crude unit include light ends, naphtha, jet fuel, diesel fuel or No. 2 fuel oil, gas oil, and residual oil. Pressures range from atmospheric to near full vacuum.

Saturates Gas Plant No. 3

FHR is proposing to construct a new Saturates Gas (Sat Gas) Plant No. 3 Unit. The new unit will include the Sat Gas No. 3 Hot Oil Heater and new equipment piping components. FHR will install an SCR system on the Sat Gas No. 3 Hot Oil Heater to reduce NO_X emissions and a catalyst bed to reduce CO and VOC emissions. The hot oil heater will have a maximum fired duty of 450 MMBtu/hr (HHV). FHR is proposing an LDAR program to reduce fugitive emissions of VOC from new equipment piping components, including annual instrument monitoring for all new gas/vapor and light liquid flanges/connectors.

General Process Description. The Saturates Gas Plant No. 3 will operate to recover propane and heavier hydrocarbons from a number of refinery streams and to fractionate the recovered hydrocarbons into various product streams. Hydrocarbon recovery will be via absorption by a combination of internally produced “lean oil” for propane recovery and by externally fed sponge oil(s) for heavy-ends recovery.

The unit will produce a fuel gas that is lean in C3+ hydrocarbons, a propane liquid product, a isobutene product, a normal butane product, a C5+ liquid product, a rich sponge oil return liquid and a sour water waste stream. Each of these streams will be sent out of the unit for further treating, sales or as feedstocks.

UDEX Unit

The Universal Dow Extraction (UDEX) Unit is an existing unit at the West Refinery currently authorized by TCEQ Permit No. 8803A. The proposed Project will require installation of new equipment piping components in the UDEX Unit. FHR is proposing an LDAR program to reduce fugitive emissions of VOC from new equipment piping components, including annual instrument monitoring for all new gas/vapor and light liquid flanges/connectors.

General Process Description. The UDEX Unit removes aromatics from a feed stream composed of toluene, mixed xylenes, benzene and heavy aromatics. The aromatics are removed from the feed stream through using glycol and liquid-liquid extraction and exit the unit as extract product that is further separated in downstream fractionation columns. The non-aromatics along with some aromatics end up in the raffinate product stream.

West Crude

The West Crude Unit is an existing unit at the West Refinery currently authorized by TCEQ Permit No. 8803A. The proposed Project will require installation of new equipment piping components in the West Crude Unit. FHR is proposing an LDAR program to reduce fugitive emissions of VOC from new equipment piping components. FHR is also proposing annual instrument monitoring for all new and existing gas/vapor and light liquid flanges/connectors.

General Process Description. The West Crude separates crude oil into fractions by distillation and steam stripping using the differences in boiling ranges to affect the separation. Distillate fractions produced by the crude unit include light ends, naphtha, jet fuel, diesel fuel or No. 2 fuel oil, gas oil, and residual oil. Pressures range from atmospheric to near full vacuum.

Utilities

The utilities area at the West Refinery consists of four existing boilers. There are no proposed physical changes or changes in method of operation to any of these boilers. However, as a result of this Project, there will be an increase in steam demand so the boilers could potentially run at a higher duty and experience an increase in actual emissions above past actual emissions as a result of increased utilization. The increased actual emissions will be below the currently authorized allowable emission rates. Therefore, FHR is not proposing any increases in any of the boilers' current permit allowable emission rates or authorized maximum duty rates.

FHR is also proposing an emission reduction project that will reduce the sulfur content of the fuel gas prior to combustion in the Mid Crude Boiler. Therefore, the Mid Crude Boiler will see a reduction in actual SO_2 emissions from past actual emission levels. FHR is proposing to decrease the SO_2 allowable emission limit for the boiler to reflect the emission reduction project. Lastly, FHR is decreasing the CO allowable emission rate limit for the Mid Crude Boiler by updating the emission factor to more accurately reflect emissions measured by the continuous emissions monitor (CEM).

General Process Description. The Boilers provide steam for use throughout several process units.

Marine Loading

As a part of the Project, FHR is proposing to increase the permitted annual loading rate of naphtha and gasoline into ships and barges at the marine terminal. Emissions resulting from these loading operations are controlled by the Marine Vapor Combustor, which is authorized under TCEQ Permit No. 6819A. FHR is not proposing any increases to the annual loading rates of other products loaded at the marine terminal and controlled by the Marine Vapor Combustor. However, FHR is proposing to decrease the hourly loading rates of several of the materials loaded at the marine terminal and controlled by the Marine Vapor Combustor.

The Marine Vapor Combustor is considered a modified source for minor NSR purposes because of the proposed increase in the permitted annual naphtha and gasoline loading rates. FHR is also:

- Increasing the control efficiency and decreasing the NO_X and CO emission factors at the Marine Vapor Combustor based on recent stack test data.
- Adding Light Straight Run, or Mixed Pentanes, as an authorized material as a result of incorporating PBR Registration No. 103051.

- Incorporating PBR Registration No. 103706, which authorized an increase in the annual gasoline loading rate from 1,900,000 bbl/yr to 4,000,000 bbl/yr (Note: this amendment proposes to increase the gasoline loading rate to 6,935,000 bbl/yr).
- Decreasing the permitted annual benzene loading rate from 18,250,000 bbl/yr to 4,000,000 bbl/yr.
- Decreasing the permitted hourly loading rate of many of the materials controlled by the Marine Vapor Combustor.
- Revising the method for calculating the NO_X and CO allowable emission limits for the Marine Vapor Combustor to be based on the firing capacity of the Marine Vapor Combustor rather than the heat content of the vapors routed to the combustor.
- Revising the method for calculating the hourly VOC emission rate from the Marine Vapor Combustor based on the maximum emission rate from any one material rather than the summation of multiple materials.
- Decreasing the fuel sulfur content of the natural gas combusted in the Marine Vapor Combustor to more accurately reflect supplier specifications and sampling. The hourly sulfur content is being decreased from 6 gr/100 scf to 5 gr/100 dscf based on supplier specifications, and the annual sulfur content is being decreased from 10 gr/100 dscf to 0.5 gr/100 dscf based on sampling.
- Revising the method for calculating crude oil emissions from the marine vapor combustor to be based on AP-42, Equation 5.2-1 rather than AP-42, Equations 5.2-2 and 5.2-3.
- Removing penexate as a material loaded at the marine terminal since the product is no longer produced at the refinery.

The result of all of the above changes is an overall decrease in the annual NO_X, CO, and VOC allowable emissions.

FHR is also proposing for the first time PM, PM_{10}, $PM_{2.5}$, and H_2S emission limits for the Marine Vapor Combustor. The particulate matter and H_2S emissions are not new emissions resulting from a physical change or change in the method of operation, but are being estimated now consistent with current TCEQ practices.

General Process Description. FHR's West Refinery uses three docks (No. 8, 9, and 10) for marine loading of both ships and barges. When loading toluene, benzene, xylene (all isomers), gasolines and blend stocks, naphthas, cumene, pseudocumene, light straight run (mixed pentanes), and crude oil, emissions are captured by a vacuum-assisted loading operation and routed to the Marine Vapor Combustor (VCS-1)

for control. The Marine Vapor Combustor is an enclosed flare with a minimum VOC destruction efficiency of 99.5% based on stack testing. The Marine Vapor Combustor converts H_2S to SO_2 at a minimum efficiency of 98%. The Marine Vapor Combustor uses natural gas as the fuel to the burners of the combustor.

Tank Farm

FHR is proposing to construct two new internal floating roof (IFR) tanks and increase the throughput for and/or change the vapor pressure of the materials stored in other existing tanks. FHR is also proposing to establish grouped annual emission rate limits for some of the tanks while maintaining an hourly emission rate limit for each individual tank in the group.

The two new IFR tanks will have capacities of 100,000 bbl and 75,000 bbl, respectively, and will have internal floating roofs. The new IFR tanks will be equipped with a suspended floating roof to minimize emissions from fittings and a primary and secondary seal to minimize emissions from rim seals. These tanks will store materials with a true vapor pressure less than 10.9 psia.

Tanks 08FB108R1, 08FB109R, 40FB4012, and 40FB4013 are existing internal floating roof tanks authorized to store materials with a true vapor pressure less than 10.9 psia. Tank 15FB507 is an existing external floating roof tank authorized to store materials with a true vapor pressure less than 10.9 psia. Tank 40FB3041 is an existing fixed-roof tank authorized to store materials with an annual true vapor pressure less than 0.02 psia and a maximum true vapor pressure less than 0.07 psia. There are no physical changes or changes in method of operation proposed for storage tanks 08FB108R1, 08FB109R, 15FB507, 40FB3041, 40FB4012, and 40FB4013. However, as a result of this Project, the tanks will experience an increase in emissions of VOCs above past actual emissions. The increased actual emissions will be below the currently authorized allowable emission rates. Therefore, for these tanks, FHR is not proposing any increases in the current permit allowable emission rates.

Tanks 08FB137 and 08FB147 are existing internal floating roof tanks and Tank 08FB142 is an existing external floating roof tank. All three tanks are authorized to store materials with a true vapor pressure less than 10.9 psia. There are no physical changes or changes in the method of operation proposed for storage tanks 08FB137, 08FB142, and 08FB147. However, as a result of this Project, the tanks will experience an increase in emissions of VOCs above past actual emissions. The increased actual emissions will be below the currently authorized allowable emission rates. Therefore, FHR is not proposing any increases in the current permit allowable VOC emission rates. FHR is also proposing for the first time H_2S emission limits for storage tanks 08FB137, 08FB142, and 08FB147. The H_2S emissions are not new emissions

resulting from a physical change or change in the method of operation, but are now being estimated consistent with TCEQ practices.

Tanks 11FB402 and 11FB403 are existing internal floating roof tanks and are authorized to store materials with a true vapor pressure less than 10.9 psia. There are no physical changes or changes in the method of operation proposed for storage tanks 11FB402 and 11FB403. However, as a result of this Project, the tanks will experience an increase in actual emissions of VOCs above past actual emissions.

Tanks 11FB408, 11FB409, and 11FB410 are existing external floating roof tanks. FHR is proposing to increase the currently permitted annual throughput for Tanks 11FB408, 11FB409, and 11FB410 and to decrease the currently permitted true vapor pressure of the materials stored in the tanks to 0.5 psia, which result in an overall decrease in allowable emission rates. FHR is also proposing an annual grouped emission limit for these three tanks and an individual hourly emission limit for each of the tanks. The tanks' future potential emissions are based on the proposed allowable throughput and vapor pressure.

Tank 15FB508 is an existing external floating roof tank, and Tank 15FB510 is an existing fixed-roof tank. There are no physical changes or changes in the method of operation proposed for existing storage tank 15FB508. FHR is proposing to decrease the true vapor pressure of the materials stored in Tank 15FB508 to 0.5 psia. FHR is proposing to increase the currently permitted annual throughput for Tank 15FB510 and increase the true vapor pressure of the materials stored in the tank to 0.5 psia, which is higher than prior permit representations. Therefore, Tank 15FB510 is considered a modified source for minor NSR purposes. FHR will be installing an internal floating roof in Tank 15FB510 as part of a pollution control project separate from the Project proposed in this application. FHR is also proposing an annual grouped emission limit for these two tanks and an individual hourly emission limit for each of the tanks. There is an overall decrease in emissions as a result of the pollution control project and proposed changes for these tanks. Although there are no physical changes or changes in the method of operation proposed for Tank 15FB508, the tank is considered modified for minor NSR purposes because it is being included in a group with Tank 15FB510, which is considered modified because of the increase in permitted throughput and vapor pressure. The tanks' future potential emissions are based on the proposed allowable throughput and vapor pressure.

Tanks 40FB3043 and 40FB3044 are existing fixed-roof tanks. FHR is proposing to increase the currently permitted annual throughput for Tanks 40FB3043 and 40FB3044 and increase the true vapor pressure of the materials stored in the tanks to 0.5 psia, which is higher than prior permit representations. Because the annual throughput and true vapor pressure of the tanks will be increasing above permitted rates as a result

of this Project, the tanks are considered modified sources for minor NSR purposes. FHR will be installing an internal floating roof in both tanks as part of a pollution control project separate from the Project proposed as part of this application. FHR is also proposing an annual grouped emission limit for these two tanks and an individual hourly emission limit for each of the tanks. There is an overall decrease in emissions as a result of the pollution control project and proposed changes for these tanks. The tanks' future potential emissions are based on the proposed allowable throughput and vapor pressure.

Tanks 40FB4010 and 40FB4011 are existing external floating roof tanks. FHR is proposing to increase the currently authorized annual throughput for Tanks 40FB4010 and 40FB4011 and limit the annual and hourly true vapor pressure of the materials stored in the tanks to 9 psia and 10.9 psia, respectively. Because the permitted annual throughputs are increasing as a result of this Project, these tanks are considered modified sources for minor NSR purposes. FHR is also proposing an annual grouped VOC emission limit for these tanks and an individual hourly VOC emission limit for each of the tanks. There is an overall decrease in VOC emissions as a result of the proposed changes for these tanks. The tanks' future potential emissions are based on the proposed allowable throughput and vapor pressure. FHR is also proposing for the first time H_2S emission limits for storage tanks 40FB4010 and 40FB4011. The H_2S emissions are not new emissions resulting from a physical change or change in the method of operation, but are now being estimated consistent with TCEQ practices. FHR is proposing an annual grouped H_2S emission limit for these tanks and an individual hourly H_2S emission limit for each of the tanks.

Tanks 40FB4014 and 40FB4015 are existing fixed-roof tanks. FHR is proposing to increase the true vapor pressure of the materials stored in Tanks 40FB4014 and 40FB4015 to 0.5 psia, which is higher than prior permit representations. Therefore, these tanks are considered modified sources for minor NSR purposes. FHR will be installing an internal floating roof in the tanks as part of a pollution control project separate from the Project proposed in this application. There is an overall decrease in emissions as a result of the pollution control project and proposed changes for these tanks. The tanks' future potential emissions are based on the proposed allowable vapor pressure.

Tanks 40FB4016 and 15FB509 are existing fixed-roof tanks. FHR is proposing to increase the true vapor pressure of the materials stored in Tanks 40FB4016 and 15FB509 to 0.5 psia, which is higher than prior permit representations. Therefore, these tanks are considered modified sources for minor NSR purposes. FHR will be installing an internal floating roof in the tanks as part of a pollution control project separate from the Project proposed in this application. FHR also is proposing an annual grouped emission limit for these tanks and an individual hourly emission limit for each of the tanks. There is an overall decrease in

emissions as a result of the pollution control projects and proposed changes for these tanks. The tanks' future potential emissions are based on the proposed allowable vapor pressure.

FHR is proposing the installation of new equipment piping components (EPN F-TK-VOC) as part of constructing two new storage tanks. FHR also is proposing the installation of new equipment piping components (EPN F-GB) to upgrade the gasoline blending system. FHR is proposing an LDAR program to reduce fugitive emissions of VOC from new equipment piping components. FHR also is proposing annual instrument monitoring for all new and existing gas/vapor and light liquid flanges/connectors associated with the gasoline blender system.

Cooling Towers

FHR is proposing to construct a new Mid Plant Cooling Tower No. 2 (44EF2) in the Mid Plant area. The new Mid Plant Cooling Tower No. 2 will be equipped with a high efficiency drift eliminator that will achieve a drift loss of 0.0005% or less. FHR is including proposed PM, PM_{10}, and $PM_{2.5}$ emission limits for the new Mid Plant Cooling Tower.

FHR will be installing a high efficiency drift eliminator on the existing Mid Plant Cooling Tower to reduce particulate matter emissions as part of a pollution control project separate from the Project proposed as part of this application. The drift eliminator will achieve a drift loss of 0.0005% or less.

General Process Description. The West Refinery is provided cooling water from a number of cooling towers throughout the refinery. The cooling towers are equipped with a TCEQ approved air-stripping system as described in Appendix P of TCEQ's Sampling and Procedure Manual. The cooling towers are monitored monthly for VOC emissions.

Wastewater Treatment

There are no proposed physical changes or changes in the method of operation for the API Separator Flare (EPN V-8). However, as a result of this Project, the flare could potentially be used to control more emissions from increased flow through the Monroe API Separator. Through this increased utilization, the flare could see an increase in actual emissions above past actual emissions. The increased actual emissions will be below the currently authorized allowable emission rates.

FHR is revising the calculation method for the potential to emit of all pollutants based on the flow rate and composition of the vent gas stream.

General Process Description. The wastewater streams affected by this Project enter the Monroe API Separator where slop oil and sludge are removed and sent to storage. Emissions from the Monroe API Separator are controlled by the API Separator Flare (EPN V-8). FHR operates a caustic scrubber on the Monroe API Separator to reduce sulfur in the waste gas stream routed to the API Separator Flare. The API Separator Flare meets the requirements of 40 C.F.R. 60.18 based on historical performance tests and provides a minimum VOC destruction efficiency of 98% based on TCEQ guidance.

Other Sources

FHR is not proposing any physical changes or changes in the method of operation for the FCCU CO Boiler/Scrubber, LSG Hot Oil Heater (47BA1), the Metaxylene Hot Oil Heater (54BA1), the DDS (distillate desulfurizer) Charge Heater (56BA1), the DDS Fractionator Reboiler (56BA2), equipment piping components in the FCCU Unit, or equipment piping components in the Hydrocracker Unit that will increase emissions. There will, however, be emissions reductions at these units. FHR will operate the FCCU catalyst regenerator at full burn which will reduce the annual average CO concentration in the exhaust from the scrubber. FHR is reducing the annual CO concentration limit in the exhaust gas from 250 ppmv, dry to 50 ppmv, dry. FHR is proposing an emission reduction project that will reduce the sulfur content of the fuel gas prior to combustion in the heaters. Therefore, the SO_2 allowable emission limits are being reduced as a result of the emission reduction project. FHR is proposing an emission reduction project for the existing equipment piping components in the FCCU and Hydrocracker Units. Specifically, FHR will reduce VOC emissions by committing to annual flange monitoring in these unit. There are no new equipment piping components proposed for the FCCU and Hydrocracker Units.

As part of installing the SCR controls on some of the heaters, there will be new equipment piping components in ammonia service. FHR is proposing an Audio, Visual, and Olfactory (AVO) LDAR monitoring program to reduce fugitive emissions of ammonia from these new equipment piping components.

Planned Maintenance, Start-up, and Shutdown Emissions

FHR is proposing to authorize planned maintenance, start up, and shutdown (MSS) activities as described below as a result of constructing the new Sat Gas Plant No. 3 Unit and new storage tanks.

General Process Description. Various maintenance activities have fugitive emissions associated with them.

- *Vessel and Equipment Openings after Decommissioning*. Once equipment has been cleaned, blinds for maintenance are installed. This requires opening the equipment to atmosphere releasing any residual VOC to the atmosphere.
- *Tank Landings and Degassing*. MSS activities associated with tanks are landing the floating roofs, degassing and cleaning for the purposes of product service changes, off-spec product removal, and other tank maintenance. When a tank is cleaned, material in the tank is removed. Diesel is introduced into the tank several times to absorb any remaining VOCs in the tank. For tanks storing material with a TVP > 0.5 psia, the tank is degassed to a control device while the diesel is being flushed into the tank. The diesel and any residual liquid are then removed from the tank. Degassing continues until the VOC concentration in the tank is below 10,000 ppmv. At that time, the tank is opened to vent any remaining VOCs.
- *Frac Tanks*. Frac tanks are utilized as temporary storage containers for refinery process and chemical cleaning materials. Emissions are generated from filling and breathing loss. The frac tanks are controlled by carbon canisters.
- *PAN Emissions*. Emissions are generated from residual hydrocarbons that remain in the process equipment after decommissioning. Emissions are also generated from leaks that occur during repair/replacement of components such as pumps, filters, valves, etc.
- *Vacuum Truck Loading*. Vacuum trucks are used to transfer materials from one container to another and empty tanks and other vessels during maintenance activities. Vacuum trucks are also used for blinding activities, pump maintenance, and dewatering crude tanks etc. Vacuum truck emissions will be controlled by a carbon canister system, an engine, or a thermal oxidizer. Consistent with prior TCEQ permitting actions, a VOC control efficiency of 98% is used in the calculations.

Summary of Project Emissions

For each of these Project components, CO_2e emissions are defined as the sum of the mass emissions of each individual GHG adjusted for its global warming potential (GWP). CO_2e emission rates for each GHG are estimated by multiplying the emission rates for each GHG by its GWP value provided in Table A-1 of 40 C.F.R. Part 98, Subpart A. Potential PSD air pollutant emissions associated with the proposed Project are provided in Table 1.

Table 1 Estimated Emissions of Prevention of Significant Deterioration (PSD) Air Pollutants for the Flint Hills Resources West Refinery Project

Pollutant	Estimated Project Emissions Increase (tpy)[1]	PSD Significant Emission Rate (SER) Threshold (tpy)	Estimated Project Emissions > Major Source Threshold	Project Contemporaneous Emission Changes after Netting Analysis[2] (tpy)	"Net" Emissions Exceed PSD Threshold?
NO_x	**61.83**	40	YES	- 228.33 [2]	NO
CO	65.37	100	NO	-801.45 [3]	n/a
SO_2	15.34	40	NO	-156.36 [3]	n/a
PM	23.79	25	NO	-15.42 [4]	n/a
PM_{10}	**23.01**	15	YES	-2.13 [2]	NO
$PM_{2.5}$	**22.41**	10	YES	-4.28 [2]	NO
VOC	**67.48**	40	YES	- 39.14 [2]	NO
H_2S	0.76	10	NO	-1.44 [3]	n/a
GHGs (as CO_2-equivalents)	**~360,000**	75,000	YES	n/a	YES

n/a = not applicable PSD = Prevention of Significant Deterioration

[1] **Bolded values** indicate the Project-only estimated emissions increases exceed the PSD permitting threshold. Emissions as estimated by WAID Environmental for the PSD permitting. Project emissions information obtained from TCEQ Form 2-F.

[2] WAID Environmental calculated contemporaneous emission increases/decreases for PSD netting analysis for any PSD regulated pollutant showing an estimated significant increase. Netting analysis results are from Table 3-F in the TCEQ permit application for each pollutant.

[3] A PSD netting analysis was not required by the TCEQ for CO, SO_2 or H_2S because Project emissions increases of these pollutants were below the PSD significant emission rates. Therefore, for these pollutants the change in permit allowable emissions is provided.

[4] Although a PSD netting analysis was not required by the TCEQ for PM because the Project emissions increase for this pollutant is below the PSD significant emission rate, FHR has calculated the net change in PM emissions as a result of the Project along with contemporaneous emission increases/decreases.

3.2 General Construction Information

The West Refinery is located outside the corporate city limits of Corpus Christi; however, it is located within the city's Extra Territorial Jurisdiction boundary. Within this boundary, the refinery is situated within the Industrial Heavy zoning district. The proposed construction activities would occur within the Industrial Heavy zoning district.

Construction activities will begin as soon as possible after construction permits have been approved and issued. The Project will be constructed with conventional construction techniques and equipment. Project activities within the main refinery operations area will include site preparation and grading, construction of foundations, and then the eventual erection of major structures (*e.g.*, Saturates Gas Plant No. 3, cooling tower).

Temporary noise impacts will result from the use of the construction equipment. The timing and decibel level of the noise will vary throughout the construction time period. Construction equipment will be fitted with standard noise reduction equipment and standard practices will be followed to operate and maintain the equipment to minimize noise generation (*e.g.*, regular maintenance and lubrication).

The construction areas are within the existing equipment, operations, and maintenance areas of the facility, with the exception of the new parking area (Figure 2), which will be located on West Refinery property adjacent to the existing equipment, operations, and maintenance areas of the facility. The noise associated with construction and equipment operations and maintenance is not expected to be discernible from existing facility operations.

The proposed parking area to the south of the main refinery operations area will be constructed with conventional techniques and equipment. Construction related activity will be a one-time occurrence. It is expected that any land-shaping will be minimal due to the existing flat terrain and that the parking area surface will be installed within a relatively short period of time. The temporary noise from equipment and haul trucks is expected to be similar to the current types and levels of noise in the I-37 travel corridor. Therefore, noise associated with construction of the parking area is not expected to be discernible from other types of traffic-related noise in the area.

3.3 General Operation and Maintenance

The majority of the Project sources of noise, lights, and maintenance activities will be within the existing equipment, operations, and maintenance footprint of the refinery (Figure 3). Potential noise associated with the Project during operations will be similar to existing activities and processes at the refinery. The

Project noise levels are expected to be indistinguishable from existing facility noise levels. Construction-related noise is discussed in Section 3.2.

3.4 Emission Controls

The air emissions permitting applications completed for the Project included a Best Available Control Technology (BACT) analysis for GHGs under 40 C.F.R. § 52.21 and a BACT analysis for Texas-regulated pollutants under the TCEQ minor NSR program. BACT-controlled emission rates were used in this analysis to assess air quality-related potential indirect effects. Additional information regarding BACT controls may be found in the respective USEPA PSD GHG and TCEQ minor NSR permit applications.

3.5 Water Use/Intake

Current operations at the refinery rely on water obtained from the Nueces River and the City of Corpus Christi Municipal Water Supply. The Project is estimated to result in a net increase in water use of about 500 gallons per minute (gpm). The City of Corpus Christi Municipal Water Supply will supply the makeup water for the Project. Therefore, the Project will not increase the amount of water obtained directly from the Nueces River for the West Refinery.

3.6 Discharge to Surface Waters

3.6.1 Texas Pollution Discharge Elimination System

The West Refinery discharge is required to meet federal and state water quality standards at the discharge location (*i.e.*, no dilution zone allowed). Federal authority to regulate the National Pollutant Discharge Elimination System (NPDES) is delegated to the State of Texas, TCEQ, Texas Pollutant Discharge Elimination System (TPDES).

The West Refinery has an existing water quality permit (TPDES Permit No. WQ0000531000), which allows discharge of wastewater and storm water. Discharge locations are identified as follows:

- Outfall 001: treated water is routed from the wastewater treatment plant (WWTP) via a pipeline to the Viola Turning Basin just to the north of the refinery. Outfall 001 is located about 30 yards to the east of Dock #8 and is an underwater discharge into the Viola Turning Basin. The Viola Turning Basin forms the very west end of the Port of Corpus Christi Inner Harbor (Inner Harbor). The Inner Harbor is separate from the Nueces River and opens into

Corpus Christi Bay. Therefore, there is no opportunity for a direct discharge of water from Outfall 001 into the Nueces River. Any water discharged into the Inner Harbor from the West Refinery travels approximately 13 km (8 mi) before reaching Corpus Christi Bay.

- Outfalls 002, 004, 007, 009, and 012: water is routed to unnamed ditches, and then to a tidal bayou (Tule Lake outlet) and then to the Tule Lake Turning Basin.
- Outfall 003: water is routed to an unnamed ditch, then to the Tule Lake Channel (the Tule Lake Channel is the portion of the Inner Harbor between the Tule Lake Turning Basin and the Chemical Turning Basin).
- Outfalls 006, 011, and 013: water is routed to unnamed ditches, then to the Viola Turning Basin.

Water from these outfalls is then is routed to the Corpus Christi Inner Harbor Segment No. 2484 of the Bays and Estuaries.

- Outfalls 005, 008, 010: water is routed to a ditch, and then to the Nueces River Tidal Segment No. 2101 of the Nueces River Basin.

Wastewater related to the Project will be routed to the wastewater treatment plant and then to Outfall 001. The wastewater streams associated with the Project will be integrated with the current wastewater streams from existing operations and are not considered a new source. Further, the waste streams associated with the Project are characteristically similar to existing permitted waste streams that feed the facility's wastewater treatment plant. Therefore, the expectation is the waste streams and wastewater from the Project will not impact the treatability of the existing wastes or prevent the treatment system from meeting the authorized final effluent limits. Wastewater streams from the Project will be similar in temperature to the wastewater from existing similar operations. Project wastewater flows *may* increase the temperature of the discharged water by up to 2 degrees Fahrenheit (ºF) at Outfall 001—about a 3% increase and unlikely to be discernible above background water temperatures —but are not expected to increase the temperature of the discharged water above the currently permitted limit of 115ºF.

Maximum water discharge from permitted Outfall 001 is 6.7 million gallons per day (gpd) (approximately 4,650 gallons per minute (gpm)), with the daily average permitted discharge set at 5.3 million gpd (approximately 3,680 gpm). Average discharge volume from Outfall 001 is approximately 2,300 gpm (average for 2011). The Project is conservatively estimated to increase the actual discharge volume by approximately 150 gpm; an increase of about 6% from the 2011 average annual discharge. This estimated increase in the annual average discharge water volume (from about 2,300 gpm to about 2,450 gpm) is

within the currently permitted discharge volume and will not require any modification to the current TPDES permit for the West Refinery.

Sanitary sewerage related to the Project will be routed to the City of Corpus Christi municipal wastewater system and will not be discharged from the TPDES permitted outfalls.

3.6.2 Storm Water

Storm water associated with construction activities will be managed under the storm water portion of the TPDES water quality permit. Acquiring a General Construction Permit (TXR150000) and implementing best management practices based on the acreage of the impacted soil will address potential storm water impacts during the construction of the proposed units. Short-term and long-term storm water runoff from within the fence-line in the main refinery operations area is not expected to increase appreciably due to the Project because the existing construction, laydown, and proposed parking areas in this portion of the property currently consist of previously disturbed and compacted areas and/or impervious surfaces (*i.e.*, concrete, asphalt, or caliche). Three construction areas totaling about 20 acres, approximately 3% of the main refinery operations area, currently have herbaceous cover and these will be converted to less pervious surfaces and therefore, may cause more storm water runoff. However, this potential change in storm water runoff for the main refinery operations area is estimated to be small, potentially a 1% to 2% increase from existing conditions. Therefore, additional construction will not result in a measurable change in runoff from impervious surfaces within the main refinery operations area. It is currently estimated that the overall run-off coefficient for the portions of the areas affected by the Project in the main refinery operations area will not change appreciably from current conditions (*i.e.*, already impervious surfaces dominate in these areas).

Storm water from within the refinery operations area is expected to be routed to and through the Mid-Plant and West Crude areas storm water grit chambers to respective first flush tanks, and then routed to either: (1) the WWTP for treatment and discharged via Outfall 001; or (2) routed to Outfall 005 or Outfall 008 for discharge. Storm water is expected to have chemistry similar to urban runoff and therefore does not typically require treatment.

For the proposed parking area to the south of the main refinery operations (Figure 2), the terrain of the approximately 10 acre site is relatively flat and current storm water is managed as urban runoff and routed to nearby ditches and through the municipal storm water management system. The location is a previously disturbed, partially grassy area (former school site), with predominantly clay soils at the ground surface. Other surface features include patches of overgrown asphalt, a former parking area and a

former running track. Given the current site conditions that tend to promote runoff (clay soils, overgrown asphalt and a former parking area) there is uncertainty as to the extent of changes in impervious surfaces as the land is converted to the parking area. Best management practices will be implemented and the runoff water will continue to be considered urban runoff and routed to the existing ditching system. The construction of the parking area will require FHR to obtain a construction permit for storm water discharge (TCEQ 2006; 2013) and to develop and implement a Storm Water Pollution Prevention Plan (SWP3). Also, notification must be provided to the Municipal Separate Storm Sewer System (MS4) operator (TCEQ 2006; 2013) (*i.e.*, for this Project notice must be provided to the City of Corpus Christi.)

Overall, when considering Project Areas 3, 17, 18 (within the main refinery operations area), and 19 (parking area to the south of the main refinery operations) (Appendix A, Figure 1 of the Habitat Assessment Report) that will be converted from currently vegetated areas to more impervious areas due to equipment installation and construction of the parking areas, there may be a 1% to 3% increase in runoff associated with the Project. This potential increase in runoff volume is expected to be within the variability of existing runoff from the FHR property and is considered an insignificant change from existing conditions.

3.7 Marine Terminal Use and Vessel Traffic

The Port of Corpus Christi averages about 6,000 vessels per year (average for the 2005 to 2011 time period; includes tankers and barges) and ships about 82,000,000 short tons, of which petroleum constitutes 84% of total tons shipped (Port of Corpus Christi 2013a). The West Refinery is located near the Viola Turning Basin, which is part of the Inner Harbor area, and is one of a number of facilities that receives raw materials and ships products via the Inner Harbor.

Shipments to the West Refinery are typically received at Public Oil Dock #8. The Project will not require any physical changes or modifications to Public Oil Dock #8 , nor require any changes in the dock operations. In addition, the Project will not require any in-water construction activities or dredging.

The proposed Project shifts the refinery from using light foreign crude oil and heavier domestic crude to domestic sweet light crude oil. The domestic light crude oil is to be delivered to the West Refinery by existing pipelines and will reduce the number of ships exporting refined products from the West Refinery. Because the post-Project refinery will process primarily light crude oil, a number of products associated with heavy crude oil will be reduced in quantity. At the same time, the production of some products associated with light crude oil processing will increase. The reduction or elimination of some products and increases in other products (*e.g.*, naptha and gasoline) results in a net effect of no change in marine

vessel traffic associated with the Project. Overall, there will be no increase in barge shipments per month associated with the Project, and it is not reasonably foreseeable that there would be a decrease in barge shipments per month associated with the Project.

4.0 Determination of the Action Area

The "action area" bounds the scope of the analysis of effects of the action, (USFWS-NMFS 1998 at 4-15), and so defining the "action area" is the first step in the Section 7 effects analysis process. USFWS regulations define an "action area" as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 C.F.R. § 402.02). "Direct effects" are defined as those "direct or immediate effects of the Project on the species or its habitat" (USFWS-NMFS 1998 at 4-26). "Indirect effects" are defined as those effects that "are caused by or result from the proposed action, are later in time, and are reasonably certain to occur" (*Id.* at 4-29). Further, "[i]ndirect effects may occur outside of the area directly affected by the action" (*Id.*). FHR identified the Action Area for the Project using the following step-wise approach.

4.1 Step One: Identify a Preliminary Action Area Based on Potential Direct Effects

First, FHR established a Preliminary Action Area based on the potential direct effects of the Project. The potential direct effects from the Project include the immediate potential effects of construction and operation of the Project (*e.g.*, ground or habitat disturbance, intrusion of permanent structures into airspace, noise, and light).

4.1.1 Ground Disturbance and Construction Activities

The locations of the majority of Project-related ground disturbance and construction activities are within the existing equipment, operations, and maintenance footprint of the refinery (Figure 3). There will also be some ground disturbance and construction activities associated with the development of the proposed parking area (Figure 2) which is south of the main refinery operations, and adjacent to the existing equipment, operations, and maintenance footprint of the refinery. These areas of ground disturbance and construction activities are therefore included in the Preliminary Action Area based on potential direct effects.

4.1.2 Noise

General construction activities related to the Project will primarily occur within the existing equipment, operations, and maintenance footprint of the existing facility. There will be some construction activities related to the development of the proposed parking area. This parking area already has some refinery-related activities occurring on it (*e.g.*, storage of materials).

Overall, processes and operations associated with the Project are similar to existing processes and operations, and Project-related sources (new and modified) are within the existing equipment, operations, and maintenance footprint of the facility. Potential types of noise and noise levels (in decibels) related to the Project operations will be similar to those from the existing process operations and maintenance activities.

The noise levels from the Project may be additive to the noise levels from the existing facility and the nearby I-37 corridor, including the insignificant and temporary noise from constructing the proposed parking area. However, decibel levels are on a logarithmic scale such that a small incremental increase in noise related to the Project may not change the overall decibel level of noise associated with the refinery. Moreover, noise decreases inversely with the square of the distance from the noise source, and so noise impacts diminish rapidly with distance.

Overall, the additional incremental noise from the Project is not expected to be discernible from the existing facility or current activities at the proposed parking area. Therefore, the Preliminary Action Area for noise is restricted to the area encompassed by the existing refinery equipment, operations, and maintenance activities and the area encompassed by the proposed parking area.

4.1.3 Lighting and Visual Impacts

Lights associated with the Project will be similar to other lighting at the existing facility and are not expected to be discernible from the baseline lighting. Lighting of the parking area is expected to be similar to other nearby urban street lighting. Potential direct effects from lighting are not reasonably foreseeable given the location of the proposed parking area near other sources of industrial/urban lights.

4.1.4 Intrusion into Air Space (Height of Structures)

All new structures associated with the Project will be constructed within and amidst the existing equipment, operations, and maintenance footprint of the refinery. The proposed Saturates Gas Plant No. 3 will include the construction of structures with heights of 40, 47, 50, and 80 meters (m) (130, 155, 160, and 265 feet [ft]). Existing structures with heights in this range and up to 100 m (300 ft) surround the area where the new Saturates Gas Plant will be built, including structures at the existing GOHT Unit, Crude/Vacuum, Utilities, Metaxylene Unit and LSG Unit (Figure 3).

Therefore, there are no new structures that will be constructed with significantly different heights than existing structures and accordingly, the Preliminary Action Area does not require vertical expansion to

address potential effects from new structure heights. Construction equipment for the Project is likely to include some or all, and one or more, of the following:

- Large Construction Cranes: at least one construction crane with a standing height of more than 30 m (100 ft) and having a reach of 60 to100 m (200 to300 ft) or more when fully extended
- Cherry Pickers: reach to heights of 18 m (60 ft)
- Hydraulic RT (Rough Terrain) Cranes: boom lengths ranging from 15 to45 m (50 to 150 ft).
- Portable generators: to provide power to construction equipment
- Vehicles:
    - Flatbed and fork trucks: for material transport to/from the construction area and laydown area
    - Cement mixing trucks: for poured pads to support Project equipment and structures

With the exception of the large construction crane(s), the other equipment and construction cranes for the Project are expected to be less than 46 m (150 ft) in height when extended, and therefore will not be taller than existing structures within the main refinery portion of the Project Area (*i.e.*, West Crude Area, Mid Plant and East Plant areas). However, if/when Cherry Pickers and Hydraulic RT Cranes are used around storage tanks (heights are approximately 12 m [40 ft] above the ground surface), these types of construction equipment would be taller than the existing structures. If these types of construction equipment are stored for some length of time in the proposed parking area, then the construction equipment would be taller than most other equipment or vehicles expected to use the parking area.

It is likely that one or more large construction cranes with a maximum height of 60 to100 m (200 to 300 ft) or more when fully extended will be used throughout the Project construction time period. These large construction cranes with heights of 100 m (300 ft) or more would be taller than the existing structures within the main refinery property and nearby power line support towers. As such, the large construction cranes will likely be the tallest structure in the vicinity of the Project. When not in use, the tall construction crane(s) will be retracted when feasible (*e.g.*, lattice type booms may not be able to be lowered daily) and if retracted, will then be similar in height or shorter than the existing structures on the FHR property.

These additional tall structures on the FHR property have the potential to affect the whooping crane. Therefore, the Action Area accounts for additional tall equipment being on the FHR property during Project construction.

The development of the parking area is not expected to require the use of tall equipment. There are no current structures in the proposed parking area.

4.2 Step Two: Determine if Preliminary Action Area Should be Expanded by Potential Indirect Effects

FHR assessed whether any potential indirect effects of the Project should cause the Preliminary Action Area to be expanded. FHR assessed two categories of potential indirect effects: (1) effects from pollutant air concentrations and potential deposition, and (2) effects related to water intake, land surface changes and runoff coefficients, and the volume, chemistry, and temperature of expected wastewater discharges.[3]

FHR used an air dispersion modeling receptor grid for non-GHG criteria pollutants and toxic air contaminants extending out to 3 km (1.9 mi) from the West Refinery property boundary as the zone within which potential indirect effects were assessed (Figure 9).

In our best professional judgment and experience, 3 km is a reasonable distance in which to assess potential indirect effects from air emissions because maximum modeled impacts typically occur at the property boundary and decrease relatively quickly with distance from the property boundary. No unusual circumstances are present here that would suggest going beyond the 3 km distance. As set forth in more detail below, our analysis of potential indirect impacts within 3 km of the FHR property boundary demonstrates that the extent of the air dispersion modeling grid is more than adequate to capture discernible potential indirect effects.

4.2.1 Air Quality

FHR would offer the observation that the Project will result in decreases in emissions for all non-GHG PSD regulated pollutants (Table 1). Further, the Project will not result in an increase of any non-PSD pollutant regulated by Texas, with the exception of ammonia. Because the Project emission changes for these pollutants are either insignificant or below zero, the Project will not result in any potential indirect effects from ammonia or other non-GHG pollutants.

Nevertheless, FHR has prepared an air quality impacts assessment of the potential indirect effects of any air pollutant for which the Project will result in an increase in *allowable* emissions at any unit. FHR conducted this modeling in accordance with Texas Commission on Environmental Quality minor NSR air

[3] FHR has concluded that there will be no increase in barge shipments per month associated with the Project, and it is not reasonably foreseeable that there would be a decrease in barge shipments per month due to the Project. Accordingly, FHR does not analyze marine vessel traffic further as an additional potential indirect effect of the Project.

quality modeling protocols. The results of this air quality impacts assessment show that: (1) no SILs were exceeded at any model receptors outside the Preliminary Action Area boundary; and (2) there were no impacts to model receptors above ESLs outside the Preliminary Action Area boundary.

In addition, FHR conducted two qualitative air quality analyses with respect to HAP air emissions and the potential for nitrogen/sulfur deposition. These additional analyses support the "no impact" conclusion as follows: (1) emissions from the Project are below USEPA HAP screening levels; and (2) because there is an overall reduction in emissions of NO_2 and SO_2 associated with the Project there are no effects on soils or vegetation from nitrogen or sulfur emissions. Consequently, based on the SIL and ESL modeling—as further supported by the qualitative HAP analysis and nitrogen and sulfur emissions/deposition analyses—the Preliminary Action Area was not expanded to account for air quality-related indirect effects. Our detailed findings are set forth in the following subsections.

4.2.1.1 Air Dispersion Modeling for Non-GHG NSR-regulated Air Pollutants

When considering only the Project emissions, emissions expected from the Project are below the significance thresholds for CO, PM, SO_2, and H_2S emissions (*i.e.*, the Project will not result in a significant emissions increase for these pollutants) (Table 1). When considering contemporaneous increases and decreases under the second step of the PSD applicability analysis, the Project will cause a *net* emissions *decrease* for NO_X, PM_{10}, $PM_{2.5}$, and VOC emissions. The Project will also cause a *net* emissions *decrease* for PM. A comparison of permit allowable emissions (current to future) identified a net reduction in allowable emissions for CO, SO_2, and H_2S. In fact, the overall Project will result in decreased emissions of non-GHG pollutants, with the exception of ammonia. Therefore, non-GHG pollutants associated with construction of new emission units and changes to existing emission units are subject only to Texas minor NSR requirements.

FHR has prepared an air quality impacts assessment of the potential indirect effects of any air pollutant for which the Project will result in an increase in allowable emissions at any unit. FHR conducted this modeling in accordance with Texas Commission on Environmental Quality minor NSR air quality modeling protocols. The air modeling included receptors out to a distance of 3 km beyond the furthest extent of the facility property boundary (Figure 9 and Figure 10).

A 25-meter receptor spacing was used out to a distance of at least 300 m from each emission source at the facility. This was done to help ensure that each pollutant's area of maximum impact (AOI) would be captured by the dense receptor grid. Beyond this dense nearfield grid, receptor spacing was increased to 100 m out to 1 km, and to 500 m from 1 km out to 3 km. Because the receptor spacing is based on the

furthest extent of the West Refinery property boundary (*e.g.*, very western, southern, and eastern extent of the boundary), some portions of the grid extend out to about 6 km from the central part of the refinery where the Project emission units will be constructed or modified (Figure 9 and Figure 10).

Modeling results for NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$ indicate that all modeled air concentrations are below the respective SILs at and beyond the Preliminary Action Area boundary (Table 2). USEPA uses SILs to determine whether emission increases from a proposed project will have any more than *de minimis* impacts on the consumption of PSD increments or attainment and maintenance with a NAAQS.[4] Modeled emissions impacts below the respective SIL are interpreted to mean that Project emissions will also have insignificant effect on soils and vegetation per the USEPA definition and use of a SIL. These modeling results indicate that estimated emissions from the Project have insignificant impacts to air quality, soils, and vegetation according to USEPA policies regarding SILs, outside the Preliminary Action Area. Modeled air concentrations declined with distance from the Preliminary Action Area, meaning that air concentrations were well below the respective SIL at the more distant locations on the receptor grid.

Table 2 Air Dispersion Modeling Results for Non-GHG Criteria Pollutants Beyond the Preliminary Action Area

Pollutant	Averaging Time	SIL[1] (µg/m3)	Primary NAAQS (µg/m3)	Secondary NAAQS (µg/m3)	Maximum Modeled Impact (µg/m3)	Percentage of the SIL (%)
NO_2	1-hr	7.5	188	None	0.9	12.1
NO_2	Annual	1	100	100	0.14	14.4
CO	1-hr	2000	40000	None	5.22	0.26
CO	8-hr	500	10000	None	3.07	0.61
SO_2	1-hr	7.8	196	None	0.12	1.6
SO_2	3-hr	25	None	1300	0.10	0.42
PM_{10}	24-hr	5	150	150	1.12	22.4
$PM_{2.5}$	24-hr	1.2	15	15	1.12	93.4
$PM_{2.5}$	Annual	0.3	35	35	0.10	33.3

NAAQS = National Ambient Air Quality Standard SIL = Significant Impact Level
[1] Significant Impact Levels (SILs) per 40 C.F.R. §51.165(b)(2)

[4] FHR followed the guidance in USEPA's (2013a) March 4, 2013, "Draft Guidance for $PM_{2.5}$ Permit Modeling."

In addition to air dispersion modeling for criteria pollutants, FHR also conducted modeling for speciated VOC emissions, particulate metal emissions, ammonia, and polycyclic aromatic hydrocarbon (PAH) emissions associated with the Project. FHR compared those modeling results to TCEQ's acute and chronic ESLs. Results for the acute and chronic modeling are reported in Table 3 and Table 4, respectively. ESLs are screening levels used in TCEQ's air permitting process to evaluate air dispersion modeling's predicted impacts. They are used to evaluate the potential for effects to occur as a result of exposure to concentrations of constituents in the air. ESLs are based on data concerning health effects, the potential for odors to be a nuisance, and effects on vegetation. They are not ambient air standards. If predicted airborne levels of a constituent do not exceed the screening level, adverse health or welfare effects are not expected. If predicted ambient levels of constituents in air exceed the screening levels, it does not necessarily indicate a problem but rather triggers a review in more depth.

None of the maximum modeled acute (1-hour) (Table 3) or chronic (Table 4) air concentrations exceed the respective ESLs at or beyond the boundary of the Preliminary Action Area. This provides additional support that the proposed Project will have no reasonably foreseeable potential effect beyond the Preliminary Action Area.

Table 3 Estimated Potential One-hour Emissions of Speciated VOCs, Particulate Metals, Ammonia and Polycyclic Aromatic Hydrocarbons (PAHs) for the West Refinery Project and Comparison of Maximum Modeled One-hour Air Concentration to Effects Screening Levels Beyond the Preliminary Action Area

Contaminant	Total Project Emission Rate (lb/hr) [1]	Estimated Max Impact (µg/m^3) [2]	Short Term ESL [3] (µg/m^3)	Ratio (Project Impact / ESL)	Percent of ESL (%)
1,2,4 Trimethylbenzene	1.70E-02	1.54E+01	700	0.02	2.2%
1,3 Butadiene	5.88E-04	3.27E-01	510	0.0006	0.06%
2-Methylnaphthalene	1.40E-05	1.08E-05	30	0.0000004	0.00004%
3-Methylchloranthrene	1.03E-06	7.91E-07	0.02	0.00004	0.004%
7,12-Dimethylbenz(a)anthracene	9.20E-06	7.14E-06	0.5	0.00001	0.001%
Acenaphthene	1.03E-06	7.91E-07	1	0.0000008	0.00008%
Acenaphthylene	1.03E-06	7.91E-07	1	0.0000008	0.00008%
Ammonia	3.63E+00	1.64E+00	170	0.010	1.0%
Anthracene	1.40E-06	1.08E-06	0.5	0.000002	0.0002%
Arsenic	1.15E-04	8.92E-05	3	0.00003	0.003%
Benz(a)anthracene	1.03E-06	7.91E-07	0.5	0.000002	0.0002%
Benzene	4.75E-01	1.30E+02	170	0.8	76.4%
Benzo(a)pyrene	6.90E-07	5.35E-07	0.03	0.00002	0.002%
Benzo(b)fluoranthene	1.03E-06	7.91E-07	0.5	0.000002	0.0002%
Benzo(g,h,i)perylene	6.90E-07	5.35E-07	0.5	0.000001	0.0001%
Benzo(k)fluoranthene	1.03E-06	7.91E-07	0.5	0.000002	0.0002%
Beryllium	6.90E-06	5.35E-06	0.02	0.0003	0.03%
Biphenyl	6.01E-04	5.46E-01	2.3	0.2	23.7%
Butane	6.80E-01	2.37E+02	66000	0.004	0.4%
Butenes	8.28E-03	2.60E-02	820	0.00003	0.003%
Cadmium	6.40E-04	4.98E-04	0.1	0.005	0.5%
Chromium	8.00E-04	6.12E-04	3.6	0.0002	0.02%
Chrysene	1.03E-06	7.91E-07	0.5	0.000002	0.0002%
Cobalt	4.70E-05	3.60E-05	0.2	0.0002	0.02%
Cresols	2.00E-04	1.82E-01	5	0.04	3.6%
Crude Oil	1.09E+00	1.9E+01	3500	0.005	0.5%
Cumene	8.92E-04	7.92E-01	230	0.003	0.3%
Dibenzo(a,h)anthracene	6.90E-07	5.35E-07	0.5	0.000001	0.0001%
Dichlorobenzene	6.90E-04	5.35E-04	600	0.0000009	0.00009%
Ethylbenzene	6.27E-02	1.48E+01	740	0.02	2.0%
Ethylene	6.50E-03	8.34E-01	1400	0.0006	0.06%
Fluoranthene	1.66E-06	1.29E-06	0.5	0.000003	0.0003%
Fluorene	1.53E-06	1.18E-06	10	0.0000001	0.00001%
Formaldehyde	4.21E-02	3.26E-02	15	0.002	0.2%
Gasoline	1.02E+00	3.75E+00	3500	0.001	0.1%

Contaminant	Total Project Emission Rate (lb/hr) [1]	Estimated Max Impact (µg/m^3) [2]	Short Term ESL [3] (µg/m^3)	Ratio (Project Impact / ESL)	Percent of ESL (%)
Hexane	2.15E+00	1.56E+02	5300	0.03	2.9%
Indeno(1,2,3-cd)pyrene	1.03E-06	7.91E-07	0.5	0.000002	0.0002%
Isobutane	1.92E-01	6.04E-01	23000	0.00003	0.003%
Isopentane	6.69E-02	2.10E-01	3800	0.00006	0.006%
Manganese	2.16E-04	1.66E-04	2	0.00008	0.008%
Mercury	1.41E-04	1.10E-04	0.25	0.0004	0.04%
Naphtha	0.00E+00	0.00E+00	3500	0.0	0.0%
Naphthalene	3.95E-03	3.28E+00	200	0.016	1.6%
Nickel	1.21E-03	9.32E-04	0.33	0.003	0.3%
Pentane	4.11E-02	1.29E-01	4100	0.00003	0.003%
Petroleum Distillates	3.96E+00	1.40E+03	3500	0.4	40.1%
Phenanathrene	9.80E-06	7.54E-06	0.5	0.00002	0.002%
Phenol	0.00E+00	0.00E+00	44	0.0	0.0%
Propane	4.53E-01	4.70E+01	No ESL	-	-
Propylene	1.15E-01	7.37E+01	No ESL	-	-
Pyrene	2.81E-06	2.18E-06	0.5	0.000004	0.0004%
Selenium	1.40E-05	1.08E-05	2	0.000005	0.0005%
Styrene	4.21E-03	3.82E+00	110	0.03	3.5%
Toluene	1.59E-01	6.56E+01	3470	0.02	1.9%
Xylene	1.60E-01	3.13E+01	350	0.09	8.9%

[1] All emissions data is from the ESL modeling spreadsheet file provided by Waid Environmental to Barr Engineering on October 30, 2013 and updates provided by Waid Environmental on January 28, 2014. Project emission rates (lb/hr) were calculated as the sum of each respective pollutant from each emission unit included in the air dispersion modeling (*i.e.*, Project increases were modeled and did not account for offsets or overall reductions in VOC or particulate emissions).

[2] The "Estimated Max Impact" for each contaminant was obtained from Waid Environmental (calculation spreadsheet). Each "Estimated Max Impact" was determined as follows:

- Each Project emission unit was modeled at a unit emission rate of 1 lb/hr.
- The "Estimated Max Impact" air concentration at or beyond the boundary of preliminary action for each modeled emission unit was identified in the air modeling output file and inserted into the calculation spreadsheet (this is a "unitized air concentration"; µg/m3 per lb/hr)
- Then, for each contaminant associated with an emission unit, the unitized air concentration is multiplied by the specific air contaminant emission rate (lb/hr) to derive an estimated air concentration for that contaminant from that emission unit.
- For each contaminant, the estimated air concentration from each emission unit are summed up to derive an overall estimated air

This approach assumes that each individual air concentration is occurring at the same location, when in actuality, the impacts (air concentrations) determined at a unit 1 lb/hr emission rate occurred at different locations because the emission units themselves are located at various places around the refinery. Therefore, this is a conservative approach to estimating contaminant air concentrations to compare to available ESLs.

[3] Effects Screening Levels from the Texas Commission on Environmental Quality as of February 2013. http://www.tceq.texas.gov/toxicology/esl/list_main.html

Table 4 **Estimated Potential Annual Emissions of Speciated VOCs, Particulate Metals, Ammonia, and Polycyclic Aromatic Hydrocarbons (PAHs) for the West Refinery Project and Comparison of Maximum Modeled Annual Air Concentration to Effects Screening Levels Beyond the Preliminary Action Area**

Contaminant	Project Emission Rate (tpy) [1]	Estimated Max Impact ($\mu g/m^3$) [2]	Long Term ESL[3] ($\mu g/m^3$)	Ratio (Project Impact / ESL)	Percent of ESL (%)
1,2,4 Trimethylbenzene	7.43E-02	3.57E-02	125	0.0003	0.03%
1,3 Butadiene	2.65E-03	2.56E-03	9.9	0.0003	0.03%
2-Methylnaphthalene	6.00E-05	4.55E-07	3	0.0000002	0.00002%
3-Methylchloranthrene	4.47E-06	3.39E-08	0.002	0.00002	0.002%
7,12-Dimethylbenz(a)anthracene	4.07E-05	3.07E-07	0.05	0.00001	0.0006%
Acenaphthene	4.47E-06	3.39E-08	0.1	0.0000003	0.00003%
Acenaphthylene	4.47E-06	3.39E-08	0.1	0.0000003	0.00003%
Ammonia	1.15E+01	5.00E-02	17	0.003	0.3%
Anthracene	6.00E-06	4.55E-08	0.05	0.0000009	0.00009%
Arsenic	5.00E-04	3.81E-06	0.067	0.0001	0.01%
Benz(a)anthracene	4.47E-06	3.39E-08	0.05	0.0000007	0.00007%
Benzene	1.57E+00	7.69E-01	4.5	0.2	17.1%
Benzo(a)pyrene	3.05E-06	2.30E-08	0.003	0.00001	0.0008%
Benzo(b)fluoranthene	4.47E-06	3.39E-08	0.05	0.0000007	0.00007%
Benzo(g,h,i)perylene	3.05E-06	2.30E-08	0.05	0.0000005	0.00005%
Benzo(k)fluoranthene	4.47E-06	3.39E-08	0.05	0.0000007	0.00007%
Beryllium	3.05E-05	2.30E-07	0.002	0.0001	0.01%
Biphenyl	2.63E-03	1.26E-03	1	0.001	0.1%
Butane	3.03E+00	1.88E+00	7200	0.0003	0.03%
Butenes	3.63E-02	3.33E-03	No ESL	-	-
Cadmium	2.80E-03	2.12E-05	0.01	0.002	0.2%
Chromium	3.56E-03	2.69E-05	0.041	0.0007	0.07%
Chrysene	4.47E-06	3.39E-08	0.05	0.0000007	0.00007%
Cobalt	2.04E-04	1.55E-06	0.02	0.00008	0.008%
Cresols	8.78E-04	4.21E-04	10	0.00004	0.004%
Crude Oil	4.78E+00	4.47E-01	350	0.001	0.1%
Cumene	3.86E-03	1.84E-03	250	0.00001	0.0007%
Dibenzo(a,h)anthracene	3.05E-06	2.30E-08	0.05	0.0000005	0.00005%
Dichlorobenzene	3.05E-03	2.30E-05	60	0.0000004	0.00004%
Ethylbenzene	7.48E-02	5.44E-02	570	0.0001	0.01%
Ethylene	2.86E-02	8.43E-03	34	0.0002	0.02%
Fluoranthene	7.30E-06	5.56E-08	0.05	0.000001	0.0001%
Fluorene	6.80E-06	5.19E-08	1	0.0000001	0.00001%
Formaldehyde	1.90E-01	1.43E-03	3.3	0.0004	0.04%
Gasoline	5.03E+00	1.18E+00	350	0.003	0.3%
Hexane	9.90E+00	1.27E+00	200	0.006	0.6%

Contaminant	Project Emission Rate (tpy) [1]	Estimated Max Impact (µg/m^3) [2]	Long Term ESL[3] (µg/m^3)	Ratio (Project Impact / ESL)	Percent of ESL (%)
Indeno(1,2,3-cd)pyrene	4.47E-06	3.39E-08	0.05	0.0000007	0.00007%
Isobutane	8.42E-01	7.75E-02	7200	0.00001	0.001%
Isopentane	2.93E-01	2.70E-02	7100	0.000004	0.0004%
Manganese	9.30E-04	7.04E-06	0.2	0.00004	0.004%
Mercury	6.30E-04	4.82E-06	0.025	0.0002	0.02%
Naphtha	0.00E+00	0.00E+00	350	0.0	0.0%
Naphthalene	1.73E-02	7.60E-03	50	0.0002	0.02%
Nickel	5.20E-03	3.91E-05	0.059	0.0007	0.07%
Pentane	1.80E-01	1.65E-02	7100	0.000002	0.0002%
Petroleum Distillates	1.34E+01	8.22E+00	350	0.02	2.3%
Phenanathrene	4.32E-05	3.26E-07	0.05	0.00001	0.0007%
Phenol	0.00E+00	0.00E+00	19	0.0	0.0%
Propane	4.47E+00	2.76E+00	No ESL	-	-
Propylene	2.92E-01	2.26E-01	No ESL	-	-
Pyrene	1.24E-05	9.42E-08	0.05	0.000002	0.0002%
Selenium	6.00E-05	4.55E-07	0.2	0.000002	0.0002%
Styrene	1.84E-02	8.85E-03	140	0.00006	0.01%
Toluene	5.55E-01	3.40E-01	1200	0.0003	0.03%
Xylene	2.62E-01	2.40E-01	180	0.001	0.1%

[1] All emissions data is from the ESL modeling spreadsheet file provided by Waid Environmental to Barr Engineering on October 30, 2013 and updates provided by Waid Environmental on January 28, 2014. Project emission rates (tpy) were calculated as the sum of each respective pollutant from each emission unit included in the air dispersion modeling (*i.e.*, Project increases were modeled and did not account for offsets or overall reductions in VOC or particulate emissions)

[2] The "Estimated Max Impact" for each contaminant was obtained from Waid Environmental (calculation spreadsheet). Each 'Estimated Max Impact" was determined as follows:
Each Project emission unit was modeled emitting at a unit emission rate of 4.38 tpy.

- The "Estimated Max Impact" air concentration at or beyond the boundary of the preliminary action area for each modeled emission unit was identified in the air modeling output file and inserted into the calculation spreadsheet (this is a "unitized air concentration"; µg/m^3 per tpy).
- Then, for each contaminant associated with an emission unit, the unitized air concentration is multiplied by the specific air contaminant emission rate (tpy) to derive an estimated air concentration for that contaminant from that emission unit.
- For each contaminant, the estimated air concentration from each emission unit are summed up to derive an overall estimated air concentration (*i.e.* "Estimated Max Impact") and reported in the above table.

This approach assumes that each individual air concentration is occurring at the same location, when in actuality, the impacts (air concentrations) determined at a unit 4.38 tpy emission rate occurred at different locations because the emission units themselves are located at various places around the refinery. Therefore, this is considered a conservative approach for estimating air concentrations to compare to available ESLs.

[3] Effects Screening Levels from the Texas Commission on Environmental Quality as of February 2013. http://www.tceq.texas.gov/toxicology/esl/list_main.html

4.2.1.2 Supporting Qualitative Assessment of Hazardous Air Pollutants

HAPs include speciated VOCs (*e.g.*, benzene, toluene), polycyclic organic matter (POM; speciated as individual polycyclic aromatic hydrocarbons, PAHs), and particulate metals (*e.g.*, cadmium, chromium). In addition to performing air dispersion modeling for criteria pollutants (and in the case of ozone, its VOC precursors), FHR also evaluated potential impacts from HAP emissions and other pollutants for which ESLs have been established.

Volatile Organic Compounds (VOCs) and Polycyclic Aromatic Hydrocarbons (PAHs)

Total VOC emissions associated with the proposed Project are estimated to decrease by about 39 tpy (Table 1). Because VOCs tend to remain in air and generally do not deposit to terrestrial or aquatic ecosystems to any great extent, and because of the overall net reduction in VOC emissions (Table 1), it is concluded that the Preliminary Action Area should not be expanded based on potential indirect effects from these pollutants.

Additionally, Table 3 (1-hour) and Table 4 (annual) provide modeling results for speciated VOC emissions and polycyclic aromatic hydrocarbon (PAH) emissions associated with the Project compared to the ESLs. The modeling included receptor locations at the Preliminary Action Area boundary and out to 3 km from the property boundary. None of the modeled air concentrations exceed the respective ESLs (Table 3 and Table 4). As identified by the TCEQ, a modeled air concentration below a respective ESL indicates that no adverse impacts to health or welfare would be expected. The ESL modeling results provide additional support for the conclusion that the Preliminary Action Area should not be expanded based on potential indirect effects from these pollutants.

Particulate Matter (PM) and Particulate Metals

Particulate emissions associated with the proposed Project are primarily related to combustion sources. All modeled particulate emission concentrations were below the SILs at and beyond the Preliminary Action Area boundary (Table 2). This SIL analysis not only demonstrates an overall *de minimis* impact to PM air concentrations beyond the Preliminary Action Area, but by extension the SIL analysis also demonstrates insignificant impact to soils and vegetation (USEPA 1990. Section D.II.C.). PM metals for which there are ESLs were also evaluated, and the summary information in Table 3 (1-hour) and Table 4 (annual) indicate that modeled air concentrations are below the ESLs for these substances at and beyond the Preliminary Action Area boundary.

In addition to these quantitative conclusions regarding the insignificant potential indirect effects from particulate metals, FHR compared calculated annual particulate metal Project emissions increases to screening emission rates available from USEPA (1980). These USEPA screening rates were developed to assist in the evaluation of whether annual emissions would be expected to cause significant air quality impacts to soils, vegetation, and in some cases, fauna. The summary information from Table 5 indicates that Project emissions are below the lowest screening emissions rates for those metals being compared.

Taken together, these analyses support the conclusion that the Preliminary Action Area should not be expanded based on potential indirect effects from these pollutants.

Table 5 Comparison of Annual Particulate Metal Emissions Estimated for the West Refinery Project to Available Screening Emission Rates

Pollutant	Emission Estimate Project Sources[1] (tons/year)	Screening Emission Rate (SER)[2] (tons/year)	Ratio (Project Emissions / screening emission rate)
Arsenic	5.00E-04	2.4E-01	0.002
Beryllium	3.05E-05	5.7E-02 [3]	0.0005
Cadmium	2.80E-03	3.7E-02	0.08
Chromium	3.56E-03	1.1E+00	0.003
Cobalt	2.04E-04	1.2E+00	0.0002
Manganese	9.30E-04	3.3E-01	0.003
Nickel	5.2E-03	6.7E+01	0.00008
Selenium	6.0E-05	1.7E+00	0.00004

[1] Emission estimates provided by WAID Environmental, October 30, 2011.
[2] Lowest screening emission rate from Table 5.7 in USEPA 1980, unless otherwise noted.
[3] Screening emission rate for beryllium is from Table 5.6 in USEPA 1980.

4.2.1.3 Potential Emissions of Nitrogen and Sulfur and the Potential Effects to Soil and Vegetation

Table 1 identified that there will be net reductions of 228 tpy NO_X and 156 tpy SO_2. This means that neither NO_X nor SO_2 emissions will increase as a result of the Project, and will therefore not increase local deposition of nitrogen or sulfur.

Ammonia is not a criteria pollutant or HAP as defined in the Clean Air Act (CAA) but is a pollutant of interest with regard to potential nitrogen deposition. A potential emissions increase in ammonia of 11.54 tpy was estimated for the Project. As shown below in Table 6, even with a potential increase of Project-related ammonia emissions, overall decreases in NO_X result in an overall net reduction in nitrogen emissions from the facility.

Emissions of both SO_2 and H_2S are estimated to decrease with the Project (Table 1). The overall decreases in SO_2 and H_2S emissions results in an overall net reduction in sulfur emissions.

Because sulfur and nitrogen have estimated reductions in emissions associated with the Project, the overall effect of the proposed Project is not to increase deposition. Therefore, the Project is not expected to have a reasonably foreseeable impact to soil or vegetation from either pollutant.

An overall reduction in nitrogen and sulfur emissions associated with the Project may provide some beneficial effect within the Preliminary Action Area (and possibly beyond), but it is uncertain if there would be a *measurable* beneficial effect. Because of this uncertainty it is not reasonably foreseeable that an overall reduction in nitrogen and sulfur emissions would have a potentially beneficial indirect effect, the Preliminary Action Area should be not be expanded.

Table 6 Estimated Reduction in Overall Nitrogen Emissions Associated with the West Refinery Project

Pollutant / Speciation	Emission Estimate (tpy)	Comments
NO_X	-228	Emission reduction estimate of 228 tpy from Table 1 of this BE Report
N (portion of N emissions from NO and NO_2 emissions)	- 97.5	Assume NO_x emissions are 75% NO and 25% NO_2. Molecular weight of N = 14 Molecular weight of O = 16 Ratio of N for NO: 14/(14+16) = 0.47 Multiply -228 tpy x 0.75 x 0.47 = -80.4 tpy of N Ratio of N for NO_2: 14 / (14+16+16) = 0.30 Multiply -228 tpy x 0.25 x 0.30 = -17.1 tpy of N Reduction in tpy of N = -80.4 + -17.1 = -97.5
NH_3	11.54	Emission increase estimated for the Project Emissions information provided by WAID Environmental.
N (portion of N emissions from NH_3 emissions)	9.5	Molecular weight of N = 14 Molecular weight of H = 1 (account for 3 Hydrogen) Ratio: 14/(14+3) = 0.82 Multiply 11.54 tpy x 0.82 = 9.5 tpy of N
"Net" N Emissions	- 88.0	"Net Emissions" = - 97.5 + 9.5 = - 88

4.2.2 Water Intake and Discharge Water Volume and Water Quality

For this BE, all potential effects related to water are considered to be indirect effects. Potential effects from increased water intake, storm water discharge, and wastewater discharge are discussed below.

4.2.2.1 Water Intake

The current facility uses water from both the Nueces River and the City of Corpus Christi Municipal Water Supply system. The Project is estimated to need approximately 500 gpm of water. This additional water is planned to be obtained from the City of Corpus Christi Municipal Water System. It is not

reasonably foreseeable that additional water use will cause potential indirect effects. Therefore, the Preliminary Action Area does not need to be expanded based on increased water intake.

4.2.2.2 Storm Water Discharge and Water Quality

Storm water associated with the Project within the existing equipment, operations, and maintenance footprint of the refinery will be managed using the existing collection and routing system at the West Refinery. Project-related storm water within the refinery operations area will be routed to either Outfall 001 (treated to remove solids, sent to the WWTP and then discharged to the Viola Turning Basin) or Outfalls 005 or 008 (treated to remove solids and then routed to a ditch that eventually discharges to the Nueces River). Runoff volume within the refinery operations area is not expected to change appreciably (potential increase of 1% to 2%) during or after Project construction because the overall area of impervious surfaces within the areas to be effected by the Project will be small (20 acres) compared to the main refinery operations area of approximately 700 acres. Therefore, even though there may be a small volume increase in storm water it is not reasonably foreseeable that Project-related storm water from this portion of the Preliminary Action Area will cause potential indirect effects.

For the proposed parking area to the south of the main refinery operations (Figure 2), the terrain is relatively flat and storm water is managed as urban runoff and routed to nearby ditches. The location is a previously disturbed, partially grassy area (a former school site) from which storm water is conducted through the municipal storm water management system. Soils are predominantly clay, with surface features including overgrown asphalt, a former parking area and a former running track. There may be an increase in runoff from the site as the parking area is constructed, although it is uncertain as to the magnitude of the potential change given the current site conditions. The parking area will likely be more than one acre in size and will require a construction permit and a storm water pollution prevention plan (SWP3) to be developed and implemented. Best management practices will be implemented and the runoff water will continue to be considered urban runoff and routed to the existing ditching system.

Because the majority of the storm water associated with the Project is from within the existing equipment, operations, and maintenance footprint of the refinery, water quality of the storm water associated with the Project will be similar to the storm water quality from the existing facility. Storm water from the Project, including the proposed parking area, and from the existing West Refinery is expected to have chemistry and temperature similar to urban runoff and therefore does not typically require treatment beyond the removal of solids. The chemistry of storm water from the FHR facility and the proposed parking area to the south of the main refinery operations is not expected to change due to the Project and it is not reasonably foreseeable that it will cause potential indirect effects.

The overall conclusion is that the Preliminary Action Area does not need to be expanded to include the receiving water at the permitted TPDES discharge locations for storm water. The Preliminary Action Area will, however, be expanded in accordance with EPA's request to include points noting the locations of Outfalls 001, 005, and 008 for the purpose of identifying the storm water discharge outfalls.

4.2.2.3 Process Water Discharge and Water Quality

Process wastewater from the Project sources will be routed to the WWTP and then to TPDES permitted Outfall 001, located in the Viola Turning Basin, which forms the west end of the Port of Corpus Christi Inner Harbor. FHR conducted an analysis of the potential indirect effects of process wastewater discharges on water quality from Outfall 001.

The current facility is permitted to discharge storm water and wastewater from Outfall 001. The maximum permitted discharge of process wastewater is 6.7 million gpd (approximately 4,650 gpm) while the allowed daily average is 5.3 million gpd (approximately 3,680 gpm). The annual average discharge rate of process wastewater from Outfall 001 is approximately 2,300 gpm based on 2011 data. It is conservatively estimated that the Project will increase process wastewater discharge by 150 gpm; about a 6% increase from the current average annual discharge volume. The Project's potential effect on the actual volume of process wastewater to be discharged is small and is within the permitted limit.

The current TPDES permit (FHR, Corpus West Permit No. WQ0000531) includes authorization for the specific discharge of pollutants and limits the concentrations of specific pollutants and water quality parameters for Outfall 001 (*e.g.*, total suspended solids) (Table 7). Table 7 provides a comparison of potential incremental changes in average parameter concentrations associated with the Project to the Average Base Case concentrations that are estimated from the average daily flow and the average parameter concentrations associated with annual average flow. Eight of the parameters are shown to have a decrease in concentration or no change, while the remaining twelve parameters show a small increase in concentration. The potential increases in concentrations are generally less than 5% of the Average Base Case concentrations. The highest estimated changes in concentration are 8% for aluminum and 7% for silica (as SiO_2.)

Table 8 provides an estimate of potential incremental parameter loading at Outfall 001 from the proposed Project compared to an estimated High Base Case loading that is estimated from the maximum daily permitted flow and the average parameter concentrations associated with annual average flow for the Average Base Case (see Table 7 for concentrations). Estimates of mass loading at Outfall 001 indicate the Project has a small potential increase in loading. All estimates of incremental parameter loads are less

than 10% of the estimated High Base Case loads and less than 1% of existing background loads to the Viola Turning Basin (Table 8).

TCEQ's Water Quality Division has issued procedures for implementing State water quality standards, which include guidelines for evaluating the potential for water quality degradation (TCEQ 2010). The guidelines call for an initial screening "to determine whether sufficient potential for degradation exists to require further analysis" (*Id.* at 63). Applying this screen allows one to decide that "an increase in loading is small enough to preclude the need for additional evaluation" (*Id.*).

For existing discharges, a potential increase that is less than 10% of an existing permitted loading is ". . . usually not considered to constitute potential degradation if (1) the increase will attain all water quality standards, (2) the aquatic ecosystem in the area is not unusually sensitive to the pollutant of concern, and (3) the discharge is not relatively large . . . ." (*Id.*). The discussion below evaluates potential incremental changes in parameter concentrations and loading due to the Project against these three criteria.

- **Attainment of water quality standards.** As shown in Table 7 all potential changes in parameter concentrations will meet water quality standards.
- **Sensitivity of the aquatic ecosystem.** The Port of Corpus Christi Inner Harbor, which includes the Viola Turning Basin, is classified as an estuary (TCEQ designation for Segment No. 2484). Primary water quality concerns (for screening levels) are nutrient enrichment related to ammonia, chlorophyll-a, and nitrate (TCEQ 2012a). Recent sampling of receiving waters for nutrients and metals indicate no exceedances of screening levels for metals. There were exceedances of the ammonia and nitrate screening levels (TCEQ 2012a), but the available data indicates there has been no exceedance of any water quality standard. Given that all potential changes in parameter concentrations will achieve compliance with water quality standards, and because recent sampling data for the Inner Harbor demonstrate no exceedance of levels of concern for metals, the sensitivity of the aquatic ecosystem to a potential small incremental addition of the listed parameters from the West Refinery is judged to be low.
- **Relative size of discharge.** Parameter loading due to the Project will represent a very small incremental increase relative to the cumulative loadings from all discharges to the Inner Harbor. In the absence of detailed data on parameter loading from other permitted discharges, permitted flows may serve as a surrogate for assessing the relative size of the additional loading due to the Project. Available information from the Nueces River Authority (NRA

2010) indicates there are 18 facilities permitted to discharge to the Inner Harbor (segment 2484), including the City of Corpus Christi Broadway wastewater treatment plant. Permitted wastewater discharge volumes range from 320,000 gpd to 20,000,000 gpd, and the estimated total for all discharges is 55,000,000 gpd. In comparison, the maximum permitted discharge from the West Refinery is 6,700,000 gpd, and the incremental increase from the Project is about 216,000 gpd, or approximately 0.4% of all permitted discharges to the Inner Harbor. The incremental wastewater discharge from the Project is very small compared to existing permitted discharges to the Inner Harbor.

When using the non-degradation criteria (TCEQ 2010), the small potential increase in loading from the Project compared to the High Base Case scenario and current background loading is not considered to constitute degradation and is expected to have no effect on aquatic receptors.

Whole effluent toxicity (WET) tests are required to be conducted for Outfall 001 and the No Observed Effect Concentration (NOEC) for survival reported (TPDES Permit No. WQ00000531000). Acute WET tests (24-hour) estimate the "end of pipe" effluent conditions on sensitive biota without any dilution considerations while chronic WET tests (7-day) estimate the effects of effluent on sensitive biota when dilution is taken into consideration. WET test data for acute toxicity from 2012 and 2013 show that percent survival of *Mysodopsis bahia* (Opossum shrimp, Mysid shrimp) and *Menidia beryllina* (Inland silverside, minnow) in 100% effluent was essentially the same as the percent survival in the control solution (*i.e.*, receiving water, Viola Turning Basin) (FHR 2012a,b; FHR 2013b,c). Data from 2012 and 2013for chronic tests show that percent survival and reproduction of *Mysodopsis bahia* and *Menidia beryllina* were in compliance with permit requirements (FHR 2012c,d,e,f; FHR 2013d,e,f). Based on the acute and chronic WET test results, the effluent discharged at Outfall 001 is not toxic and is not expected to cause harm to aquatic life in the receiving water. Because the relatively small additional wastewater discharges associated with the proposed Project are similar in chemistry to the existing wastewater (Table 7), the Project is not expected to have an effect on the acute or chronic toxicity of the wastewater discharged from Outfall 001 and therefore constitutes no change from existing conditions.

The potential increase in temperature of the discharge at Outfall 001 also was evaluated. Modeling indicates a potential relative increase of up to 2ºF for the post-Project wastewater discharge from Outfall 001 or about a 3% increase. This potential increase is within the variability of the existing effluent temperature. When the discharge water is allowed to mix in the Outfall 001 mixing zone (200-foot mixing zone as defined in TPDES Permit No. WQ 0000531000), the increase in temperature of the surface water is expected to be below the maximum allowed change of 1.5ºF in June, July, and August and the

maximum allowed change of 4ºF from September to May (TCEQ 2012b). Therefore, the Project is not expected to have an effect on the receiving water temperature in the mixing zone of Outfall 001.

Conclusion. Overall, with an estimated increase in wastewater discharge volume of approximately 150 gpm (approximately 216,000 gpd), and a very small associated increase in chemical load for some parameters, the percent increase in potential loading for each chemical is not a significant increase when compared to the estimated High Base Case load and background load. The increase in chemical load does not degrade water quality according to TCEQ criteria (2010). The acute and chronic WET test results for Outfall 001 indicate the current discharges are not toxic to aquatic life and because the additional water discharges from the Project are relatively small and similar in chemistry to the existing wastewater, the Project is not expected to have an effect on aquatic life. The potential increase in temperature of the wastewater discharge also is estimated to be small (a potential relative increase of about 2°F for the wastewater discharge and less than a 2ºF increase reasonably expected in the mixing zone of Outfall 001), and is within water quality standards. Based on the small potential increase in chemical loading and temperature from the Project, no reasonably foreseeable effects are expected from the Project's wastewater discharge. Nevertheless, the Preliminary Action Area is expanded at EPA's request to include the point identifying the location of Outfall 001 and the 200-foot regulatory mixing zone because of the estimated small increase in wastewater discharges and associated changes in parameter concentrations and loadings.

Table 7 Wastewater Modeling Results for Outfall 001 and the Potential Incremental Change in Chemical Concentrations Due to the Project Compared to the Average Base Case Scenario and Background in the Viola Turning Basin

Parameter	Permitted Daily Average or Water Quality Based Effluent Limit	Permitted Daily Maximum or Water Quality Based Effluent Limit	Average Base Case (Conc. at Annual Average Flow)	Average Base Case + Project (Conc. for Project at Potential Flow)	Change due to Project (Incremental Increase or Decrease)	Change due to Project (Incremental Conc. Change compared to Average Base Case)	Existing Viola Turning Basin (Total Background Conc. From 2000 to Current) [2]	Texas Water Quality Standards, Criteria or Screening Level (SL) [3]
Flow (gallons per day)	5,300,000	6,700,000						
Flow (gallons per minute, gpm)	3,681	4,653	2,306	2451	146	6.3%		
Concentration (mg/L)								
Alkalinity (M-)			211.4	201.1	-10.3	-4.9%	132.1	--
Aluminum			0.13	0.14	0.01	7.7%	0.16	--
Ammonia Nitrogen (NH_3-N)	9							--
Ammonia (as NH_3)			0.48	0.47	-0.01	-2.1%	0.17	0.0001 (SL)
Barium			0.35	0.37	0.02	5.7%		2.0, dissolved
Boron			0.66	0.69	0.03	4.5%		--
Calcium			130.4	139.0	8.6	6.6%	340.6	--
Chloride			663.3	686	22.7	3.4%		--
Chromium, total								
Chromium, hexavalent								0.062, dissolved
Copper, total								0.004, dissolved
Fluoride			0.1	0.09	-0.01	-10.0%	0.96	4.0
Magnesium			36.9	38.2	1.3	3.5%	1,015.6	--
Manganese			0.08	0.08	0	0.0%	0.02	--
Nitrate (as N) [1]			4.23	4.40	0.17	4.1%	0.58	10.0 0.00017 (SL)

Parameter	Permitted Daily Average or Water Quality Based Effluent Limit	Permitted Daily Maximum or Water Quality Based Effluent Limit	Average Base Case (Conc. at Annual Average Flow)	Average Base Case + Project (Conc. for Project at Potential Flow)	Change due to Project (Incremental Increase or Decrease)	Change due to Project (Incremental Conc. Change compared to Average Base Case)	Existing Viola Turning Basin (Total Background Conc. From 2000 to Current) [2]	Texas Water Quality Standards, Criteria or Screening Level (SL) [3]
Phenolic compounds								--
Potassium			30.2	31.3	1.1	3.6%	227.5, dissolved	--
Silica (as SiO_2)			50.8	54.4	3.6	7.1%		--
Sodium			728.8	728.4	-0.4	-0.1%	9222.0	--
Sulfate (as SO_4^{-2})			922.8	926.6	3.8	0.4%	2602.4	
Sulfide (as S)								
Strontium			1.10	1.15	0.05	4.5%		
Total Dissolved Solids			2791.2	2817.6	26.4	0.9%		
Total Suspended Solids (TSS)								
Zinc	0.251 [4]	0.530 [4]	0.22	0.22	0	0.0%	0.009	0.08, dissolved
Carbonate (as CO_3^{-2})			8.87	8.41	-0.46	-5.2%	132.1	
Bicarbonate (as HCO_3^-)			239.7	228.1	-11.6	-4.8%		

(Results from Wastewater Modeling conducted for Outfall 001; wastewater modeling conducted for total concentrations)

[1] Nitrate concentrations converted from nitrate basis to nitrogen basis for direct comparison with water quality standards and Viola Turning Basin background concentration by Barr Engineering Co. on 1-10-2013.

[2] Viola Turning Basin background concentration obtained from Station ID 13439 on TCEQ Surface Water Quality Web Reporting website.

[3] Texas Water Quality Standards values obtained from Table 1 and Table 2 of Chapter 307 – Texas Surface Water Quality Standards.

[4] Calculated using daily average and daily maximum water quality based effluent limit for zinc per TPDES Permit No. WQ000053-1000.

Table 8 Wastewater Modeling Results for Outfall 001 and the Potential Incremental Change in Chemical Loads due to the Project Compared to Estimated Average and High Base Case Loads

Parameter	Permitted Daily Average or Load Estimate Using Water Quality Based Effluent Limit	Permitted Daily Maximum or Load Estimate Using Water Quality Based Effluent Limit	High Base Case Load [1, 2, 3] (Permitted Daily Max Flow and Average Base Case Total conc.) (mg/day)	Average Base Case Load [1, 2, 3] (Annual Average Flow) (mg/day)	Average Base Case + Project Load (Project at Potential Flow) (mg/day)	Change due to Project (Incremental Increase or Decrease) (mg/day)	Change due to Project (Incremental Change in Load as % of Estimated High Base Case Load)	Existing Background Viola Turning Basin Load (Total Conc. From 2000-Current x Volume of Basin) [5, 6] (mg/day)	Incremental Change in Load due to Project as % of Viola Turning Basin Load
Flow (gallons per day)	5,300,000	6,700,000							
Flow (gallons per minute, gpm)	3,681	4,653	4,653	2,306	2451	146	3.1%		
	Loading (mg/day)[4]	Loading (mg/day)[4]							
Alkalinity (M-)			5.366E+09	2.659E+09	2.690E+09	3.029E+07	0.6%	3.010E+11	0.01%
Aluminum			3.300E+06	1.635E+06	1.872E+06	2.371E+05	7.2%	3.658E+08	0.06%
Ammonia Nitrogen (NH_3-N)	1.103E+08	1.839E+08							
Ammonia (as NH_3)			1.218E+07	6.038E+06	6.286E+06	2.478E+05	2.0%		
Barium			8.885E+06	4.403E+06	4.948E+06	5.457E+05	6.1%		
Boron			1.675E+07	8.302E+06	9.228E+06	9.259E+05	5.5%		
Calcium			3.310E+09	1.640E+09	1.859E+09	2.187E+08	6.6%	7.762E+11	0.03%
Chloride			1.684E+10	8.344E+09	9.175E+09	8.309E+08	4.9%		
Chromium, total	5.675E+06	1.607E+07							
Chromium, hexavalent	4.812E+05	1.071E+06							
Copper, total									
Fluoride			2.538E+06	1.258E+06	1.204E+06	-5.425E+04	-2.1%	2.194E+09	0.00%
Magnesium			9.367E+08	4.642E+08	5.109E+08	4.672E+07	5.0%	2.314E+12	0.00%
Manganese			2.031E+06	1.006E+06	1.070E+06	6.359E+04	3.1%	3.715E+07	0.17%
Nitrate (as N)			1.073E+08	5.317E+07	5.883E+07	5.655E+06	5.3%	1.329E+09	0.43%
Phenolic compounds	3.768E+06	7.809E+06							
Potassium			7.666E+08	3.799E+08	4.186E+08	3.872E+07	5.1%	1.02E+12	0.00%
Silica (as SiO_2)			1.290E+09	6.390E+08	7.276E+08	8.853E+07	6.9%		
Sodium			1.850E+10	9.168E+09	9.742E+09	5.740E+08	3.1%	2.097E+13	0.00%
Sulfate (as SO_4^{-2})			2.342E+10	1.161E+10	1.239E+10	7.844E+08	3.3%	5.929E+12	0.01%
Sulfide (as S)	2.906E+06	6.447E+06							

Parameter	Permitted Daily Average or Load Estimate Using Water Quality Based Effluent Limit	Permitted Daily Maximum or Load Estimate Using Water Quality Based Effluent Limit	High Base Case Load [1, 2, 3] (Permitted Daily Max Flow and Average Base Case Total conc.) (mg/day)	Average Base Case Load [1, 2, 3] (Annual Average Flow) (mg/day)	Average Base Case + Project Load (Project at Potential Flow) (mg/day)	Change due to Project (Incremental Increase or Decrease) (mg/day)	Change due to Project (Incremental Change in Load as % of Estimated High Base Case Load)	Existing Background Viola Turning Basin Load (Total Conc. From 2000-Current x Volume of Basin) [5, 6] (mg/day)	Incremental Change in Load due to Project as % of Viola Turning Basin Load
Strontium			2.792E+07	1.384E+07	1.538E+07	1.543E+06	5.5%		
Total Dissolved Solids			7.085E+10	3.511E+10	3.768E+10	2.572E+09	3.6%		
Total Suspended Solids (TSS)	4.685E+08	7.400E+08							
Zinc	7.258E+08 [7]	1.937E+10 [8]	5.585E+06	2.767E+06	2.942E+06	1.749E+05	3.1%	2.12E+07	0.83%
Carbonate (as HCO_3^{-2})			2.252E+08	1.116E+08	1.125E+08	8.986E+05	0.4%		
Bicarbonate (as HCO_3^{-})			6.085E+09	3.015E+09	3.051E+09	3.540E+07	0.6%		

Average Base Case and "Average Base Case + Project" Results from Wastewater Modeling for Outfall 001 [1]

[1] Parameter concentrations from Table 7.

[2] Factors in equations gpm to cubic feet per second =0.00223 Liters per cubic feet =28.31625 Seconds per day =86400

[3] Convert Flow in million gallons per day to gallons per minute: hour per day =24 hours per minute =0.01666667

[4] Loading estimate from the NPDES Permit:

Convert daily average load in pounds/day to mg/day: grams per pound =454 milligrams per gram =1000

[5] Viola Turning Basin background concentration obtained from Station ID 13439 on TCEQ Surface Water Quality Web Reporting website.

[6] Viola Turning Basin Load determined by multiplying the calculated Viola Turning Basin Volume by total background concentration.
Viola Turning Basin Volume determined by assuming a circular cylinder shape with a diameter of 460 m and depth of 13.7 m.

[7] Estimated Daily Average Zinc Load determined by multiplying daily average water quality based effluent limit for dissolved zinc and TPDES Permit Daily Average Discharge Rate.

[8] Estimated Daily Maximum Zinc Load determined by multiplying daily maximum water quality based effluent limit for dissolved zinc and TPDES Permit Daily Maximum Discharge Flow Rate.

4.3 Step Three: Define the Final Action Area

Based on the foregoing steps, FHR defines the final Action Area as the area within the facility property boundary that is encompassed by the existing equipment, operations, and maintenance areas of the refinery and the proposed parking area to the south of the refinery (Figure 4). Additionally, at the request of USEPA, the Action Area also includes as points the specific outfall locations expected to receive storm water (Outfalls 005 and 008) and both storm water and process wastewater (Outfall 001) related to the Project. USEPA also requested the 200-foot regulatory mixing zone for Outfall 001 be included in the Action Area because of the small potential increase in discharge volume and potential changes in parameter concentrations and loading.

Other factors that were evaluated but do not expand the Action Area include the following:

- The current facility uses water from both the Nueces River and the City of Corpus Christi Municipal Water Supply system. It is not reasonably foreseeable that additional water use will cause potential indirect effects. Therefore, the Preliminary Action Area does not need to be expanded based on increased water intake.
- The additional incremental increase in storm water discharge volume related to the Project was found to be small and is not expected to have any effects on potential ecological receptors.
- The air dispersion modeling results demonstrate that all air concentrations at the Preliminary Action Area boundary and out to the edge of the receptor grid are less than the SILs and the ESLs. Modeling below the respective SIL and ESL at and beyond the Preliminary Action Area boundary indicates a very small area for potential direct and indirect impacts from air emissions. Additional qualitative analyses of HAP and nitrogen/sulfur deposition support this conclusion. Accordingly, ground level receptors beyond the Preliminary Action Area are not included in the Action Area.

Overall, FHR determined that in the absence of air quality- and water quality-related indirect effects beyond the Preliminary Action Area, the final Action Area should include only the Preliminary Action Area that bounds potential direct effects, the three points identifying the locations of Outfalls 001, 005, and 008, and the regulatory mixing zone for Outfall 001.

5.0 Environmental Setting and Resource Inventory

5.1 General Description

The Project is located within Nueces County, Texas at the far west end of the Port of Corpus Christi Inner Harbor. The Port includes many large industrial developments, dredge disposal areas, a railway system and the industrial ship channel. Two of the active dredge disposal areas are within 100 m (300 ft) east and west of the refinery.

Population around the West Refinery is generally located to the south of the I-37 transportation corridor and is approximately 2,000 to 6,000 persons per census tract (USDOT 2013). Approximately 305,000 persons are estimated to reside in the City of Corpus Chris and approximately 340,000 persons in Nueces County (US Census 2010).

5.1.1 Land Use

The Project is located within the Western Gulf Coast Plains ecoregion recognized for its mild and humid climate, with hot summers and mild winters. Flat coastal plains, barrier islands, dunes, beaches, bays, estuaries, and tidal marshes characterize the ecoregion (USEPA 2012; Griffith et al. 2007).

The area around the West Refinery includes the Port of Corpus Christi shipping channel to the north and the I-37 corridor to the south. East and west of the West Refinery are similar industrial land uses. The closest residential land use is south of the I-37 corridor.

The National Land Cover Data (NLCD) for the land surrounding the West Refinery identifies it as primarily “Developed Medium Intensity” and “Developed High Intensity Developed.” North of the I-37 corridor are areas of “Barren Land” and “Open Water” associated with Nueces River, the Inner Harbor, and Nueces Bay. “Emergent Herbaceous Wetlands” associated with the open water areas are also recognized. Minor areas of “Shrub/Scrub” with even more minor areas of “Deciduous Forest” occur within the area north of the I-37 corridor. South of the I-37 corridor are areas of “Developed Low Intensity” and “Developed Medium Intensity”. The developed land transitions into an area predominantly characterized by “Cultivated Crops.” Refer to Figure 11 for a complete map of the NLCD 2006 landcover data.

5.1.2 Climate

Based on weather records provided by the City of Corpus Christi, the average annual temperature is 71 degrees Fahrenheit with average relative humidity at 61%. Prevailing winds are from the southeast. Average rainfall amount is 32 to 33 inches (in) per year (Climate Zone 2013).

5.1.3 Topography

The land area around the West Refinery is within the Annaville (TX) 1:24,000 topographic quadrangle and is generally on level terrain 15 m (50 ft) above sea level (USGS 2010)

5.1.4 Geology

According to the USGS, the underlying geology is Quaternary-aged Beaumont Formation composed of: clay, silt, sand, and gravel deposited along waterways within the past 2.6 million years (BEG 1992).

5.1.5 Soils

According to the USDA Soil Conservation Service, the area around the West Refinery includes several different soil categories along the Nueces River channel. Table 9 summarizes soils information for the area within 3 km of the proposed Project.

Table 9 Summary Information for Soil Types within 3 Kilometers of the Proposed Project

Series	Acres	Percent of Total
Aransas clay, saline	1424.21	10.58
Barrada-Tatton association	1743.22	12.95
Clareville loam, 0 to 1 percent slopes	174.66	1.30
Comitas fine sand	747.39	5.55
Edroy clay	22.69	0.17
Edroy clay, 0 to 1 percent slopes, ponded	10.62	0.08
Galveston and Mustang fine sands	338.59	2.51
Ijam clay loam	32.54	0.24
Miguel fine sandy loam, 0 to 1 percent slopes	169.04	1.26
Miguel fine sandy loam, 1 to 3 percent slopes	161.23	1.20
Miguel fine sandy loam, 3 to 5 percent slopes	267.40	1.99
Monteola clay, eroded	344.78	2.56
Oil-waste land	392.25	2.91
Orelia fine sandy loam	740.93	5.50
Pits	24.54	0.18
Point Isabel clay	63.00	0.47
Raymondville complex, 0 to 1 percent slopes	215.00	1.60
Raymondville complex, 1 to 3 percent slopes	222.96	1.66
Raymondville complex, 3 to 5 percent slopes	9.63	0.07
Tidal flats	810.99	6.02
Victoria clay, 0 to 1 percent slopes	3706.90	27.53
Victoria clay, 1 to 3 percent slopes	115.05	0.85
Victoria clay, low	75.44	0.56
Water	1567.62	11.64
Willacy fine sandy loam, 1 to 4 percent slopes	83.74	0.62
Totals	**13464.39**	**100.00**

5.1.6 Water Resources

Immediately north of the Action Area (within about 100 m) is the Viola Turning Basin which is the western-most end of the Port of Corpus Christi Inner Harbor. The Inner Harbor is a man-made feature constructed by the US Army Corp of Engineers. Construction began in 1925, and the Inner Harbor opened to shipping in 1926. Over time, the Inner Harbor channel has been widened and deepened: it is now dredged to a depth of approximately 14 m (45 ft). Dredging of the Inner Harbor, including the Viola Turning Basin, is conducted about every 10 years by the U.S. Army Corps of Engineers (USACE). Available records indicate the Inner Harbor is planned to be dredged in the 2013/2014 calendar years. The Inner Harbor was last dredged in 2003 (the Industrial Canal through the Viola Turning Basin)

(USACE 2013). A search of available information from the USACE and the Port of Corpus Christi did not identify any records of maintenance dredging specifically for Oil Dock #8. The Port of Corpus Christi is the fifth busiest port in the United States, by tonnage, serving over 6,000 vessels in 2012 (Port of Corpus Christi 2013b).

Just north of the Inner Harbor channel, extending from the northwest, is the Nueces River. A thin strip of land separates the Inner Harbor from the Nueces River. The nearest stretch of the Nueces River is approximately 300 m (1000 ft) to the north of the facility property boundary. The Nueces River flows into Nueces Bay. The nearest portion of Nueces Bay is approximately 1,400 m (0.9 mi) to the northeast of the Action Area. Nueces Bay then connects to Corpus Christi Bay, a bay just off of the Gulf of Mexico.

The National Wetlands Inventory (NWI) mapping indicates significant tidally influenced estuarine emergent wetlands associated along the West Nueces Bay and the Nueces River Tidal Segment (TPWD 2000) that includes the stretch of the Nueces River approximately 300 m (0.2 mi) to the north of the facility property boundary. Additional minor palustrine emergent wetlands are indicated by NWI mapping associated with the Nueces River Delta 300 to 400 m (0.2 mi) north of the facility property boundary on the north side of the Nueces River and Tule Lake approximately 1,400 m (0.9 mi) to the east of the Action Area. These brackish marshes associated with the Nueces Delta are typically comprised of a variety of saline tolerant vegetation.

5.1.7 Vegetation

The Project is in an ecoregion typified by flat topography and native grassland vegetation that includes little bluestem (*Schizachyrium scoparium)*, yellow Indiangrass *(Sorghastrum nutans)*, tall dropseed *(Sporobolus asper)*; and invasive species that include honey mesquite (*Prosopis glandulosa*), huisache (*Acacia smallii*), blackbrush (*Acacia rigidula*), and granjeno (*Celtis pallida*) (USEPA 2012).

Most of the regional native coastal prairie is now pastureland, cropland, or residential, urban, commercial, and industrial development. Primary crops in this coastal region include rice, grain, sorghum, cotton, and soybeans, and approximately 40% of the ecoregion to the south and southwest of the West Refinery have been classified as Prime Farm Lands (USDA 2009).

While the Project is located within the Western Gulf Coast Plains ecoregion, the Action Area is highly disturbed from past and current industrial activity, with minimal areas of vegetation (minimal acreage vegetated in the northwest and southeast portions of the facility footprint near the edges of the Action Area boundary).

5.2 Federally-Listed Species

5.2.1 Identification of Federally-Listed Species

The identification of species and their habitats that could potentially be present in the Action Area was conducted using a desktop review for the West Refinery property and surrounding areas. For the desktop review, the following resources were evaluated:

- USFWS County Lists
- USFWS Critical Habitat Mapper
- Texas Natural Diversity Database (TXNDD 2013)
- Texas Park and Wildlife Department (TPWD) County Lists
- The National Oceanic and Atmospheric Administration (NOAA) Fisheries website (http://www.nmfs.noaa.gov/pr/species/esa/) was reviewed for listings of endangered marine species relevant to the Corpus Christi area and state of Texas

The evaluation of species considered the following: (1) state and FHR-documented records of species occurring within the Action Area; (2) qualitative comparison of the suitable habitat requirements listed by the USFWS for each species relative to the Action Area; and (3) TXNDD information on Elements of Occurrence (recorded occurrences of federally-listed species). The nearest documented occurrence of a federally-listed species is about 7 km to the southwest of the Project (Figure 5).

Refer to Table 10 for a summary of the federally-listed threatened and endangered species for Nueces County and whale species for the state of Texas.

5.2.2 Initial Federal Agency Contacts

FHR staff was designated as non-federal representatives by USEPA Region 6 for consultations related to this BE (USEPA 2013b). FHR contacted the USFWS (FHR 2013g) and the NMFS (FHR 2013h) to provide Project information and initiate the informal consultation process. These discussions identified the manatee and the whooping crane as species of interest for the Project.

5.2.3 Critical Habitat Designation

The USFWS Critical Habitat Mapper (USFWS 2013a) indicates that there is no critical habitat in the Action Area. The closest critical habitat area is designated for the Piping Plover on the narrow peninsula between Corpus Christi Bay and Nueces Bay, approximately 15 km (9 mi) to the east/northeast of the Project (Figure 6).

Table 10 Federally-Listed Threatened and Endangered and Candidate Species for Nueces County, Texas

Common Name[1]	Scientific Name	Federal Listing Status[2]	Preferred Habitat
Reptiles			
Green Sea Turtle	*Chelonia mydas*	E, T	Seagrass beds associated with larger coastal bodies of water and inland marine habitats
Hawksbill Sea Turtle	*Eretmochelys imbricata*	E	Clear off-shore waters near coral reefs
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E	Larger coastal bodies of water and inland marine habitats
Leatherback Sea Turtle	*Dermochelys coriacea*	E	Primarily an open ocean dweller that only enters coastal water during nesting season
Loggerhead Sea Turtle	*Caretta caretta*	T	Larger coastal bodies of water and inland marine habitats
Mammals			
Gulf Coast Jaguarundi	*Herpailurus (=Felis) yagouaroundi cacomitli*	E	Thick brush.
Ocelot	*Leopardus (=Felis) pardalis*	E	Dense, thorny, low brush composed of spiny hackberry, lotus bush, and black brush.
West Indian Manatee	*Trichechus manatus*	E	Shallow tropical and subtropical coastal waters with abundant areas of sea grass.
Red wolf	*Canis rufus*	E*	Extensive bottomland forest and swamps.
Blue Whale	*Balaenoptera musculus*	E	Deepwater ocean off the continental shelf
Finback Whale	*Balaenoptera physalus*	E	Deepwater ocean, off the continental shelf
Humpback Whale	*Megaptera novaeangliae*	E	Deepwater ocean, off the continental shelf
Sei Whale	*Balaenoptera borealis*	E	Deepwater ocean, off the continental shelf
Sperm Whale	*Physeter macrocephalus*	E	Deepwater ocean, off the continental shelf

Common Name[1]	Scientific Name	Federal Listing Status[2]	Preferred Habitat
Birds			
Piping Plover	*Charadrius melodus*	T/E	Large open flats or sandy areas.
Northern Aplomado Falcon	*Falco femoralis septentrionalis*	E	Open grassland or savannah habitat with scattered trees or shrubs.
Whooping Crane	*Grus americana*	E	Salt flats or open expanses of herbaceous wetland.
Eskimo curlew	*Numenius borealis*	E*	Grasslands are used for resting and feeding on the travel route between South America and the Arctic.
Fish			
Smalltooth Sawfish	*Pristis pectinata*	E**	Shallow coastal waters of tropical seas and estuaries.
Plants			
Slender Rush-Pea	*Hoffmannseggia tenella*	E	Clayey soil of blackland prairies and creek banks in association with short and midgrasses.
South Texas Ambrosia	*Ambrosia cheiranthifolia*	E	Open grasslands or savannas on soils varying from clay loams to sandy loams.
Candidate Species			
Red Knot	*Calidris canutus rufa*	C	Intertidal, marine habitats, especially near coastal inlets, estuaries, and bays.
Sprague's Pipit	*Anthus spragueii*	C	Well-drained, open grasslands and fields.
Yellow-billed Cuckoo	*Coccyzus americanus*	C	Riparian habitat; cottonwoods and willows, with dense understory

* USFWS does not list this species. Identified as federally-listed for Nueces County by the Texas Parks and Wildlife Department.

** NOAA Fisheries does not list this species. Identified as federally-listed for Nueces County by the Texas Parks and Wildlife Department.

1 Source of information for species in Nueces County (Online query of USFWS Nueces County List, November 2012; accessed again September 2013).
2 Endangered (E), Threatened (T), Candidate (C) Species or Delisted (D)

5.3 Listed Species Habitat Evaluation in the Action Area

A Listed Species Habitat Evaluation (Habitat Evaluation) was conducted by the Whitenton Group, Inc. (WGI) for a survey area of approximately 717 acres that included the Action Area. The Habitat Evaluation included: (1) a desktop review of background information available from state and federal agencies that included the most-recent federal listing of threatened, endangered, and candidate species for Nueces County and known occurrences, topographic maps, aerial photos, and soil survey information in the vicinity of the Project; (2) an on-site field survey; and (3) an analysis of results. The Field Survey included a pedestrian survey of the proposed areas for construction and other Project activities, including the proposed parking area, (hereafter referred to as "Project Areas"), and all vegetated portions of the Action Area. The pedestrian survey also included Outfall 001 which is located about 170 m (550 ft) north of the Action Area in the Viola Turning Basin which forms the far west end of the Corpus Christi Inner Harbor, and Outfalls 005 and 008 which are located to the north of the West Crude and Mid Plant areas, respectively (Figure 4).

A summary of the Habitat Assessment is presented below and the full report from WGI is provided in Appendix A.

5.3.1 Plant Communities Observed

The Project Areas are located within a disturbed industrial area consisting mostly of concrete, caliche, or roadbase with small patches of vegetation.

The dominant habitat types observed within the Action Area include:

- Retention Pond: This habitat includes the existing, maintained storm water retention ponds with vegetation observed on the banks including bermudagrass and Kleingrass.
- Shrub: This habitat is primarily very small and fragmented areas with the predominant species being mesquite, cedar elm, huisache, lime prickly ash, and granjeno.
- Herbaceous Habitat: This habitat consisted of small areas of grasses that appear to be routinely disturbed or maintained; primarily bermudagrass, Kleingrass, guinea grass, King Ranch bluestem, bristlegrass, and silverleaf nightshade.
- Drainage Ditch: There is a man-made storm water drainage ditch which discharges at existing Outfall 005. Outfall 005 discharges into a man-made drainage canal that immediately drains into a wetland adjacent to the Suntide Dredge Material Placement Area. Vegetation is

primarily mesquite, retama, huajillo, and mustang grape. Vegetation around Outfall 005 included Jesuit's bark and mesquite. A second man-made drainage ditch used for storm water drainage discharges at existing Outfall 008. Outfall 008 discharges into a man-made drainage canal that ultimately drains into a wetland adjacent to the Suntide Dredge Material Placement Area. Vegetation around Outfall 008 included Jesuit's bark, eastern baccharis, and wax myrtle.

- Estuarine Open Water: Outfall 001 is an underwater discharge into the Viola Turning Basin, which is considered a tidally influenced open water estuary habitat. The outfall structure is located about 30 yards to the east of the Port of Corpus Christi Dock #8, at a point where the water is approximately 0.6 to 1.2 m (2 to 4 ft) deep. The water depth increases quickly to accommodate ship and barge traffic within about 15 m (50 ft) of the outfall structure. No vegetation was observed within the aquatic habitat near the outfall structure. The shoreline is currently a concrete wall. Vegetation onshore adjacent to the concrete wall included Kleingrass, bermudagrass, and silverleaf nightshade. While the Viola Turning Basin provides an open water habitat, periodic channel dredging likely limits the growth of aquatic vegetation and creates a relatively steep-sided water body in order for barges and ships to effectively utilize the existing docks. In the vicinity of Outfall 001 the littoral area is limited to essentially the area immediately adjacent to the shoreline.

5.3.2 Listed Species Habitat Evaluation Results

The background desktop review suggested that terrestrial habitat for Sprague's pipit, Eskimo curlew, slender rush-pea, and South Texas Ambrosia had the potential to occur within the survey area and/or Project Areas of the West Refinery Project, but the results of the field survey indicated that no such potential habitat exists for these species. Regarding potential estuary habitat, the desktop review and field study indicated that the Viola Turning Basin has the potential to provide foraging habitat for the green, Kemp's ridley and loggerhead sea turtles, and that no nesting habitat was present for these species. Port activities likely deter these species from using this potential habitat. No habitat for any other federally-listed marine species was identified in the Action Area.

The habitat evaluation indicates the following with regard to the quality of each habitat type as potential habitat for listed species:

- Retention Pond: The retention pond is man-made and disturbed by storm water runoff and by routine maintenance. The observable habitat does not have the characteristics necessary to

support any of the federally-listed threatened, endangered, or candidate species for Nueces County.

- Shrub Habitat: These habitat areas are very small fragmented tracts surrounded by industrial development. The observable habitat does not have the characteristics necessary to support any of the federally-listed threatened, endangered, or candidate species for Nueces County.
- Herbaceous Habitat: The habitat areas are small fragmented patches of grasses occurring throughout the facility that have historically been disturbed by development and are currently routinely disturbed and/or maintained. The substrate observed in the herbaceous areas was primarily deposited fill material (loam, caliche, roadbase, etc.). The observable habitat does not have the characteristics necessary to support any of the federally-listed threatened, endangered, or candidate species for Nueces County.
- Drainage Ditch: The storm water drainage ditch at Outfall 005 and the drainage ditch at Outfall 008 is a man-made habitat that is considered to be small and fragmented. The observable habitat does not have the characteristics necessary to support any of the federally-listed threatened, endangered, or candidate species for Nueces County. The respective man-made drainage canals that receive storm water discharges from Outfalls 005 and 008 ultimately flow into separate wetlands that are also a man-made habitat. The observable habitat does not possess the characteristics needed to support the federally-listed threatened, endangered, or candidate species for Nueces County.
- Estuarine habitat. The estuarine open water habitat at the location of Outfall 001 is in the Viola Turning Basin of the Corpus Christi Inner Harbor. It is connected to Corpus Christi Bay and is tidally-influenced. The shoreline of this channel at the location of the outfall is concrete, and would not provide potential nesting habitat for sea turtles. The outfall is located adjacent to an existing Port of Corpus Christi dock facility and this portion of the Viola Turning Basin is regularly dredged and disturbed by existing marine vessel traffic. The current wastewater discharge at existing Outfall 001 could be a potential attractant for the rare, transient West Indian manatee in Texas seeking warm water during the winter, however, the Inner Harbor does not offer seagrass beds (Figure 7) as a food source and the distance the manatee would travel amidst heavy marine vessel traffic to reach Outfall 001 would be a significant deterrent. In addition, the existing dock facility traffic within the wastewater discharge plume would be a deterrent for the manatee. Habitat with the potential to support foraging leatherback and hawksbill sea turtles was not observed near Outfall 001 or within the Viola Turning Basin. The potential exists for foraging green sea turtles, Kemp's ridley sea

turtles and loggerhead sea turtles to utilize the Viola Turning Basin. However, the lack of nesting habitat, lack of seagrass beds **(**Figure 7**)** and an uncertain supply of algae for the green sea turtle, an uncertain benthic food supply for the Kemp's ridley and loggerhead sea turtles, and the regular marine vessel traffic would be a danger and a deterrent for these three species. The estuarine open habitat was not suitable for whales or the smalltooth sawfish.

5.3.3 Conclusions on Potential Habitat for Listed Species

A background desktop review and field survey were completed to determine if potential habitat for federally-listed species is present within the survey area and/or Action Area of the West Refinery Project. The habitat evaluation concluded that there is no terrestrial habitat present with characteristics preferred by any of the federally-listed species. Results indicate that the Viola Turning Basin in the vicinity of Outfall 001 does not provide potential habitat to support leatherback and hawksbill sea turtles, whales, or smalltooth sawfish. The Viola Turning Basin in the vicinity of Outfall 001 provides poor quality open estuary habitat that has the potential to be used by green sea turtles, Kemp's ridley sea turtles, loggerhead sea turtles, and West Indian manatees. However, the Corpus Christi Inner Harbor offers an uncertain source of algae for the green sea turtle and benthic invertebrates as a food source for Kemp's ridley and loggerhead sea turtles), and no seagrass beds **(**Figure 7**)** as a food source for green sea turtles or West Indian manatees. The approximately 13 km (8 mi) that manatees and sea turtles would have to travel up the Inner Harbor from Corpus Christi Bay amidst relatively frequent marine vessel traffic to reach the Viola Turning Basin would be a deterrent to their presence near Outfall 001. In addition, the existing vessel traffic and associated loading/unloading activities at Dock #8, near Outfall 001, would also deter green sea turtles, Kemp's ridley sea turtles, loggerhead sea turtles, and West Indian manatees from using the area near Outfall 001.

Although potential habitat for whooping cranes was not identified within the survey area, the West Refinery is located within the whooping crane migration corridor. The potential exists for migrating whooping cranes to fly over the facility.

The potential for effects from the Project on federally-listed threatened, endangered, and candidate species for Nueces County are further discussed in Sections 5.4 and 5.5.

5.4 Descriptions of Listed Species and Assessing the Project's Potential for Effects

5.4.1 Reptiles

The following resources were reviewed to compile descriptions of the turtle species.

- USFWS Species Fact Sheets
- TPWD (Texas Park and Wildlife Department) Species Fact Sheets
- National Park Service (NPS) Padre Island Seashore Current Sea Turtle Nesting Season (Preliminary count of nests documented in 2013) maintained by the Padre Island Seashore Chief of the Division of Turtle Science and Recovery (NPS, 2013)
- Online access to USACE Environmental Laboratory (EL) information for sea turtles accessed for information related to dredging activities in the Corpus Christi Ship Channel (2004 – 2013 information) and turtle species encountered during those dredging operations (http://el.erdc.usace.army.mil/seaturtles/index.cfm)

5.4.1.1 Green Sea Turtle

The green sea turtle grows to a maximum size of about 1.2 m (4 ft) and a weight of 200 kilograms (kg) (440 pounds [lbs]). It has a heart-shaped shell, small head, and single-clawed flippers. Color is variable. Hatchlings generally have a black carapace, white plastron, and white margins on the shell and limbs. The adult carapace is smooth, keelless, and light to dark brown with dark mottling; the plastron is whitish to light yellow. Adult heads are light brown with yellow markings. Identifying characteristics include four pairs of costal scutes, none of which borders the nuchal scute, and only one pair of prefrontal scales between the eyes.

Green sea turtles feed in shallow water areas with abundant sea grasses or algae. Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on sea grasses and marine algae. Green sea turtles have a worldwide distribution in tropical and subtropical waters. They migrate from nesting areas to feeding grounds, which are sometimes several thousand kilometers apart. Most green sea turtles migrate along the coasts, but some populations are known to migrate across the ocean from nesting area to feeding grounds. Preferred nesting habitat is high energy oceanic beaches with a sloping platform and minimal disturbance. The nearest green sea turtle nests to the Action Area were identified at Padre Island National Seashore more than 95 km (60 mi) to the southeast along the Gulf of Mexico (NPS 2013).

There is potential for this species to be present within Nueces Bay and Corpus Christi Bay because of the aquatic vegetation present in those water bodies. A juvenile green sea turtle was found at the Corpus Christi Municipal Marina in 2012 (Sikes 2012), which is located on Corpus Christi Bay 1.6 km (1 mi) south of the entrance to the Inner Harbor. According to the USACE Sea Turtle Data Warehouse, one green sea turtle was collected from the Corpus Christi Ship Channel near Aransas Pass (approximately 43 km [27 mi] east of the Action Area) in 2007 (USACE, 2007). The TXNDD did not identify any green sea turtle sightings within the Inner Harbor. The potential exists for green sea turtles to incidentally occur within the Viola Turning Basin. Any incidental occurrence is likely to be temporary as there is no suitable seagrass foraging habitat **(**Figure 7**)** or nesting habitats within the Viola Turning Basin. There is an uncertain algae forage base in the Viola Turning Basin.

Green sea turtles are not expected to be present on land in the industrialized Action Area (an active refinery with asphalt and concrete surfaces), which has had past disturbance and continues to be disturbed by industrial activities. Preferred nesting habitat was not observed near Outfall 001. The shoreline is a concrete wall. Because there are no observable seagrasses or algae near Outfall 001, the green sea turtle is not expected to be present near Outfall 001. However, USEPA has concluded that the presence of sea turtles cannot be ruled out in the Inner Harbor, and therefore a foraging green sea turtle has the potential to be present near Outfall 001. The water quality analysis indicates that the potential change in parameter concentrations, loading, and temperature of the effluent at Outfall 001 due to the Project will be minimal, will meet water quality standards, and will be within permitted limits (Table 7 and Table 8). Biomonitoring data from 2012 and 2013 (FHR 2012a-f; FHR 2013b-f) indicates that the current effluent is not toxic to aquatic life, and because the additional water discharges from the Project are relatively small and similar in chemistry to the existing wastewater, the Project is not expected to have an effect on aquatic life. Therefore, no indirect effects from wastewater discharges are reasonably foreseeable.

Nevertheless, because of USEPA's conclusion that the presence of sea turtles cannot be ruled out in the Inner Harbor, FHR conservatively concludes that green sea turtles may incidentally occur near Outfall 001 and that the Project may affect but is not likely to adversely affect this species and that any effects would be discountable or insignificant.

5.4.1.2 Atlantic Hawksbill Sea Turtle

The Atlantic hawksbill sea turtle is a small to medium-sized marine turtle having an elongated oval shell with overlapping scutes on the carapace, a relatively small head with a distinctive hawk-like beak, and flippers with two claws. Juveniles are black or very dark brown with light brown or yellow coloration on

the edge of the shell, limbs, and raised ridges of the carapace. Adults are generally brown with numerous splashes of yellow, orange, or reddish-brown on the carapace. The plastron is yellowish with black spots on the intergular and postanal scutes. Adult Atlantic hawksbill turtles may reach up to 1 m (3 ft) in length and weigh up to 135 kg (300 lbs), although adults more commonly average about 0.7 m (2.5 ft) in length and typically weigh around 80 kg (176 lbs) or less. It is the only sea turtle with a combination of two pairs of prefrontal scales on the head and four pairs of costal scutes on the carapace.

Atlantic hawksbill sea turtles live in clear offshore waters of mainland and island shelves. Juveniles, subadults, and adults will spend most of their time in their primary foraging habitat, coral reefs. They primarily feed on sponges. Atlantic hawksbill sea turtles nest on sandy beaches, often in the proximity of coral reefs. Hawksbill sea turtles are the most tropical of all sea turtles. They are found primarily in warmer waters and are only an occasional visitor to the Texas coast. Records for the Atlantic hawksbill were not available from NPS. No recent observations of hawksbill sea turtles occurring in Corpus Christi Bay or the Ship Channel were found (USFWS 2013b). The TXNDD did not identify any hawksbill sea turtle observations within the Inner Harbor.

The species is not expected to be present on land in the industrialized Action Area (an active refinery with asphalt and concrete surfaces), which has had past disturbance and continues to be disturbed by industrial activities. Preferred nesting habitat was not observed near Outfall 001. The shoreline is a concrete wall. The nearest deepwater coral reef is more than 48 km (29 mi) north and east of the Project Area (Reefbase, 2013; NOAA, 2014). Because the area near Outfall 001 does not provide potential nesting or foraging habitat for this species the Atlantic hawksbill sea turtle is, not expected to be present near Outfall 001. However, USEPA has concluded that the presence of sea turtles cannot be ruled out in the Inner Harbor, and therefore a foraging hawksbill sea turtle has the potential to be present near Outfall 001. The water quality analysis indicates that the potential change in parameter concentrations, loading, and temperature of the effluent at Outfall 001 due to the Project will be minimal, will meet water quality standards, and will be within permitted limits (Table 7 and Table 8). Biomonitoring data from 2012 and 2013 (FHR 2012a-f; FHR 2013b-f) indicates that the current effluent is not toxic to aquatic life, and because the additional water discharges from the Project are relatively small and similar in chemistry to the existing wastewater, the Project is not expected to have an effect on aquatic life. Therefore, no indirect effects from wastewater discharges are reasonably foreseeable.

Nevertheless, because of USEPA's conclusion that the presence of sea turtles cannot be ruled out in the Inner Harbor, FHR conservatively concludes that Atlantic hawksbill sea turtles may incidentally occur

near Outfall 001 and that the Project may affect but is not likely to adversely affect this species and that any effects would be discountable or insignificant.

5.4.1.3 Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle is considered the smallest sea turtle with an olive-gray carapace, a triangular shaped head, and a hooked beak. Adults can grow to 0.6 m (2 ft) in length and weigh between 30-50 kg (70-108 lbs).

Kemp's ridley sea turtles are found in the coastal waters and bays of the Gulf of Mexico and Atlantic Ocean. They prefer open ocean and gulf waters with the females only coming ashore to lay eggs in beach sand. Young Kemp's ridley sea turtles float on large mats of sargassum. Kemp's ridley sea turtles feed in shallow water areas with muddy or sandy bottoms. This turtle is a shallow water benthic feeder with a diet consisting primarily of crustaceans (crabs) (USFWS 2006; NMFS et al. 2011). Shrimp, Cnidarians (jellyfish), gastropods (snails), and echinoderms (sea stars) supplement the diet. Kemp's ridleys are often found in salt marsh habitats (USFWS 2006).

Kemp's ridley sea turtles migrate from nesting areas to feeding grounds, which are sometimes several thousand kilometers apart. Most turtles migrate along the coasts, but some populations are known to migrate across the ocean from nesting area to feeding grounds. The major nesting beaches are always found in places where the seawater temperature is greater than 25ºC (77ºF). The preferred sections of nesting beaches are backed up by extensive swamps or large bodies of open water having seasonal narrow ocean connections (USFWS 2006).

The Kemp's ridley is the most common nesting sea turtle on Texas beaches. In 2012, 209 Kemp's ridley nests were documented in Texas (NPS, 2012). The closest known Kemp's ridley sea turtle nesting location is at the mouth of the Corpus Christi Inner Harbor into Corpus Christi Bay near Burleson Beach Park, approximately 12 km (8 mi) east of Outfall 001 (Reefbase, 2013). NPS records indicate no nest sites at Corpus Christi Bay, two nest sites at San Jose Island more than 64 km (40 mi) northwest of the Action Area along the Gulf of Mexico, and ten nest sites at North Padre Island, more than 95 km (60 mi) southeast of the Action Area along the Gulf of Mexico). According to the USACE Sea Turtle Data Warehouse, 24 Kemp's ridley sea turtles were collected from the Corpus Christi Ship Channel near Aransas Pass, approximately 43 km (27 mi) east of the Action Area in 2007 (USACE, 2007). The TXNDD did not identify any Kemp's ridley sea turtle sightings within the Inner Harbor.

The Kemp's ridley sea turtle is not expected to be present on land in the industrialized Action Area (an active refinery with asphalt and concrete surfaces), which has had past disturbance and continues to be disturbed by industrial activities. Preferred nesting habitat was not observed near Outfall 001. The shoreline is a concrete wall. The Viola Turning Basin is a tidally-influenced waterbody connected to Corpus Christi Bay. Therefore, it does offer marine aquatic fauna, which is a potential food source for Kemp's ridley sea turtles. However, the Inner Harbor is a maintained, dredged channel subject to regular marine vessel traffic, multiple active dock facilities, and multiple permitted wastewater outfalls. The quality and abundance of forage in the Viola Turning Basin would reasonably be inferior to neighboring ecosystems, such as Nueces and Corpus Christi bays. The distance a sea turtle would travel amidst heavy marine vessel traffic to reach Outfall 001 would be a significant deterrent. The likelihood of occurrence would decrease with distance upstream of the Inner Harbor confluence with Corpus Christi Bay. Further, the existing dock facility traffic within the wastewater discharge plume would be a deterrent for this species. Therefore, it is not reasonably foreseeable that the Kemp's ridley sea turtle would be present near Outfall 001. However, USEPA has concluded that the presence of sea turtles cannot be ruled out in the Inner Harbor, and therefore a foraging Kemp's ridley sea turtle has the potential to be present near Outfall 001.

The water quality analysis indicates that the potential change in parameter concentrations, loading, and temperature of the effluent at Outfall 001 due to the Project will be minimal, will meet water quality standards, and will be within permitted limits (Table 7 and Table 8). Biomonitoring data from 2012 and 2013 (FHR 2012a-f; FHR 2013b-f) indicates that the current effluent is not toxic to aquatic life, and because the additional water discharges from the Project are relatively small and similar in chemistry to the existing wastewater, the Project is not expected to have an effect on aquatic life. Therefore, no indirect effects from wastewater discharges are reasonably foreseeable.

Nevertheless, because of USEPA's conclusion that the presence of sea turtles cannot be ruled out in the Inner Harbor, FHR conservatively concludes that Kemp's ridley sea turtles may incidentally occur near Outfall 001 and that the Project may affect but is not likely to adversely affect this species and that any effects would be discountable or insignificant.

5.4.1.4 Leatherback Sea Turtle

The leatherback is the largest of all sea turtles, with weights of 590 kg (1,300 lbs) and a carapace length of up to 2.5 m (8 ft). This turtle is unique because of the smooth leathery skin covering its carapace. Research on captive leatherback sea turtles indicates that they grow faster than any other marine turtle.

Leatherback sea turtles primarily inhabit the upper reaches of the open ocean, but they also frequently descend to depths of 200-500 m (650 to 1650 ft). Leatherback sea turtles feed mainly on pelagic (open ocean) soft-bodied invertebrates such as jellyfish and tunicates. Their diet may also include squid, fish, crustaceans, algae, and floating seaweed. The highest concentrations of these prey animals are often found in areas where deep water comes to the surface (upwelling areas) and where ocean currents converge. Although small groups may move into coastal waters following concentrations of jellyfish, these turtles seldom travel in large groups.

The leatherback sea turtle is a highly pelagic species that moves into coastal waters only during the reproductive season. Preferred nesting areas are high energy, sandy beaches with vegetation immediately upslope and, unobstructed oceanic access. Leatherback sea turtles are rare visitors to Texas coastal beaches. Nesting records for the Leatherback were not available from NPS. The closest known leatherback sea turtle nesting area was identified in 2008 at the Padre Island National Seashore, more than 107 km (67 mi) south of the Project Area (Duke University, 2013). This is the only known nesting site for a leatherback sea turtle in Texas since the 1930s (Revkin, 2008). No recent observations of leatherback sea turtles occurring in Corpus Christi Bay or the Ship Channel were found. The TXNDD (2013) did not identify any recorded leatherback sightings in the Inner Harbor.

Leatherback sea turtles are not expected to be present on land in the industrialized Action Area (an active refinery with asphalt and concrete surfaces), which has had past disturbance and continues to be disturbed by industrial land activities. Preferred nesting habitat was not observed near Outfall 001. The shoreline is a concrete wall. Because the Leatherback is a highly pelagic species, it is reasonable to conclude this species will not be present near Outfall 001 in the Viola Turning Basin at the far west end of the Inner Harbor some 13 km (8 mi) from Corpus Christi Bay. However, USEPA has concluded that the presence of sea turtles cannot be ruled out in the Inner Harbor, and therefore a foraging leatherback sea turtle has the potential to be present near Outfall 001. The water quality analysis indicates that the potential change in parameter concentrations, loading, and temperature of the effluent at Outfall 001 due to the Project will be minimal, will meet water quality standards, and will be within permitted limits (Table 7 and Table 8). Biomonitoring data from 2012 and 2013 (FHR 2012a-f; FHR 2013b-f) indicates that the current effluent is not toxic to aquatic life, and because the additional water discharges from the Project are relatively small and similar in chemistry to the existing wastewater, the Project is not expected to have an effect on aquatic life. Therefore, no indirect effects from wastewater discharges are reasonably foreseeable.

Nevertheless, because of USEPA's conclusion that the presence of sea turtles cannot be ruled out in the Inner Harbor, FHR conservatively concludes that leatherback sea turtles may incidentally occur near Outfall 001 and that the Project may affect but is not likely to adversely affect this species and that any effects would be discountable or insignificant.

5.4.1.5 Loggerhead Sea Turtle

Loggerhead sea turtles were named for their relatively large heads, which support powerful jaws and enable them to feed on hard-shelled prey, such as whelks and conch. Hatchlings are dark gray to brown above with white to white-gray margins. Their plastron is generally yellowish to tan. Adults' and sub-adults' top shell (carapace) is slightly heart-shaped and reddish-brown, while the bottom shell (plastron) is generally a pale yellowish color. The neck and flippers are usually dull brown to reddish brown on top and medium to pale yellow on the sides and bottom.

Juveniles inhabiting the neritic zone feed primarily on benthic invertebrates, notably mollusks and benthic crabs (NMFS and USFWS, 2008). The diet of adult loggerheads in the neritic zone is primarily comprised of mollusks and crabs (NMFS and USFWS 2008). Adult loggerheads in the oceanic zone also feed on jellyfish, salps (a small oceanic animal that can form large chains), pelagic snails *(Janthina spp*.), and barnacles *(Lepas spp*.) (NMFS and USFWS, 2008). In south Texas, sea pens (a colonial coral) were the most common prey item, followed by benthic crabs (Plotkin et al., 1993; NMFS and USFWS, 2008).

For juveniles, estuarine waters, large open sounds and embayments comprise important inshore habitat (NMFS and USFWS, 2008). Adult loggerhead sea turtles seem to prefer shallow water habitats with large expanses of open ocean access that provide year-round resident foraging areas. Shallow water estuarine habitats with limited ocean access are used infrequently (NMFS and USFWS, 2008). Loggerhead sea turtles nest on narrow, steeply sloped, coarse-grained beaches oceanic beaches between the high tide line and dune fronts and occasionally on estuarine shorelines with suitable sand.

Loggerhead sea turtles are found in the Gulf of Mexico and are considered a rare visitor to the Texas coast (TPWD, 2013). Only minor and solitary nesting has been recorded along the coasts of the Gulf of Mexico. The closest known loggerhead sea turtle nesting location is on the Gulf Coast shore of Mustang Island, approximately 45 km (28 mi) east of the Project Area (Duke University, 2013). Six loggerhead sea turtle nests were identified at Padre Island National Seashore, more than 95 km (60 mi) southeast of the Action Area along the Gulf of Mexico (NPS, 2013). According to the USACE Sea Turtle Data Warehouse, 12 loggerhead sea turtles were collected from the Corpus Christi Ship Channel near Aransas

Pass, approximately 43 km (27 mi) east of the Action Area in 2007 (USACE, 2007). The TXNDD (2013) did not identify any loggerhead sea turtle sightings in the Inner Harbor.

The species is not expected to be present on land in the industrialized Action Area (an active refinery with asphalt and concrete surfaces), which has had past disturbance and continues to be disturbed by industrial activities. Preferred nesting habitat was not observed near Outfall 001. The shoreline is a concrete wall. The Viola Turning Basin is tidally-influenced waterbody connected to Corpus Christi Bay. Therefore, it does offer marine aquatic fauna, which is a potential food source for loggerhead sea turtles. However, the Inner Harbor is a maintained, dredged channel subject to regular marine vessel traffic, multiple active dock facilities, and multiple permitted wastewater outfalls. The quality and abundance of forage in the Viola Turning Basin would reasonably be inferior to neighboring ecosystems, such as Nueces and Corpus Christi bays. The distance a sea turtle would travel amidst heavy marine vessel traffic to reach Outfall 001 would be a significant deterrent. The likelihood of occurrence would decrease with distance upstream of the confluence of the Inner Harbor with Corpus Christi Bay. Further, the existing dock facility traffic within the wastewater discharge plume would be a deterrent for this species. Therefore, it is not reasonably foreseeable that the loggerhead sea turtle would be present near Outfall 001. However, USEPA has concluded that the presence of sea turtles cannot be ruled out in the Inner Harbor, and therefore a foraging loggerhead sea turtle has the potential to be present near Outfall 001.

The water quality analysis indicates that the potential change in parameter concentrations, loading, and temperature of the effluent at Outfall 001 due to the Project will be minimal, will meet water quality standards, and will be within permitted limits (Table 7 and Table 8). Biomonitoring data from 2012 and 2013 (FHR 2012a-f; FHR 2013b-f) indicates that the current effluent is not toxic to aquatic life, and because the additional water discharges from the Project are relatively small and similar in chemistry to the existing wastewater, the Project is not expected to have an effect on aquatic life. Therefore, no indirect effects from wastewater discharges are reasonably foreseeable.

Nevertheless, because of USEPA's conclusion that the presence of sea turtles cannot be ruled out in the Inner Harbor, FHR conservatively concludes that loggerhead sea turtles may incidentally occur near Outfall 001 and that the Project may affect but is not likely to adversely affect this species and that any effects would be discountable or insignificant.

5.4.2 Mammals

5.4.2.1 Gulf Coast Jaguarundi

The jaguarundi is a member of the cat family. Their coats are brown to gray in color. Jaguarundis are small cats that typically weigh between 3.5 and 7 kg (8 and 16 lbs). Jaguarundis are found throughout Central and South America. Their historic range may have extended into the Upper Texas Coast; however their current range in Texas is restricted to the Lower Rio Grande Valley.

Jaguarundis are primarily nocturnal hunters, preferring thick brush to ambush small prey such as birds, rabbits, and rodents.

The species is not expected to be present in the industrialized Action Area (an active refinery with asphalt and concrete surfaces) which has had past disturbance and continues to be disturbed by industrial activities. There is no known occurrence of the species in the Action Area and no identified habitat. The nearest known occurrence is 160 km (100 mi) to the south of the Action Area. The Project will have no effect on this species.

5.4.2.2 Ocelot

Ocelots are members of the cat family. Their coat is a creamy tan color with reddish brown spots that are outlined in black. Two distinct black stripes extend from the inside corner of the eyes to the back of the head. Ocelots tend to be bobcat sized with typical lengths reaching 76-104 centimeters (cm) (30-41 in) long and weighs ranging from 7-14 kg (15-30 lbs). From a distance they can be mistaken for bobcats.

The Ocelot is distributed over South and Central America, Mexico, and small areas of southwestern Texas. Ocelots are primarily nocturnal spending the days resting in thick cover. They are solitary and very territorial, usually meeting only to mate. In Texas, breeding occurs in the spring. Females have a gestation period of 72-80 days and produce litters of 1-3 kittens a year.

Ocelots primarily feed on small prey such as snakes, lizards, birds, rabbits, and other small rodents. The ocelot's preferred habitat is dense, thorny, low brush composed of spiny hackberry, lotus bush, and black brush.

The species is not expected to be present in the industrialized Action Area (an active refinery with asphalt and concrete surfaces) which has had past disturbance and continues to be disturbed by industrial activities. There is no known occurrence of the species in the Action Area and no identified habitat. It is unlikely for this species to be present in the Action Area. The Project will have no effect on this species.

5.4.2.3 Red Wolf

The red wolf is not listed by the USFWS as a federal threatened or endangered species for Nueces County. Although USFWS has authority over the status of this species, it is included in this discussion as a conservative measure because it is described on the TPWD website as federally-listed.

The red wolf is a smaller cousin of the gray wolf. As the name implies the red wolf has a coat that is brown to reddish in color. The red wolf weighs 20-35 kg (45-80 lbs), stands approximately 0.6 m (26 in) tall at the shoulder and measures 1.2 m (4 ft) in length (USFWS 2007a). Red wolves feed mostly on mammals including rabbits, deer, small pigs, and opossums. Red wolves are thought to prefer warm, moist, and densely vegetated habitat.

Historically the red wolf was found throughout much of Texas. The species was declared extinct in Texas in 1980.

The species is not expected to be present in the industrialized Action Area (an active refinery with asphalt and concrete surfaces), which has had past disturbance and continues to be disturbed by industrial activities. There is no known occurrence of the species in the Action Area and no identified habitat. It is unlikely for this species to be present in the Action Area. The Project will have no effect on this species.

5.4.2.4 West Indian Manatee

The West Indian manatee is listed as an endangered species under the ESA. See 50 C.F.R. § 17.11(h), and is therefore subject to ESA Section 7 consultation with USFWS. While the West Indian manatee is also a marine mammal protected under the Marine Mammal Protection Act of 1972, 16 U.S.C. § 1361, *et. seq.*, Section 1362(12) vests authority over marine mammals other than the order Cetacea and the order Pinnipedia (other than walruses) with USFWS. *See also* NOAA Fisheries, Endangered and Threatened Marine Mammals: List of Mammal Species under NMFS' Jurisdiction, http://www.nmfs.noaa.gov/pr/species/esa/ mammals.htm (last visited Sep. 24, 2013) (noting list of cetaceans and pinnipeds, and noting USFWS jurisdiction over manatees). Accordingly, NMFS plays no jurisdictional role under Section 7 consultations for the manatee.

The West Indian manatee is a large gray-colored marine mammal. The West Indian manatee is found in warm tropical and subtropical waters of the Gulf of Mexico. They average 3 m (10 ft) in length and weigh 450 kg (1,000 lbs). West Indian manatees are slow moving and spend most of their time in shallow water where sea grass is present, feeding on aquatic vegetation.

The West Indian manatee has been documented along the Upper Texas coast, however these occurrences are rare (USFWS 2007b), with occurrences in the Corpus Christi area in September 2001, October 2006, and January 2011 (TXNDD 2013). These occurrences were located near Ingleside On-The-Bay (over 29 km [18 mi] from the Action Area); near the Port Aransas City Marina Boat Basin (over 45 km [28 mi] from the Action Area), and in Corpus Christi Bay, respectively (TXNDD 2013).

The nearest occurrence for the West Indian manatee was approximately 15 km (9 mi) east/northeast of the Action Area. Although the map coordinates locate the occurrence in Corpus Christi Bay near the mouth of the Inner Harbor, the TXNDD (2013) text description for the occurrence indicates the location as Corpus Christi Bay and Port Aransas with the caveat that, "*These are generalized directions as this record consists of multiple on-the-ground observations*." Although the occurrence was mapped on the western side of Corpus Christi Bay near the mouth of the Inner Harbor, the TXNDD (2013) database describes the observation of the West India manatee as occurring elsewhere within Corpus Christi Bay, providing uncertainty as to the location of this observation.

There are two additional West Indian manatee sightings not identified in the TXNDD (2013) database. The first occurred in early 2007 in the Inner Harbor about 13 km (8 mi) east/northeast of the Action Area (Wilson 2007). The second occurred in September 2012 in Nueces Bay (Indian Point) and Corpus Christi Bay (Lawrence Street T-Head) (The Rockport Pilot 2011). These observations further emphasize that manatees may occasionally be present in the Corpus Christi area.

Seagrass--potential foraging habitat--is present in small areas along the northeast Nueces Bay coastline, in Corpus Christi Bay near the mouth of the Inner Harbor and the northern Corpus Christi Bay coastline near Ingleside on the Bay **(**Figure 7**)**. Larger areas of seagrass are present along the eastern shore of Corpus Christi Bay (TPWD 2013).There is no seagrass habitat identified near Outfall 001, within the Viola Turning Basin, or within the Inner Harbor. According to TPWD, the dredging and boating in Corpus Christi Ship Channel and Inner Harbor may affect the prevalence of seagrass in this area. "… Both boating and dredging can disturb the seagrass roots and suspend sediments which block sunlight needed for growth. …" (TPWD 2011). Thus, based on the available seagrass data, it reasonable to conclude that there is no manatee foraging habitat near Outfall 001.

Warm water discharges along the length of the Inner Harbor could be a potential attractant for a transient West Indian manatee in Texas seeking warm water during the winter. This includes the current effluent from Outfall 001 at the westernmost end of the Inner Harbor in the Viola Turning Basin. Outfall 001 is a

submerged discharge pipe located slightly offshore, immediately adjacent to Dock #8 (Figure 4). However, the distance the manatee would have to travel amidst heavy marine vessel traffic to reach Outfall 001 would be a significant deterrent. Further, the existing dock facility traffic within the wastewater discharge plume would be a deterrent for this species. The water quality analysis indicates that the potential change in parameter concentrations, loading, and temperature of the effluent at Outfall 001 due to the Project will be minimal, will meet water quality standards, and will be within permitted limits (Table 7 and Table 8). Biomonitoring data from 2012 and 2013 (FHR 2012a-f; FHR 2013b-f) indicates that the current effluent is not toxic to aquatic life, and because the additional water discharges from the Project are relatively small and similar in chemistry to the existing wastewater, the Project is not expected to have an effect on aquatic life. Therefore, no indirect effects from wastewater discharges are reasonably foreseeable.

The available information could support a determination that the Project will have no reasonably foreseeable effect on West Indian manatees. However, because warm water discharges along the length of the Inner Harbor, including the existing facility discharge at Outfall 001, could act as attractants to West Indian manatees, the species has some remote potential to be present in the Viola Turning Basin. FHR voluntarily concludes that the Project may affect, but is not likely to adversely affect the West Indian manatee. This potential effect would be discountable or insignificant.

5.4.2.5 Whale Species

Five whale species are listed by NOAA Fisheries as endangered for the state of Texas.

- Blue Whale (*Balaenoptera musculus)*
- Finback whale **(***Balaenoptera physalus)*
- Humpback whale **(***Megaptera novaeangliae)*
- Sei whale (*Balaenoptera borealis)*
- Sperm whale (*Physeter macrocephalus)*

All five whale species are considered deepwater species unlikely to be found in harbor areas or in shallow coastal bays and estuaries (NOAA 2003; NOAA 2008). Typically, no threatened or endangered species of whales occur in the nearshore waters over the continental shelf of the Gulf of Mexico (NOAA, 2008). The Action Area includes Outfall 001 that discharges into the Viola Turning Basin at the far west end of the Corpus Christi Inner Harbor, some 160 km (100 mi) from the edge of the continental shelf in the Gulf of Mexico. No whale species are expected to be present near Outfall 001 in the Viola Turning Basin.

Based on the unlikelihood of their presence in a shallow bay, estuary or harbor area, their preference for deep ocean waters (> 100 m depths) and feeding habits, the Project is expected to have no effects on the five listed whale species.

5.4.3 Birds

5.4.3.1 Piping Plover

The piping plover is an uncommon to locally common shorebird that can be found wintering along the Texas coast on sandy beaches, sand flats, mudflats, algal flats, washover passes, and spoil islands (Nicholls and Baldassarre 1990; Campbell 1995; USFWS 2003; Lockwood and Freeman 2004; Haig et al. 2005). They can also be found probing for invertebrates along shorelines of streams, ephemeral ponds, and lagoons. Small sand dunes, debris, and sparse vegetation in adjacent beaches provide shelter from wind and extreme temperatures (USFWS 2003).

Critical habitat for the wintering population of piping plovers was designated in 2001 and divided into 137 units across eight states (USFWS 2001a). Nineteen of those units were located along the Texas coastline (USFWS 2001a). In 2009, the units in Texas were reconfigured and reduced to eighteen (USFWS 2009). Critical wintering habitat for the piping plover was designated in many locations along the Texas coast, extending from Chambers County south to Cameron County (USFWS 2009). Designated critical habitat for this species is located approximately 15 km (9 mi) northeast and east of the Action Area in specific locations along Corpus Christi Bay (Figure 6).

The species is not expected to be present in the industrialized Action Area (an active refinery with asphalt and concrete surfaces) which has had past disturbance and continues to be disturbed by industrial activities. There is no known occurrence of the species in the Action Area and no identified habitat. It is unlikely for this species to be present in the Action Area. The Project will have no effect on this species.

5.4.3.2 Whooping Crane

The whooping crane occurs only in North America and is North America's tallest bird, with males approaching 1.5 m (5 ft). The species can have a wingspan of 2.3 m (7.5 ft) and can weigh 7.0 kg (17 lbs). The body length averages about 132 cm (52 in). The whooping crane's adult plumage is snowy white except for black primaries, black or grayish alula (specialized feathers attached to the upper leading end of the wing), sparse black bristly feathers on the carmine crown and malar region (side of the head from the bill to the angle of the jaw), and a dark gray-black wedge-shaped patch on the nape. Immature whooping cranes are cinnamon brown.

The whooping crane is reclusive in nature and tends to avoid areas with human activity, with a preferred habitat that includes salt flats or open expanses of herbaceous wetlands. Whooping cranes are a long-lived species: current estimates suggest a maximum longevity in the wild of at least 30 years. There is only one self-sustaining wild population, the Aransas-Wood Buffalo National Park population, which nests in the area of Wood Buffalo National Park in Canada, and winters in coastal marshes surrounding Aransas National Wildlife Refuge in Texas. Whooping cranes migrate throughout the central portion of the state from the eastern panhandle to the Dallas-Fort Worth area and south through the Austin area to the central coast during October and November and again in April (Figure 8).

The West Refinery is within the travel corridor identified by the USFWS (2012). That travel corridor extends from Wood Buffalo National Park in northern Alberta, Canada to the Gulf coast and includes a 65 km (40 mi) distance on either side of the Aransas National Wildlife Refuge. The total width of the travel corridor is 130 km (80 mi) and includes the coastal area of Corpus Christi (Figure 8).

Given the reclusive nature of the species, and its tendency to avoid areas with human activity, whooping cranes are not expected to be present in the industrialized Action Area (an active refinery with impervious surfaces and tall structures). There are no food sources in the Action Area, therefore there is no attractant for the species to fly in or around the Action Area. There have been no recorded observations of whooping cranes in the Action Area or near the Project location (TXNDD, 2013; USGS 2012; USFWS 2012b). However, because the Project is located within the whooping crane travel corridor, potential effects from Project structures and construction activities were further evaluated.

The existing West Refinery and nearby industrial sources have tall stacks and have experienced new construction of tall stacks and expansions during the period that the whooping crane population has been reestablished. The Project structures and construction activities will be similar in scale to existing structures and previous construction activities. There are no publically available reports of whooping crane deaths caused by tall stacks related to industrial sources or of any whooping crane deaths within Nueces County (TXNDD 2013). To date, some whooping crane deaths have been related to birds flying into power lines on their migration route (TPWD 2006), but none of these have taken place near the Project. Based on these observations, and on the species preference to avoid areas with human activity, it is not expected that migrating whooping cranes would fly through the Action Area. However, because there is a remote possibility that a whooping crane could fly through the Action Area during construction activities, FHR's overall conclusion is that the Project may affect but is not likely to adversely affect the whooping crane, and that any effects would be discountable or insignificant.

As part of the construction activities, FHR will implement best management practices (BMP) regarding use of construction cranes throughout the duration of the Project. The BMPs will include:

- retracting the Cherry Picker and Hydraulic RT cranes to less than 15 m (50 ft) in height when their activities have ceased for the day unless construction activities and plans dictate otherwise
- retracting construction cranes capable of retraction when construction crane activities have ceased for the day, and when feasible during the work, consistent with worker safety and construction requirements
- marking all construction equipment above 15 m (50 ft) tall, including construction cranes, at their maximum height with flagging and/or lighting

5.4.3.3 Eskimo Curlew

Eskimo curlews have not been seen in Texas since 1962 and are assumed to be extirpated. The discussion in this section is based on historic data on the species.

The Eskimo curlew is not listed by the USFWS for Nueces County. Although USFWS has authority over the status of this species, it is included in this discussion as a conservative measure because it is described on the TPWD website as federally-listed.

Eskimo curlews are the smallest and most gregarious of the four Western Hemisphere curlew species. Measuring 30-36 cm (12-14 in) in length and weighing 0.45 kg (1 pound), adults are mottled brown on the back, with a white throat and yellowish-buff undersides. A buff-white eyebrow divides the dark crown from the eye line and the bill is thin, curving downward approximately 5 cm (2 in) in length. Cinnamon colored wing linings are visible in flight and the stilt-like legs are dark green to blackish-gray. The Eskimo curlew feeds on berries, insects, ants, snails, and grasshoppers. Their voice is a melodious, whistling “tee-tee-tee.”

During late August the Eskimo curlew migrates as far south as Argentina, and returns Northward in February. The Eskimo curlew breeds in the arctic tundra with simple nests in depressions along the bare ground.

The species is not expected to be present in the industrialized Action Area (an active refinery with asphalt and concrete surfaces) which has had past disturbance and continues to be disturbed by industrial

activities. There is no known occurrence of the species in the Action Area and no identified habitat. It is unlikely for this species to be present in the Action Area. The Project will have no effect on this species.

5.4.3.4 Northern Aplomado Falcon

Aplomado falcons are most often seen in pairs. They do not build their own nests, but use stick nests built by other birds. Pairs work together to find prey and flush it from cover. Aplomados falcons eat mostly birds and insects. They are fast fliers, and often chase prey animals as they try to escape into dense grass. Parents make 25-30 hunting attempts per day in order to feed their young. Chicks are fed 6 or more times each day. Aplomado falcons live up to 20 years in captivity (TPWD 2012a).

Aplomado falcons require open grassland or savannah habitat with scattered trees or shrubs. In Texas, aplomado falcons are found in the South Texas and Trans-Pecos regions. Their geographical distribution extends to the southern tip of South America.

The Northern Aplomado Falcon was most commonly observed and collected in its U.S. range during the period 1870–1930. The falcon seemingly disappeared in the U.S. after the 1930s for reasons that largely remain a mystery. Because the Aplomado Falcon was at the northern limits of its continental range in southeastern Arizona, southern New Mexico, and western and southern Texas it is possibly vulnerable to small changes in habitat quality in this region.

Reintroduction of captive-reared Aplomado falcons was considered an essential step in the 1990 federal recovery plan. They are being reintroduced in south Texas to bring back the population. Recently, the Peregrine Fund ,a private organization focused on the worldwide conservation of birds of prey, with support from the U.S. Fish and Wildlife Service, released 14 chicks during the summer of 2012 to Texas' Mustang Island State Park on the southeast shore of Corpus Christi Bay (The Peregrine Fund, 2012).

The species is not expected to be present in the industrialized Action Area (an active refinery with asphalt and concrete surfaces) which has had past disturbance and continues to be disturbed by industrial activities. There is no known occurrence of the species in the Action Area and no identified habitat. It is unlikely for this species to be present in the Action Area. The Project will have no effect on this species.

5.4.4 Fish

5.4.4.1 Smalltooth Sawfish

The smalltooth sawfish is not listed by NMFS for the area. Although NMFS has authority over the status of this species, it is included in this discussion as a conservative measure because it is described on the TPWD website as federally-listed.

The smalltooth sawfish is one of only two species of sawfishes in the U.S. Sawfish are in the same group of fish such as sharks and skates whose skeletons are made of cartilage. The smalltooth sawfish can reach lengths up to 7 m (25 ft) and average 5.5 m (18 ft) (NMFS 2013).

Smalltooth sawfish inhabit shallow saline to brackish waters close to shore with muddy to sandy substrates. Historically smalltooth sawfish were found throughout the Gulf of Mexico, however the only known population in the U.S. is near the peninsula of Florida (NMFS 2013).

The species is not present in the industrialized Action Area (an active refinery with asphalt and concrete surfaces) which has had past disturbance and continues to be disturbed by industrial activities. The TXNDD (2013) did not identify any recorded sightings in the Inner Harbor. The area around Outfall 001 is not considered suitable habitat for this fish species, therefore it is reasonable to conclude this species will not be present near Outfall 001 in the Viola Turning. In addition, no indirect effects from the Project are reasonably foreseen near Outfall 001. As described in Section 4.0, analyses indicate that the potential small change in water quality parameter concentrations and loading, and the small temperature increase of the discharge water at Outfall 001 due to the Project will meet water quality standards and be within permitted limits (Table 7 and Table 8). Biomonitoring data from 2012 and 2013 (FHR 2012a-f; FHR 2013b-f) indicates that the current effluent is not toxic to aquatic life, and because the additional water discharges from the Project are relatively small and similar in chemistry to the existing wastewater the Project is therefore expected to have no effect on aquatic receptors. FHR therefore concludes that the Project will have no effect on this species.

5.4.5 Plants

5.4.5.1 Slender Rush-Pea

Slender rush-pea is a perennial legume, 7.5 to15 cm (3 to 6 in) tall, with spreading stems. The slender rush-pea is only known from Texas. Slender rush-pea grows on clayey soil of blackland prairies and creek banks in association with short and midgrasses such as buffalo grass, Texas winter grass, and Texas

grama. Woody plants such as mesquite, huisache, huisachillo, spiny hackberry, brasil, retama, lotebush, tasajillo, and prickly pear are also common at the known sites. The seedpods contain 2-4 seeds and its tiny blooms are produced between early March and June, and sporadically thereafter depending on rainfall (TPWD 2012b).

Historically, this plant is known only from Nueces and Kleberg counties, Texas. Today, this plant occurs in four populations in Nueces and Kleberg counties. One large population, discovered in 1985, consists of about 10,000 plants in a rural cemetery in southern Nueces County.

The species is not expected to be present in the industrialized Action Area (an active refinery with asphalt and concrete surfaces) which has had past disturbance and continues to be disturbed by industrial activities. There is no known occurrence of the species in the Action Area and no identified habitat. It is unlikely for this species to be present in the Action Area. The Project will have no effect on this species.

5.4.5.2 South Texas Ambrosia

A member of the aster family, South Texas ambrosia is an erect, silvery to grayish-green, perennial, herbaceous plant, 10 to 30 cm (4 to 12 in) in height. South Texas ambrosia blooms in late summer and fall, but its flowers are not showy and may be missed by the casual observer. It spreads through rhizomes (underground stems), and a single individual plant may be represented by hundreds of stems forming close-spaced colonies. South Texas ambrosia occurs in open grasslands or savannas on soils varying from clay loams to sandy loams (TPWD 2012c).

Historically, South Texas ambrosia was known from Cameron, Jim Wells, Kleberg, and Nueces counties in South Texas, and the state of Tamaulipas in Mexico. Today, the species occurs at six locations in Nueces and Kleberg counties. The current status of any populations in Mexico is unknown.

The species is not expected to be present in the industrialized Action Area (an active refinery with asphalt and concrete surfaces) which has had past disturbance and continues to be disturbed by industrial activities (Figure 4). There is no known occurrence of the species in the Action Area and no identified habitat. It is unlikely for this species to be present in the Action Area. The Project will have no effect on this species.

5.5 Candidate Species

5.5.1 Red Knot

The Red Knot is the largest of the "peeps" in North America, and one of the most colorful. It makes one of the longest yearly migrations of any bird, traveling 15,000 km (9,300 mi) from its Arctic breeding grounds to Tierra del Fuego in southern South America and then repeats the trip in spring. It breeds in drier tundra areas, such as sparsely vegetated hillsides. Outside of breeding season, it is found primarily in intertidal, marine habitats, especially near coastal inlets, estuaries, and bays. Despite their gregariousness during the winter, pairs maintain breeding territories and generally nest about 1 km (0.7 mi) apart from each other.

Migrating red knots break their spring migration into non-stop segments of 2,400 km (1,500 mi) or more, converging on just a few critical stopover areas along the way. Red knots are faithful to these specific sites, stopping at the same locations year after year. The spring migration is timed to coincide with the spawning season for the horseshoe crab (*Limulus polyphemus*). Horseshoe crab eggs provide a rich, easily digestible food source for migrating birds. Mussel beds are also an important food source for migrating knots, particularly if insufficient horseshoe crab eggs are available. Birds arrive at stopover areas with depleted energy reserves and must quickly rebuild their body fat to complete their migration to Arctic breeding areas. Red knots feed on invertebrates, especially bivalves, small snails, crustaceans, and, on breeding grounds, terrestrial invertebrates.

As with most shorebirds, the long-winged, strong-flying knots fly in groups, sometimes with other species (Cornell 2013).

The species is not expected to be present in the industrialized Action Area (an active refinery with asphalt and concrete surfaces) which has had past disturbance and continues to be disturbed by industrial activities. There is no known occurrence of the species in the Action Area and no identified habitat. It is unlikely for this species to be present in the Action Area. The Project will have no effect on this species.

5.5.2 Sprague's Pipit

The Sprague's pipit is a candidate species and therefore does not currently carry regulatory protection. This small passerine is found in well-drained, open grasslands and fields. It is distinguished from other passerines by their characteristic slender shape, relatively narrow bill, and thin, high-pitched calls and songs of pipits. It is distinguishable from American pipit (*Anthus rubescens*) by its buffy brown upper

parts with broad blackish streaking, yellowish to pale pinkish brown legs, and a dark upper mandible that contrasts with a pale lower mandible. Males and females are cryptically colored and similar in appearance.

Sprague's pipits breed in the native prairie of the Great Plains, including the southern portions of Alberta, Saskatchewan, and Manitoba in Canada, and Montana, North and South Dakota, and Minnesota in the US where it makes a canopy of dead grass to cover its nest on the ground. It winters in Arizona, New Mexico, Texas, Oklahoma, Arkansas, Mississippi, Louisiana, and northern Mexico. The Sprague's pipit leaves the wintering grounds in April, arriving on breeding grounds in late April to mid-May. It leaves the breeding grounds anywhere from September through November and will arrive in wintering grounds over the same period. It prefers well-drained areas of open grassland with native grasses of intermediate height and thickness with moderate litter depths. This species is a ground feeder that eats mainly arthropods, but occasionally seeds during migration.

The species is not expected to be present in the industrialized Action Area (an active refinery with asphalt and concrete surfaces) which has had past disturbance and continues to be disturbed by industrial activities. There is no known occurrence of the species in the Action Area and no identified habitat. It is unlikely for this species to be present in the Action Area. The Project will have no effect on this species.

5.5.3 Yellow-billed Cuckoo

The yellow-billed cuckoo is a migratory, medium-sized bird characterized by a zygodactyl foot (2 toes point forward and 2 toes point backwards), a blue-black bill with yellow on the base of the mandible, and a narrow yellow eye ring. It is 30 cm (12 in) in length and weighs approximately 57 g (2 ounces).

East of the continental divide, yellow-billed cuckoos breed from the north-central US and south-central Canada to the southeastern US, Greater and Lesser Antilles, and northern Mexico. Yellow-billed cuckoos migrate to South America for the winter (USFWS 2001b).

Yellow-billed cuckoos nest between June and August. Nesting habitat includes large patches of riparian habitat that is comprised of *Populus* spp. (cottonwoods), *Salix* spp. (willows), and a dense understory. The eastern population is believed to use more habitat types, which include other broad-leaved woodlands. Clutch size is typically 2-3 eggs per season and the young fledge approximately 17 days after hatching. Yellow-billed cuckoos usually raise their own young, but they are also known to be facultative

brood parasites where they lay eggs in other cuckoos or bird species nests. Cuckoos are insectivorous (USFWS 2001b).

This species is thought to be declining in west Texas; however it is considered to be widespread and uncommon to common in central and east Texas (USFWS 2001b).

The species is not expected to be present in the industrialized Action Area (an active refinery with asphalt and concrete surfaces) which has had past disturbance and continues to be disturbed by industrial activities. There is no known occurrence of the species in the Action Area and no identified habitat. It is unlikely for this species to be present in the Action Area. The Project will have no effect on this species.

6.0 Summary of Effects of the Federal Action

6.1 Air Quality

No federally-listed threatened, endangered, or candidate species are reasonably expected to be present at ground-level in the Action Area, nor is there suitable habitat or designated critical habitat within the Action Area. Air emissions from the Project, as described in Section 4.2.1, are not anticipated to impact any federally-listed or candidate species.

6.2 Water Quantity and Water Quality

Water for the Project will be supplied by the City of Corpus Christi Municipal Water Supply. Therefore, potential impacts to federally-listed threatened, endangered, or candidate species from Project water use are not reasonably foreseeable.

Evaluation also indicates that potential impacts to federally-listed threatened, endangered, or candidate species are not reasonably foreseeable due to Project-related changes in wastewater volume, chemistry, or temperature. The potential incremental increase in wastewater discharge volume related to the Project are estimated to be small (about 0.4% of currently permitted discharges to the Inner Harbor) and are not expected to have any reasonably foreseeable effects on potential ecological receptors. The Project is estimated to increase the volume of wastewater to be discharged by about 6% over the West Refinery's current annual average actual discharge. Total facility wastewater discharge including Project-related wastewater will be within the currently permitted discharge volume and will not require any modification to the current TPDES permit for the West Refinery.

Water chemistry changes associated with the incremental wastewater discharges from the Project at Outfall 001 in the Viola Turning Basin are small; 8 of 20 parameters show a decrease in concentration or no change; the other 12 parameters have small increases in concentrations (most less than a 5% change). All parameters will meet water quality standards. Estimated loading from the Project is less than 10% of the High Base Case loadings, with the highest potential increase estimated to be about 8% (*e.g.*, aluminum, 0.01 mg/L change). Estimated loading from the Project is less than 1% of the existing background loading to the Viola Turning Basin. The current wastewater discharge is not toxic on an acute or chronic basis and the Project is not expected to affect future toxicity test results. The potential small

increase in parameter loading is not expected to have any reasonably foreseeable direct or indirect effects on aquatic receptors.

The temperature of the wastewater discharges at Outfall 001 may increase by up to 2ºF due to the Project. This would be about a 3% increase and would not increase the temperature of the discharged water above the currently permitted limit. This change is within the variability of the existing discharge temperatures and it is unlikely to be a discernible change.

Finally, no reasonably foreseeable effects are expected to occur to federally-listed species or ecological receptors in the Action Area due to Project-related storm water. Storm water runoff may increase slightly because the Project will convert 4 small areas (~ 30 acres total) of previously disturbed and/or industrial lands that currently have some vegetative cover to equipment or parking areas with more impervious surfaces. For the entire Project, there may be a 1% to 3% increase in storm water runoff from current conditions. The storm water from the main refinery operations area related to the Project is expected to have the same water quality as other storm water at the facility and will be handled similarly to the other storm water. For the parking area to the south of the main refinery operations area, a storm water pollution prevention plan will be developed and implemented and the future runoff will be handled similarly to other urban runoff.

6.3 Noise

The Project is within an active industrial area and transportation corridor that is subject to routine construction, operations, and maintenance activities, as well as transportation-related road construction and vehicle traffic and harbor activities (*e.g.*, ship and barge traffic). Project-related construction activities will be managed to reduce noise impacts including proper construction equipment maintenance, and use of standard noise reducing equipment. The additional noise associated with Project construction (including construction of the proposed parking area), and then Project operations is not expected to be discernible from the noise associated with the existing facility or with existing transportation-related activities. Therefore, the potential incremental increase in noise levels associated with the construction and operation of the Project will have no effect on any species.

6.4 Infrastructure-Related Impacts

The Project will not require any modification to existing docks and no Project construction will occur in or immediately adjacent to the Viola Turning Basin. There are no external linear facilities associated with

the Project. No new infrastructure independent of the new equipment and piping to be installed within the Action Area identified in the Project description is required to support the Project. Therefore, there are no infrastructure-related impacts to consider for the Project.

6.5 Human Activity Impacts

Minor temporary increases in human activity compared to the existing operation of the refinery will result from the Project during the construction and operation phases. It has been estimated that at times, up to 1,000 additional temporary workers may be needed for the construction phase of the Project, with some additional employees hired to handle the work related to the additional process operations. However, the existing facility and Project are within a zoned industrial area that is also part of the I-37 corridor and adjacent to the Port of Corpus Christi Inner Harbor. As a result of the industrial nature of the area, transportation corridor characteristics, and existing human activity related to the area's general construction, operations, and maintenance activities, the temporary incremental increase of construction-related activity and the smaller incremental activity from long-term operations is expected to have no effect on the Action Area.

6.6 Species Effect Analysis

No occurrences of federally-listed threatened, endangered, or candidate species have been recorded in the Action Area, and no critical habitat is present.

Five sea turtle species were assessed for potential effects. Because of their food source preferences and life history, it is not reasonably foreseeable that hawksbill sea turtles and leatherback sea turtles would be present in the vicinity of Outfall 001. The Viola Turning Basin hosts in-water structures that may support algal growth and marine aquatic fauna, including fish and invertebrates, providing potential forage for green sea turtles, Kemp's ridley sea turtles and loggerhead sea turtles. Nevertheless, there are several reasons why the likelihood of occurrence of green sea turtles, Kemp's ridley sea turtles and loggerhead sea turtles, or any of the other sea turtle species, decreases with distance upstream of the confluence of the Inner Harbor with Corpus Christi Bay such that it is not reasonably foreseeable that these species would be present near Outfall 001. First, the quality and abundance of forage in the Viola Turning Basin would reasonably be inferior to neighboring ecosystems, such as Nueces and Corpus Christi bays. Second, the distance a sea turtle would have to travel amidst heavy marine vessel traffic to reach Outfall 001 would be a significant deterrent. Third, the existing dock facility traffic within the 200-foot regulatory mixing zone for Outfall 001 would be a deterrent for these species. However, USEPA has concluded that the presence

of all five sea turtle species cannot be ruled out in the Inner Harbor and the Viola Turning Basin. In addition, no effects from the Project wastewater or storm water discharges are reasonably foreseen near Outfall 001. Nevertheless, because the incidental occurrence of a sea turtle near Outfall 001 cannot be ruled out, FHR conservatively concludes that the Project may affect but is not likely to adversely affect green sea turtles, Atlantic hawksbill sea turtles, Kemp's ridley sea turtles, leatherback sea turtles and loggerhead sea turtles. Any effects would be discountable or insignificant.

A transient West Indian manatee may be attracted to warm-water discharges in the Inner Harbor in winter and may eventually reach the Viola Turning Basin and be present near Outfall 001. The potential for this to occur is very low because of infrequent visits by West Indian manatees to the Corpus Christi area and the distance the manatee would travel amidst heavy marine vessel traffic to reach Outfall 001 would be a significant deterrent. Further, the existing dock facility traffic within the wastewater discharge plume would be a deterrent for this species. In addition, no water quality effects from the Project are reasonably foreseen near Outfall 001. However, because a transient West Indian manatee has some remote potential to be attracted to warm water discharges in the Inner Harbor and may be present in the Viola Turning Basin, FHR voluntarily concludes that the Project may affect, but is not likely to adversely affect the West Indian manatee. This potential effect would be discountable or insignificant.

For the whooping crane, there is no known occurrence of the species within the Action Area and no identified critical habitat. However, because the Action Area is within the mapped whooping crane migration route there is a remote possibility that a whooping crane could fly through the Action Area during construction activities, FHR concludes that the Project may affect but is not likely to adversely affect the whooping crane. This potential effect would be discountable or insignificant. As part of the construction activities, FHR will implement best management practices (BMP) regarding use of construction cranes throughout the duration of the Project, which includes reducing the heights of retractable equipment whenever possible, marking construction equipment taller than 15 m (50 ft) with lights and flagging.

For all other federally-listed threatened, endangered, and candidate species for Nueces County, it is concluded there is no potential for occurrence in the Action Area and therefore, no other species are expected to be affected by the Project.

7.0 Summary and Conclusions

USEPA's action in issuing a GHG PSD permit to FHR for the Corpus Christi West Refinery Domestic Crude Project in Nueces County, Texas, may affect but is not likely to adversely affect the green sea turtle, Atlantic hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, West Indian manatee and the whooping crane, and any affect is expected to be discountable or insignificant.

- For the green sea turtle, Atlantic hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle and the West Indian manatee, respectively, the USEPA (sea turtles) and the USFWS (manatee) have concluded there is a small potential for an individual to be present near Outfall 001 in the Viola Turning Basin at the far west end of the Inner Harbor. Based on this potential for incidental occurrence, FHR conservatively concludes that the Project may affect but is not likely to adversely affect the five turtle species and the manatee and that any effect is expected to be discountable or insignificant.
- For the whooping crane, there is a small potential for individuals to fly through the Action Area. Because some construction equipment may have heights of 18 to more than 100 m (60 to more than 300 ft), FHR concludes that the Project may affect but is not likely to adversely affect the whooping crane, and that any effect is expected to be discountable or insignificant. Best practices for managing construction equipment heights will be used by FHR and equipment with heights of 15 m (50 ft) or more will have lights and/or flagging attached to the top.

USEPA's action will have no reasonably foreseeable effect on other federally-listed threatened, endangered, or candidate species or designated critical habitat for purposes of Section 7 of the ESA because it is not reasonably foreseeable that these other federally-listed threatened, endangered, or candidate species would be present in the Action Area, their suitable habitat is not present, nor is their designated critical habitat within the Action Area of the Project Table 11 provides a summary of the conclusions for each federally-listed species.

Table 11 Determination of the West Refinery Domestic Crude Project's Potential for Effect on Federally-Listed Threatened and Endangered Species and Candidate Species

Common Name[(1)]	Scientific Name	Federal Listing Status[(2)]	Effects Determination
Reptiles			
Green Sea Turtle	*Chelonia mydas*	E, T	No documented occurrence or habitat in Action Area; USEPA concludes that the presence of this species in the Viola Turning Basin cannot be ruled out. Therefore, FHR conservatively concludes that green sea turtles may incidentally occur near Outfall 001 and the Project may affect but is not likely to adversely affect this species and any effects would be insignificant or discountable.
Hawksbill Sea Turtle	*Eretmochelys imbricata*	E	No documented occurrence or habitat in Action Area; USEPA concludes that the presence of this species in the Viola Turning Basin cannot be ruled out. Therefore, FHR conservatively concludes that hawksbill sea turtles may incidentally occur near Outfall 001 and the Project may affect but is not likely to adversely affect this species and any effects would be insignificant and discountable.
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E	No documented occurrence and no reasonably foreseeable presence in Action Area; USEPA concludes that the presence of this species in the Viola Turning Basin cannot be ruled out. Therefore, FHR conservatively concludes that Kemp's ridley sea turtles may incidentally occur near Outfall 001 and the Project may affect but is not likely to adversely affect this species and any effect would be insignificant or discountable.
Leatherback Sea Turtle	*Dermochelys coriacea*	E	No documented occurrence or habitat in Action Area; USEPA concludes that the presence of this species in the Viola Turning Basin cannot be ruled out. Therefore, FHR conservatively concludes that leatherback sea turtles may incidentally occur near Outfall 001 and the Project may affect but is not likely to adversely affect this species and any effects would be insignificant and discountable.
Loggerhead Sea Turtle	*Caretta caretta*	T	No documented occurrence and no reasonably foreseeable presence in Action Area; USEPA concludes that the presence of this species in the Viola Turning Basin cannot be ruled out. Therefore, FHR conservatively concludes that loggerhead sea turtles may incidentally occur near Outfall 001 and the Project may affect but is not likely to adversely affect this species and any effect would be insignificant or discountable.

Common Name[1]	Scientific Name	Federal Listing Status[2]	Effects Determination
Mammals			
Gulf Coast Jaguarundi	*Herpailurus (=Felis) yagouaroundi cacomitli*	E	No documented occurrence or habitat in Action Area; no effect.
Ocelot	*Leopardus (=Felis) pardalis*	E	No documented occurrence or habitat in Action Area; no effect.
West Indian Manatee	*Trichechus manatus*	E	No documented occurrence or habitat in the Action Area; the Project is not a warm water attractant by itself, but there is a very low potential for a manatee to be present near Outfall 001 in the winter because existing warm water discharges in the Inner Harbor may eventually attract it to the Viola Turning Basin. No effects are reasonably foreseen because there is no increase in marine vessel traffic associated with the Project; wastewater discharge associated with the Project will be within permitted limits and meet water quality standards and chemical load threshold; and biomonitoring data indicates the current discharges from Outfall 001 are not acutely or chronically toxic and the Project is not expected to have an effect on future toxicity tests. Despite evidence of "no reasonably foreseeable effect," FHR voluntarily concludes, based on the potential for a manatee to be attracted to warm water discharges in the Inner Harbor and reach the Viola Turning Basin, that the Project may affect but is not likely to adversely affect the manatee and any effects are expected to be discountable or insignificant.
Red wolf	*Canis rufus*	E*	No documented occurrence or habitat in Action Area; no effect.
Blue Whale	*Balaenoptera musculus*	E	No documented occurrence or habitat in Action Area; a deepwater ocean species that is not reasonably expected to be present in the Action Area; no effect.
Finback Whale	*Balaenoptera physalus*	E	No documented occurrence or habitat in Action Area; a deepwater ocean species that is not reasonably expected to be present in Action Area; no effect.
Humpback Whale	*Megaptera novaeangliae*	E	No documented occurrence or habitat in Action Area; a deepwater ocean species that is not reasonably expected to be in the Action Area; no effect.
Sei Whale	*Balaenoptera borealis*	E	No documented occurrence or habitat in Action Area; a deepwater ocean species that is not reasonably expected to be in the Action Area; no effect.

Common Name[(1)]	Scientific Name	Federal Listing Status[(2)]	Effects Determination
Sperm Whale	*Physeter macrocephalus*	E	No documented occurrence or habitat in Action Area; a deepwater ocean species that is not reasonably expected to be present in Action Area; no effect.
Birds			
Piping Plover	*Charadrius melodus*	T/E	No documented occurrence or habitat in Action Area; no effect.
Northern Aplomado Falcon	*Falco femoralis septentrionalis*	E	No documented occurrence or habitat in Action Area; no effect.
Whooping Crane	*Grus Americana*	E	No documented occurrence or habitat in Action Area; the probability of a whooping crane being present in the Action Area is very low. Tall construction equipment may present obstacles to a whooping crane; therefore, the Project may affect but is not likely to adversely affect the whooping crane, and any effects are expected to be discountable or insignificant.
Eskimo curlew	*Numenius borealis*	E*	No documented occurrence or habitat in Action Area; no effect.
Fish			
Smalltooth Sawfish	*Pristis pectinata*	E**	No documented occurrence or habitat in Action Area; no effect.
Plants			
Slender Rush-Pea	*Hoffmannseggia tenella*	E	No documented occurrence or habitat in Action Area; no effect.
South Texas Ambrosia	*Ambrosia cheiranthifolia*	E	No documented occurrence or habitat in Action Area; no effect.
Candidate Species			
Red Knot	*Calidris canutus rufa*	C	No documented occurrence or habitat in Action Area; no effect.
Sprague's Pipit	*Anthus spragueii*	C	No documented occurrence or habitat in Action Area; no effect.
Yellow-billed Cuckoo	*Coccyzus americanus*	C	No documented occurrence or habitat in Action Area; no effect.

* USFWS does not list this species. Identified as federally-listed for Nueces County by the Texas Parks and Wildlife Department.

** NOAA Fisheries does not list this species. Identified as federally-listed for Nueces County by the Texas Parks and Wildlife Department.

(1) Source for species in Nueces County (Online query of USFWS Nueces County List, November 2012; accessed again September 2013).

(2) Endangered (E), Threatened (T), or Candidate (C) Species.

8.0 List of Preparers

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9.0 References

NOTE: USEPA Region 6 staff is requiring that electronic copies of all references be provided to them as part of the BE submittal and the Section 7 ESA consultation process. Therefore, to fulfill the requirement of the ESA-BE review process and the Section 7 consultation, FHR and Barr Engineering will be providing the following references to USEPA Region 6 with the expectation that USEPA Region 6 will comply with all applicable copyright and intellectual property protection requirements.

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Figures

Figure 1 Project Location

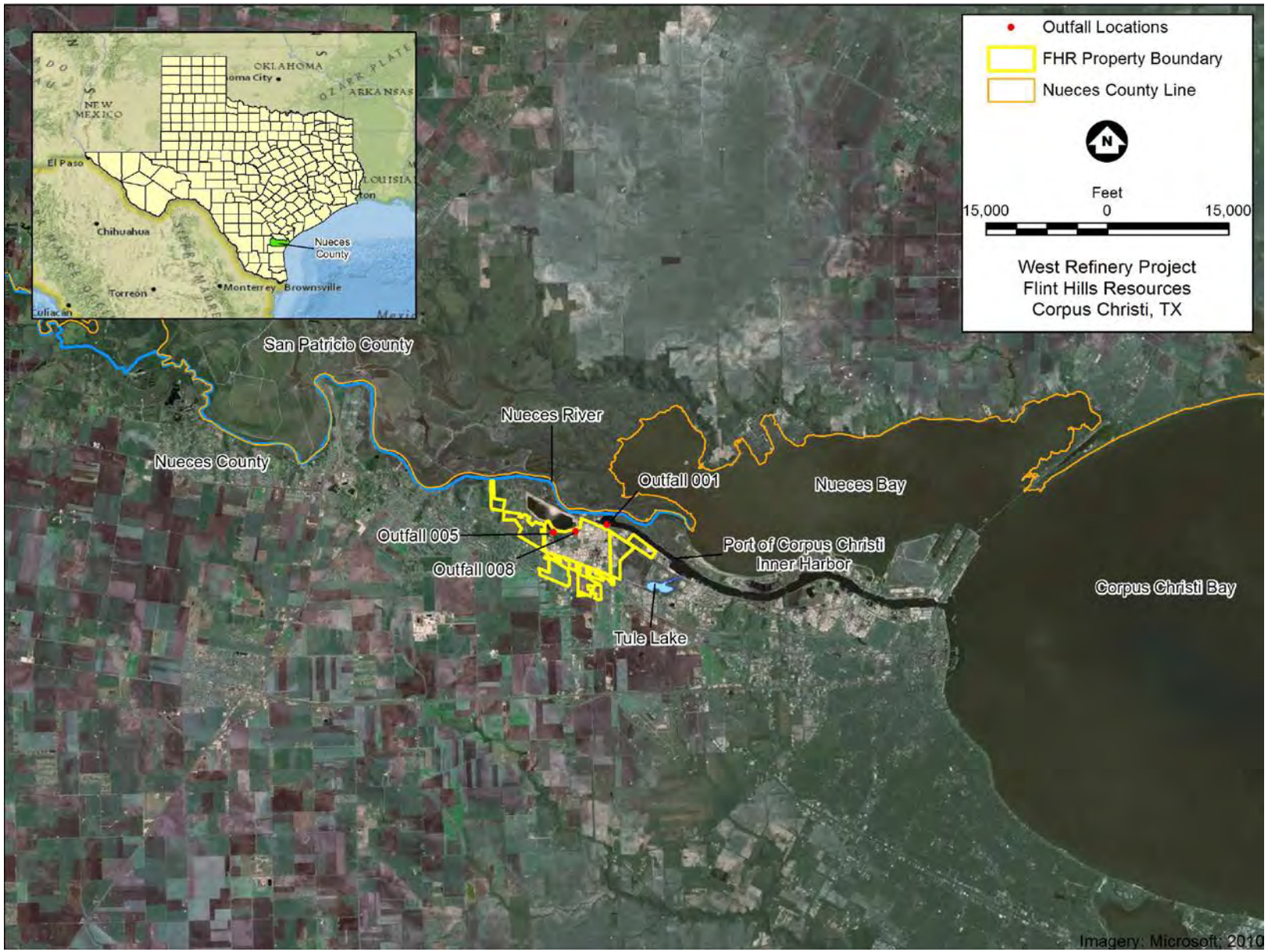


Figure 2 General Property Boundary and Proposed Parking Area

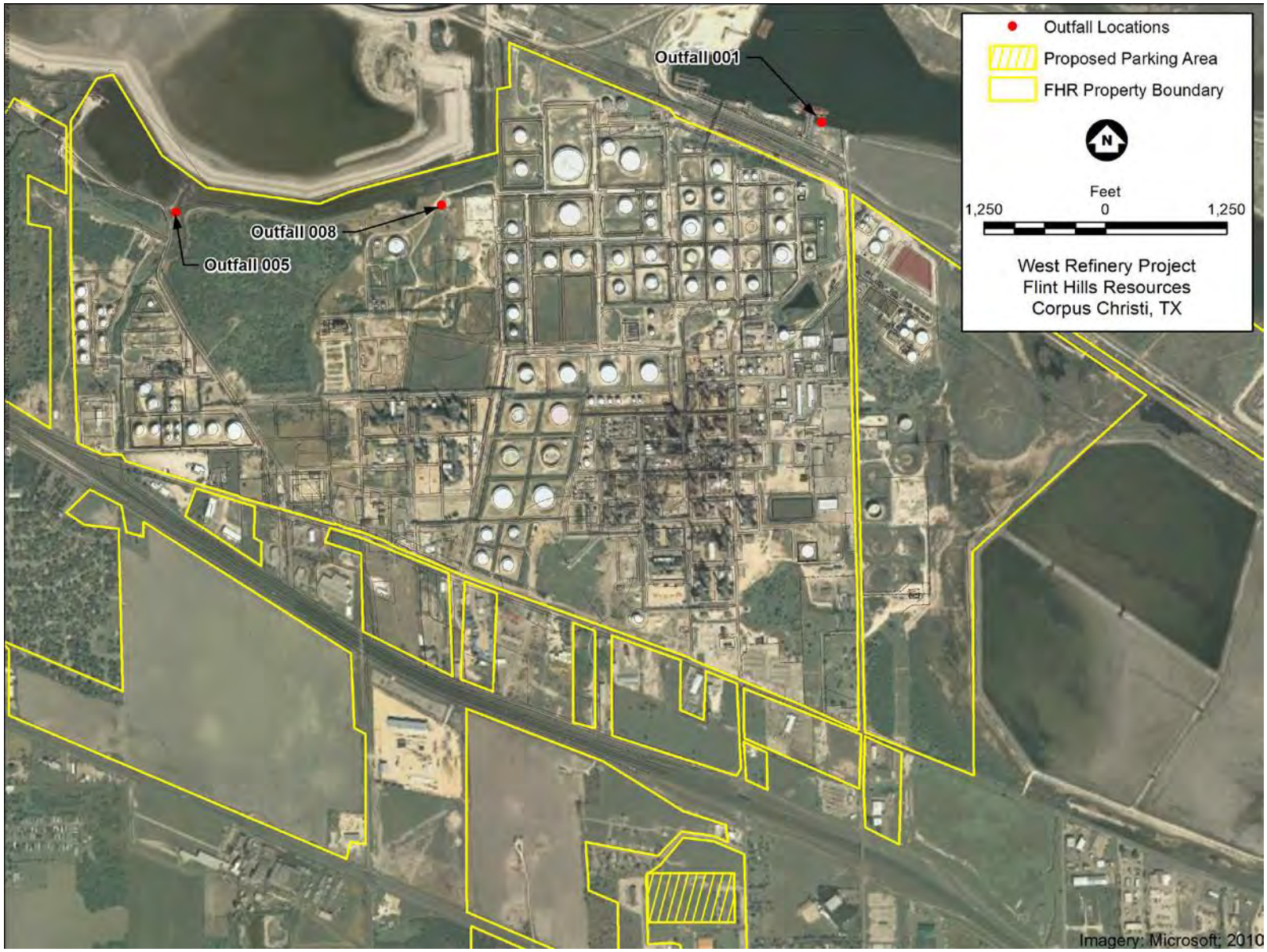


Figure 3 Location of Project Construction Areas and New Sources

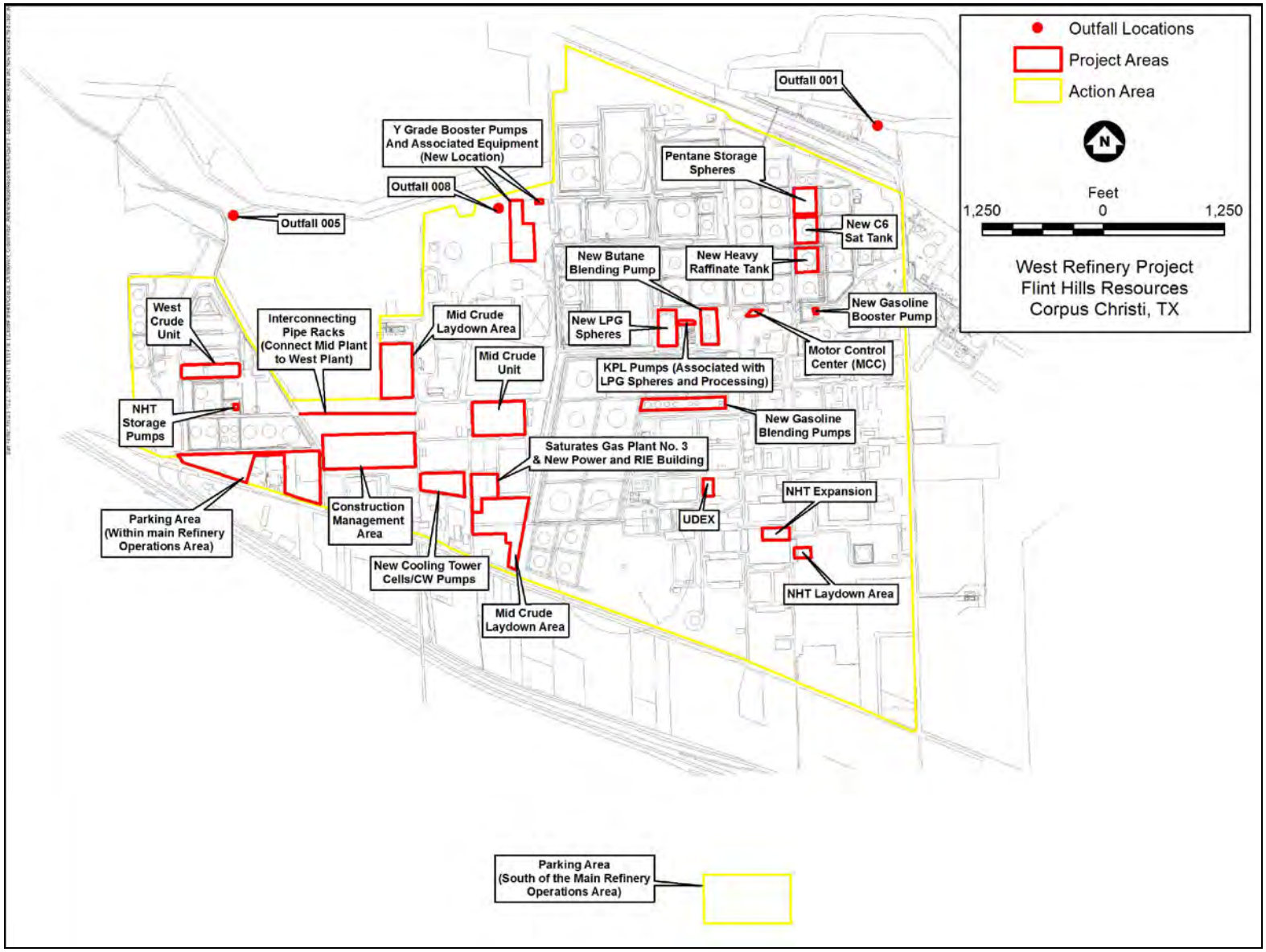


Figure 4 Action Area

Figure 5 Elements of Occurrence for Federally-Listed Threatened and Endangered Species

(note: occurrence of nearest marine species is ~ 14 km east of the project in Corpus Christi Bay, near the mouth of the Inner Harbor)

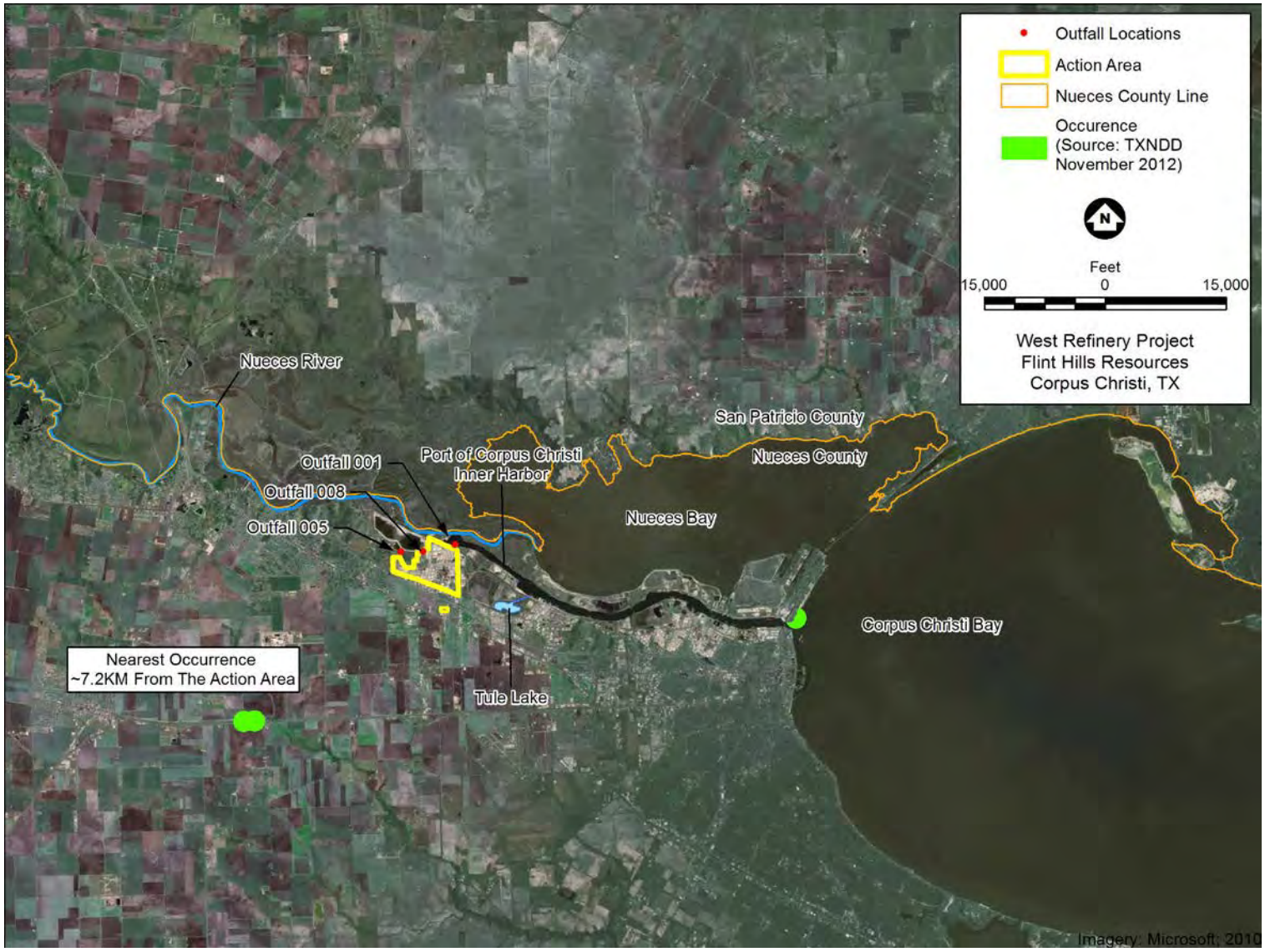


Figure 6 Critical Habitat for Federally-Listed Threatened and Endangered Species

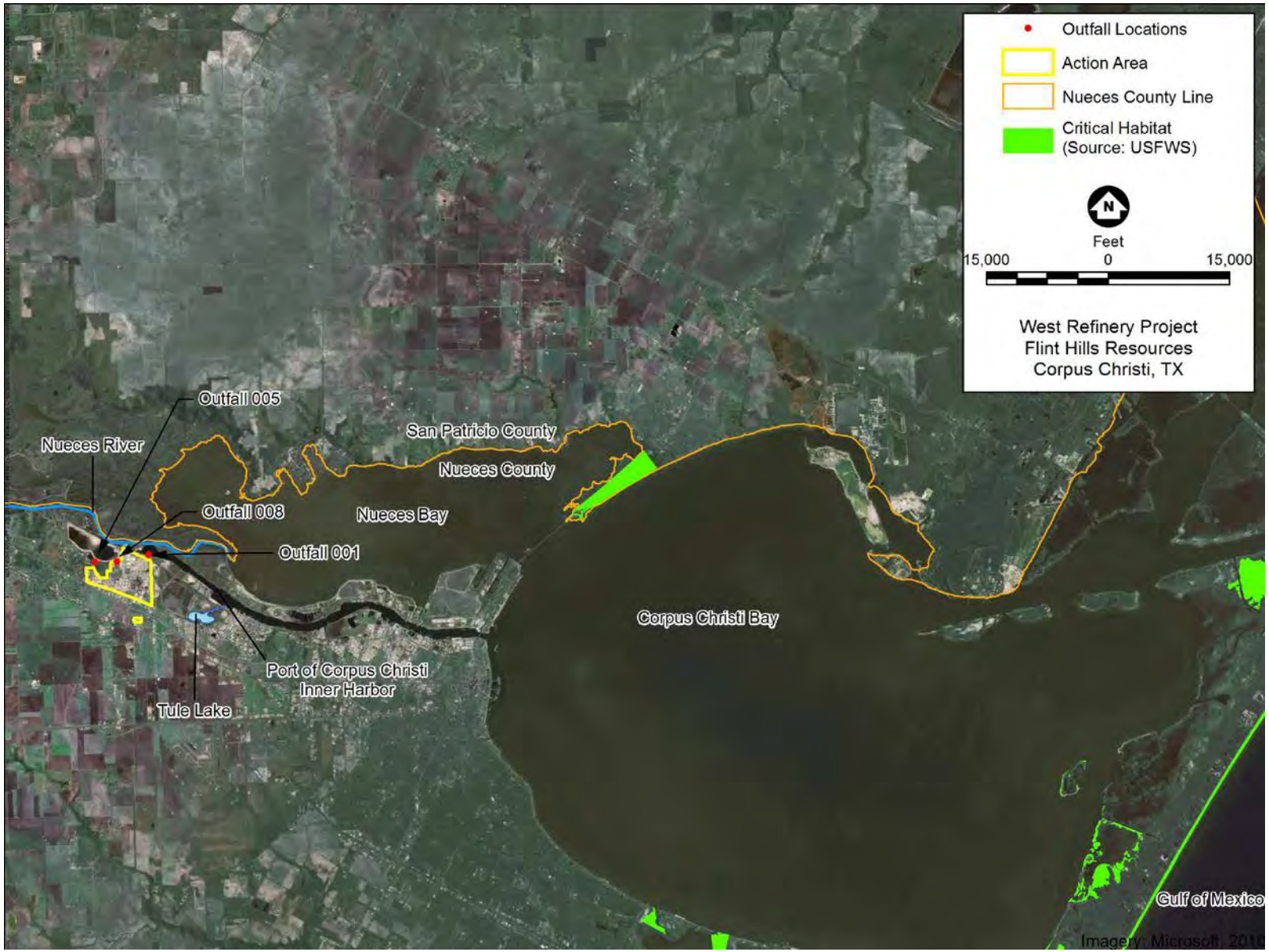


Figure 7 Seagrass Habitat in the Corpus Christi Area

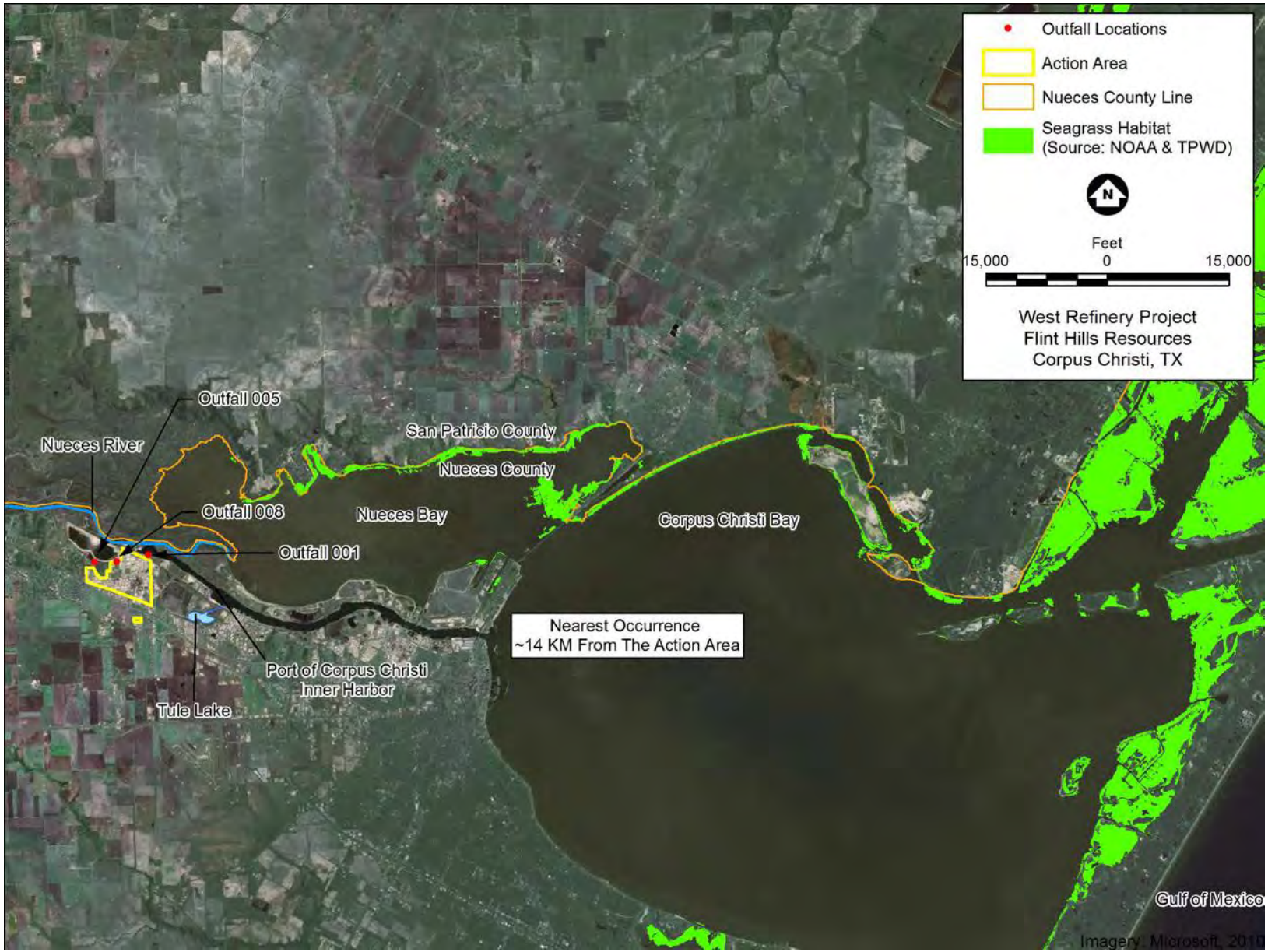


Figure 8 Whooping Crane Critical Habitat and Migration Route

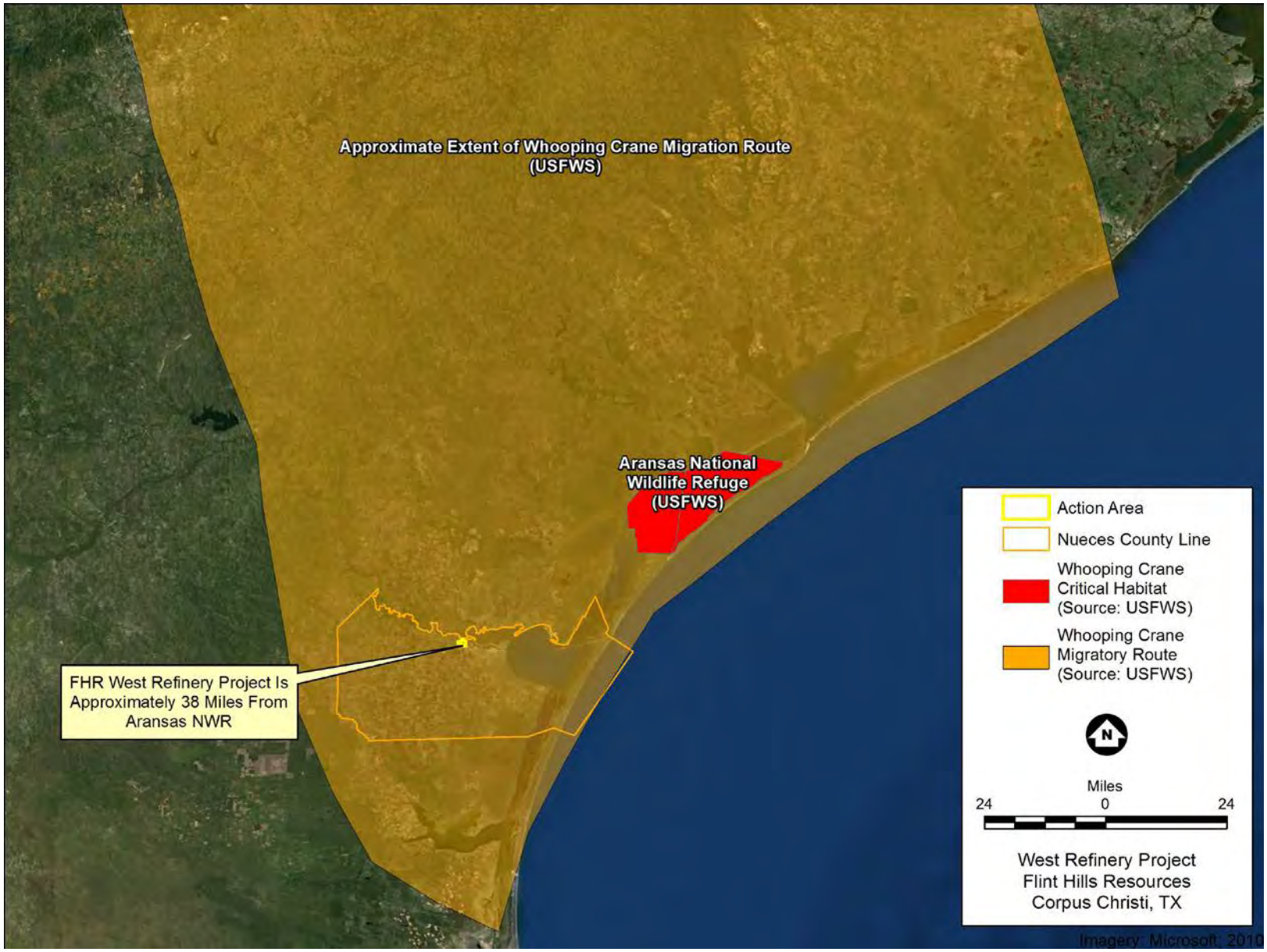


Figure 9 Air Dispersion Modeling Grid Out to 3 Kilometers

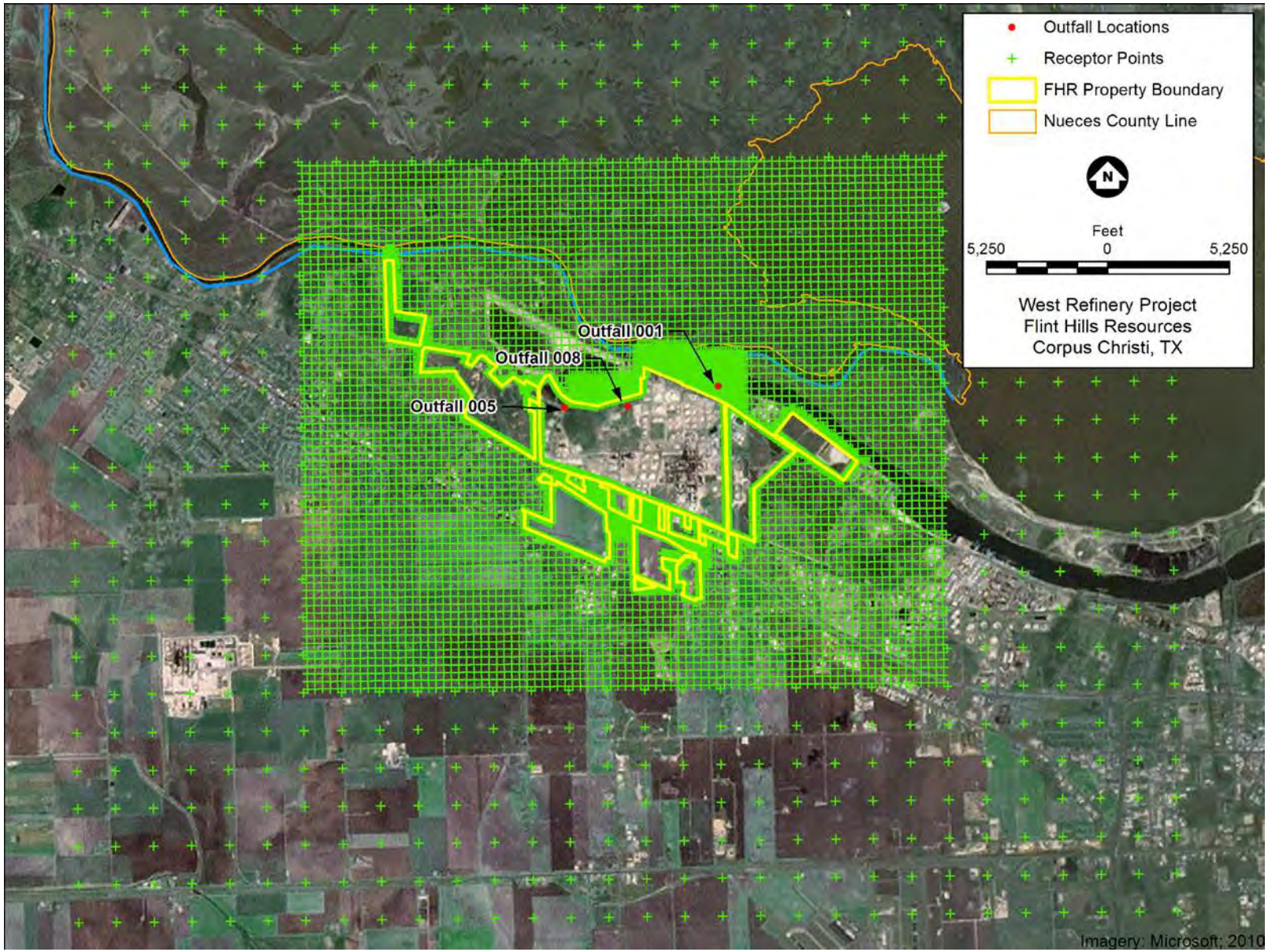


Figure 10 Air Modeling Grid Showing Near Field Receptors

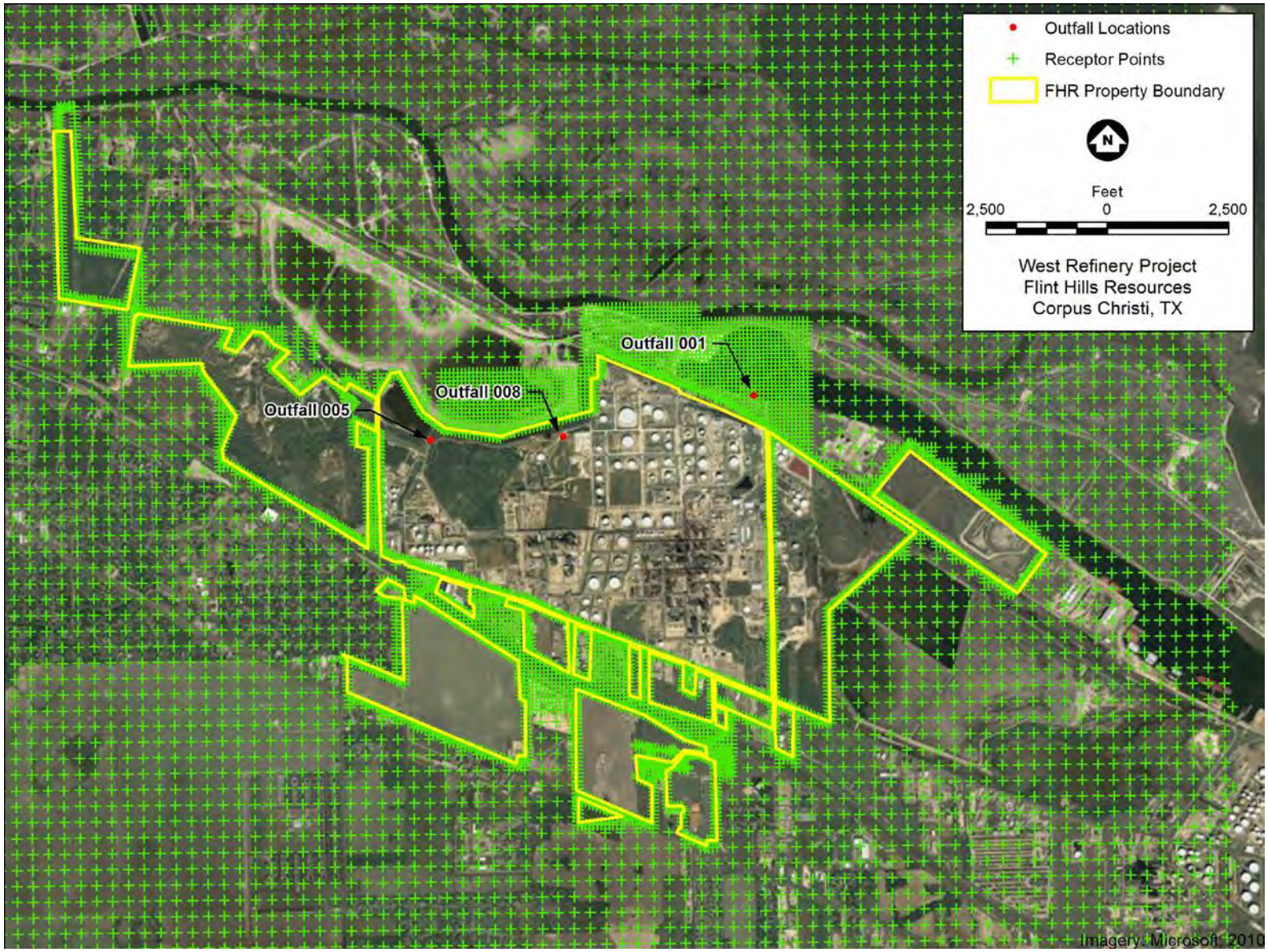
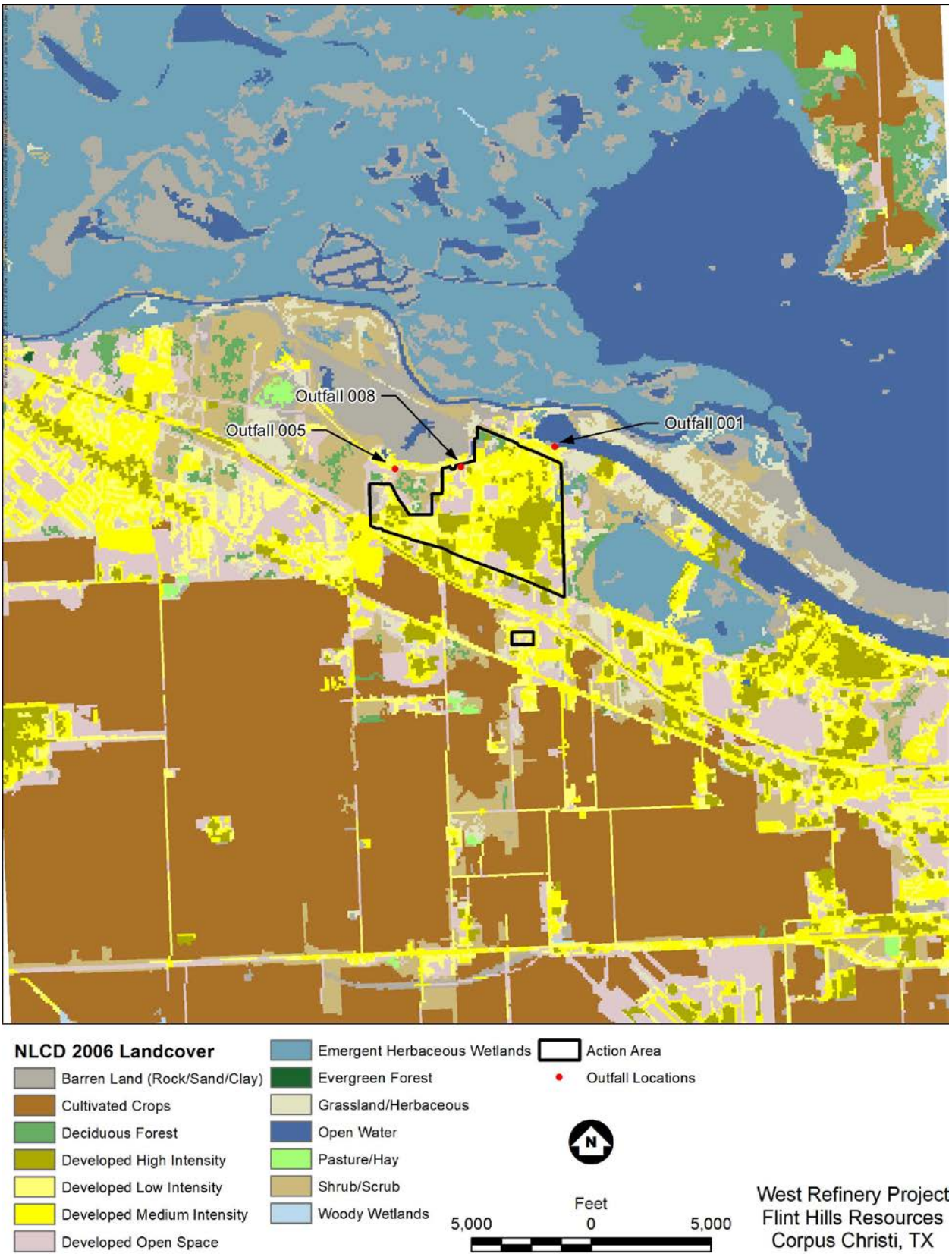


Figure 11 Land Use / Land Cover



Appendices

Appendix A

Protected Species Habitat Evaluation – Field Survey Data and Report

Listed Species Habitat Evaluation

FHR Corpus Christi West Refinery Project
Nueces County, Texas

Prepared for
Barr Engineering Company

Prepared by

Whitenton Group, Inc

October 2013

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Listed Species Habitat Evaluation
FHR Corpus Christi West Refinery Project
Nueces County, Texas

Prepared for

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San Marcos, Texas 78666

WGI Project No. 1353

November 2013

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ACRONYMS

Barr	Barr Engineering Company
BE – West Refinery	Endangered Species Act Biological Evaluation- FHR Corpus Christi West Refinery Project, Nueces County, Texas
EO	Element of Occurrence
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FHR	Flint Hills Resources Corpus Christi, LLC
LSHE	Listed Species Habitat Evaluation
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
TNDD	Texas Natural Diversity Database
TPWD	Texas Parks and Wildlife Department
West Refinery	Corpus Christi West Refinery
US	United States
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
WGI	Whitenton Group, Inc.

1.0 INTRODUCTION

Flint Hills Resources Corpus Christi, LLC (FHR) operates a crude oil refinery in Corpus Christi, Nueces County, Texas, named the Corpus Christi West Refinery (West Refinery). It produces a wide variety of petroleum products and has a refining capacity of 230,000 barrels per day[1]. FHR proposes to modify the facility to increase total crude processing for crude oil derived from the Eagle Ford Shale[2].

Whitenton Group (WGI) was contracted by Barr Engineering Company, FHR's environmental consultant for the proposed project, to complete a Listed Species Habitat Evaluation (LSHE) for the proposed project. The LSHE included a federally-listed species background review, an on-site field survey, and an analysis of the results. This LSHE follows the verbal guidance established by the United States (US) Environmental Protection Agency (EPA) for Biological Assessments in support of EPA Prevention of Significant Deterioration Greenhouse Gas Permits. This LSHE is further in support of Barr's "Endangered Species Act Biological Evaluation - FHR Corpus Christi West Refinery Project, Nueces County, Texas" (BE - West Refinery).

The proposed expansion project is located in Corpus Christi, Nueces County, Texas. The approximately 705-acre West Refinery is located on the southwest end of the Viola Turning Basin, near the intersection of US Interstate 37 and Tuloso Road (Figure 1 – Appendix A).

Project location information:

USGS Quad	Latitude/Longitude
Annaville	27.827861, -97.525285

Project construction will occur entirely within the property boundaries of the existing West Refinery. Specifically, 47 areas, hereafter referred to as Project Areas, will be developed (Figure 2 – Appendix A). Linear features associated with the proposed project include modifications to existing interconnecting pipe racks located within the West Refinery. More specific construction details are provided in the BE – West Refinery. The Project Areas are identified below in Table 1.

Table 1. List of Project Areas

Project Area	Designated Purpose
1	NHT Expansion
1a	NHT Laydown Area
2	Grassroots (Pre-Flash/Depent, Sat. Gas No. 3, and RIE Building)
3	Hot Oil Heater and New Cooling Tower
4	NHT Storage Charge Pump
4a	West Crude Unit
5	Mid Crude Unit
5a	Mid Crude Laydown Area
6	LPG Spheres
7	Pumps Associated with LPG Spheres (Project Area 6)
8	Heavy Raffinate Tank/Heavy Naptha Blend/Tsfr Pump
9	C6 Saturates Tank/Pump
9a	Pentane Storage Spheres/LPG Spheres
10	OSBL Motor Control Center
11	Blending Skid Modifications/Gasoline Booster Pumps
12	Butane Blending Pumps
13	Udex Unit
14	Mid Crude Laydown Area/Warehouse
15	Y Grade Booster Pumps
16	Interconnecting Pipe Racks
17	Parking Area
18	Construction Management Area
19	Parking Area

The survey area (approximately 717 acres total) included all designated Project Areas, all habitats within the designated Action Area (as defined in the BE – West Refinery), and 3 existing outfall structures (Outfall 001, 005 and 008). The interconnecting pipe racks are existing racks that will house additional pipelines. These racks may require minor modifications to the supporting structures in areas. The Project Areas include 1 satellite parking area located within FHR property, but outside and to the south of the existing West Refinery fenceline. Outfall 001 is located approximately 550 feet north of the terrestrial survey area and discharges into the Viola Turning Basin. The Action Area at Outfall 001 includes the 200-foot regulatory mixing zone.

Outfall 005 is within the survey area and discharges into a drainage canal. Outfall 008 discharges into a drainage canal that flows into an impounded wetland.

2.0 ENDANGERED SPECIES ACT

The US Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration - National Marine Fisheries Service (NOAA-NMFS) implement the Endangered Species Act of 1973 (ESA). "The purpose of the ESA is to protect and recover imperiled species and the ecosystems on which they depend." Imperiled species specifically includes those listed by the USFWS as threatened or endangered[3]. Candidate species are those "the USFWS has enough information to warrant proposing them for listing but is precluded from doing so by higher listing priorities[4]." Candidate species are not specifically protected by the ESA but were evaluated in this LSHE.

Section 9 of the ESA prohibits the "take" of threatened and endangered species; "take" is defined as "harass, harm, pursue, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." Generally, the USFWS considers modification of regularly occupied endangered species habitat to constitute "harm" and, therefore, a violation of the ESA[5].

If listed species and/or listed species habitat are identified within the proposed project area, 3 options are available:

Option 1. Avoidance of potential habitat.
Option 2. Additional surveys to establish the presence or absence of the listed species. Informal consultation with USFWS may be required.
Option 3. Incidental Take Permit authorized by the USFWS.

Proposed projects located on Texas state lands are governed by state regulations and may require additional surveys and/or permitting.

3.0 BACKGROUND INFORMATION

3.1 GENERAL ENVIRONMENTAL DESCRIPTION

The Project Areas are within the Southern Subhumid Gulf Coastal Prairie ecoregion[6]. This region borders a portion of the Gulf Coast in the state of Texas. The Gulf of Mexico influence creates multiple dynamic ecosystems within this ecoregion including bays, estuaries, salt marshes, and tidal flats. Inland ecosystems are composed of mixed brush and grassland communities. These ecosystems are home to a variety of nongame wildlife including several endangered species[7]. This region is prime wintering grounds for migratory birds[8]. The bays and estuaries are invaluable breeding grounds and fish hatcheries[9].

Vegetation of the Southern Subhumid Gulf Coastal Prairie includes *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (yellow indiangrass), *Sporobolus* spp. (tall dropseed), *Bouteloua* spp. (grama), *Buchloe* sp. (buffalograss), *Eragrostis* spp. (lovegrass), *Hilaria* spp. (curly-mesquite), *Setaria* spp. (bristlegrass), *Prosopis glandulosa* (mesquite), and *Acacia farnesiana* (huisache)[10].

Agriculture and urban and industrial development have replaced most of the native coastal prairie[11]. Almost 70% of the county is considered prime farmland[12]. Remaining native vegetation consists of fragmented remnants of natural habitat.

As part of the Gulf Coast of Texas, Nueces County is comprised of generally flat terrain, with elevations ranging from sea level to approximately 180 feet above sea level[12]. It is prone to flooding. The climate in Nueces County is sub-humid tropical with an average annual rainfall of 30 inches. The mean temperature in July is 93 °F and 47 °F in January. The growing season lasts roughly 309 days per year[12].

4.0 FEDERALLY-LISTED SPECIES

4.1 SPECIES LIST

The Texas Parks and Wildlife Department (TPWD), NOAA, and the USFWS maintain lists of federally-listed species by county in Texas. Table 2 is a list of federal candidate, proposed,

threatened, and endangered species with the potential to occur in Nueces County according to these agencies[13,14,15,16]. In accordance with EPA Biological Assessment protocol for Greenhouse Gas Permits, federally-listed species mentioned by these 3 agencies will be discussed. State-listed species are not included in this report.

Table 2. List of Federal Threatened, Endangered, or Candidate Species for Nueces County, Texas[13,14,15,16]

Common Name	Scientific Name	Species Group	USFWS List Status*	NOAA List Status*	TPWD List Status*
Green sea turtle	*Chelonia mydas*	reptile	T	T	T
Hawksbill sea turtle	*Eretmochelys imbricata*	reptile	E	E	E
Kemp's Ridley sea turtle	*Lepidochelys kempii*	reptile	E	E	E
Leatherback sea turtle	*Dermochelys coriacea*	reptile	E	E	E
Loggerhead sea turtle	*Caretta caretta*	reptile	T	T	T
Whooping crane	*Grus americana*	birds	E	-	E
Northern aplomado falcon	*Falco femoralis septentrionalis*	birds	E	-	E
Piping plover	*Charadrius melodus*	birds	T	-	T
Eskimo curlew	*Numenius borealis*	birds	-	-	E
Red knot	*Calidris canutus rufa*	birds	C	-	-
Sprague's pipit	*Anthus spragueii*	birds	C	-	C
Yellow-billed cuckoo	*Coccyzus americanus*	birds	C	-	-
West Indian manatee	*Trichechus manatus*	mammals	E	-	E
Red wolf	*Canis rufus*	mammals	-	-	E
Gulf coast jaguarundi	*Puma yagouaroundi cacomitli*	mammals	E	-	-
Ocelot	*Leopardus pardalis*	mammals	E	-	E
Smalltooth sawfish	*Pristis pectinata*	Fishes	-	-	E
South Texas ambrosia	*Ambrosia cheiranthifolia*	plants	E	-	E

Common Name	Scientific Name	Species Group	USFWS List Status*	NOAA List Status*	TPWD List Status*
Slender rush-pea	*Hoffmannseggia tenella*	plants	E	-	E
Blue whale	*Balaenoptera musculus*	mammals	-	E	-
Finback whale	*Balaenoptera physalus*	mammals	-	E	-
Humpback whale	*Megaptera novaeangliae*	mammals	-	E	-
Sei whale	*Balaenoptera borealis*	mammals	-	E	-
Sperm whale	*Physeter macrocephalus*	mammals	-	E	-

***E=Endangered; T=Threatened; C=Candidate for Federal Listing**

4.2 SPECIES DESCRIPTIONS

A brief description of these species and their habitat requirements are included below.

Green Sea Turtle

The green sea turtle can grow to 4 feet in length and reported weights vary from 350-850 pounds. The carapace is smooth and keelless, and the color varies with shades of black, gray, green, brown, and yellow. Adults are herbivorous. Hatchlings are omnivorous[17,18].

Green sea turtles occupy 3 ecosystems according to their life stage: high-energy oceanic beaches, convergence zones in the pelagic habitat, and benthic feeding grounds in relatively shallow, protected waters. Females briefly occupy high-energy oceanic beaches during nesting and hatching activities. Hatchlings move out to the convergence zone until their carapace reaches approximately 7.8-9.8 inches in length. Juveniles and adults primarily occupy benthic feeding grounds in shallow, protected waters. Preferred feeding grounds include pastures of seagrasses and/or algae. They are also found over coral reefs, worm reefs, and rocky bottoms[18].

Green sea turtles have a worldwide distribution in tropical and subtropical waters. The nesting season in the southeastern US is June through September. Nesting is nocturnal

and occurs in 2, 3, or 4-year intervals. Females may lay up to 9 clutches per season at 13-day intervals. Hatchlings typically emerge at night. In Florida, it is estimated that 5,000 females nested on beaches in the year 2010. Nesting occurs on high energy oceanic beaches with a sloping platform and minimal disturbance. Green sea turtles return to the same nesting site and are known to travel long distances between foraging areas and nesting beaches[17,18].

Hawksbill Sea Turtle

The hawksbill sea turtle is a small to medium-sized marine turtle with a reddish-brown carapace. The head is relatively small with a distinctive hawk-like beak. The adult hawksbill is commonly 2.5 feet in length and typically weighs 176 pounds or less[19,20].

Hawksbill hatchlings live in a pelagic environment, specifically in the weedlines that accumulate at convergence zones. Juveniles will return to a coastal environment when their carapace reaches approximately 7.8-9.8 inches in length. Juveniles, subadults, and adults will spend most of their time in their primary foraging habitat, coral reefs. Hawksbills primarily feed on sponges[19,20].

Hawksbill sea turtle nesting varies depending on locality but most nesting occurs between April and November yielding up to 200 eggs with each nest. Nesting is nocturnal and occurs every 2-3 years, 4-5 times per season, approximately every 14 days. Preferred nesting habitat includes low and high-energy beaches in tropical oceans. Approximately, 15,000 females are estimated to nest each year worldwide[19,20].

The hawksbill is found in tropical and subtropical waters of the Atlantic, Pacific, and Indian Oceans. Hawksbills are typically associated with rocky areas and coral reefs in water less than 65 feet. Mexico is now considered the most important region for hawksbills in the Caribbean. The hawksbill sea turtle is an occasional visitor to the Texas coast[19,20].

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle is considered the smallest sea turtle with an olive-gray carapace, a triangular shaped head, and a hooked beak. Adults can grow to 2 feet in length and weigh between 70-108 pounds. This turtle is a shallow water benthic feeder with a diet consisting primarily of crustaceans (i.e., shrimp and swimming crabs), Cnidarians (jellyfish), gastropods (snails), and echinoderms (sea stars)[21,22].

Kemp's ridley sea turtles occupy 3 ecosystems according to life stage: terrestrial zone, neritic zone (nearshore marine environment), and oceanic zone. The terrestrial zone is occupied briefly during nesting and hatching activities. Hatchlings move out to the oceanic zone for an average of 2 years. Juveniles and adults primarily occupy the neritic and oceanic zones[21,22].

Most nesting occurs on the eastern coast of Mexico, however a small number consistently nest at Padre Island National Seashore in Texas and various other locations along the Gulf and lower Atlantic coasts. Nesting occurs from April to July during daylight hours. Large numbers of females emerge for a synchronized nesting event referred to as "arribada". Arribadas are thought to be caused by strong winds or changes in barometric pressure. Females may breed annually and nest an average of 2.5 times per season at intervals of 14-28 days[21,22].

The Kemp's ridley sea turtles range includes the Gulf of Mexico and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland[21,22].

Leatherback Sea Turtle

The leatherback sea turtle is the largest sea turtle. The carapace of adult female leatherback turtles range from 4-6 feet and leatherback sea turtles can weigh up to 2,000 pounds. The turtle lacks a "normal" turtle shell and is covered by firm, rubbery skin that is approximately 1.5 inches thick. Coloration is predominantly black with varying degrees of pale spotting; including a notable pink spot on the dorsal surface of the head in adults. Diet is primarily jellyfish, siphonophores, and salpae, but it is also known to feed on members of echinoideans (sea urchins), cephalopods (squid), crustaceans,

ascidiacean (tunicates), osteichthyes (bony fish), cyanobacteria (blue-green algae), and floating seaweed[23,24].

Leatherbacks are highly migratory and the most pelagic of all sea turtles. Females prefer high energy, sandy beaches with vegetation immediately upslope and a beach sloped sufficiently so the crawl to dry sand is not too far. Preferred beaches have deep, unobstructed oceanic access on continental shorelines[24].

In the US, nesting occurs from March to July. Females nest 5-7 times per season at 10-day intervals. Most leatherbacks return to their nesting beaches at 2 to 3-year intervals[24].

Distribution is worldwide in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans. The leatherback is also found in small numbers as far north as British Columbia, Newfoundland, and the British Isles and as far south as Australia and Argentina. The leatherback has a small presence in the US with most nesting occurring on the Florida east coast, Sandy Point, US Virgin Islands, and Puerto Rico[23,24].

Loggerhead Sea Turtle

The loggerhead sea turtle is reddish-brown marine turtle characterized by a large head with blunt jaws. Adults on average weigh 255 pounds and are 3 feet in length. Adult loggerheads feed on jellyfish, salps, mollusks, benthic crabs, *Janthina* spp. (snails), and *Lepas* spp. (barnacles)[25,26].

Loggerheads occupy 3 ecosystems according to life stage: terrestrial zone, neritic zone, and oceanic zone. The terrestrial zone is occupied briefly during nesting and hatching activities. Hatchlings move out to the oceanic zone until their carapace reaches approximately 3-25 inches in length. Juveniles and adults primarily occupy the neritic zone (nearshore marine environment)[25,26].

The nesting season in the US is April through September. Nesting occurs every 2-3 years and is mostly nocturnal. Females can nest up to 5 times per season at intervals of approximately 12-15 days. Hatchling emergence is mostly nocturnal. Loggerheads nest on oceanic beaches between the high tide line and dune fronts and occasionally on

estuarine shorelines with suitable sand. Females prefer narrow, steeply sloped, coarse-grained beaches[25,26].

Distribution of the loggerhead includes the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Although the majority (~80%) of nesting activity in the US occurs in south Florida, loggerheads nest along the Gulf and Atlantic coastlines from Texas to Virginia. Loggerheads are considered an occasional visitor to Texas[25,26].

Whooping Crane

The whooping crane is a large bird that stands approximately 5 feet tall and weighs approximately 14-16 pounds. Adult birds have long necks and legs, a white body, a red crown, black primary feathers, and a long, pointed beak. Juveniles are reddish-cinnamon in color[27,28].

Whooping cranes are migratory with the main population breeding in Wood Buffalo National Park in Alberta, Canada (May to October) and wintering on the Texas coast (November to March). During breeding, whooping cranes demonstrate high site fidelity, using the same areas each year. Nests are typically constructed within tall rushes or sedges of marshes, sloughs, or along lake margins. Females lay 2 eggs per season. Parents share rearing duties although the female take the primary role in raising the young[27,28].

Migration occurs twice per year during daylight hours. The main population typically remains within a 200-mile migration pathway from Canada to Texas, and they regularly stop to feed and rest along the way. Whooping cranes use a variety of habitats during migration, including inland marshes, lakes, wetlands, ponds, wet meadows, rivers, and agricultural fields[27,28].

The wintering population primarily occupies habitat in or near the Aransas National Wildlife Refuge near Rockport, Texas. However, the birds have been expanding their winter range due to population increases and climate change[29]. Winter habitat includes brackish bays, marshes, and salt flats[27,28].

Whooping cranes are omnivorous with a diet of crustaceans, mollusks, amphibians, fish, acorns, and berries[27,28].

Northern Aplomado Falcon

The northern aplomado falcon is a subspecies of the aplomado falcon. It is larger and has a longer wingspan than the aplomado falcon. Its length is approximately 14-17 inches. The upper coloration is light gray and the underside has a black belly-band. The tail is banded black and white. Sexes are similar in appearance. This subspecies is currently found only in Texas, Guatemala, and Mexico[30].

The northern subspecies prefers coastal prairies and desert grasslands with scattered *Yucca* spp. (yuccas) and mesquites. They also utilize *Quercus* spp. (oak) woodlands and riparian gallery forests that are within desert grasslands. Its diet consists mostly of birds and insects, but also small mammals and reptiles. The birds are capable of long pursuits of prey, such as *Columba livia* (pigeons) and *Zenaida* spp. (doves). Mated pairs remain together year-round and hunt cooperatively[30].

Piping Plover

Piping plovers are small, migratory shorebirds approximately 5-7 inches in length with a wingspan of approximately 15 inches. These birds have a short, black and orange bill that varies in color depending on the time of year, orange legs, pale gray back and dorsal wings, white undersurface, and black breastband[31].

Three main breeding populations of piping plovers have been distinguished by geographic region within the US: Great Lakes, Northern Great Plains, and American Atlantic. These 3 populations winter on beaches and barrier islands in the South Atlantic, Gulf of Mexico, and Caribbean coasts, including the Bahamas and West Indies. Piping plovers from these 3 regions primarily winter along coastal areas of the US from North Carolina to Texas[32]. Piping plovers generally begin arriving on the Texas coast in mid-July and begin leaving for the breeding grounds in late February. It is believed that the migration to and from wintering grounds is a non-stop effort. Few birds remain on the Texas coast year round, but they are thought to be non-breeders[33].

Wintering habitat includes foraging and roosting habitat types. Preferred foraging habitat includes wet sand in the wash zone, bare to sparsely vegetated, intertidal ocean beaches, wrack lines, shorelines of streams, ephemeral ponds, lagoons, salt marshes, emergent seagrass beds, wash-over passes, mudflats, sandflats, or algal flats. Most preferred foraging habitats are dynamic systems that fluctuate with the tide and wind. Their diet consists of invertebrates such as marine worms, fly larvae, beetles, crustaceans, and mollusks. Piping plovers demonstrate high winter site fidelity[31]. Preferred roosting habitat is adjacent to foraging habitat and includes sandy beaches, often with cover such as driftwood, seaweed clumps, small dunes, and debris that is used for shelter from wind and extreme temperatures[34]. Critical habitat for wintering piping plovers has been designated in several areas along the Texas coast[35]. Piping plovers are known to occupy similar habitats as other shorebirds such as *Tringa semipalmata* (willets), *Arenaria interpres* (ruddy turnstones), *Limnodromus scolopaceus* (dowitchers), *Calidris* spp. (sandpipers), *Haematopus palliatus* (American oystercatchers), and other plovers[33].

Eskimo Curlew

The Eskimo curlew is a migratory bird that is approximately 12-14 inches long with a slightly down-curved bill. These birds have brown feathers with streaking on the sides of the face and neck. The undersides of their wings have cinnamon-colored feathers[36].

Its breeding habitat consists of treeless dwarf shrub-graminoid tundra and grassy meadow habitat. Non-breeding birds utilize a variety of habitats, including grasslands, pastures, plowed fields, intertidal flats, and sand dunes. Their diet consists of *Empetrium nigrum* (crowberry), *Vaccinium* sp. (blueberries), Orthopterans (grasshoppers), Annelids (earthworms), and other insects[36].

Eskimo curlews migrate from nesting grounds in the Alaskan and Canadian Arctic across the North American prairies to South America. This species is known to migrate north through the mid-western US, including Texas during the spring. Eskimo curlews are extremely rare. It is estimated that the population is less than 50 individuals and may even be extinct[37]. There are no known extant populations of Eskimo curlews. The last confirmed record of an Eskimo curlew in Texas was in 1962 in Galveston County,

Texas[38]. Another possible sighting was noted in 1981 of a flock of 23 birds in Galveston Bay on Atkinson Island[39].

West Indian Manatee

The West Indian manatee is a large, fusiform-shaped, marine mammal. The adult manatee may grow up to 10 feet in length and up to 2,200 pounds. The manatee has dark gray, rubber-like skin. Manatees have forelimbs shaped like a paddle, no hind limbs, and a horizontal, flat, spatulate tail. Manatees breathe surface air with nostrils located on the upper snout. Manatees also have very small eyes and minute ears. Manatees are herbivores and opportunistic. Their diet consists of a wide variety of submerged, floating, and emergent vegetation. Seagrasses appear to be a dominant food source in coastal areas[40].

West Indian manatees have both opportunistic and predictable migration patterns, which are dependent on water temperature. They are able to travel long distances, typically in a north-south direction, according to seasonal temperature changes. In autumn and winter when water temperatures drop below 68 °F, manatees congregate in natural and artificial warm-water refuges. Most manatees return to the same warm water refuges each year. During mild winters, manatees will leave the warm-water refuge to feed on nearby grassbeds. As the water temperature rises in spring and summer, some manatees will remain near their wintering grounds and others will migrate up the coast or into river and canal systems. Manatees prefer depths ranging from 3-7 feet, but can be found in shallow areas down to 1.5 feet. Preferred feeding grounds are shallow grassbeds adjacent to deep channels in both coastal and riverine habitats. Manatees will seek freshwater drinking sources, but are not dependent upon fresh drinking water[40].

Mating and calving are not seasonally or habitat dependent. One or more males are attracted to females in heat to form a mating herd for up to 4 weeks. Length of gestation is thought to be between 11-14 months. Typical litter size is one and calves remain with the mother for 1-2 years after birth. Manatees reach sexual maturity at approximately age 5 years and can live in excess of 50 years[40].

Distribution is limited to warm coastal waters in the Gulf of Mexico including the US and Mexico, Central America, the north and northeastern coast of South America, and islands throughout the Caribbean Sea[41]. Manatee protection is not as well-supported in areas outside of the US, which results in smaller populations. According to the Texas Marine Mammal Stranding Network, manatees are rarely sighted in Texas[42]. The Florida coast supports the largest known population of West Indian manatees of any location within the species range[40].

Red Wolf

The red wolf is one of the world's most endangered canids. Their fur is a reddish color and they are smaller in size than the gray wolf. The average adult red wolf grows up to 5 feet in length and 45-80 pounds[43].

Red wolves are thought to prefer warm, moist, and densely vegetated habitat. They also can be found in pine forests, bottomland hardwood forests, coastal prairies, and marshes[44]. Little information is available describing red wolf preferred habitat characteristics.

Originally, the red wolves were found throughout the southeastern US. The USFWS declared the red wolf extinct in the wild in 1980. In 1987, captive individuals were released to the wild in North Carolina[45]. This reintroduced population is estimated at 100-120 individuals[43].

Red wolves feed on Lagomorphs (rabbits), *Odocoileus* sp. (deer), *Procyon* sp. (raccoons), and Rodentia (rats and mice). They live in packs of 5-8, which typically consist of 1 breeding pair and their offspring[45].

Gulf Coast Jaguarundi

Jaguarundis are diurnal small cats, weighing between 8-20 pounds. They have a slender build, long neck, short legs, a long tail, and a small, flattened head. Their fur may be either red or gray colored[46].

Historically, the Gulf Coast jaguarundi was found from the Lower Rio Grande Valley in southern Texas to Veracruz, Mexico. They inhabit dense, thorny brushlands/woodlands

and adjacent bunchgrass pastures. Jaguarundis have been observed spending half their time in tall, dense grass habitats. Typical thorn-scrub habitat consists of the following species: *Condalia hookeri* (brasil), *Schaefferia cuneifolia* (desert yaupon), *Lycium berlandieri* (wolfberry), *Ziziphus obtusifolia* (lotebush), *Castela erecta* (amargosa), *Aloysia gratissima* (white-brush), *Acacia greggii* (catclaw), *Acacia rigidula* (blackbrush), *Lantana achyranthifolia* (lantana), *Guajacum angustifolium* (guayacan), *Leucophyllum frutescens* (cenizo), *Forestiera angustifolia* (elbowbush), and *Diospyros texana* (Texas persimmon). Trees that may be interspersed within the thornscrub include mesquite, *Quercus virginiana* (coastal live oak), *Ebenopsis ebano* (ebony), and *Celtis laevigata* (hackberry). River and creek riparian habitat may also be used[46].

Gulf Coast jaguarundis are solitary, except during the mating season from November to December. They may have up to 2 litters per year, each with 1-4 young. Jaguarundis are predators with a diverse diet of birds, small mammals, and reptiles[46].

Ocelot

Ocelots are a medium-sized cat comparable in size to the bobcat. These cats weigh between 15 – 35 pounds and are up to 41 inches long. The short fur of the ocelot varies from pale gray to cinnamon. The undersides of the cat are white. Blotched spotting on the fur is bordered with black or solid black. Black stripes run from the eyes to the back of the head and across the cheeks. The tail is ringed or marked with dark bars[47].

Historically ocelots were found throughout south Texas, the southern Edwards Plateau, and the coastal plains. Currently, their distribution in the US is limited to the extreme southern tip of Texas and Arizona. The range of the ocelot is reduced because of continued habitat loss. Ocelots prefer dense, thorny thickets and rocky areas. Individuals have varying home ranges, estimated between 500-4,500 acres in size[47].

Ocelots are carnivores that feed on small mammals, birds, and some reptiles. Females create their dens in caves, hollow trees, or dense brush and will give birth every other year to 1-2 kittens. Kittens will stay with the mother for up to 2 years. The estimated population of ocelots in Texas is approximately 50 individuals[48].

Smalltooth Sawfish

Smalltooth sawfish are large elasmobranchs. They have a body similar to shark with ventral gill slits like a ray. Most notable is the long, flat snouts with pairs of teeth along the edges. Smalltooth sawfish can grow up to 25 feet in length[49].

The toothed snout is used to locate, stun, and kill fish and crustaceans. These sawfish are ovoviviparous, usually with litters of 15-20 pups[50].

Preferred habitat includes shallow coastal seas and estuaries with muddy and sandy bottoms. They are typically found close to shore, in sheltered bays and on shallow banks[49,50].

The US population of smalltooth sawfish is found in the Gulf of Mexico and Atlantic Ocean. Historically, these sawfish could be found throughout the Gulf of Mexico. Today, their range has shrunk to peninsular Florida[49].

South Texas Ambrosia

The South Texas ambrosia is a perennial, herbaceous plant in the Asteraceae family. It stands 4-12 inches in height. The plant has silvery to grayish-green leaves about 3 inches long and 1.5 inches wide. Flower heads are inconspicuous terminal racemes. South Texas ambrosia spreads via rhizomes that allow a single individual to be represented by hundreds of stems[51,52].

The South Texas ambrosia can be associated with the federally-listed species, slender rush-pea. Associated native grasses include *Bouteloua rigidiseta* (Texas grama), buffalograss, *Nassella leucotricha* (Texas wintergrass), and *Pleuraphis mutica* (tobosa). Associated native woody species can include mesquite, huisache, *Acacia schaffneri* (huisachillo), brasil, *Celtis ehrenbergiana* (spiny hackberry), and *Ziziphus obtusifolia* (lotebush)[51].

South Texas ambrosia occurs in open grasslands or savannahs on soils varying from clay loams to sandy loams. Mowing, with consideration to cut height and frequency, is believed to promote growth of South Texas ambrosia. Fire may also promote growth. Tall grasses and non-native vegetation negatively affects the growth of South Texas

ambrosia. Currently, South Texas ambrosia is known from only 6 locations in Nueces and Kleberg counties[51].

Slender Rush-pea

The slender rush-pea is a perennial legume in the Fabaceae family. The stems are 0.3-0.6 inches long and the inflorescence consists of 3-5 orange flowers about 0.2 inches long. Flowers bloom from March to June. Legumes are 0.4-0.6 inches long and contain 2-4 seeds. Leaves are bipinnately compound with oblong leaflets 0.08-0.16 inches long and 0.04-0.08 inches wide[53,54].

Slender rush-pea is found in bare patches or among low native grasses in disturbed clayey soils of blackland prairies and creek banks of the Gulf Coastal Prairie[53]. It is also found along ROWs[54]. The slender rush-pea is negatively affected by encroachment of competing plant species, such as *Bothriochloa ischaemum var. songarica* (King Ranch bluestem), *Dichanthium annulatum* (Kleberg bluestem), and *Cynodon dactylon* (bermudagrass)[54].

Commonly associated shrub and tree species include blackbrush, huisache, amargosa, spiny hackberry, brasil, *Parkinsonia aculeata* (retama), mesquite, *Schaefferia cuneifolia* (desert yaupon), and *Yucca treculeana* (spanish dagger). Associated cacti include *Cylindropuntia leptocaulis* (tasajillo), *Opuntia engelmanni* (prickly pear), and *Ferocactus setispinus* (twisted rib). Native grasses associated with the slender rush-pea include Texas grama, buffalograss, and *Stipa leucotricha* (Texas speargrass)[53].

Blue Whale

Blue whales are baleen whales and are the largest of all whales. These whales may weigh up to 330,000 pounds and reach lengths up to 108 feet. Females tend to be larger than the males. Blue whales have a long, slender body mottled with a gray pattern that appears light blue when seen through the water. Key identifying characteristics of the blue whale include a broad, flat rostrum and a proportionately smaller dorsal fin than other baleen whales[55,56].

Little information is available concerning the life history of blue whales. Blue whales are thought to inhabit all oceans but occurrence is likely influenced by the presence of food. Few records exist that demonstrate occurrence in the Gulf of Mexico. Sightings in the Gulf of Mexico consist of stranded whales with the most recent observation in 1940 along the coast of Texas[57]. Blue whales may occur in coastal waters but are believed to occur more frequently in offshore waters. Blue whales are migratory, moving to colder waters during the spring and summer and to waters that are more temperate in the fall and winter. Mating and parturition occur in temperate waters during winter months. Typically, one calf is born after a 10 to 12 month gestation period, and it is nursed for 6 to 7 months. Sexual maturity is likely achieved between 5-15 years of age[55,57,56].

Blue whales have baleen, keratinized transverse plates that are used to filter water for food (i.e., zooplankton). Euphasiids (krill) comprise the largest component of their diet. Fish and other select crustaceans (copepods) are also consumed in small amounts[55,56].

Finback Whale

Finback whales are the second-largest species of whale, weighing between 80,000-160,000 pounds and reaching lengths between 75-85 feet. These baleen whales have sleek, streamlined bodies, a V-shaped head, and a tall, curved dorsal fin. They are large, fast swimmers. Finback whales are dark gray with a white underbelly. The lower jaw and the baleen plates are bi-colored with gray or black on the left side and cream white on the right side. The tongue is oppositely colored. Many individuals have several light-gray, V-shaped "chevrons" behind their head. Individuals can be identified by the size and shape of their dorsal fin and by the pattern of chevrons and streaks of lighter coloration on their back[58,59].

Finback whales inhabit deep, offshore waters of all major oceans, most often in the temperate to polar latitudes. They are rarely found within the tropics. There are distinct populations in the North Atlantic Ocean, North Pacific Ocean, and Southern Hemisphere; and, these populations are thought to rarely interact. Fin whales have a complex migratory pattern that is not yet fully understood. The current consensus is that these whales move into and out of high-latitude feeding areas. Movement may be affected by prey availability, climate, reproductive condition, etc[58,59]. Finback whales are

not abundant in the Gulf of Mexico. One young individual was stranded on the beach in Gilchrist, Chambers County, Texas on 21 February 1951. This is the only recorded observation of finback whales in Texas[60].

During the summer, finback whales will consume large amounts of prey at higher latitudes; and, will fast or selectively feed at lower latitudes in the winter. Their diet primarily consists of krill, squid, and small, schooling fish such as *Mallotus villosus* (capelin), *Clupea harengus* (herring), and *Ammodytes* spp. (sand lance). Finback whales' distribution along the eastern US is strongly correlated with the availability of sand lance. Fish are more often consumed during pre-spawning, spawning, and post-spawning adult stages on the continental shelf and in coastal waters[58,59].

Although social and mating systems of finback whales are not well known, finback whales form social groups of 2 to 7 whales. Reproduction maturity likely occurs between 6 to 12 years. Mating and calving occur from November to March. Females give birth at 3-year intervals to a single calf, after 11 months of gestation[58,59].

Humpback Whale

Humpback whales have long pectoral fins, which can reach up to 15 feet in length, a thick body, and fewer throat grooves as compared to other baleen whales. These baleen whales can weigh up to 50,000-80,000 pounds and have a length up to 60 feet. Adult females are typically larger than males. Their body and baleen plates are grayish-black; however, white pigmentation may be present on their pectoral fins, belly, and tail flukes. The pigmentation on the undersides of their tail flukes help to identify individual whales. Humpback whales also have numerous knobby structures, called dermal tubercles, on the dorsal surface of the snout, chin, and mandible[61,62,63].

Humpback whales inhabit all major oceans particularly over continental shelves. Humpback whales occur at higher latitudes during the summer and in temperate and tropical zones during winter. They may migrate long distances between winter and summer habitats or migrate throughout their summer range. During the winter and reproductive periods, humpback whales demonstrate site fidelity to mate and reproduce. Shallow waters (approximately 65 to 130 feet) are often used while feeding

and calving. Calving grounds are commonly near offshore reef systems, islands, or continental shores[62,63].

Humpback whales from the Atlantic population may infrequently stray into the Gulf of Mexico during the breeding season or on their return migration northward. The only known occurrence along the Texas Coast is of a young, immature individual observed at the inshore side of Bolivar Jetty near Galveston, Texas in 1992[61].

Humpback whales' diet consists of krill, herring, sand lance, and capelin. It also includes *Scomber sombrus* (mackerel), *Pollachius virens* (small pollock), and *Melanogrammus aeglefinus* (haddock). Humpback whales utilize unique foraging behavior, including techniques such as "bubble netting" and synchronized feeding lunges. Bubble netting is expelling columns of air bubbles to concentrate krill or fish for easier consumption. They may also opportunistically feed on prey around fishing boats[61,62,63].

Humpback whales congregate in groups of up to 200 individuals to mate, which usually occurs once every 2 years. Gestation lasts for approximately 11 months; and, weaning occurs between 6 to 10 months after birth[61,62,63].

Sei Whale

Sei whales are members of the baleen whale family and can reach lengths of 40-60 feet and weigh up to 100,000 pounds. Sei whales have long, slender bodies that is dark bluish-gray dorsally and pale-colored ventrally. They often have mottling or white spots on the body that may be the result of pits or wounds. Sei whales have very fine bristles on the baleen, 30-65 ventral pleats, short ventral grooves, and prominent, curved-backward dorsal fins. Sei whales differ from other whales by rarely raising their flukes above water and never breaching[64,65].

Sei whales are widely distributed across the globe; however, they are not known to stay in any particular area year-round. Sei whales tend to migrate to higher latitudes during the summer for feeding and to temperate or subtropical waters during the summer, These whales do not migrate as high into the polar latitudes as other baleen whales. Sei whales are highly mobile and their occurrences in an area are unpredictable. The North Atlantic population is usually observed in deeper waters over the continental slope and

tends to avoid semi-enclosed waters, such as the Gulf of Mexico. These whales may travel singly or in groups of 2 to 50 individuals[64,65].

Sei whales's diet consists primarily of zooplankton and micronekton, which includes calanoid copepods and krill. They may dive for up to 20 minutes looking for food and use gulping and skimming as foraging strategies. Feeding typically occurs at dawn[64,65].

Sei whales reach sexual maturity at 6 to 12 years of age. Gestation lasts approximately 11 to 13 months, and parturition typically occurs in November to December. Females typically breed every 2 to 3 years, resulting in the birth of a single calf. Calves are weaned in the summer and fall months, approximately 6 to 9 months after birth[64,65].

Sperm Whale

Sperm whales are odontocetes or toothed whales. Males are significantly larger than females, weigh up to 125,000 pounds, and reach lengths up to 52 feet. Sperm whales have a disproportionately large head, which can make up one third of the total body length. They are also distinguished by a blowhole on the left side of the head and a rod-shaped lower jaw with many teeth. No functional teeth are present on the upper jaw. The bodies of sperm whales are dark gray dorsally and white ventrally. Their dorsal fin is short and thick, is not pointed or curved, and has knuckles along the spine. They have the largest brain of any animal on Earth[66, 67].

Sperm whales inhabit all deep ice-free waters and are thought to inhabit the entire Atlantic basin, including the Gulf of Mexico. Occurrence in the Gulf of Mexico strongly correlates with mesoscale physical features, such as Loop Current eddies and the Mississippi Canyon. Research suggests these whales move along the shelf break in the Gulf of Mexico and may be present year-round[68]. Female sperm whales and their young are more often found in lower latitudes while males can often be found at polar latitudes during parts of the year. Distribution is dependent on their food source and suitable conditions for breeding; and, varies with the sex and age composition of the group[67].

Sperm whales will dive deeply to forage for cephalopods (squids and octopus), bottom-dwelling fish, *Cyclopterus lumpus* (lumpsuckers), rays, sharks, and many other bony fishes[66,67].

Breeding season occurs from March to June in the North Atlantic. Females sexually mature between 7 to 13 years of age; and, males do not mature until they reach their twenties. Females enter estrous synchronously, which maximizes the reproductive success for traveling males. Gestation is approximately 15 months, resulting in the birth of a single calf. Birthing intervals are approximately every 4 to 6 years[67].

Sperm whales have strong family bonds, particularly between the females. Typically, twelve females will form a pod, while males are more likely to separate themselves from the family unit. Young males will leave the family unit between 4 to 21 years of age[66,67].

4.3 CANDIDATE SPECIES DESCRIPTIONS

Red Knot

Red knots are long-distance migratory birds that travel bi-annually between their breeding areas in the central Canadian Arctic and wintering areas in southern South America. Red knots have a wingspan of 20 inches, short thick legs, and a tapered straight bill. Its plumage is gray during the non-breeding season, but its head and breast turn a reddish color during the breeding season[69,70].

During the breeding season, males and females have simultaneous arrivals in the arctic. Nest sites are typically found on dry, slightly elevated tundra locations, on wind-swept ridges or slopes with little vegetation, and near wetlands. The clutch size is usually 4 eggs. The breeding season occurs from May to July[70].

Red knots are long-distance travelers and use a limited number of stopover sites during migration. Stopover habitat includes intertidal, marine habitats that are near coastal inlets, estuaries, and bays. The diet of migrating red knots includes *Limulus polyphemus* (horseshoe crab) eggs, bivalves, polychaete worms, amphipods, and crustaceans[70].

Red knots may be found in Texas anytime of the year with the greatest numbers occurring during winter (January) and during spring passage (April to May). Between 1985 and 1996, approximately 3,000 individuals were recorded on the Bolivar flats. This population has declined significantly to about 300 individuals. Red knots have been observed utilizing sandy beaches, tidal mudflats, and salt marshes when in Texas[70].

Sprague's Pipit

Sprague's pipits are small, migratory passerines with a relatively narrow bill and yellowish to pale brown legs. Their underparts are buffy with broad black streaks. The upper mandible is dark and contrasts with the pale lower mandible[71].

The only population of Sprague's pipit occurs within North America. Known breeding sites are located in Canada, Montana, North and South Dakota, and Minnesota. Nests are shaped as a cup and are found on the ground. They are made of woven dried grasses. Average clutch size is 4.6 eggs and young are cared for by the female for approximately 25 days until fledging[71].

Wintering grounds are located in Arizona, New Mexico, Texas, Oklahoma, Arkansas, Louisiana, and Mexico. Migration occurs in April to May and September to November. In Texas, preferred wintering habitat includes grass-forb prairies dominated by little bluestem and *Andropogon* spp. (bluestem) grasses that are about 8 inches in height. They have also been found in old rice fields that have been re-planted with bermudagrass, on turf grass farms, golf courses, and recently burned pastures. Food primarily consists of arthropods and sometimes seeds[71].

Yellow-billed Cuckoo

The yellow-billed cuckoo is a migratory, medium-sized bird characterized by a zygodactyl foot (2 toes point forward and 2 toes point backwards), a blue-black bill with yellow on the base of the mandible, and a narrow yellow eye ring. It is 12 inches in length and weighs approximately 2 ounces[72].

East of the continental divide, yellow-billed cuckoos breed from the north-central US and south-central Canada to the southeastern US, Greater and Lesser Antilles, and northern Mexico. Yellow-billed cuckoos migrate to South America for the winter[72].

Yellow-billed cuckoos nest between June and August. Nesting habitat includes large patches of riparian habitat that is comprised of *Populus* spp. (cottonwoods), *Salix* spp. (willows), and a dense understory. The eastern population is believed to use more habitat types, which include other broad-leaved woodlands. Clutch size is typically 2-3

eggs per season and the young fledge approximately 17 days after hatching. Yellow-billed cuckoos usually raise their own young, but they are also known to be facultative brood parasites where they lay eggs in other cuckoos or bird species nests. Cuckoos are insectivorous[72].

This species is thought to be declining in west Texas; however it is considered to be widespread and uncommon to common in central and east Texas[72].

4.4 BACKGROUND REVIEW RESULTS

Prior to conducting the pedestrian survey of the proposed project area, background information was collected from sources including, but not limited to, the US Geological Survey (USGS), the TPWD, the USFWS, and the Natural Resources Conservation Service (NRCS). WGI reviewed:

- USGS 1 Meter Digital Ortho Quarter Quad (2010 Color Infrared aerial photograph) and USGS topographic map (1981) - Annaville
- TPWD Texas Natural Diversity Database (TNDD) search results[73];
- USFWS Critical Habitat Portal[74]; and
- Web-based soil survey information from the NRCS[75].

The tidally influenced Viola Turning Basin is the terminus of a man-made ship channel, referred to as the Inner Harbor. The Inner Harbor/Corpus Christi Ship Channel is connected to Corpus Christi Bay and ultimately the Gulf of Mexico. The Viola Turning Basin is maintained to a depth of 45 feet and is subject to regular commercial and industrial marine vessel traffic[76]. The Inner Harbor is lined with commercial and industrial dock facilities. For 2012, the Port of Corpus Christi ship and barge activity was 6,082 vessels[77].

Since the Inner Harbor is a tidal aquatic feature, it can host marine aquatic fauna, including fish and invertebrates. This marine aquatic fauna provides potential forage for Kemp's ridley and loggerhead sea turtles. The Inner Harbor is also subject to wastewater and stormwater effluent from multiple permitted wastewater outfalls. TCEQ assigns an Aquatic Life Use Designation (Exceptional, High, Intermediate, Limited, and Minimal) as part of their Texas Water Quality Inventory[78]. The Inner Harbor is currently listed as Intermediate. Comparatively, Corpus Christi and Nueces Bays are listed as Exceptional. Since the Inner Harbor is a dredged ship channel,

forage potential for these turtles would be primarily limited to the narrow littoral zones. Green sea turtles are known to forage for algae and the potential exists for algae to occur within the Viola Turning Basin. However, no documentation has been found to demonstrate that green sea turtles would forage for algae within the Viola Turning Basin or Inner Harbor. The Viola Turning Basin does not have general habitat or forage characteristics that could potentially support the leatherback or hawksbill sea turtles. Despite exhaustive research including that of local sea turtle experts, no documentation has been found indicating any sea turtles have occurred within the Viola Turning Basin or the Inner Harbor with the exception of the confluence of the Inner Harbor and Corpus Christi Bay.

The existing Outfall 001 would be a potential attractant for the rare, transient West Indian manatee in Texas seeking warm water during the winter. No seagrass beds are mapped within the Viola Turning Basin[79]; therefore, no forage potential is indicated near Outfall 001 for the West Indian manatee.

The sheltered bays and shallow banks associated with the smalltooth sawfish were not indicated within the Viola Turning Basin or the terrestrial survey area.

Appropriate water depth and adequate forage opportunities suitable for the 5 listed whale species are not present with the Viola Turning Basin or Inner Harbor.

Habitat characteristics with the potential to support the Gulf Coast jaguarundi and the ocelot, such as dense thorny brush and adjacent grasslands, were not indicated within the survey area during the background review.

The large, open grasslands with scattered trees and/or shrubs preferred by the northern aplomado falcon were not identified within the survey area during the background review.

Wintering habitat (brackish bays and marshes immediately adjacent to the coastline) preferred by whooping cranes was not identified within the survey area. Freshwater wetlands were indicated downstream of Outfall 008. The wetlands downstream of Outfall 008 may have the potential to provide stopover habitat for migrating whooping cranes.

Small patches of grass or herbaceous land were indicated within the survey area during the background review. These herbaceous areas may have some characteristics consistent with Sprague's pipit or Eskimo curlew habitat.

Habitat characteristics with the potential to support piping plovers and red knots were not identified in the survey area. Based on reviews of aerial photography, the shoreline of the Viola Turning Basin appeared impacted (bank is shored). No tidal flats, marshes, or sandy beaches were identified.

Habitat characteristics with the potential to support the yellow-billed cuckoo (i.e., riparian habitat or broad-leaved woodlands) were not identified within the survey area.

No large tract, dense vegetation, brushland, forests, swamps, or prairies were indicated within the survey area. Therefore, no habitat with the potential to support the red wolf was indicated.

Bare patches and clay and loamy soils were identified within the survey area. Therefore, habitat that could potentially support the slender rush-pea and South Texas ambrosia may be present within the survey area.

According to the USFWS, there is no designated critical habitat for any of the federally-listed threatened and endangered species within the survey area. The nearest critical habitat is for piping plovers, which is located approximately 9.8 miles northeast of the Project Areas[74].

4.5 TEXAS NATURAL DIVERSITY DATABASE RESULTS

A records review of TNDD was completed for the survey area on 29 May 2013 by the TPWD. No element of occurrence (EO) for federally-listed species is located within 3 miles of the survey area. The nearest record is for South Texas ambrosia (EO 1470), located approximately 4.9 miles southwest of the survey area.

5.0 LISTED SPECIES HABITAT EVALUATION

WGI biologists completed a listed species habitat evaluation on 19 September 2013 and 1 October 2013 to determine if any habitats within the survey area were likely to support any federally-listed species. Data were collected to describe resident vegetation communities and

habitat quality to assess the potential for occurrence of listed species. The dominant habitats observed are described below and are demonstrated in Figure 2. Photographs of the proposed survey area are included as Appendix B. A summary of the field survey data is provided as Appendix C.

5.1 PLANT COMMUNITIES OBSERVED

The Project Areas are located within a disturbed industrial area consisting mostly of concrete, caliche, roadbase, and infrastructure with small patches of vegetation. The Projects Areas and discharge location included 5 habitat types, which are described below.

The area to the west of the survey area is a combination of residential communities, potential wetlands, shrublands, and woodlands. The Viola Turning Basin/Corpus Christi Ship Channel, the Nueces River, Nueces Bay, and associated wetlands are located to the north of the survey area. Potential wetlands, retention ponds, Tule Lake, and industrial development are to the east of the survey area. Croplands comprise the majority of land use to the south of the survey area.

The dominant habitat types observed within the survey area include: retention pond, shrub, herbaceous, and drainage ditch. Outfall 001 discharges into an estuarine open water habitat (Viola Turning Basin) and Outfall 008 discharges into an impounded wetland. These habitats have historically been created and/or disturbed by industrial development.

Retention Pond – This habitat includes the existing, maintained stormwater retention ponds. Vegetation observed on the banks included bermudagrass and *Panicum coloratum* (Kleingrass).

Shrub – This habitat is primarily very small, fragmented tracts. Dominant species observed included mesquite, *Ulmus crassifolia* (cedar elm), retama, huisache, *Baccharis halimifolia* (eastern baccharis), *Ehretia anacua* (Anacua), *Zanthoxylum fagara* (lime prickly ash), and *Celtis pallida* (granjeno).

Herbaceous – This habitat consisted of small areas of grasses that appear to be routinely disturbed or maintained. Dominant species observed included bermudagrass, Kleingrass, *Megathyrsus maximus* (guinea grass), King Ranch bluestem, bristlegrass, and *Solanum elaeagnifolium* (silverleaf nightshade).

Drainage Ditch – A man-made drainage ditch used for stormwater drainage discharges at existing Outfall 005. Outfall 005 discharges into a man-made drainage canal that ultimately drains into a wetland adjacent to the Suntide Dredge Material Placement Area. Vegetation around the stormwater drainage included mesquite, retama, *Havardia pallens* (huajillo), and *Vitis mustangensis* (mustang grape). Vegetation around Outfall 005 included *Iva frutescens* (Jesuit's bark) and mesquite. A second man-made drainage ditch used for stormwater drainage discharges at existing Outfall 008. Outfall 008 discharges into a man-made drainage canal that ultimately drains into a wetland adjacent to the Suntide Dredge Material Placement Area. Vegetation around Outfall 008 included Jesuit's bark, eastern baccharis, and *Morella cerifera* (wax myrtle).

Wetland – Outfall 008 discharges into palustrine shrub wetland. The wetland is impounded and is not connected to tidal waters. Dominant vegetation included *Morella cerifera* (wax myrtle), Jesuit's bark, and eastern baccharis.

Estuarine Open Water – The existing Outfall 001 is located within the Viola Turning Basin, which is tidally influenced. The outfall is located immediately adjacent to an existing Port of Corpus Christi dock facility. The shoreline is currently a concrete wall. The water depth at the outfall structure was approximately 2-4 feet deep. The depth increased to accommodate ship and barge traffic within 50 feet of the outfall structure. No vegetation was observed within the aquatic habitat near the outfall structure. Vegetation onshore adjacent to the concrete wall included Kleingrass, bermudagrass, and silverleaf nightshade.

5.2 HABITAT EVALUATION RESULTS

The following results of the listed species habitat analysis are based on the data gathered during the background review and the pedestrian survey.

The Project Areas are located within a disturbed industrial area consisting mostly of concrete, caliche, or roadbase with small patches of vegetation. The Project Areas do not possess habitat with the potential to support any federally-listed candidate, threatened, or endangered species.

The habitats observed within the survey area and the existing outfall structures have historically been disturbed by industrial activities and development. The dominant habitat types observed within the survey area include: retention pond, shrub, herbaceous, and drainage

ditches. Outfall 001 discharges into an estuarine open water habitat (Viola Turning Basin) and Outfall 008 discharges into an impounded wetland.

The retention ponds are man-made and disturbed by stormwater runoff and regular maintenance. This habitat does not have characteristics necessary to support any of the threatened, endangered, or candidate species federally listed for Nueces County.

The shrub habitat areas are very small fragmented tracts surrounded by industrial development. The shrub habitat observed within the survey area did not have characteristics necessary to support any of the threatened, endangered, or candidate species federally listed for Nueces County.

The stormwater drainage ditches are man-made. This habitat does not have characteristics necessary to support any of the threatened, endangered, or candidate species federally listed for Nueces County.

Outfall 005 and 008 discharge into man-made drainage canals, which ultimately flow into an impounded wetland. The drainage canals do not possess the habitat characteristics needed to support the federally-listed species for Nueces County.

The herbaceous habitat consists of small, fragmented patches of grasses throughout the facility. This habitat was historically disturbed by development and is routinely disturbed and/or maintained. The substrate observed in the herbaceous areas was primarily deposited fill material (loam, caliche, roadbase, etc.). This habitat does not have characteristics necessary to support any of the federally-listed threatened, endangered, or candidate species for Nueces County.

The estuarine open water habitat at the location of the existing Outfall 001 includes the Viola Turning Basin/Inner Harbor. The Inner Harbor connects the Viola Turning Basin to Corpus Christi Bay, all of which are tidally influenced. The shoreline of this channel at the location of Outfall 001 is concrete. The outfall is located immediately adjacent to an existing Port of Corpus Christi dock facility and a majority of the 200-foot regulatory mixing zone is regularly disturbed by existing marine vessel traffic. The existing Outfall 001 would be a potential attractant for the rare, transient West Indian manatee in Texas seeking warm water during the winter. However, the Action Area, Viola Turning Basin, and Inner Harbor do not offer seagrass beds as a food

source and the distance the manatee would travel amidst heavy marine vessel traffic to reach Outfall 001 would be a significant deterrent. In addition, the existing dock facility traffic within the regulatory mixing zone would be a deterrent for the manatee. The nearest record of a manatee occurrence was located more than 5-miles east adjacent to an unspecified Citgo wastewater outfall structure in the Inner Harbor[80]. This record from 2007 is the only known record of a manatee occurring within the Inner Harbor.

Habitats with the potential to support foraging green, hawksbill, and leatherback sea turtles were not observed within the Action Area or Viola Turning Basin. Radio-telemetry studies have found that green sea turtles concentrate their time in areas with algae and/or seagrass beds[81,82]. No seagrass beds are documented within the Inner Harbor[79]. Green sea turtles may use dredged waterways as thoroughfares between foraging sites[82]. However, the Inner Harbor does not provide a nexus between known seagrass beds. The potential exists for algae to occur within the Action Area; however, no evidence has been found that green sea turtles forage within the Viola Turning Basin or Inner Harbor. The lack of forage and disturbance from marine vessel traffic is likely to discourage occupancy by green sea turtles.

Hawksbill sea turtles are associated with coral reefs, which are not present within the ship channel. In addition, hawksbill sea turtles rarely occur within the inshore waters of Texas. The most recent observation of a hawksbill sea turtle in Texas occurred in 1998 at the Padre Island National Seashore where a female laid eggs[83]. Also rare along the Texas coast is the leatherback sea turtle. This species is most often associated with deeper, rougher waters[84]. Only 1 record was found of a leatherback sea turtle occurring in the general area, which was the documentation of 1 relocated leatherback, as a result of dredging the Aransas Pass Entrance Channel of the Corpus Christi Ship Channel in 2003[85]. The Aransas Pass Entrance Channel is greater than 20 miles east of the Action Area.

The potential exists for foraging juvenile and subadult Kemp's ridley and loggerhead sea turtles to utilize the Inner Harbor, if crab, small fish, and other food sources are present[81,82,86]. Although Kemp's ridley sea turtles may utilize the littoral zones of dredged channels if prey is available, no research was found in support of sea turtles inhabiting or foraging within dredged channels. The Inner Harbor is subject to marine vessel traffic and multiple wastewater and storm water discharges. Radio-telemetry studies indicate that young Kemp's ridley sea turtles primarily occupy habitat around sea jetties and areas parallel to the shoreline[87]. Another radio-tracking

study suggested that Kemp's ridley sea turtles might avoid areas where there are freshwater inflows, potentially due to the change in water salinity[81]. These events may serve as deterrents for sea turtles, particularly given the availability of better foraging habitat in nearby bays and along the coastline. In addition, the existing dock facility traffic within the regulatory mixing zone for Outfall 001 would be a further deterrent for these 2 sea turtle species. Kemp's ridley and loggerhead sea turtles have been recorded within the Corpus Christi Ship Channel, approximately 26 river miles east of Outfall 001[88]. One Kemp's ridley sea turtle nest was identified on the shoreline of Corpus Christi Bay in 2009 approximately 0.5 mile northeast of the confluence of the Inner Harbor and Corpus Christi Bay[89]. Despite exhaustive research including that of local sea turtle experts, no documentation has been found indicating any sea turtles have occurred within the Viola Turning Basin or the Inner Harbor with the exception of the confluence of the Inner Harbor and Corpus Christi Bay.

The estuarine open habitat was not suitable for the smalltooth sawfish as the area is routinely dredged and does not provide suitable shallow, protected water habitat. The appropriate water depth for the 5 listed whale species also was not available within the Action Area, Viola Turning Basin, or Inner Harbor. No records were found of smalltooth sawfishes or whales occurring in the Inner Harbor.

6.0 CONCLUSION

A background review and field survey were completed to determine if federally-listed species had the potential to occur within the survey area and/or Project Areas of the West Refinery Project. Based on the results of the background review, the survey area may have characteristics preferred by the Sprague's pipit, Eskimo curlew, slender rush-pea, South Texas Ambrosia, and whooping cranes. The Viola Turning Basin may have characteristics preferred by the West Indian manatee and the Kemp's ridley and loggerhead sea turtles. Habitat characteristics with the potential to support any other federally-listed species were not indicated within the survey area during the background review.

The results of the field survey confirmed the results of the background review for the Viola Turning Basin. The estuarine open water habitat adjacent to the discharge location in the Viola Turning Basin has select characteristics with the potential to support the West Indian manatee, the Kemp's ridley sea turtle, the green sea turtle, and the loggerhead sea turtle. However, the Inner

Harbor does not offer seagrass beds as a food source for manatees and the distance the manatee and sea turtles would travel amidst heavy marine vessel traffic to reach the Viola Turning Basin would be a significant deterrent. The Action Area does not have characteristics with the potential to support the hawksbill or leatherback sea turtles. In addition, the existing dock facility traffic within the regulatory mixing zone of Outfall 001 would be a deterrent for these marine species.

The herbaceous habitat within the survey area consists of small, fragmented patches of grasses throughout the facility. This habitat was historically disturbed by development and is routinely disturbed and/or maintained. The substrate observed in the herbaceous areas was primarily deposited fill material (loam, caliche, roadbase, etc.). This habitat does not have characteristics necessary to support the Sprague's pipit, Eskimo curlew, slender rush-pea, or South Texas ambrosia. No potential federally-listed species habitat was identified within the terrestrial survey area during an on-site habitat evaluation.

The wetland habitat identified during the background review is located did not possess the necessary characteristics for migrating whooping cranes. No potential forage known to support whooping cranes was observed. In addition, this habitat is within and adjacent to an industrial facility with significant human disturbance. This habitat does not have characteristics necessary to support whooping cranes.

Although suitable habitat for whooping cranes was not identified within the survey area, the West Refinery is located within the whooping crane migration corridor. The potential exists for migrating whooping cranes to fly over the facility.

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APPENDIX A

FIGURES

Figure 1
Survey Area - Aerial Photograph
FHR Corpus Christi West Refinery Project
Nueces County, Texas

Action Area

Existing Outfall

Project Area (Polygon)

Project Area (Line)

Background Resources: Bing Aerial Imagery	Surveyor(s): Jayme Shiner PWS Scott Jecker PWS, CWB	Project Number and Information: 1353 FHR Corpus Christi West Refinery Listed Species Habitat Evaluation	WHITENTON group environmental consultants 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XT UTM NAD 1983 Zone 14 North	Map Created: 9/25/2013 by M. Pillion		Feet 0 1,250 2,500

Figure 2
Observed Habitats
FHR Corpus Christi West Refinery Project
Nueces County, Texas

- Project Areas (Line)
- Project Areas (Polygon)
- Action Area
- Outfall
- Estuarine Open Water
- Shrub
- Herbaceous Habitat
- Retention Pond
- Drainage Ditch

Background Resources: Bing Aerial Imagery	Surveyor(s): Jayme Shiner PWS Scott Jecker PWS, CWB	Project Number and Information: 1353 FHR Corpus Christi West Refinery Project Listed Species Habitat Evaluation	WHITENTON group environmental consultants 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XT UTM NAD 1983 Zone 14 North	Map Created: 9/25/2013 by D.Scott		Feet 0 1,250 2,500

APPENDIX B

PHOTOGRAPHIC LOG

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PHOTOGRAPHIC LOG 1

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: South view of the proposed Project Area 1.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: East view of the proposed Project Area 1a.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: East view of the proposed Project Area 2.

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PHOTOGRAPHIC LOG 2

FHR Corpus Christi West Refinery Project 9/19/2013 Nueces County, Texas View: Southwest view of the proposed Project Area 3.	
FHR Corpus Christi West Refinery Project 9/19/2013 Nueces County, Texas View: Southweast view of the proposed Project Area 4.	
FHR Corpus Christi West Refinery Project 9/19/2013 Nueces County, Texas View: West view of proposed Project Area 4a.	

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PHOTOGRAPHIC LOG 3

FHR Corpus Christi West Refinery Project 9/19/2013 Nueces County, Texas View: North view of proposed Project Area 5.	
FHR Corpus Christi West Refinery Project 9/19/2013 Nueces County, Texas View: West view of proposed Project Area 5a.	
FHR Corpus Christi West Refinery Project 9/19/2013 Nueces County, Texas View: Northeast view of proposed Project Areas 6 and 7.	

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PHOTOGRAPHIC LOG 4

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: East view of proposed Project Area 8.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: Northeast view of proposed Project Area 9.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: Southwest view of proposed Project Area 9a.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: Southwest view of proposed Project Area 10.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: Southwest view of proposed Project Area 11.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: Northeast view of the existing Outfall 001.

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PHOTOGRAPHIC LOG 6

FHR Corpus Christi West Refinery Project 9/19/2013 Nueces County, Texas View: Northwest view of the existing Outfall 001 and adjacent Port of Corpus Christi dock facility.	
FHR Corpus Christi West Refinery Project 9/19/2013 Nueces County, Texas View: North view of proposed Project Area 12.	
FHR Corpus Christi West Refinery Project 9/19/2013 Nueces County, Texas View: East view of proposed Project Area 13.	

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PHOTOGRAPHIC LOG 7

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: West view of proposed Project Area 14.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: West view of proposed Project Area 15.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: West view of proposed Project Area 16.

FHR Corpus Christi West Refinery Project

10/1/2013

Nueces County, Texas

View: Southwest view of proposed Project Area 17.

FHR Corpus Christi West Refinery Project

10/1/2013

Nueces County, Texas

View: North view of proposed Project Area 18.

FHR Corpus Christi West Refinery Project

10/1/2013

Nueces County, Texas

View: Northeast view of proposed Project Area 19.

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PHOTOGRAPHIC LOG **9**

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: Southeast view of the Marine Vapor Combustor Unit.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: Southwest view of the Monroe Separator Flare.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: West view of the drainage ditch general habitat type within the survey area not associated with a Project Area. Located at the west end of the survey area.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: North view of the drainage ditch general habitat type within the survey area not associated with a Project Area. Located at the west end of the survey area.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: Northeast view of an existing storm water retention pond, a general habitat type within the survey area not associated with a Project Area. Located at the northeast end of the survey area.

FHR Corpus Christi West Refinery Project

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Nueces County, Texas

View: East view of the herbaceous general habitat type within the survey area not associated with a Project Area. Located at the northeast end of the survey area.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: North view of the drainage ditch general habitat type within the survey area not associated with a Project Area. Located at the north end of the survey area.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: Southeast view of the shrub general habitat type within the survey area not associated with a Project Area. Located at the north end of the survey area.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: North view the shrub general habitat type within the survey area not associated with a Project Area. Located at the north end of the survey area.

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FHR Corpus Christi West Refinery Project

10/1/2013

Nueces County, Texas

View: Southwest view of the Outfall 005 and the drainage canal into which it discharges. Located at the west end of the survey area.

FHR Corpus Christi West Refinery Project

9/19/2013

Nueces County, Texas

View: North view of the drainage canal that Outfall 005 discharges into. Located at the west end of the survey area.

FHR Corpus Christi West Refinery Project

10/1/2013

Nueces County, Texas

View: North view of the drainage canal/wetland that Outfall 008 discharges into. Located at the north central portion of the survey area.

APPENDIX C

FIELD SURVEY DATA SUMMARY

FIELD SUMMARY FOR THE FHR CORPUS CHRISTI WEST REFINERY PROJECT, NUECES COUNTY, TEXAS

Survey Date: 19 September 2013 and 1 October 2013

Surveyors: Jayme Shiner PWS, Scott Jecker PWS, CWB

Activity: Pedestrian survey (listed species habitat evaluation) at the Flint Hill Resources (FHR) Corpus Christi West Refinery in Nueces County, TX.

1.0 INTRODUCTION

Surveyed Action Area for the FHR Corpus Christi West Refinery Project. The following notes for 19 September 2013 and 1 October 2013 describe general habitat descriptions. The listed species habitat evaluation included a pedestrian survey of the proposed Project Areas and all vegetated portions of the Action Area. The pedestrian survey also included the existing Outfall 001, which is located approximately 550 feet north of the Action Area boundary within the Corpus Christi Ship Channel (Viola Turning Basin). The Project Areas and Action Area are located within a disturbed industrial area consisting mostly of concrete, caliche, roadbase, and existing infrastructure with small patches of vegetation.

2.0 HABITAT SURVEY RESULTS FOR THE PROJECT AREAS

Project Area 1: This site will include the NHT Expansion. This site consisted of concrete and infrastructure. No habitat was observed.

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Project Area 1a: This site will include the NHT Laydown Area. This site consisted of roadbase. No habitat was observed.


Project Area 2: This site will include the Grass Roots (Pre-Flash/Depent, Saturates Gas Plant No. 3, and RIE Building). The site consists of roadbase and equipment. No habitat was observed.


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Project Area 3: The site will include a New Cooling Tower and Hot Oil Heater. Site has historically been disturbed by industrial activity. The site currently consists of roadbase and herbaceous habitat.


Project Area 4: The site will include the NHT Storage Charge Pump. The site consists of roadbase, infrastructure, and equipment. No habitat was observed.

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Project Area 4a: The site will include the West Crude. The site consists of roadbase, infrastructure, and equipment. Few patches of herbaceous habitat was observed.

Project Area 5: The site will include the Mid Crude Unit. The site consists of concrete and infrastructure. No habitat was observed.

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Project Area 5a: The site will include the Mid Crude Laydown Area. Site has historically been disturbed by industrial activity. The site currently consists of roadbase, equipment, and herbaceous habitat.

Project Area 6 and 7: This site will include the LPG Spheres and pumps associated with LPG Spheres. Site has historically been disturbed by industrial activity. The site currently consists of roadbase, equipment, and herbaceous habitat.

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Project Area 8: This site will include the Heavy Raffinate Tank, the Heavy Naptha Blend, and the Transfer Pump. The site has historically been disturbed and previously included a storage tank. The site currently consists of roadbase and few scattered grasses. No habitat was observed.

Project Area 9: This area will include a C6 Saturates Tank and Pump. The site has historically been disturbed and previously included a storage tank. The site currently consists of roadbase and few scattered grasses. No habitat was observed.

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Project Area 9a: This site will include LPG and Pentane Storage Spheres. The site has historically been disturbed and previously included a storage tank. The site currently consists of roadbase, infrastructure, and patches of herbaceous habitat.

Project Area 10: This site will include OSBL MCC. The site has historically been disturbed. The site currently consists of roadbase and infrastructure. No habitat observed.

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Project Area 11: This site will include Blending Skid Modifications and a Gasoline Booster Pump. The site currently consists of roadbase and infrastructure. No habitat observed.

Project Area 12: This site will include Butane Blending Pumps. The site currently consists of roadbase, infrastructure, and few patches of herbaceous habitat.

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Project Area 13: This site will include Udex. The site currently consists of concrete and infrastructure.

Project Area 14: This site will include Mid Crude Laydown and Warehouse. The site currently consists of roadbase and equipment. No habitat was observed.

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Project Area 15: This site will include Y Grade Booster Pumps. The site currently consists of roadbase, infrastructure, and equipment. No habitat was observed.

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Project Area 16: This site will include modification (additional piping and potential additional structural supports) to existing Interconnecting Pipe Racks throughout the West Refinery (See Figure 1 – Appendix A). The site currently consists of roadbase, infrastructure, and very few, small patches of herbaceous habitat.

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Project Area 17: This site will include a Parking Area for contractors. The site currently consists of roadbase and herbaceous habitat.

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Project Area 18: This site will include the Construction Management Area. The site currently consists of roadbase and herbaceous and shrub habitats.

Project Area 19: This site will become a satellite Parking Area. The site currently consists of herbaceous habitat with scattered trees.

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3.0 ADDITIONAL AREAS

The Marine Vapor Combustor Unit and nearby areas. Herbaceous habitat and few shrubs were observed in select areas. Remaining areas consisted of roadbase and infrastructure.

The Monroe Separator Flare and nearby areas. Herbaceous and shrub habitats were observed in select areas. Remaining areas consisted of roadbase and infrastructure.

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4.0 OBSERVED HABITAT TYPES AND EXISTING OUTFALLS

Observed general habitats within the Action Area, including the existing Outfall 001 and 005 locations, include: retention pond, shrub, herbaceous, drainage ditch, and estuarine open water.

Retention pond: This habitat includes the existing, maintained storm water retention ponds. Vegetation observed on the banks included *Cynodon dactylon* and *Panicum coloratum*.

Shrub: This habitat is primarily very small, fragmented tracts. Dominant species observed included *Prosopis glandulosa*, *Ulmus crassifolia*, *Ehretia anacua*, *Zanthoxylum fagara*, and *Celtis pallida*.

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Herbaceous: This habitat consisted of small areas of grasses that appear to be routinely disturbed or maintained. Dominant species observed included *Cynodon dactylon*, *Panicum coloratum*, *Megathyrsus maximus*, and *Solanum elaeagnifolium*.

Drainage Ditch: One drainage ditch is man-made and utilized for storm water drainage. Vegetation included *Prosopis glandulosa*, *Parkinsonia aculeata*, *Havardia pallens*, and *Vitis mustangensis*.

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Estuarine Open Water: The existing Outfall 001 is located within the Viola Turning Basin, which is tidally influenced. The outfall is located immediately adjacent to an existing Port of Corpus Christi dock facility. The shoreline is currently a concrete wall. The water depth at the outfall structure was approximately 2-4 feet deep. The depth increased to accommodate ship and barge traffic within 50 feet of the outfall structure. No vegetation was observed within the aquatic habitat near the outfall structure. Vegetation onshore adjacent to the concrete wall included *Cynodon dactylon, Panicum coloratum*, and *Solanum elaeagnifolium.*

Outfall 005 discharges into a drainage ditch that discharges into a wetland area. The wetland habitat is not confirmed, but assumed based on background data. Surrounding vegetation included *Prosopis glandulosa* and *Iva frutescens*.

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Outfall 008 discharges into a man-made drainage ditch, which ultimately discharges into an impounded wetland area. The wetland habitat is not confirmed, but assumed based on background data. Surrounding vegetation included *Morella cerifera, Baccharis halimifolia,* and *Iva frutescens*.

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