Whitenton Group, Inc.
ENVIRONMENTAL CONSULTANTS

Biological Assessment

BFLP Ethylene Cracker Expansion Project
Jefferson County, Texas

Prepared for

BASF FINA Petrochemicals, L.P.

Prepared by

Whitenton Group, Inc.

November 2011
Revised January 2012

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ACRONYMS

AHPS	Advanced Hydrologic Prediction Service
AOI	Area of Impact
BGEPA	Bald and Golden Eagle Protection Act
BFLP	BASF FINA Petrochemicals LP
BACT	Best Available Control Technology
BA	Biological Assessment
CO	Carbon Monoxide
ESL	Effects Screening Levels
EO	Element of Occurrence
ESA	Endangered Species Act
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GHG	Greenhouse Gas
GPM	Gallons per Minute
Pb	Lead
MMPA	Marine Mammal Protection Act
MAOI	Maximum Area of Impact
MBTA	Migratory Bird Treaty Act
NAAQS	National Ambient Air Quality Standards
NCDC	National Climatic Data Center
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NWS	National Weather Service
NWI	National Wetland Inventory
NRCS	Natural Resources Conservation Service
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxide
O_3	Ozone
PM	Particulate Matter
PSD	Prevention of Significant Deterioration
RBLC	RACT/BACT/LAER Clearinghouse
SCR	Selective Catalytic Reduction
SIL	Significant Impact Level
SO_2	Sulfur Dioxide
TCEQ	Texas Commission on Environmental Quality
TNDD	Texas Natural Diversity Database
TPWD	Texas Parks and Wildlife Department
US	United States
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VOC	Volatile Organic Compound
WGI	Whitenton Group, Inc.

1.0 EXECUTIVE SUMMARY

BASF FINA Petrochemicals LP (BFLP) currently operates an ethylene cracker facility in Port Arthur, Jefferson County, Texas. BFLP proposes to expand the plant and increase the production capacity with the construction of an additional cracker furnace within the existing plant footprint, immediately adjacent to nine existing cracker furnaces. The proposed project is located approximately 0.4 mile north-northeast of the intersection of Farm to Market Road 366 and State Highway 73. The project is subject to Prevention of Significant Deterioration (PSD) review for NO_x, CO, VOC, $PM/PM_{10}/PM_{2.5}$, and greenhouse gases (GHG). The Texas Commission on Environmental Quality (TCEQ) is responsible for issuance of the PSD permit for all pollutants except GHGs. The United States (US) Environmental Protection Agency (EPA) is responsible for the GHG PSD permit.

This Biological Assessment (BA) is a complete evaluation of the potential environmental impacts the proposed expansion project may have on federally-protected species and/or their potential habitat. Protected species evaluated in this document include threatened, endangered, and candidate species, migratory birds, Bald and Golden Eagles, and marine mammals. This BA includes a pedestrian protected species habitat evaluation of the proposed construction area, a windshield assessment of all publicly-accessible habitats in the surrounding area, and an evaluation of potential environmental impacts based on air quality modeling results, construction information, and National Pollutant Discharge Elimination System (NPDES) information provided by BFLP and RPS, BFLP's air quality permitting consultant for the project.

Construction for the proposed expansion, associated infrastructure, and auxiliary equipment will take place within the existing facility in an area approximately 40 feet by 76 feet. No additional earth disturbance will be required outside of this 40-foot by 76-foot area, which is currently a concrete slab. The only new and modified facilities associated with the project are the tenth furnace, the associated piping fugitives, and decoking facilities. The existing decoking facilities will not undergo any actual physical modifications; however, the increased utilization will require an increase in the allowable annual emission rates.

Federally-protected species considered in this BA include Piping Plover, green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, Bald and Golden Eagles, migratory birds, and marine mammals. The field surveys included a pedestrian survey of the proposed project area and the portions of the surrounding facility that are not restricted by stringent safety requirements as well as a windshield survey of all habitats

visible or terrestrially accessible from public areas within a three-mile radius of the project area. Data were collected to describe resident vegetation communities and assess the potential for occurrence of protected species. No potential protected species habitat was observed within the ethylene cracker facility. Six habitat types were observed in the areas surrounding the ethylene cracker facility: marshland, pastureland, mixed woodland, open water, riverine, and drainage canals.

RPS performed dispersion modeling of air pollutants that will be emitted by the proposed project in accordance with the PSD Permit requirements. The majority of the predicted concentrations due to the project are less than the Significant Impact Levels (SIL) designated by EPA for each pollutant and averaging period. All predicted concentrations from the project and existing emission sources plus background concentrations are demonstrated to comply with the applicable National Ambient Air Quality Standards (NAAQS). For the two pollutant averaging periods [annual nitrogen dioxide (NO_2) and 1-Hour NO_2] for which the dispersion modeling predicted a significant impact (concentrations above the SIL), the significant areas of impact (AOI)s located the farthest distance from the source in all directions were plotted to create an action area.

The action area for the annual NO_2 source emission is limited to the existing facility and refinery boundaries and no protected species habitat was identified within these boundaries, the annual NO_2 source emission will not impact protected species habitat.

The action area for the 1-Hour NO_2 source emission has a maximum radius of approximately 2.6 miles and has the potential to impact portions of the six observed habitat types: riverine, drainage canals, marshland, open water, mixed woodland, and pastureland. All six of these habitats may be utilized by migratory birds. Bald or Golden Eagles have the potential to utilize any of the six habitats. The Piping Plover has the potential to utilize portions of the riverine habitat (Neches River). Green sea turtles, Kemp's ridley sea turtles, loggerhead sea turtles, and bottlenose dolphins have the potential to utilize the open water habitat (Sabine Lake) or riverine habitat (Neches River). No additional federally-protected species are likely to utilize these areas.

The maximum predicted concentrations of all modeled pollutants is well below the respective TCEQ Effects Screening Levels and also well below the first screening level of 10% of the Effects Screening Levels. Accordingly, no adverse welfare impacts are expected to occur within the action area as the result of the additional emissions of these pollutants.

The construction of the proposed expansion project will have no direct impact on federally-protected species habitat. BFLP will utilize the best available control technology (BACT) to control emissions and thus minimize impacts to the surrounding environment to the maximum extent practicable. The controls proposed for each pollutant are consistent with both the TCEQ BACT guidance and the most stringent limits in the RACT/BACT/LAER Clearinghouse (RBLC).

Based on the background research described in Section 8.1 and the determinations described in Section 8.2.3, the proposed expansion project will likely have no direct or indirect impact on federally-protected species habitat.

Based on the information gathered for this BA, Whitenton Group, Inc. (WGI) biologists recommend that a finding of no effect be accepted for the following federally-protected species: hawksbill sea turtle and leatherback sea turtle. WGI biologists recommend that a finding of may affect, not likely to adversely affect be accepted for the following federally-protected species: Piping Plover, green sea turtle, Kemp's ridley sea turtle, and loggerhead sea turtle. The take of migratory birds, Bald or Golden Eagles, or marine mammals is not anticipated as a result of this project.

Note: The term "take" represents the more specific language of the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, and the Marine Mammal Protection Act described below in Sections 3.3 - 3.5, respectively.

2.0 INTRODUCTION

BFLP currently operates an ethylene cracker facility in Port Arthur, Jefferson County, Texas. The ethylene cracker facility currently has a nominal capacity of 2.45 billion pounds of ethylene per year and is currently one of the largest single train naphtha crackers in the world. BFLP proposes to expand the facility and increase the capacity to 2.76 billion pounds of ethylene per year by constructing one additional cracker furnace within the existing plant footprint, immediately adjacent to nine existing cracker furnaces. The proposed expansion project will require a PSD Permit for nitrogen oxide (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compound (VOC), particulate matter (PM)/PM_{10}/$PM_{2.5}$, and GHG.

This BA is a complete evaluation of the potential environmental impacts the proposed expansion project may have on federally-protected species and/or their potential habitat.

Protected species evaluated in this document include threatened, endangered, and candidate species, migratory birds, Bald and Golden Eagles, and marine mammals. Federal agency regulations for protected species evaluated in this BA are described in Section 3.0.

The purpose of this BA is to research, evaluate, analyze, and document the potential for direct and indirect effects, interdependent and interrelated actions, and cumulative effects on federally-protected species as a result of the proposed expansion project. This BA includes a pedestrian protected species habitat evaluation of the proposed construction area, a windshield assessment of all publicly-accessible habitats in the surrounding areas, and an evaluation of potential environmental impacts based on air quality modeling results, construction information, operation information, and NPDES information provided by RPS.

The conclusion of this BA will include a recommended determination of effect on federally-protected species and their habitat. Three possible determinations offered by the US Fish and Wildlife Service (USFWS) for the purpose of Biological Assessments and Evaluations are described (verbatim) below[1].

1. No effect – A "no effect" determination means that there are absolutely no effects from the proposed action, positive or negative, to listed species. A "no effect" determination does not include effects that are insignificant (small in size), discountable (extremely unlikely to occur), or beneficial. "No effect" determinations do not require written concurrence from the Service unless the National Environmental Policy Act analysis is an Environmental Impact Statement. However, the Service may request copies of no effect assessments for our files.

2. May affect, not likely to adversely affect – A "may affect, not likely to adversely affect" determination may be reached for a proposed action where all effects are beneficial, insignificant, or discountable. Beneficial effects have contemporaneous positive effects without any adverse effects to the species or habitat (i.e., there cannot be a "balancing," where the benefits of the proposed action would be expected to outweigh the adverse effects – see below). 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 the Service exempts the proposed action from formal consultation. The federal action agency's written request for Service concurrence should accompany the biological assessment/biological evaluation.

Note: A conclusion or finding of "may affect, but is not likely to adversely affect" by an action agency and the USFWS, consultation with the USFWS is considered complete. This is known as "informal consultation".

3. May affect, likely to adversely affect - A "may affect, likely to adversely affect" determination means that all adverse effects cannot be avoided. A combination of beneficial and adverse effects is still "likely to adversely affect" even if the net effect is neutral or positive. Section 7 of the Endangered Species Act require that the federal action agency request initiation of formal consultation with the Service when a "may affect, likely to adversely affect" determination is made. A written request for formal consultation should accompany the biological assessment/biological evaluation.

   Note: A conclusion or finding of "may affect, likely to adversely affect" by an action agency and the USFWS; or if USFWS does not concur with an action agency's finding of "not likely to adversely affect" determination, then "formal consultation" is required between the action agency and the USFWS. Formal consultation results in the USFWS issuing a biological opinion as to whether or not the action, as proposed, will jeopardize the continued existence of any listed species.

3.0 AGENCY REGULATIONS

3.1 REGULATIONS AND STANDARDS

The Clean Air Act requires air quality standards be maintained to protect public health and the environment. These standards are the NAAQS and are regulated by the US EPA. Ambient air is the air to which the general public has access, as opposed to air within the boundaries of an industrial facility. The NAAQS are concentration limits of pollutants in ambient air within specific averaging time. The averaging time is the time period over which the air pollutant concentrations must be met to comply with the NAAQS. The NAAQS are classified into two categories: primary and secondary standards. Primary standards are set to protect public health, including "sensitive" populations. Secondary standards are set to protect public welfare, including the environment[2].

The EPA sets NAAQS for six principal air pollutants, also referred to as criteria air pollutants. These six criteria air pollutants are NO_2, ozone (O_3), SO_2, PM, CO, and lead (Pb)[2]. A geographic area whose ambient air concentration for a criteria pollutant is equal to or less than the primary standard is an attainment area. A geographic area with an ambient air concentration greater

than the primary standard is a nonattainment area. A geographic area will have a separate designation for each criteria pollutant[3].

The Clean Air Act also requires the EPA to establish regulations to prevent significant deterioration of air quality in attainment areas. The EPA established PSD Increments to satisfy this requirement. A PSD Increment is a measure of the maximum allowable increase in ambient air concentrations of a criteria pollutant from a baseline concentration after a specified baseline date. An SIL is a concentration that represents a de minimis, or insignificant, threshold applied to PSD permit applicants. The SIL is a measurable limit above which a source may cause or contribute to a violation of a PSD Increment for a criteria pollutant[5]. Before a PSD permit can be issued, the applicant must demonstrate that the proposed emissions from a project will not cause or contribute to a violation of a NAAQS or to an increase above a PSD Increment for each pollutant emitted in significant amounts by the project[4].

The air quality analysis to demonstrate compliance with NAAAQS and PSD Increments is performed using computer models to simulate the dispersion of the emitted pollutants into the atmosphere and predict ground level concentrations at specified receptor locations in the area around the source of emissions. If the modeled concentration for a given pollutant and averaging period is less than the EPA-specified SIL, the project is determined to have no significant impact on ambient air quality and no further analysis is required for that pollutant and averaging period. If the SIL is predicted by the model to be exceeded for a given pollutant, further modeling of the project emissions combined with existing emission sources in the area is required to estimate total ambient concentrations. The modeling must demonstrate that the total concentration, including an appropriate background, does not exceed the applicable NAAQS and PSD Increment.

3.2 ENDANGERED SPECIES ACT

The USFWS and the National Oceanic and Atmospheric Administration - National Marine Fisheries Service (NOAA-NMFS) regulate the Endangered Species Act (ESA) of 1973. "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[6]. Candidate species are those "the FWS has enough information to warrant proposing them for listing but is precluded from doing so by higher listing priorities[7]." Candidate species are not specifically protected by the ESA, but will be included for the purposes of this BA.

Section 9 of the ESA prohibits the "take" of threatened and endangered species. "Take" is defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." "Harm" is defined as "an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering[8]."

3.3 MIGRATORY BIRD TREATY ACT

All migratory birds are protected under the Migratory Bird Treaty Act (MBTA) of 1918, which is regulated in the US by the USFWS. The MBTA prohibits the following: "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird"[9].

"A migratory bird is any species or family of birds that live, reproduce, or migrate within or across international borders at some point during their annual life cycle." According to the USFWS, there are approximately 836 bird species protected by the MBTA[9].

3.4 BALD AND GOLDEN EAGLE PROTECTION ACT

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA) of 1940, which is regulated by the USFWS. The BGEPA prohibits the following: ''take, possess, sell, purchase, barter, offer to sell, purchase, or barter, transport, export or import, at any time or any manner, any Bald Eagle (or Golden Eagle), alive or dead, or any part, nest, or egg thereof.'' "Take" is defined as ''pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest or disturb.'' ''Disturb'' is defined as: ''to agitate or bother a Bald or Golden Eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior[10].''

3.5 MARINE MAMMAL PROTECTION ACT

The USFWS and NOAA-NMFS regulate the Marine Mammal Protection Act (MMPA) of 1972. The MMPA prohibits the "take" of marine mammals in US waters or by US Citizens outside US waters and the importation of marine mammals or marine mammal products into the US. "Take" is defined as "hunt, harass, capture, or kill." [11]

4.0 PROJECT DESCRIPTION

4.1 PROJECT PURPOSE AND LOCATION

The purpose of the project is to expand the existing BFLP ethylene cracker facility by adding a tenth cracking furnace immediately adjacent to the nine cracking furnaces currently in operation in Port Arthur, Texas. The proposed project is located approximately 0.4 miles north-northeast of the intersection of Farm to Market Road 366 and State Highway 73 (Figure 1 - Appendix A).

Project location information:

USGS Quad	Latitude/Longitude
Port Arthur North	N29° 57' 14.11" W93° 53' 02.26"

4.2 CONSTRUCTION INFORMATION

Construction of the proposed expansion, associated infrastructure, and auxiliary equipment will take place within the existing facility in an area approximately 40 feet by 76 feet. No additional earth disturbance will be required outside of this 40-foot by 76-foot area, which is currently a concrete slab. The existing concrete slab will be demolished to allow installation of auger cast concrete piles and a new mat and pier foundation for the furnace. The proposed construction activities include the installation of approximately 100 steel-reinforced concrete piles, 18-inches in diameter, installed to a depth of 50 feet, within a 40-foot by 76-foot area. The construction area is shown on Figure 2 (Appendix A).

The projected construction start date is June 2012. The projected operation start date is 01 October 2013.

4.2.1 CONSTRUCTION ACTIVITIES AND SCHEDULE

The total time estimated to complete the construction of the expansion project is approximately 70 weeks and includes the following list of general construction activities.

- pre-turnaround tie-ins
- turnaround tie-ins
- demo slab & excavation of furnace plot
- install auger cast piles
- place concrete for furnace structure
- erect furnace (in modules) & furnace piping; electrical, instrumentation installation
- install interconnecting piping from pipe rack to furnace
- final piping tie-ins
- completion of instrumentation & electrical work
- insulation
- touch-up painting

4.2.2 CONSTRUCTION EQUIPMENT REQUIRED

Equipment required to complete the furnace construction activities and their estimated schedule is listed below.

- one large crane (200 ton) for major lifts - 20 wks
- 1 to 2 small rigs (30-40 ton) - 70 wks for one, 60 wks for one
- fork truck / lull - 70 wks
- 2 to 3 welding machines and generators - 70 wks

4.2.3 EMISSION CONTROLS

Per 30 TAC §116.111(a)(2)(c), new or modified facilities must utilize BACT, with consideration given to the technical practicability and economic reasonableness of reducing or eliminating the emissions from the facility. The only new and modified facilities associated with the project are the tenth furnace, the associated piping fugitives, and decoking facilities. The existing decoking facilities will not undergo any physical modifications; however, the increased utilization will require an increase in the allowable annual emission rates. The expansion project is subject to PSD review for NO_x, CO, VOC, and $PM/PM_{10}/PM_{2.5}$[12].

4.2.3.1 NO_x

According to the RBLC, the BACT to minimize NO_x emissions from a gas-fired furnace is a combination of low NO_x burners and selective catalytic reduction (SCR). BFLP will use this technology to achieve an annual average NO_x emission rate of 0.01 pounds per MMBtu (lb/MMBtu) from the proposed expansion project. The most recent cracking furnace constructed at BFLP (permitted in 2007) also utilizes this combination of technology to control NO_x emissions to 0.01 lb/MMBtu on an annual average basis. This annual average limit is currently consistent with both the TCEQ BACT guidance and the most stringent limit in the RBLC; and, is considered to be the top level of control available for a cracking furnace[12].

SCR is a post-combustion flue gas treatment in which ammonia is injected into the furnace exhaust upstream of a catalyst bed. On the catalyst surface, the ammonia reacts with NO_x to form nitrogen and water. Optimal NO_x emission reduction occurs at catalyst bed temperatures of between 575 and 750°F for conventional catalyst types, which are usually vanadium or titanium-based. Decoking will be performed using existing decoking facilities, with decoking effluent venting to the atmosphere via an existing separator drum[12].

4.2.3.2 CO and VOC

CO and VOC emissions from gas-fired furnaces are the result of incomplete fuel combustion caused by conditions such as low temperature, insufficient residence time, or insufficient oxygen in the residence zone. Proper fuel-to-air ratio and a design that provides the necessary residence time, temperature, and turbulence within the combustion zone ensure good combustion to minimize the emission of CO and VOC[12].

Good combustion practices and design are the only control methods identified in the RBLC database for CO and VOC control in a gas-fired furnace. The proposed average annual CO emission limit for the expansion project is 0.035 lb/MMBtu. The proposed average annual VOC emission limit for the expansion project is 0.005 lb/MMBtu. These annual average limits are consistent with both the TCEQ BACT guidance and the RBLC[12].

4.2.3.3 $PM/PM_{10}/PM_{2.5}$

Emissions of PM from gas-fired furnaces result from inert solids in the fuel and combustion air and from unburned fuel hydrocarbons that agglomerate to form particles that are emitted in the

exhaust. $PM/PM_{10}/PM_{2.5}$ emissions from gas-fired furnaces are inherently low because they achieve high combustion efficiencies and burn clean fuels[12].

TCEQ does not specify a BACT guideline for PM emissions from gas-fired furnaces. A review of the RBLC indicated that currently no $PM/PM_{10}/PM_{2.5}$ control strategies other than good combustion and the use of clean fuels have been applied to gas-fired furnaces. The proposed average $PM/PM_{10}/PM_{2.5}$ emission limit for the expansion project is 0.005 lb/MMBtu based on efficient combustion of clean fuels[12].

4.2.3.4 SO_2

Emissions of SO_2 from the expansion project will be controlled by burning natural gas and/or cracker offgas with minimal sulfur contents. A review of the RBLC indicated that currently no SO_2 control strategies other than firing low sulfur fuels have been applied to gas-fired furnaces[12].

4.3 OPERATION AND MAINTENANCE INFORMATION

4.3.1 OPERATION

The tenth cracking furnace (H-1000) will be added onto the existing hydrocarbon cracking train consisting of nine furnaces, also referred to as heaters[12].

The role of the Cracking System is to convert less valuable saturated hydrocarbons into the highly desirable basic building blocks of the petrochemical industry (ethylene, propylene, and butane). The conversion takes place in the presence of dilution steam by gradually raising the hydrocarbon/dilution steam temperature to cracking temperatures (~1500 F). The extreme temperature acts to destabilize the structure of the hydrocarbon molecule and initiate the rearrangement of the hydrocarbon molecular bonds[12].

Furnace H-1000 will be designed to produce approximately 35,000 lb/hr of ethylene from naphtha feed, with a maximum fired duty of 498 MMBtu/hr using natural gas and/or cracker offgas as fuel[12].

The maximum operating schedule is 24 hours a day, 7 days a week, and 52 weeks a year[12].

Decoking will be done using existing decoking facilities. Coke builds up on the heater coils and the transfer line exchangers during each ethylene run. Standard practice is to decoke in between each run, which is up to thirteen times per year for the new cracking furnace[12].

4.3.2 WATER USE

Raw water is supplied to the ethylene cracker facility by the Lower Neches Valley Authority. BFLP estimates a 0.5% increase in fresh water intake to make up for losses and blowdown increase associated with the 10th furnace. This estimate equals an annual increase of roughly 32 gallons per minute (gpm) over the current estimated annual average freshwater intake of 6000 gpm for the existing nine furnaces. Figure 1 (Appendix B) shows how these estimates were determined.

4.3.3 NOISE LEVELS

BFLP project engineers estimate that noise levels during construction should be comparable to noise levels from maintenance activities that currently take place at the plant.

The best available technology shall be used to maintain noise levels of the furnace and auxiliary equipment below 85 decibels measured at a distance of 3-feet from the source.

4.4 NPDES INFORMATION

The BFLP facility wastewater that is generated on site is treated at the adjacent TOTAL Refinery prior to discharge under the TOTAL Texas PDES Permit No. WQ0000419-000 (EPA ID NO. TX0004201). The TOTAL Refinery wastewater outfall (Outfall 001) discharges to the Neches River at the TOTAL Dock. The proposed expansion project would produce no additional wastewater impact.

If ancillary areas are disturbed in support of the construction project, structural controls may be used to protect surrounding areas from impacted surface runoff. Runoff from within the site is directed through a series of onsite ditches to a holding pond that allows runoff velocity to slow considerably, effectively allowing sedimentation to fall out of suspension and be retained in the pond system. Additional erosion control measures (silt fence, sandbags) may be used if excess erosion and/or sedimentation is observed during the construction phases. Re-vegetation is not a concern since the site is a heavy industrial site consisting of gravel or concrete-paved surfaces.

The BFLP facility currently has an Oil and Hazardous Materials Spill Prevention, Control, and Countermeasure Plan and Storm Water Pollution Prevention Plan in place and the facility employees are trained to implement these plans. These plans will be utilized during construction, operations, and maintenance of the proposed additional furnace.

Best Management Practices will be utilized in accordance with Section 401 of the Clean Water Act Chapter 279 of the Texas Water Code and as prescribed in the BFLP Storm Water Pollution Prevention Plan.

5.0 BACKGROUND INFORMATION

5.1 GENERAL ENVIRONMENTAL INFORMATION

This section provides applicable environmental characteristics for the general region in which the project is located.

5.1.1 GENERAL REGION INFORMATION

The proposed construction site is located within the Gulf Coast Prairies and Marshes eco-region of Texas[13] which is in the Gulf Coastal Plain physiographic province of North America[14]. The area in which the project is located is typical for the West Gulf Coastal Plains eco-region.

This region borders the Gulf Coast within the state of Texas. The Gulf Coast influence creates multiple dynamic ecosystems within this ecoregion including bays, estuaries, salt marshes, and tidal flats. These ecosystems are home to an abundance and variety of wildlife including mammals, birds, reptiles, amphibians, fish, and invertebrates. This region is prime wintering grounds for migratory birds. The bays and estuaries are invaluable breeding grounds and fish hatcheries[15, 16].

The majority of the river basins of Texas drain towards the Gulf of Mexico. This ecoregion also receives more rainfall than many other ecoregions in Texas. As a result, this region is ecologically diverse inland as well as immediately adjacent to the coastline. Freshwater wetlands, marshes, and swamps as well as hardwood bottomlands, prairies, and oak mottes are common throughout this region[17].

The Gulf Coast Prairies and Marshes eco-region spans the Texas Coastline and includes 12 counties. Because of the abundant water resources, the rich soils, and the proximity to the coast, this area is commonly converted to cropland, ranchland, and industrial development[16]. These land uses have reduced and fragmented the critical protected species habitat throughout the region.

The proposed expansion project is located in Jefferson County, which is the eastern-most coastal county of southeast Texas.

5.1.2 LAND USE

Most of the native coastal prairie is now planted pastureland for beef cattle grazing or cropland for rice, sugarcane, forage, and grain crops[16]. Other land uses throughout Jefferson County include residential, urban, commercial, and other agricultural development. The proximity and access to the Gulf of Mexico through the Port Arthur ship canal and Sabine Lake make Jefferson County a prime location for deepwater transport and industrial development, primarily petrochemical, shipbuilding, and rubber[17].

Based on the background review, the land use within the proposed project area is currently industrial development. Land use types within the surrounding areas include commercial, residential, and industrial development, as well as undeveloped waterbodies, marshland, woodland, and pastureland (Figure 3 – Appendix A).

5.1.3 CLIMATE

According to the Natural Resource Conservation Service (NRCS), the mean annual precipitation in the region is 59.88 inches. The mean annual growing season is 250 days. In winter, the average temperature is 54°F and average daily minimum temperature is 44°F. In summer, the average temperature is 82°F and the average daily maximum temperature is 91°F. Prevailing winds are from the south with an average speed of 11.8 miles per hour. Average humidity is 72 percent with a higher average humidity at night of 91 percent[18].

At the time of the field survey, the US Drought Monitor[19] indicated the survey area is in D4 Drought - Exceptional. According to the National Weather Service/Advanced Hydrologic Prediction Service (NWS/AHPS), the area has received approximately 1 – 4 inches of rain within the 30 days prior to the field survey, the area is approximately 1 - 5 inches below normal for the previous 30 days, and is approximately 4 - 12 inches below normal for the previous 60 days[20].

The NOAA – National Climatic Data Center (NCDC) Standardized Precipitation Index[21] reported results for Jefferson County, east Texas (the river basins that contribute to the water resources in Jefferson County and surrounding areas), and the State of Texas are shown in Table 1 below.

Table 1. Standardized Precipitation Index Summary[21]

Year	Jefferson County	East Texas	Texas
2005	moderately dry	moderately dry to exceptionally dry	near normal to exceptionally dry
2006	very moist	mid-range to very moist	moderately dry to very moist
2007	very moist	moderately moist to extremely moist	moderately moist to extremely moist
2008	mid-range	near normal to moderately dry	near normal to extremely dry
2009	mid-range	near normal to abnormally moist	near normal to abnormally moist
2010	mid-range	near normal to extremely dry	extremely dry to moderately moist
2011	exceptionally dry	severely dry to exceptionally dry	severely dry to exceptionally dry

The NOAA – NCDC Standardized Precipitation Index indicates that, while Jefferson County has been impacted by drought only two of the past seven years, the majority of Texas has been impacted by significant drought conditions for five out of the past seven years. The river basins that contribute to the water resources in Jefferson County in east Texas have been impacted by significant drought for four out of the past seven years. Long-term drought conditions have weakened many ecosystems across Texas. While the coastline has not experienced as severe a deficiency in direct precipitation as have other areas of Texas, it is directly affected by the limited influx of freshwater from Texas' river basins[21].

5.1.4 TOPOGRAPHY

Jefferson County has low and flat terrain, with elevations ranging from sea level to approximately 50 feet[17]. The topography of the project area is flat with an approximate elevation of 7 feet above sea level[22] (Figure 4 – Appendix A).

According to the Federal Emergency Management Agency (FEMA) flood insurance rate map, the proposed project site and portions of the surrounding areas are located within the designated 100-year floodplain. FEMA floodplain designation is demonstrated in Figure 5 (Appendix A)[23].

5.1.5 GEOLOGY

The specific geologic formation found in the area is the Beaumont Formation from the Cenozoic Era[24]. The Spindletop and Big Hill salt domes contain sulfur and petroleum. Geologic resources in the area include clay, sand, oil, gas, and sulfur.

The geologic units found within and surrounding the proposed project area are listed and described below in Table 2.

Table 2. Geologic Units Summary[25]

Map Unit	Unit Name and Description	Rock Types
Fs	fill and spoil	sand, silt, clay, or mud
Qal	alluvium	sand, silt, clay, mud, or gravel
Qbc	Beaumont Formation, areas predominantly clay	clay, mud, or silt
Qbs	Beaumont Formation, areas predominantly sand	sand, silt, clay, mud, or gravel
Water	water	water

5.1.6 SOILS

Dominant soils found in Jefferson County include: beach sands and sediments along the coastline; light loam soils over deep, red clay or loam subsoils with calcium deposits to the north; and light to dark loam soils over clay subsoils or black clays throughout the remainder of the county[17].

The NRCS soil units mapped within and surrounding the proposed project area are listed and described below in Table 3.

Table 3. NRCS Soil Units Summary[26]

NRCS Map Unit Symbol	NRCS Map Unit Name	NRCS Map Unit Characteristics	USDA Classification				NRCS Hydric Soil
			Depth	Drainage	Permeability	Landform	
BaA	Bancker mucky peat	0-1% slopes, frequently flooded, tidal	Very deep	Very poorly drained	Very slowly permeable	Coastal marshes	Yes
HaA	Harris clay	0-1% slopes, frequently flooded, tidal	Very deep	Very poorly drained	Very slowly permeable	Coastal marshes	Yes
ImA	Ijam clay	0-2% slopes, frequently flooded, tidal	Very deep	poorly drained	Very slowly permeable	N/A	Yes
LeA	Labelle-Urban land complex	0-1% slopes	Very deep	Somewhat poorly drained	Very slowly permeable	Nearly level uplands	Yes
LtA	League clay	0-1% slopes	Very deep	Somewhat poorly drained	Very slowly permeable	Nearly level uplands	Yes
LuA	League-Urban land complex	0-1% slopes	Very deep	Somewhat poorly drained	Very slowly permeable	Nearly level uplands	No
NeA	Neel clay	2-5% slopes, occasionally flooded, tidal	Very deep	Moderately well drained	Very slowly permeable	Levees and spoilbanks	Yes
NuC	Neel-Urban land complex	2-5% slopes, rarely flooded, tidal	Very deep	Moderately well drained	Very slowly permeable	Levees and spoilbanks	Yes
W	Water						No

5.1.7 WATER RESOURCES

Jefferson County has abundant water resources, with its south border formed by the Gulf of Mexico, north border by Pine Island Bayou, and east border by the Neches River, Sabine Lake, and Sabine Pass. Other prominent water features in the area include Taylor's Bayou, Hillebrandt Bayou, and the Intracoastal Waterway. The low, flat topography invites freshwater and tidal influence to create a variety of aquatic ecosystems mentioned above in Section 5.1.1 General Region Information[17].

The watersheds or river basins that contribute water resources into the proposed project site and surrounding areas are the Neches River Basin, Sabine River Basin, Trinity River Basin, and Neches-Trinity Coastal Basin. The proposed project site is located on the border between the Neches River Basin and the Neches-Trinity Coastal Basin[27].

According to the Texas Parks and Wildlife Department (TPWD) available digital data, the Neches River, north of the survey area, is designated as an Ecologically Unique River and Stream Segment[28].

Based on the background review, the water resources in the areas surrounding the project site include marshlands, irrigation and drainage canals, and retention ponds. The Neches River is approximately 1.8 miles to the north of the project area at its closest point. Sabine Lake is approximately 1.1 miles to the east-southeast at its closest point.

Sabine Lake, the lower Sabine and Neches Rivers, and portions of the Intracoastal Waterway are all part of the Sabine-Neches Estuary. According to multiple sources including the TPWD, US Geological Survey (USGS), and Sabine River Authority, the Sabine-Neches estuary and its component waterbodies are tidally-influenced[29]. Sabine Lake has an average depth of 6 feet. At the south end of the lake, depths range from 1-4 feet. Depths reach up to 40 feet in dredged areas[30, 31].

The USFWS National Wetland Inventory (NWI) data within, and immediately adjacent to, the proposed project area is demonstrated in Figure 6 (Appendix A)[32].

5.1.8 VEGETATION

Historically, the native plant community of the region was Coastal Prairie, which is a tallgrass prairie with scattered trees. Most of the native coastal prairie is now pastureland, cropland, or residential, urban, commercial, and industrial development[15].

Today, the natural vegetation of the region is dominated by three plant communities: marshy saltgrass, coastal prairie, and pine-hardwood forest. According to the Texas State Historical Association, common species in the region include pine, white oak, red oak, pin oak, ash, beech, magnolia, gum, cypress, bunchgrasses, marsh millet, seashore saltgrass, and cordgrasses[17].

5.2 PROTECTED SPECIES

5.2.1 THREATENED OR ENDANGERED SPECIES LIST

Threatened or endangered species listed by the USFWS as having the potential to occur in Jefferson County[33] are provided in Table 4.

Table 4. USFWS List of Threatened or Endangered Species for Jefferson County, Texas[33]

Common Name	Scientific Name	Species Group	Listing Status
green sea turtle	*Chelonia mydas*	reptiles	E, T
hawksbill sea turtle	*Eretmochelys imbricata*	reptiles	E
Kemp's ridley sea turtle	*Lepidochelys kempii*	reptiles	E
leatherback sea turtle	*Dermochelys coriacea*	reptiles	E
loggerhead sea turtle	*Caretta caretta*	reptiles	T
Piping Plover	*Charadrius melodus*	birds	E, T

5.2.2 THREATENED OR ENDANGERED SPECIES DESCRIPTIONS

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

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, black breastband, and white collar[34].

Three main breeding populations of Piping Plovers have been distinguished by geographic region within the US: Great Lakes, Northern Great Plains, and Atlantic Coast. These three populations winter on beaches and barrier islands in the South Atlantic, Gulf, and Caribbean coasts, including the Bahamas and West Indies. Studies have shown that birds from the Great Lakes and Northern Great Plains regions primarily winter along the Gulf Coast. Individuals from the Atlantic Coast population have been observed on the Gulf Coast as well. 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[34].

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. Preferred roosting habitat includes sandy beaches, often with cover such as driftwood, seaweed clumps, small dunes, and debris. Spoil islands along the Intracoastal Waterway are known to be utilized by this species. Piping Plovers are known to occupy similar habitats as other shorebirds such as Willets, Ruddy Turnstones, Dowitchers, Sandpipers, American Oystercatchers, and other plovers[34,35].

These shorebirds forage on exposed beach substrates, pecking for prey at or just below the substrate surface. They feed on marine worms, beetles, flies, spiders, aquatic invertebrates, crustaceans, and mollusks, as well as their eggs and larvae[34].

Hawksbill Sea Turtle

The USFWS describes the hawksbill sea turtle as 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 weighs between 95 to 165 pounds[36].

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 20-25 centimeters in length. Juveniles and adults will spend most of their time in their primary foraging habitat, coral reefs. The hawksbill feeds primarily on sponges[36].

Hawksbill turtle nesting occurs sometime between April and November. Nesting is nocturnal and occurs every 2 to 3 years, 4 to 5 times per season, approximately every 14 days. Preferred nesting habitat includes low and high energy beaches in tropical oceans. Nesting habitat is often shared with green sea turtles. Hawksbills can traverse beaches limited to other species of sea turtles with their ability to traverse fringe reefs.

Hawksbills have a tolerance for a variety of nesting substrates and often build their nests under vegetation[36].

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 yielding 3,000 to 4,500 nests/year. The Hawksbill is an occasional visitor to the Texas coast[36].

Loggerhead Sea Turtle

The loggerhead sea turtle is reddish-brown marine turtle characterized by a large head with blunt jaws. Adults can be up to 500 pounds and 4 feet in length. Adult loggerheads feed on jellyfish, floating egg clusters, flying fishes, mollusks, crustaceans, and other marine animals[37].

Loggerheads occupy three ecosystems according to lifestage: 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 40-60 centimeters in length. Juveniles and adults primarily occupy the neritic zone (nearshore marine environment)[37].

The nesting season in the US is May through August. Nesting occurs every 2 to 3 years and is mostly nocturnal. Females can nest up to 5 times per season at intervals of approximately 14 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[37].

Distribution of the loggerhead includes the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Although the majority (~80%) of the US nesting activity occurs in south Florida, loggerheads nest along the Gulf and Atlantic coastlines from Texas to Virginia. Loggerheads are considered an occasional visitor to Texas[37].

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle is considered the smallest sea turtle with an olive-gray carapace and a triangular shaped head and a hooked beak. Adults can grow to about 2

feet in length and weigh up to 100 pounds. This turtle is a shallow water benthic feeder with a diet consisting primarily of shrimp, jellyfish, snails, sea stars, and swimming crabs[38].

Kemp's ridleys, similar to loggerhead sea turtles, occupy three ecosystems according to lifestage: 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 for an average of 2 years. Juveniles and adults primarily occupy the neritic zone (nearshore marine environment)[38].

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 May 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 female pheromone release, offshore winds, and/or lunar cycles. Females nest up to 4 times per season at intervals of 10 to 28 days. The preferred nesting beaches are adjacent to extensive swamps or large bodies of open water[38].

The Kemp's ridley turtles range includes the Gulf coasts of Mexico and the US, and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland[38].

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[39].

Greens occupy three ecosystems according to lifestage: 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 20-25 centimeters in length. Juveniles and adults primarily occupy benthic feeding grounds in shallow, protected waters. Preferred feeding grounds include pastures of seagrasses and/or algae[39].

Green 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 nest an average of 5 times per season at 14 day intervals. Hatchlings typically emerge at night. Approximately 200 to 1,100 females are estimated to nest on US beaches. Nesting occurs on high energy oceanic beaches, primarily on islands with minimal disturbance. Green turtles return to the same nesting sight and are known to travel long distances between foraging areas and nesting beaches[39].

Leatherback Sea Turtle

The leatherback sea turtle is the largest sea turtle. The adult leatherback can get up to 8 feet in length and up to 2000 pounds. The turtle lacks a "normal" turtle shell and is covered by firm, rubbery skin that is approximately 4 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 and salp, but it is also known to feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed[40].

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[40].

In the United States, nesting occurs from March to July. Females nest on average 6 times per season at 10 day intervals. Most leatherbacks return to their nesting beaches at 2 to 3-year intervals[40].

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[40].

According to the USFWS, there is no designated critical habitat for any of the federally-listed threatened and endangered species within 16 miles of the survey area[41].

5.2.3 TEXAS NATURAL DIVERSITY DATABASE RESULTS

A records review of the Texas Natural Diversity Database (TNDD) was completed for the proposed project area and surrounding areas by the TPWD on 20 June 2011. No elements of occurrence (EO) are located within the proposed project area. The EO closest to the proposed project area (EO ID 4008) is approximately 2.1 miles to the northeast and is listed as a black skimmer nesting colony last observed in 1984. No additional federally-protected species are recorded within the action area (maximum radius of approximately 2.6 miles). EO data are demonstrated in Figure 7 (Appendix A)[42].

5.2.4 MARINE SPECIES HABITAT

In an informal telephone conversation on 6 July 2011, Eric Hawk with the NOAA - NMFS conveyed the following information regarding sea turtles and marine mammals in Sabine Lake, the Sabine River, and the Neches River[43].

Leatherback sea turtles are limited to deep water habitats and are not known to occur within the Sabine Lake area. Hawksbill sea turtles are limited to coral reefs and are not known to occur within the Sabine Lake area[43].

The Kemp's ridley, green, and loggerhead sea turtles have been observed within Sabine Lake. They are thought to utilize the area for feeding on blue crab and shrimp. In general, if coastal waterbodies are tidal, they are likely considered potential feeding grounds for these three sea turtles[43].

The only marine mammal Eric Hawk confirmed would utilize the Sabine Lake area is the bottlenose dolphin[43].

5.2.4 TPWD PIPING PLOVER SURVEY OF UPPER TEXAS COAST

The TPWD conducted a survey in 2008-2009 of wintering Piping Plovers on the Upper Texas coast from the mouth of the Sabine River (Sabine Pass) to the mouth of the Colorado River. This survey confirmed that the TPWD identified heavy use areas corresponded with the USFWS designated critical habitat areas. Within the Upper Texas coast, significant density areas are located at the mouth of rivers (primarily Brazos and Colorado Rivers) or passes into major bay systems (primarily Bolivar Flats and San Luis Pass). Investigators found that salt and brackish marshes dominated by *Spartina alterniflora* (smooth cordgrass) were not utilized by the plovers[44].

The habitats primarily utilized on the Upper Texas coast differed from those utilized on the Lower Texas coast. Significant algal flats and beach washover areas were not observed within their survey areas along the Upper Texas coast. The results also showed that Hurricane Ike (made landfall at Galveston Bay in 2008) had a significant impact on the habitats within and to the east of Galveston Bay. Many beaches were stripped of sand and eroded. These areas are not preferred Piping Plover foraging habitat[44].

Prior to Hurricane Ike, the closest recorded observance of Piping Plovers to the action area was approximately 19 miles to the south on McFaddin Beach, near Sabine Pass. The USFWS designated critical habitat located northeast of Sabine Pass was not included in the TPWD survey areas[44].

6.0 PROTECTED SPECIES HABITAT EVALUATION

WGI completed a protected species habitat evaluation on 21 June 2011 to determine if habitat within the project area was likely to support any of the federally-protected species potentially occurring in Jefferson County. The field surveys included a pedestrian survey of the proposed project area and the portions of the surrounding facility that are not restricted by stringent safety requirements. The field surveys also included a windshield survey of all terrestrially accessible habitats visible from public areas within a three-mile radius of the project area. The majority of the lands adjacent to Sabine Lake, Neches River, and the Intracoastal Waterway are privately-owned and not visible or accessible from public areas. Data were collected to describe resident vegetation communities and assess the potential for occurrence of protected species. The dominant habitats observed are described below and demonstrated in Figure 8 (Appendix A). Photographs of the proposed project area and accessible surrounding areas are included as Appendix C. A summary of the field survey data is provided in Appendix D.

6.1 PLANT COMMUNITIES OBSERVED

The proposed project area is an existing concrete slab surrounded by industrial infrastructure and a caliche roadway. No vegetation currently exists in the project area. The majority of the cracker facility is industrial infrastructure, concrete, caliche, or asphalt.

The area to the southwest of the cracker facility is predominantly residential. The area to the immediate northwest of the cracker facility is the TOTAL Port Arthur Refinery.

The Neches River is approximately 1.8 miles to the north of the project area at its closest point. The Sabine Lake is approximately 1.1 miles to the east-southeast at its closest point. Industrial development dominates the shoreline of the Sabine Lake, the Intracoastal Waterway, and portions of the Neches River. A seawall has been constructed along portions of the Intracoastal Waterway.

The dominant habitats observed in the areas surrounding the cracker facility include: marshland, pastureland, mixed woodland, open water, riverine, and drainage canals. A significant portion of these habitats have historically been constructed, manipulated, or impacted by industrial and recreational development.

Marshland – This habitat is a mosaic of emergent herbaceous and shrub vegetation and open water. Dominant species observed throughout this habitat included *Paspalum vaginatum* (seashore paspalum), *Typha latifolia* (broadleaf cattail), *Phragmites australis* (common reed), *Baccharis halimifolia* (eastern baccharis), *Iva frutescens* (iva), *Schoenoplectus robustus* (sturdy bulrush), and *Schoenoplectus* spp. (bulrush).

Pastureland – This habitat is primarily improved and maintained. Dominant species observed *Cynodon dactylon* (bermudagrass). Eastern baccharis and *Solidago altissima* (Canada goldenrod) were also observed along the pastureland boundaries.

Mixed woodland – This habitat is primarily small, fragmented tracts. Dominant species were too distant from the public roadways to be identified. However, tree genera likely to be found include *Quercus* sp. (oak), *Triadica sebifera* (Chinese tallow), *Salix* sp. (willow), *Celtis* sp. (hackberry), *Ulmus* sp. (elm), and *Acer* sp. (maple).

Open water – This habitat includes man-made retention ponds, the Intracoastal Waterway, and Sabine Lake. Dominant species observed along the banks (in limited areas) included eastern baccharis, iva, Chinese tallow, seashore paspalum, and common reed.

Riverine – This habitat includes the Neches River. This habitat was not accessible from a close enough vantage point to identify vegetation. However, species likely to be found

include eastern baccharis, iva, Chinese tallow, seashore paspalum, bulrush, and common reed.

Drainage canals – This habitat includes man-made drainage and flood control canals. This habitat was not accessible from a close enough vantage point to identify vegetation. However, dominant species likely to be found include iva, seashore paspalum, bulrush, *Juncus* sp. (rush), and *Rumex* sp. (dock).

6.2 PROTECTED SPECIES HABITAT ANALYSIS

The proposed project area consists entirely of concrete and caliche; and, therefore, does not possess habitat with the potential to support any federally-protected species. Land use and plant community types outside the proposed project site include residential and industrial development, marshland, pastureland, mixed woodland, open water, riverine, and drainage canals. The areas surrounding the project location have historically been impacted by commercial and industrial activities.

Industrial development areas are typically comprised of mainly impervious cover with minimal vegetation on site. Therefore, these areas are not likely to support any federally-protected species.

Residential areas have the potential to support migratory songbirds. Habitat to support federally-protected species other than small migratory songbirds is not likely to occur in residential areas.

The marshland habitat observed is a mosaic of emergent and shrub vegetation and open water. Based on the historic aerial photography and the pedestrian survey, this habitat has historically been impacted by industrial and recreational development. Existing development impacts to the marshlands include, but are not limited to, dock facilities, navigable canals, open water ponds, and roadways. The observable quality of this habitat ranges from low to moderate. The marshland habitat areas have the potential to support migratory birds, Bald or Golden Eagles, and other wildlife. Herons and egrets were observed within areas of the marshland habitat.

The pastureland habitat observed is primarily improved and maintained. The observable quality of this habitat ranges from low to moderate. The potential exists for migratory birds, Bald or Golden Eagles, and other wildlife to utilize this habitat.

The mixed woodland habitat areas are primarily small, fragmented tracts. The observable quality of this habitat ranges from low to moderate. The potential exists for migratory birds, Bald or Golden Eagles, and other wildlife to utilize the mixed woodland habitat.

The open water habitat areas include man-made retention ponds, the Intracoastal Waterway, and Sabine Lake. Many of these areas support adjacent industrial facilities. The Intracoastal Waterway was created and dredged to facilitate recreational, commercial, and industrial traffic. The shoreline primarily consists of dock facilities, industrial development, and a seawall. The shoreline of Sabine Lake also primarily consists of dock facilities and industrial development. The Port of Port Arthur is an international transfer facility and, as such, introduces barge and commercial vessel traffic to the Intracoastal Waterway and Sabine Lake. Beyond the shoreline, Sabine Lake and the Intracoastal Waterway are a part of a tidally-influenced estuary system. The observable quality of these open water habitats ranges from low to moderate. The open water habitat areas have the potential to support migratory birds, Bald or Golden Eagles, some sea turtles, bottlenose dolphins, and other wildlife.

The riverine habitat includes the Neches River. Based on the historic aerial photography and windshield survey, this habitat has historically been impacted by industrial and recreational development. Existing development impacts to the shoreline of the Neches River include, but are not limited to, barge dock facilities, small boat docks, and roadways. The observable quality of this habitat ranges from low to moderate. The Neches River is a navigable water of the US and is subject to industrial, commercial, and recreational traffic. The Neches River is also a part of a tidally-influenced estuary system. The riverine habitat areas have the potential to support migratory birds, Bald or Golden Eagles, Piping Plovers, some sea turtles, bottlenose dolphins, and other wildlife.

The drainage canal habitat areas include man-made drainage and flood control canals. The observable quality of this habitat ranges from low to moderate. The potential exists for migratory birds, Bald or Golden Eagles, and other wildlife to utilize the drainage canal habitat.

6.3 PIPING PLOVER HABITAT EVALUATION RESULTS

WGI biologists completed a Piping Plover habitat evaluation (via boat) on 28 December 2011. The habitat evaluation was limited to foraging and roosting habitat, as Piping Plovers are migratory birds and their breeding habitat is known to be the northern US and Canada. The survey included all areas within, and adjacent to, the action area that are accessible by boat within the Neches River, the Intracoastal Waterway, and Sabine Lake. These areas included

accessible portions of Sabine Lake, the Intracoastal Waterway, the Neches River, Pleasure Island, Dooms Island, Stewts Island, and Humble Island. The survey areas and results are indicated in Figure 9 (Appendix A). Photographs of the survey areas are provided in Appendix C.

WGI biologists surveyed the above-mentioned shorelines by boat, as close to shore as possible. Observed habitat types and species were recorded. Surveys were conducted during the afternoon falling tide.

The shorelines within, and adjacent to, the action area have historically been impacted by significant erosion due to multiple factors, such as tide, wind, and vessel-generated wave action. The Intracoastal Waterway requires maintenance dredging and erosion control measures, such as rip rap, breakwaters, and sheet piling, have been installed to stabilize the shorelines in this area. Evidence of erosion was observed along the shorelines within the action area. The majority of the shorelines of Pleasure Island and the Intracoastal Waterway are lined with rip rap, sheet piling, or breakwaters. The majority of the shorelines observed during the survey have steep slopes and are subject to wave action[45].

Portions of the shorelines of Sabine Lake and the Intracoastal Waterway are commercially or industrially developed. Pleasure Island is a man-made island, built from dredge material, and is used as a spoil bank for dredged material[45]. The Intracoastal Waterway was being dredged at the time of the survey. Portions of the shorelines of Stewts Island and Humble Island are utilized for temporary vessel storage. Dooms Island was under water at the time of the survey. Portions of the Neches River shoreline are recreationally, commercially, or industrially developed.

No emergent seagrass beds were observed. Few flats were observed. The undeveloped and unvegetated shorelines within the action area range from 3-50 feet wide (at the fall of tide), with the majority measuring approximately 3-10 feet wide. Piping Plovers are known to occupy similar habitats as other shorebirds such as willets, ruddy turnstones, dowitchers, sandpipers, and other plovers[34]. Few of the potential foraging or roosting areas observed were occupied by other shorebirds. Upland areas were occupied by dense vegetation. The dominant vegetation community observed along the shorelines included eastern baccharis, iva, seashore paspalum, Chinese tallow, bulrush, common reed, and smooth cordgrass.

Marginal potential foraging and roosting habitat for the Piping Plover was observed within, and adjacent to, the action area. Within the action area, marginal foraging and roosting habitat

is limited to the Neches River and the northern tip of Pleasure Island. Although this survey was not a presence/absence survey, no Piping Plover individuals were observed.

7.0 AIR QUALITY ANALYSIS RESULTS

7.1 ESTIMATED TOTAL ANNUAL EMISSION RATE OVERVIEW

RPS completed detailed pollutant emission calculations for the BFLP project in accordance with the Air Permit Amendment Application requirements. This BA does not include detailed estimated emission rates. Estimated emission rates and descriptions of emission calculation methods are available upon request.

The total emissions for the expansion project were based on the maximum emissions of each pollutant from either of two potential fuels: natural gas or cracker offgas. The maximum SO_2 emissions occur when burning natural gas. All other pollutants are emitted at the same rate when burning either fuel.

The total emissions for the decoking drum were calculated by multiplying the short-term emission rates by the number of decoking cycles per year. The short-term emission rates were calculated for each decoking cycle based on the mass of coke that will be combusted.

A summary, provided by RPS, of the total estimated annual emission for PSD pollutant that would be emitted by the expansion project are provided in Table 5.

Table 5. Emission Point Summary

Emission Point Name	Air Pollutant Name	Air Pollutant Emission Rate (Tons per Year)
Tenth Cracking Furnace (H-1000)	NO_x	21.81
	SO_2	8.72
	CO	76.34
	$PM/PM_{10}/PM_{2.5}$	10.91
	VOC	11.76
Process Fugitives	VOC	1.4
Decoking Drum	CO	36.34
	$PM/PM_{10}/PM_{2.5}$	0.71

In addition to the emission rates calculated for PSD criteria pollutants, RPS calculated emission rates for other pollutants that will emitted by the project. This analysis was performed in accordance with TCEQ guidelines on the modeling of non-criteria pollutants. The predicted increases in pollutant concentrations were compared to the TCEQ Effects Screening Levels (ESLs). ESLs are not ambient air standards, but instead are screening concentrations used by TCEQ to assess the potential of the emissions to impact public health and welfare. ESLs are set by TCEQ at a level well below which adverse health effects on humans have been observed to occur. In addition to human health effects, ESLs are based on the potential for odors to be a nuisance and effects on vegetation. Therefore, if predicted concentrations of a constituent do not exceed an ESL, adverse health or welfare effects are not expected. In the first level of analysis conducted for permitting of new emissions, the predicted increase in concentration of a pollutant is compared to 10% of the ESL. If the predicted concentration increase is less than this level, no further analysis is required, and it is concluded that the emissions of that pollutant from the project pose no significant additional impact on public health and welfare.

A comparison of the modeled concentrations of the project's non-criteria pollutant emissions to TCEQ established ESLs is shown in Table 6 (Appendix E). Based on these results, the maximum predicted concentrations of all modeled pollutants is well below the respective ESL and also well below the first screening level of 10% of the ESL. Accordingly, no adverse welfare impacts are expected to occur within the action area as the result of the additional emissions of these pollutants.

7.2 AREA OF IMPACT DISPERSION MODELING RESULTS

RPS performed dispersion modeling of the proposed emissions of air pollutants from the proposed expansion project in accordance with the PSD Permit requirements. According to the EPA, "dispersion modeling uses mathematical formulations to characterize the atmospheric processes that disperse a pollutant emitted by a source."[5] This section provides the methods and results of the dispersion modeling.

7.2.1 DISPERSION MODELING METHODS

This section discusses air quality monitoring, including preconstruction monitoring requirements, presentation of these data, and how background concentrations were obtained. If the SIL was exceeded for a pollutant, a NAAQS and/or PSD Increment analysis was performed, and the appropriate background concentrations presented in this section were added to the

modeling results to demonstrate compliance with the NAAQS and PSD Increments. The modeling methods were provided by RPS[46].

Table 7. Standards for Comparison with Modeling for Criteria Pollutants[46]

Pollutant	Regulation	Averaging Period	Modeling Deminimis (µg/m3)	Standard (µg/m3)
SO_2	Chapter 112	30-min	20.4	1021
	NAAQS	1-hr	7.8	195
		3-hr	25	1300
		24-hr	5	365
		Annual	1	80
	Increment	3-hr	25	512
		24-hr	5	91
		Annual	1	20
	PSD Monitoring	24-hr	13	NA
NO_2	NAAQS	1-hr	7.5	188.7
		Annual	1	100
	Increment	Annual	1	25
	Monitoring	Annual	14	NA
CO	NAAQS	1-hr	2000	40,000
		8-hr	500	10,000
	PSD Monitoring	8-hr	575	NA
PM_{10}	NAAQS	24-hr	5	150
	Increment	24-hr	5	30
		Annual	1	17
	PSD Monitoring	24-hr	10	NA
$PM_{2.5}$	NAAQS	24-hr	1.2	35
		Annual	0.3	15
	Increment	24-hr	1.2	9
		Annual	0.3	4
	PSD Monitoring	24-hr	4	NA

The model parameters specified for the modeled location, such as meteorological data, rural versus urban dispersion coefficients, and receptor grid are discussed below. The remaining modeled parameters were determined by the EPA-recommended "regulatory default option", which includes the use of stack-tip downwash, the effects of elevated terrain, and calms and missing data processing routines[46].

7.2.1.1 AERMOD

Modeling was performed using the AMS/EPA Regulatory Model (AERMOD) (version number 11103). The AERMOD model was chosen because it is approved by the EPA as a Preferred/Recommended model and is approved by the TCEQ modeling staff[46].

AERMOD is a steady-state plume dispersion model for assessment of pollutant concentrations from a variety of sources. AERMOD determines concentrations from multiple point, area, or volume sources based on an up-to-date characterization of the atmospheric boundary layer. The model employs hourly sequential preprocessed (AERMET) meteorological data to estimate concentrations. The AERMOD model is applicable to receptors on all types of terrain, including flat terrain, simple elevated terrain (below height of stack), intermediate terrain (between height of stack and plume height), and complex terrain (above plume height). In addition, AERMOD provides a smooth transition of algorithms across these different terrains. Therefore, AERMOD was selected as the most appropriate model for the air quality impact analysis for the proposed facility. The Oris Solutions, LLC software program, "BEEST for Windows", was used to set up the model inputs and used to perform the model runs[46].

7.2.1.2 AERMAP

AERMAP is a preprocessor program which processes the terrain information to provide inputs to AERMOD. AERMAP was used to processes this terrain data in conjunction with the receptor grids and sources to be used in AERMOD input files[46].

7.2.1.3 Building Wake Effects

Building wake effects occur when the air flow around buildings influences the dispersion from sources in the model input, resulting in variations to air concentrations[46].

A building wake (downwash) analysis was performed to determine appropriate downwash parameters for the major structures at the facility. Downwash parameters were calculated using the Bee Line Software's BPIP-PRIME (Dated: 04274) Program. Because the structures making up

the facility are not regularly shaped, the building wakes effects (downwash) analysis was simplified by using approximate rectangles and cylindrical tanks (for columnar structures). Only structures that are solid all the way to ground level were included in the downwash analysis[46].

7.2.1.4 Terrain

The terrain heightened difference between the modeled source and each receptor can vary. For each source/receptor combination, the relationship may be characterized as flat terrain, simple terrain, intermediate or complex terrain. This variation affects the dispersion and the relative plume height of modeled sources[46].

The terrain surrounding the facility is described as generally flat terrain. The receptor, source, and building base elevations was determined using data from USGS National Elevation Dataset files and the AERMAP processing program. The output from AERMAP provides not only base elevations for the receptors, but also an effective "hill height" that enables AERMOD to make more realistic simple to complex terrain concentration calculations[46].

7.2.1.5 Receptor Grid

The receptor grid defines the locations at which the concentrations are calculated based on the dispersion of the emissions from the sources in the model input. Receptor spacing followed the guidance in TCEQ's Air Quality Modeling Guidelines (TCEQ, 1999). The receptor grids to be used for the modeling analyses were as follows[46]:

- 25-meter spacing on the entire property;
- 25-meter spacing extending from the property line out 100 meters and within ~500 meters of the nearest source;
- 100-meter spacing within 100 meters to ~1,000 meters of the sources; and
- 500-meter spacing within 1,000 meters to ~5,000 meters of the sources.

The grid to be modeled was necessary to ensure that it was sufficient to capture the maximum predicted concentrations and any exceedances at those locations[46].

For the NAAQS/PSD increment modeling, receptor grids were developed by analyzing concentrations at each receptor from the Area of Impact (AOI) analysis for each of the five

modeled years. Only those receptors from the AOI analysis that had at least one predicted concentration greater than de minimis (significant) were included in the NAAQS/PSD increment analyses[46].

7.2.1.6 Meteorological Data

The meteorological data used in the models includes observed hourly wind speed, wind direction, temperature and numerous other parameters. This data is used, along with other inputs, by the models to determine the dispersion of the emissions from sources in the model input[46].

7.2.1.7 Monitoring Stations

The EPA tracks air quality and pollutant emissions with the use of monitoring stations in various locations[46].

There are monitoring stations in Jefferson County for NO_2, CO, $PM_{2.5}$, and SO_2.

Table 8 (Appendix F) presents background concentrations to be used in the NAAQS analysis for NO_2. The ambient monitoring data was obtained from the Texas Air Monitoring Information System web interface. These values represent the existing ambient air quality concentrations[46].

7.2.2 DISPERSION MODELING RESULTS

Table 9 shows the maximum predicted concentrations due to the expansion project for each pollutant and averaging period. Note: These are not total ambient concentrations. These are predicted increases in ground level concentrations due to new emissions from the proposed project[46]. These potential increases in ground level concentrations would be limited to a maximum distance identified below as the maximum area of impact or action area (maximum radius of approximately 2.6 miles limited to the 1-Hour NO_2 source emission).

Table 9. Maximum Predicted Concentrations[46]

Pollutant	Standard	Averaging Period	Project GLCmax (µg/m3)	SIL (µg/m3)	Less Than SIL?
NO_2	NAAQS	1-hour	29.6	7.5	No
		Annual	1.1	1	No
CO	NAAQS	1-hour	1143.6	2000	Yes
		8-hour	196.8	500	Yes
PM_{10}	NAAQS	24-hour	1.3	5	Yes
		Annual	0.3	1	Yes
$PM_{2.5}$	NAAQS	24-hour	1.17	1.2	Yes
		Annual	0.299	0.3	Yes
SO_2	NAAQS	1-hour	4.6	7.8	Yes
		3-hour	4.3	25	Yes
		24-hour	2.3	5	Yes
		Annual	0.3	1	Yes

The SIL is a level set by the EPA, below which, modeled source impacts would be considered insignificant. The GLCMax value is the maximum ground level concentration predicted by the model for each pollutant and averaging period resulting from this project. If a GLCMax value is less than the SIL, the modeled source impacts are considered insignificant and are not considered to cause or contribute to a violation of a NAAQS or PSD Increment for that pollutant and averaging period. If a GLCMax is greater than the SIL, additional analysis is required to demonstrate that the project would not cause or contribute to a violation of the NAAQS or PSD Increment for that pollutant and averaging period.

Ten out of twelve of the Project GLCMax values are less than the SIL: 1-Hour CO, 8-Hour CO, 24-Hour PM_{10}, annual PM_{10}, 24-Hour $PM_{2.5}$, annual $PM_{2.5}$, 1-Hour SO_2, 3-Hour SO_2, 24-Hour SO_2, and annual SO_2. These ten source impacts are considered insignificant based on stringent limits set to protect the most sensitive human populations. Therefore, these ten source impacts are not expected to impact federally-protected species and will be excluded from further analysis.

Project impacts for the following two out of twelve pollutants and averaging periods are greater than the designated SIL: 1-Hour NO_2 and annual NO_2.

Based on the methods and inputs described in Section 7.2.1, the dispersion model predicts concentrations at specific downwind receptor locations for both pollutant averaging periods that are predicted greater than the designated SIL. The coordinates of each receptor with modeled concentrations greater than the SIL for each averaging period were plotted to delineate

significant AOIs. Significant AOIs (represented by a blue dot) are shown on RPS Figures 1 and 2 (Appendix G). Note: The significant AOIs do not infer that the maximum concentration predicted for each pollutant averaging period will reach each location for each emission. Further, the plotted modeling results on Figures 1 and 2 (Appendix G) do not infer a frequency of occurrence, but rather a potential location of "significant impact" pollutant concentration.

RPS provided specific frequency results for the 1-Hour NO_2 source emission separate from the typical air dispersion modeling results. In general, each receptor is modeled as a single and separate emission event in which the concentration breeches the SIL. The frequency results indicate how many hours within a year the concentration for the 1-Hour NO_2 source emission will breech the SIL at each receptor location. This data is limited to receptors located over Sabine Lake and the Neches River. The number of hours within a year that the receptors over Sabine Lake and the Neches River breeched the SIL for the 1-Hour NO_2 source emission ranged from 1 – 138 out of 8760 (maximum of 1.6% of the hours in a year).

The significant AOIs located the farthest distance from the source in all directions were plotted to create a maximum AOI (mAOI) (theoretical) boundary, or otherwise referred to as the action area, for the 1-Hour NO_2 source emission. The potential impacts from the annual NO_2 source emission will not reach as far as the 1-Hour NO_2 source emission and did not contribute to the mAOI boundary. The modeling predicts all of the significant AOIs for the annual NO_2 source emission would be located within the existing ethylene cracker facility and TOTAL refinery boundaries (Figure 2 – Appendix G). The modeling also predicts the densest portion of the significant AOIs for the 1-Hr NO_2 source emission would be located within the existing ethylene cracker facility and TOTAL refinery boundaries (Figure 1 – Appendix G). The action area (maximum radius of approximately 2.6 miles) was utilized to analyze the potential impacts to protected species and/or their habitat by the proposed expansion project and is demonstrated in Figure 10 (Appendix A). The results of the analysis of potential impacts to protected species are presented in Section 8 below.

8.0 EFFECTS OF THE PROPOSED ACTION

This section presents the results of the analysis of potential impacts to federally-protected species as a result of the proposed expansion project. The following impact sources are included in the analysis: air quality, water quality, noise pollution, infrastructure-related disturbance,

human-related disturbance, and federally-protected species effects. This analysis is based on total emissions and dispersion modeling data provided by RPS, field survey and background review data collected by WGI, and literature review and research of potential effects of known pollutants on flora and fauna.

8.1 AIR POLLUTION EFFECTS BACKGROUND RESEARCH

Resources were searched extensively for data, documentation, or research regarding the potential effects of NO_2 on flora and fauna. WGI biologists also specifically searched for concentrations and length of time of exposure at which flora and/or fauna are impacted. Additional research included, but was not limited to, documentation of long-term exposure to airborne pollutants, short-term exposure to airborne pollutants, accumulation of pollutants in surface water, accumulation of pollutants in various ecosystems and habitat types, the potential for pollutants to impact vegetation composition, and potential impacts to the food chain. Information regarding the general impacts airborne pollutants can have on a variety of ecosystems is included. However, very little information was located that included specific concentrations at which impacts occur on a long-term or short-term basis. A list of research resources is available upon request.

According to EPA's "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals," the data presented in Table 11 (Section 8.2.3) indicate the level, at or above which, airborne pollutant concentrations are known to cause significant impacts on flora and fauna. Concentrations at, or in excess of, any of the screening concentrations would indicate that the source emission may have adverse impacts on plants or animals. The estimation of potential impacts on flora and fauna is highly variable and dependent upon site-specific conditions[47].

According to a publication focused on the affects of air pollution on biodiversity, in general, air pollution has a greater impact on lower life forms than higher life forms. Lower life forms that would likely be the first to be impacted would include lichens, bryophytes, fungi, and soft-bodied aquatic invertebrates. Impacts to adult higher life forms are typically the result of secondary impacts to the food chain and reproduction, with the exception of extreme exposure. Potential secondary impacts include acidification, changes in food or nutrient supply, or changes to biodiversity and competition. In general, plant communities are less adaptable to changes in air pollution than animals. Animals typically have the ability to migrate away from unfavorable conditions. Lower order animals, such as amphibians and fish, are known to be impacted by acidification as a result of the subsequent release of metals into water[48].

The Nature Conservancy and the Institute of Ecosystem Studies have published two documents that describe the known effects of airborne nitrogen and other airborne pollutants on various ecosystems in the eastern US. Airborne nitrogen dioxide is known to be converted into acid particles or acid precipitation. Both forms are deposited onto soils, vegetation, and surface waters[49].

The potential effects of airborne nitrogen dioxide on terrestrial ecosystems are generally long-term effects as opposed to short-term effects. Many soils are buffered against acid inputs and biodiversity changes are not immediately evident for vegetation species with a longer lifespan. The deposition of nitrogen can result in nitrate leaching, which can cause acidification of soils and surface waters as well as the release of aluminum, calcium, and magnesium[49]. Arthropods with high-calcium needs are some of the animals inhabiting the soil that can be impacted by soil acidification. The release of aluminum into soil water can harm plant roots. The leaching of aluminum into surface waters can be toxic to aquatic plants, fish, and other aquatic organisms[50]. The accumulation of nitrogen can impact plant species competition, thereby impacting plant species composition. Nitrogen accumulation can also lead to nitrogen saturation, which impacts microorganisms, plant production, and nitrogen cycling[49]. Additional potential terrestrial ecosystem effects include reduced forest productivity and increased vulnerability to pests and pathogens[50].

The potential effects of airborne nitrogen dioxide on aquatic ecosystems include acidification and eutrophication. The effects of acidification on water quality, whether introduced by direct acid deposition or leaching from adjacent terrestrial ecosystems, include increased acidity, reduced acid neutralization capacity, hypoxia, and mobilization of aluminum[49]. Stream and lake acidification can be chronic or episodic and both can be damaging. In general, larger aquatic ecosystems have a greater buffering capacity than smaller systems. Increased acidity can reduce dissolved organic carbon and increase light penetration and visibility through the water column. Increased light penetration can result in increased macrophyte and algal growth. Increased visibility can alter the predator-prey balance. Eutrophication is the over enrichment of nutrients into an aquatic system, which can result in excess algal growth. The decomposition of the excess algae can result in a decrease in dissolved oxygen, which can be harmful to fish and other aquatic organisms. Wetlands, estuaries, bays, and salt marshes are generally less impaired by acid deposition than other aquatic ecosystems. However, they are subject to eutrophication. Increased nitrogen in salt marshes often results in increased plant growth[50], which can be a positive or negative effect.

8.2 AIR QUALITY EFFECTS

8.2.1 EMISSIONS

RPS completed detailed pollutant emission calculations for the BFLP project in accordance with the Air Permit Amendment Application requirements. A summary of the total proposed annual emissions of each pollutant that would be emitted by the project are provided in Table 5 (Section 7.1).

RPS also performed dispersion modeling of the emissions of air pollutants from the proposed BFLP project in accordance with the PSD Permit requirements. The results of the modeling are provided as a summary of the maximum predicted concentrations in Table 9 (Section 7.2.2).

The only new and modified facilities associated with the project are the tenth furnace, the associated piping fugitives, and decoking facilities. The existing decoking facilities will not undergo any physical modifications; however, the increased utilization will require an increase in the allowable annual emission rates. The project is subject to PSD review for NO_x, CO, VOC, and PM/PM_{10}/$PM_{2.5}$. BFLP will utilize the best available control technology to control emissions from the project and thus minimize impacts to the surrounding environment to the maximum extent practicable. The proposed emissions limits of each pollutant are consistent with both the TCEQ BACT guidance and the most stringent limits in the RBLC; and, are considered to be the top level of control available for the new and modified facilities.

Emissions resulting from gasoline and diesel-fueled vehicles and equipment during construction and maintenance are considered negligible. The project will not require a significant increase in vehicle and equipment use compared to current daily emissions for the ethylene cracker facility.

8.2.2 FUGITIVE DUST

Dust will be emitted during the demolition of the existing concrete slab (40 Feet by 76 Feet). This emission will be minimal and will last a few days. Dust emissions are expected to be negligible after the concrete demolition activities are completed.

8.2.3 IMPACTS OF AIR POLLUTION SOURCES ON FLORA AND FAUNA

Since SILs are concentrations that represent thresholds of insignificant modeled source impacts, the pollutant concentrations predicted to be less than or equal to the SILs are expected to have

no significant impact on flora and fauna. Only the pollutant concentrations and averaging periods predicted to be greater than the SILs (annual NO_2 and 1-Hour NO_2) were considered for potential impact to flora and fauna in the areas surrounding the proposed project site.

The data presented in Table 11 below is taken directly from EPA's "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals." The concentrations presented in Table 11 reflect vegetation sensitivity only. Vegetation sensitivity was determined based on visible damage or growth effects. For the purposes of this BA, only the screening concentrations for vegetation with the highest sensitivity are included for comparison with predicted project concentrations in Table 11. By focusing on the most sensitive species, we are thereby comparing the lowest level concentrations at which potential impacts may occur. The pollutants screened in the EPA document for direct and indirect sensitivity to animals did not include any of the pollutants subject to PSD review for this project[47].

Table 11. Comparison of EPA's Screening Concentrations of Vegetation Sensitivity to Predicted Concentrations[47]

Pollutant	Averaging Period	Project GLCmax (mg/m3)	Total Concentration (mg/m3)	EPA Screening Concentrations (mg/m3)
NO2	4-hour	≤29.6	≤188	3760
	Annual	1.1	100	94-188

Although the total concentration for annual NO_2 is within the lower range of potential impacts to vegetation, the annual Project GLCmax concentration is a small fraction of the total concentration for the area. Since the potential impacts from the annual NO_2 concentration are limited to the existing facility and refinery boundaries (Figure 2 – Appendix G) and no protected species habitat was identified within these boundaries, the annual NO_2 source emission will not impact protected species habitat.

According to the EPA screening procedure, the concentration at which airborne NO_2 impacts vegetation rises exponentially with the decrease in length of exposure. An EPA screening concentration for 1-Hour NO_2 is not available. The screening concentrations not represented in Table 11 were not included in the EPA document, reportedly as a result of a lack of data available to provide a suitable screening concentration[47]. The screening concentration for 4-Hour NO_2 would be less than or equal to the screening concentration for 1-Hour NO_2. The

values for both the GLCmax and total concentrations for 1-Hour NO_2 are significantly below the EPA screening concentration for 4-Hour NO_2. Therefore, it is reasonable to assume that vegetation located within the action area for 1-Hour NO_2 will not be adversely impacted by the 1-Hour NO_2 source emission.

The action area for 1-Hour NO_2 is shown in Figure 1 (Appendix G) and Figure 9 (Appendix A). The portion of the action area outside of the facility and refinery boundaries has the potential to impact portions of the six observed habitat types: riverine, drainage canals, marshland, open water, mixed woodland, and pastureland. All six of these habitats may be utilized by migratory birds. Bald or Golden Eagles have the potential to utilize any of the six habitats. The Piping Plover has the potential to utilize portions of the riverine habitat (Neches River). Green sea turtles, Kemp's ridley sea turtles, loggerhead sea turtles, and bottlenose dolphins have the potential to utilize the open water habitat (Sabine Lake or the Intracoastal Waterway) or riverine habitat (Neches River). No additional federally-protected species are likely to utilize these areas.

The 1-Hour NO_2 concentration predicted to occur as a result of the expansion project is a fraction of the total concentration for the area. The total concentration for the area, which includes the predicted addition from the expansion project, is below the NAAQS limit, which is set to protect the most sensitive populations. The total concentration for the area is a fraction of the screening level the EPA has determined could impair vegetation. According to the research identified in Section 8.1, fauna, except soft-bodied invertebrates, are not impaired by airborne nitrogen dioxide with the exception of extreme levels of exposure. The potential for airborne nitrogen dioxide to directly alter the pH of surface waters was also considered. Given the infrequency of the predicted exposure of a concentration greater than the SIL to surface waters (i.e., maximum 1.5% of hours in the year over Sabine Lake or the Neches River) and the low concentration of airborne pollutant over large volumes of surface waters, it is reasonable to assume the emission resulting from the expansion project will not affect surface water pH. Any potential pH impact would be a rare and short-term event. Potential direct and short-term effects, resulting from the 1-Hour NO_2 source emission, are not expected. Therefore, the protected species and their habitats with the potential to occur within the action area for the 1-Hour NO_2 source emission will not likely be directly impacted by the proposed expansion project.

Based on the background research described above in Section 8.1, the potential effects on terrestrial habitats (mixed woodland and pastureland) from the 1-Hour NO_2 source emission

include indirect, long-term effects, such as nitrogen accumulation and nitrogen leaching into adjacent surface waters. Nitrogen accumulation occurs when more nitrogen is put into a system than the system can utilize or cycle out. Nitrogen leaching is a subsequent effect of nitrogen accumulation, in which an excess of nitrogen in soils is leached out in soil water and transferred into adjacent surface waters. If the deposition of nitrogen in the area exceeds the capacity of the system, the potential exists for nitrogen to be leached into adjacent surface waters. It is reasonable to assume that these indirect effects are more likely to be the result of an annual NO_2 concentration, rather than an infrequent 1-Hour NO_2 concentration. Since evidence of ecosystem impairment (i.e., vegetation damage, fish kills, absence of higher life forms) was not observed in the field and the total concentrations for the area are below the NAAQS level, it is reasonable to assume the terrestrial ecosystems surrounding the facility are currently sufficiently cycling nitrogen. The addition of short-term, infrequent nitrogen dioxide concentrations by the expansion project will not likely cause indirect, long-term effects to terrestrial ecosystems.

Based on the background research described above in Section 8.1, the potential effects on aquatic habitats (riverine, drainage canals, marshland, and open water) from NO_2 emissions include indirect, long-term effects, such as acidification or eutrophication. Acidification can be caused by direct acid deposition or leaching from adjacent terrestrial systems. Eutrophication is caused by the over enrichment of nutrients, such as nitrogen, into a system. Based on evidence provided above, acidification, resulting from deposition or leaching, is not likely to occur as a result of the proposed expansion project. If acidification is not likely to occur as a result of the proposed project, it is reasonable to assume the subsequent eutrophication will not occur.

Since it has been determined that the potential indirect effects are unlikely to occur as a result of the proposed expansion project, the protected species and their habitats with the potential to occur within the action area for the 1-Hour NO_2 source emission (Bald or Golden Eagles, migratory birds, Piping Plovers, green sea turtles, Kemp's ridley sea turtles, loggerhead sea turtles, and bottlenose dolphins) will not likely be indirectly impacted by the proposed expansion project.

8.3 WATER QUALITY EFFECTS

8.3.1 WASTEWATER

The BFLP facility wastewater that is generated on site is treated at the adjacent TOTAL Refinery prior to discharge under the TOTAL TPDES Permit No. WQ0000419-000 (EPA ID NO. TX0004201). The TOTAL Refinery wastewater outfall (Outfall 001) discharges to the Neches

River at the TOTAL Dock. The project would produce no additional wastewater impact. The additional water required by the project will be recycled within the Cracking System or lost to evaporation.

If ancillary areas are disturbed in support of the construction project, structural controls may be used to protect surrounding areas from impacted surface runoff. Runoff from within the site is directed through a series of onsite ditches and to a holding pond that allows runoff velocity to slow considerably, effectively allowing sedimentation to fall out of suspension and be retained in the pond system.

8.3.2 SURFACE WATER

The action area for 1-Hour NO_2 is shown in Figure 1 (Appendix G) and Figure 9 (Appendix A). The portion of the action area outside of the facility and refinery boundaries has the potential to impact portions of the six observed habitat types: riverine, drainage canals, marshland, open water, mixed woodland, and pastureland. All six of these habitats may be utilized by migratory birds. Bald or Golden Eagles have the potential to utilize any of the six habitats. The Piping Plover has the potential to utilize portions of the riverine habitat (Neches River). Green sea turtles, Kemp's ridley sea turtles, loggerhead sea turtles, and bottlenose dolphins have the potential to utilize the open water habitat (Sabine Lake or the Intracoastal Waterway) or riverine habitat (Neches River). No additional federally-protected species are likely to utilize these areas.

The potential for airborne nitrogen dioxide to directly alter the pH of surface waters was also considered. Given the infrequency of the predicted exposure of a concentration greater than the SIL to surface waters (i.e., maximum 1.5% of hours in the year over Sabine Lake or the Neches River) and the low concentration of airborne pollutant over large volumes of surface waters, it is reasonable to assume the emission resulting from the expansion project will not affect surface water pH. Any potential pH impact would be a rare and short-term event. Potential direct and short-term effects, resulting from the 1-Hour NO_2 source emission, are not expected. Therefore, the protected species and their habitats with the potential to occur within the action area for the 1-Hour NO_2 source emission will not likely be directly impacted by the proposed expansion project.

Based on the background research described above in Section 8.1, the potential effects on aquatic habitats (riverine, drainage canals, marshland, and open water) from NO_2 emissions include indirect, long-term effects, such as acidification or eutrophication. Acidification can be

caused by direct acid deposition or leaching from adjacent terrestrial systems. Eutrophication is caused by the over enrichment of nutrients, such as nitrogen, into a system. Based on evidence provided above, acidification, resulting from deposition or leaching, is not likely to occur as a result of the proposed expansion project. If acidification is not likely to occur as a result of the proposed project, it is reasonable to assume the subsequent eutrophication will not occur.

Since it has been determined that the potential indirect effects are unlikely to occur as a result of the proposed expansion project, the protected species and their habitats with the potential to occur within the action area for the 1-Hour NO_2 source emission (Bald or Golden Eagles, migratory birds, Piping Plovers, green sea turtles, Kemp's ridley sea turtles, loggerhead sea turtles, and bottlenose dolphins) will not likely be indirectly impacted by the proposed expansion project.

8.4 NOISE EFFECTS

BFLP project engineers estimate that noise levels during construction should be comparable to noise levels from maintenance activities that currently take place at the plant.

The best available technology shall be used to maintain noise levels of the furnace and auxiliary equipment below 85 decibels measured at a distance of 3-feet from the source.

No noise effects to wildlife are expected as a result of the infrastructure construction of the expansion project.

8.5 INFRASTRUCTURE-RELATED EFFECTS

Construction of the proposed expansion project involves the addition of a tenth cracking furnace to the existing operational nine furnaces within an existing ethylene cracker facility. The proposed project area is an existing concrete slab surrounded by industrial infrastructure and a caliche roadway. The majority of the cracker facility is industrial infrastructure, concrete, caliche, or asphalt. No vegetation or potential wildlife habitat will be directly impacted as a result of the infrastructure construction activities.

No additional effects to wildlife are expected as a result of the infrastructure construction of the expansion project.

8.6 HUMAN ACTIVITY EFFECTS

Construction and operation of the proposed expansion project will not require significant additional human activity compared to typical maintenance activities that occur at the plant on a regular basis.

No additional effects to wildlife are expected as a result of the increase in human activity associated with the expansion project.

8.7 FEDERALLY-PROTECTED SPECIES EFFECTS

8.7.1 FEDERALLY-LISTED SPECIES

8.7.1.1 Piping Plover

Potential to Occur in the Action Area

Piping Plovers are migratory birds and their breeding habitat is known to be the northern US and Canada. Therefore, the consideration of potential nesting habitat was excluded from this analysis. Potential habitat within the action area would be limited to wintering habitat (foraging and roosting). Preferred foraging habitat includes bare to sparsely vegetated beaches, 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. Preferred roosting habitat includes sandy beaches, often with cover such as driftwood, seaweed clumps, small dunes, and debris. Spoil islands along the Intracoastal Waterway are known to be utilized by Piping Plovers[34].

No habitat with the potential to support the Piping Plover was observed within the existing ethylene cracker facility.

Sabine Lake is approximately 1.1 miles to the east-southeast of the project area at its closest point. The Intracoastal Waterway and Sabine Lake are high barge and commercial vessel traffic areas. The majority of the shorelines of Sabine Lake and the Intracoastal Waterway are commercially or industrially developed. The majority of the shoreline of Pleasure Island is lined with rip rap, or other measures, to minimize erosion. Pleasure Island is a man-made island and used as a spoil bank for dredged material[45]. The Neches River is approximately 1.8 miles to the north of the project area at its closest point. Portions of the banks of the Neches River are

recreationally, commercially, or industrially developed. Portions of the shorelines of Stewts Island and Humble Island are utilized for temporary vessel storage.

Marginal potential foraging and roosting habitat for the Piping Plover was observed within, and adjacent to, the action area. Within the action area, marginal foraging and roosting habitat is limited to the Neches River and the northern tip of Pleasure Island. No Piping Plover individuals were observed during the habitat evaluation survey.

Piping Plovers are known to prefer areas immediately adjacent to the coastline. The action area is located approximately 19 miles inland from the coast. The closest UFWS designated critical habitat for the Piping Plover is approximate 19 miles south of the action area[41]. Piping plovers are also known to occupy areas co-occupied by other shorebirds. Few of the potential habitat areas observed were occupied by other shorebirds. The closest recorded observation of Piping Plovers found occurred prior to Hurricane Ike on McFaddin Beach, near Sabine Pass (approximately 19 miles south of the action area)[44].

Potential foraging and roosting habitat for the Piping Plover exists within portions of the action area. However, Piping Plovers are not known to occur, and are unlikely to occur, within the action area for this project.

Potential Effects to Piping Plovers

Potential foraging and roosting habitat for the Piping Plover exists within portions of the action area. However, Piping Plovers are not known to occur, and are unlikely to occur, within the action area for this project. Details of this determination are provided above in Section 8.7.1.1 Piping Plover – Potential to Occur in the Action Area.

The Piping Plover will not be directly impacted by construction activities associated with the completion of the expansion project, noise pollution, or human disturbance. All wastewater associated with construction and operation of the expansion project will be treated onsite or in the neighboring TOTAL Refinery and will not impact the Piping Plover.

As described in Section 8.0, the Piping Plover would not be directly impacted by air emissions resulting from the expansion project.

As described in Section 8.0, neither acidification, resulting from deposition or leaching, nor eutrophication in aquatic habitats are likely to occur as a result of the proposed expansion

project. Therefore, the Piping Plover would not likely be impacted by indirect effects resulting from the expansion project, should they occur near the project area.

Determination of Effect

The proposed action may affect, is not likely to adversely affect Piping Plovers.

8.7.1.2 Green Sea Turtle

Potential to Occur in the Project Area

Nesting occurs on high energy oceanic beaches, primarily on islands with minimal disturbance. Juveniles and adults primarily occupy benthic feeding grounds in shallow, protected waters. Preferred feeding grounds include pastures of seagrasses and/or algae[39].

No habitat with the potential to support the green sea turtle was observed within the existing ethylene cracker facility.

A portion of Sabine Lake, the Intracoastal Waterway, and the Neches River is included within the action area. Sabine Lake is approximately 1.1 miles to the east-southeast at its closest point. The shoreline of Sabine Lake and Intracoastal Waterway near the proposed project area primarily consists of dock facilities, industrial development, and a seawall. The portion of Sabine Lake and the Intracoastal Waterway included in the action area is industrially and commercially developed, has a maintained, dredged channel, and is considered a high traffic area for cargo vessels. The Neches River is approximately 1.8 miles to the north of the project area at its closest point. Portions of the banks of the Neches River have been recreationally, commercially, or industrially developed.

The portions of Sabine Lake, the Intracoastal Waterway, and the Neches River within the action area do not possess preferred green sea turtle nesting or feeding habitat. However, green sea turtles have been intermittently observed within areas of Sabine Lake[43]. These occurrences have been infrequent. No occurrences of the green sea turtle have been recorded within at least 15 miles of the project site[42] and no designated critical habitat is located within at least 16 miles of the project site[41]. Although the portion of Sabine Lake within the action area does not possess preferred habitat, the chance exists for the green sea turtle to incidentally occur in this area.

Potential Effects to Green Sea Turtles

Preferred green sea turtle nesting or feeding habitat is not documented within at least 16 miles of the project site. However, green sea turtles have been intermittently observed within areas of Sabine Lake[43].

The green sea turtle will not be directly impacted by construction activities associated with the completion of the expansion project, noise pollution, or human disturbance. All wastewater associated with construction and operation of the expansion project will be treated onsite or in the neighboring TOTAL Refinery and will not impact the green sea turtle.

As described in Section 8.0, the green sea turtle would not be directly impacted by air emissions resulting from the expansion project.

As described in Section 8.0, neither acidification, resulting from deposition or leaching, nor eutrophication in aquatic habitats are likely to occur as a result of the proposed expansion project. Therefore, the green sea turtle would not likely be impacted by indirect effects resulting from the expansion project.

Determination of Effect

The proposed action may affect, is not likely to adversely affect green sea turtles.

8.7.1.3 Hawksbill Sea Turtle

Potential to Occur in the Action Area

Preferred nesting habitat includes low and high energy, vegetated beaches in tropical oceans with a variety of substrates. Juveniles and adults primarily occupy their primary foraging habitat, coral reefs[36].

No habitat with the potential to support the hawksbill sea turtle was observed within the existing ethylene cracker facility.

A portion of Sabine Lake, the Intracoastal Waterway, and the Neches River is included within the action area. Sabine Lake is approximately 1.1 miles to the east-southeast at its closest point. The shoreline of Sabine Lake and Intracoastal Waterway near the proposed project area primarily consists of dock facilities, industrial development, and a seawall. The portion of Sabine Lake and the Intracoastal Waterway included in the action area is industrially and

commercially developed, has a maintained, dredged channel, and is considered a high traffic area for cargo vessels. The Neches River is approximately 1.8 miles to the north of the project area at its closest point. Portions of the banks of the Neches River have been recreationally, commercially, or industrially developed.

The portions of Sabine Lake, the Intracoastal Waterway, and the Neches River within the action area do not possess preferred nesting or feeding habitat. Further, no sources have been found to indicate the hawksbill sea turtles have been observed within Sabine Lake, the Intracoastal Waterway, or the Neches River. Any potential occurrence would be highly unlikely. No occurrences of the hawksbill sea turtle have been recorded within at least 15 miles of the project site[42] and no designated critical habitat is located within at least 16 miles of the project site[41].

Habitat with the potential to support the hawksbill sea turtle was not identified and hawksbills are highly unlikely to occur within the action area for this project.

Potential Effects to Hawksbill Sea Turtles

Potential habitat to support the hawksbill sea turtle was not identified within at least 16 miles of the proposed project area. No sources have been found to indicate the hawksbill sea turtles have been observed within Sabine Lake, the Intracoastal Waterway, or the Neches River[43].

The hawksbill sea turtle will not be directly impacted by construction activities associated with the completion of the expansion project, noise pollution, or human disturbance. All wastewater associated with construction and operation of the expansion project will be treated onsite or in the neighboring TOTAL Refinery and will not impact the hawksbill sea turtle.

As described in Section 8.0, the hawksbill sea turtle would not be directly impacted by air emissions resulting from the expansion project, should they occur within the action area.

As described in Section 8.0, neither acidification, resulting from deposition or leaching, nor eutrophication in aquatic habitats are likely to occur as a result of the proposed expansion project. Therefore, the hawksbill sea turtle would not likely be impacted by indirect effects resulting from the expansion project, should they occur within the action area.

Determination of Effect

The proposed action will have no effect on the hawksbill sea turtle.

8.7.1.4 Kemp's Ridley Sea Turtle

Potential to Occur in the Action Area

Nesting occurs on high energy oceanic beaches, primarily adjacent to extensive swamps or large bodies of open water. This turtle is a shallow water benthic feeder with a diet consisting primarily of shrimp, jellyfish, snails, sea stars, and swimming crabs[38].

No habitat with the potential to support the Kemp's ridley sea turtle was observed within the existing ethylene cracker facility.

A portion of Sabine Lake, the Intracoastal Waterway, and the Neches River is included within the action area. Sabine Lake is approximately 1.1 miles to the east-southeast at its closest point. The shoreline of Sabine Lake and Intracoastal Waterway near the proposed project area primarily consists of dock facilities, industrial development, and a seawall. The portion of Sabine Lake and the Intracoastal Waterway included in the action area is industrially and commercially developed, has a maintained, dredged channel, and is considered a high traffic area for cargo vessels. The Neches River is approximately 1.8 miles to the north of the project area at its closest point. Portions of the banks of the Neches River have been recreationally, commercially, or industrially developed.

The portions of Sabine Lake, the Intracoastal Waterway, and the Neches River within the action area do not possess preferred Kemps' ridley sea turtle nesting habitat. The portions of Sabine Lake that are not dredged are potential foraging habitat for the Kemp's ridley. These sea turtles have been intermittently observed within areas of Sabine Lake[43]. These occurrences have been infrequent. According to the TNDD results, one known occurrence of the Kemp's ridley sea turtle was recorded approximately 10 miles south of the project site, towards the southern end of Sabine Lake[42]. No designated critical habitat is located within at least 16 miles of the project site[41]. Since the portion of Sabine Lake within the action area has the potential to have preferred foraging habitat, the chance exists for the Kemp's ridley sea turtle to incidentally occur in this area.

Potential Effects to Kemp's Ridley Sea Turtles

Preferred Kemp's ridley sea turtle nesting habitat was not identified within at least 16 miles of the proposed project area. The closest potential foraging habitats to the project site are the non-

dredged portions of Sabine Lake. Kemp's ridley sea turtles have been intermittently observed within areas of Sabine Lake[43].

The Kemp's ridley sea turtle will not be directly impacted by construction activities associated with the completion of the expansion project, noise pollution, or human disturbance. All wastewater associated with construction and operation of the expansion project will be treated onsite or in the neighboring TOTAL Refinery and will not impact the Kemp's ridley.

As described in Section 8.0, the Kemp's ridley sea turtle would not be directly impacted by air emissions resulting from the expansion project.

As described in Section 8.0, neither acidification, resulting from deposition or leaching, nor eutrophication in aquatic habitats are likely to occur as a result of the proposed expansion project. Therefore, the Kemp's ridley sea turtle would not likely be impacted by indirect effects resulting from the expansion project.

Determination of Effect

The proposed action may affect, is not likely to adversely affect Kemp's ridley sea turtles.

8.7.1.5 Leatherback Sea Turtle

Potential to Occur in the Action Area

Preferred nesting habitat includes 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. Juveniles and adults are pelagic and primarily occupy deep water habitat[40].

No habitat with the potential to support the leatherback sea turtle was observed within the existing ethylene cracker facility.

A portion of Sabine Lake, the Intracoastal Waterway, and the Neches River is included within the action area. Sabine Lake is approximately 1.1 miles to the east-southeast at its closest point. The shoreline of Sabine Lake and Intracoastal Waterway near the proposed project area primarily consists of dock facilities, industrial development, and a seawall. The portion of Sabine Lake and the Intracoastal Waterway included in the action area is industrially and commercially developed, has a maintained, dredged channel, and is considered a high traffic

area for cargo vessels. The Neches River is approximately 1.8 miles to the north of the project area at its closest point. Portions of the banks of the Neches River have been recreationally, commercially, or industrially developed.

The portions of Sabine Lake and the Intracoastal Waterway within the action area do not possess preferred nesting or feeding habitat. Further, no sources have been found to indicate the leatherback sea turtles have been observed within Sabine Lake. Any potential occurrence would be highly unlikely. No occurrences of the leatherback sea turtle have been recorded within at least 15 miles of the project site[42] and no designated critical habitat is located within at least 16 miles of the project site[41].

Habitat with the potential to support the leatherback sea turtle was not identified and leatherbacks are highly unlikely to occur within the action area for this project.

Potential Effects to Leatherback Sea Turtles

Potential habitat to support the leatherback sea turtle was not identified within at least 16 miles of the proposed project area. No sources have been found to indicate the leatherback sea turtles have been observed within Sabine Lake, the Intracoastal Waterway, or the Neches River[43].

The leatherback sea turtle will not be directly impacted by construction activities associated with the completion of the expansion project, noise pollution, or human disturbance. All wastewater associated with construction and operation of the expansion project will be treated onsite or in the neighboring TOTAL Refinery and will not impact the leatherback.

As described in Section 8.0, the leatherback sea turtle would not be directly impacted by air emissions resulting from the expansion project, should they occur within the action area.

As described in Section 8.0, neither acidification, resulting from deposition or leaching, nor eutrophication in aquatic habitats are likely to occur as a result of the proposed expansion project. Therefore, the leatherback sea turtle would not likely be impacted by indirect effects resulting from the expansion project, should they occur within the action area.

Determination of Effect

The proposed action will have no effect on the leatherback sea turtle.

8.7.1.6 Loggerhead Sea Turtle

Potential to Occur in the Action Area

Nesting occurs 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. This turtle is a shallow water benthic feeder with a diet consisting primarily of shrimp, jellyfish, snails, sea stars, and swimming crabs[37].

No habitat with the potential to support the loggerhead sea turtle was observed within the existing ethylene cracker facility.

A portion of Sabine Lake, the Intracoastal Waterway, and the Neches River is included within the action area. Sabine Lake is approximately 1.1 miles to the east-southeast at its closest point. The shoreline of Sabine Lake and Intracoastal Waterway near the proposed project area primarily consists of dock facilities, industrial development, and a seawall. The portion of Sabine Lake and the Intracoastal Waterway included in the action area is industrially and commercially developed, has a maintained, dredged channel, and is considered a high traffic area for cargo vessels. The Neches River is approximately 1.8 miles to the north of the project area at its closest point. Portions of the banks of the Neches River have been recreationally, commercially, or industrially developed.

The portions of Sabine Lake and the Intracoastal Waterway within the action area do not possess preferred loggerhead sea turtle nesting habitat. The portions of Sabine Lake that are not dredged are potential foraging habitat for the loggerhead. These sea turtles have been intermittently observed within areas of Sabine Lake[43]. These occurrences have been infrequent. No occurrences of the loggerhead sea turtle have been recorded within at least 15 miles of the project site[42] and no designated critical habitat is located within at least 16 miles of the project site[41]. Since the portion of Sabine Lake within the action area has the potential to have preferred foraging habitat, the chance exists for the loggerhead sea turtle to incidentally occur in this area.

Potential Effects to Loggerhead Sea Turtles

Preferred loggerhead sea turtle nesting habitat was not identified within at least 16 miles of the proposed project area. The closest potential foraging habitats to the project site are the non-dredged portions of Sabine Lake. Loggerhead sea turtles have been intermittently observed within areas of Sabine Lake, the Intracoastal Waterway, or the Neches River[43].

The loggerhead sea turtle will not be directly impacted by construction activities associated with the completion of the expansion project, noise pollution, or human disturbance. All wastewater associated with construction and operation of the expansion project will be treated onsite or in the neighboring TOTAL Refinery and will not impact the loggerhead.

As described in Section 8.0, the loggerhead sea turtle would not be directly impacted by air emissions resulting from the expansion project.

As described in Section 8.0, neither acidification, resulting from deposition or leaching, nor eutrophication in aquatic habitats are likely to occur as a result of the proposed expansion project. Therefore, the loggerhead sea turtle would not likely be impacted by indirect effects resulting from the expansion project.

Determination of Effect

The proposed action may affect, is not likely to adversely affect loggerhead sea turtles.

8.7.2 MIGRATORY BIRDS

Potential to Occur in the Action Area

No habitat with the potential to support migratory birds was observed within the existing ethylene cracker facility.

As described in Section 6.2, a variety of migratory birds have the potential to utilize the habitats surrounding the proposed project area, including the residential areas. A variety of species of migratory birds were observed in select habitats surrounding the project location, including wading birds and songbirds. The habitats surrounding the facility range in quality from low to moderate and have historically been subject to commercial and industrial activities. According to the TNDD results, no recorded rookeries are located within 2 miles of the project area[42].

Select migratory birds are likely to occur in all habitats surrounding the proposed project area, excluding existing industrial facilities. The frequency of occurrence and species of migratory birds in each habitat is dependent upon habitat characteristics and quality.

Potential Effects to Migratory Birds

Habitat with the potential to support migratory birds was not observed within the existing ethylene cracker facility. However, a variety of migratory birds has the potential to and

currently do utilize the habitats surrounding the proposed project area, excluding existing industrial facilities.

Migratory birds will not be directly impacted by construction activities associated with the completion of the expansion project, noise pollution, or human disturbance. All wastewater associated with construction and operation of the expansion project will be treated onsite or in the neighboring TOTAL Refinery and will not impact migratory birds.

As described in Section 8.0, migratory birds would not be directly impacted by air emissions resulting from the expansion project.

As described in Section 8.0, nitrogen accumulation, acidification, resulting from deposition or leaching, and eutrophication in terrestrial or aquatic habitats are not likely to occur as a result of the proposed expansion project. Therefore, migratory birds would not likely be impacted by indirect effects resulting from the expansion project.

Determination of Effect

The take of migratory birds is not anticipated as a result of this project.

Note: The term "take" represents the more specific language of the Migratory Bird Treaty Act described above in Section 3.3.

8.7.3 BALD AND GOLDEN EAGLES

Potential to Occur in the Action Area

No habitat with the potential to support Bald or Golden Eagles was observed within the existing ethylene cracker facility.

Select areas surrounding the project area are potential feeding habitats for Bald or Golden Eagles. Select wooded areas are potential nesting habitats for Bald Eagles. However, these wooded areas would be considered low quality nesting sites. The areas surrounding the project site are impacted by residential, commercial, and industrial development. The portion of Sabine Lake and the Intracoastal Waterway included in the action area is industrially and commercially developed, has a maintained, dredged channel, and is considered a high traffic area for cargo vessels. Portions of the banks of the Neches River located within the action area have been recreationally, commercially, or industrially developed.

No sources have been found to indicate Bald or Golden Eagles have been observed near the proposed project area. No occurrences of Bald or Golden Eagles have been recorded within at least 15 miles of the project site[42]. Bald or Golden Eagles are highly unlikely to occur within the action area for this project.

Potential Effects to Bald and Golden Eagles

The potential exists for Bald Eagles to utilize the select habitats surrounding the existing cracker facility. No sources have been found to indicate Bald or Golden Eagles have been observed near the project area.

Bald or Golden Eagles will not be directly impacted by construction activities associated with the completion of the expansion project, noise pollution, or human disturbance. All wastewater associated with construction and operation of the expansion project will be treated onsite or in the neighboring TOTAL Refinery and will not impact these eagles.

As described in Section 8.0, Bald or Golden Eagles would not be directly impacted by air emissions resulting from the expansion project.

As described in Section 8.0, nitrogen accumulation, acidification, resulting from deposition or leaching, and eutrophication in terrestrial or aquatic habitats are not likely to occur as a result of the proposed expansion project. Therefore, Bald or Golden Eagles would not likely be impacted by indirect effects resulting from the expansion project.

Determination of Effect

The take of Bald or Golden Eagles is not anticipated as a result of this project.

Note: The term "take" represents the more specific language of the Bald and Golden Eagle Protection Act described above in Section 3.4.

8.7.4 MARINE MAMMALS

Potential to Occur in the Action Area

The only marine mammal with the potential to occur near the project area is the bottlenose dolphin. Preferred habitat includes warm, shallow bays, lagoons, and large rivers. Bottlenose dolphins travel throughout a wide territory for preferred habitat and feeding grounds and feed on a squid, shrimp, eels, and a variety of fishes.

No habitat with the potential to support marine mammals was observed within the existing ethylene cracker facility.

A portion of Sabine Lake, the Intracoastal Waterway, and the Neches River is included within the action area. Sabine Lake is approximately 1.1 miles to the east-southeast at its closest point. The shoreline of Sabine Lake and Intracoastal Waterway near the proposed project area primarily consists of dock facilities, industrial development, and a seawall. The portion of Sabine Lake and the Intracoastal Waterway included in the action area is industrially and commercially developed, has a maintained, dredged channel, and is considered a high traffic area for cargo vessels. The Neches River is approximately 1.8 miles to the north of the project area at its closest point. Portions of the banks of the Neches River have been recreationally, commercially, or industrially developed.

This dolphin has the potential to utilize the Neches River, the Intracoastal Waterway, and Sabine Lake[43]. No sources have been found to confirm or deny the occurrence or frequency of occurrence of the bottlenose dolphins in this area. Since the portion of Sabine Lake within the action area has the potential to have preferred feeding habitat, the chance exists for the bottlenose dolphin to occur in this area.

Potential Effects to Marine Mammals

The only marine mammal with the potential to occur near the project area is the bottlenose dolphin. This dolphin has the potential to utilize the Neches River, the Intracoastal Waterway, and Sabine Lake[43]. Occurrences of the bottlenose dolphin within the action area would infrequent and intermittent.

The bottlenose dolphin will not be directly impacted by construction activities associated with the completion of the expansion project, noise pollution, or human disturbance. All wastewater associated with construction and operation of the expansion project will be treated onsite or in the neighboring TOTAL Refinery and will not impact these dolphins.

As described in Section 8.0, bottlenose dolphins would not be directly impacted by air emissions resulting from the expansion project.

As described in Section 8.0, nitrogen accumulation, acidification, resulting from deposition or leaching, and eutrophication in terrestrial or aquatic habitats are not likely to occur as a result of

the proposed expansion project. Therefore, bottlenose dolphins would not likely be impacted by indirect effects resulting from the expansion project.

Determination of Effect

The take of marine mammals, including the bottlenosed dolphin, is not anticipated as a result of this project.

Note: The term "take" represents the more specific language of the Marine Mammal Protection Act described above in Section 3.5.

9.0 CONCLUSIONS

This section is a summary of WGI's recommended determination of effect for all federally-protected species, a description of any interdependent and interrelated actions, and a description of any anticipated cumulative effects resulting from the proposed project.

9.1 DETERMINATION OF EFFECT

The recommended determinations of effect for all federally-protected species with the potential to occur within habitat located within the action area (maximum radius of approximately 2.6 miles) are summarized below in Table 12.

Table 12. Determination of Effect Summary

Federally-Protected Species	Determination of Effect
Piping Plover	May Affect, Not Likely to Adversely Affect
Green Sea Turtle	May Affect, Not Likely to Adversely Affect
Hawksbill Sea Turtle	No Effect
Kemp's Ridley Sea Turtle	May Affect, Not Likely to Adversely Affect
Leatherback Sea Turtle	No Effect
Loggerhead Sea Turtle	May Affect, Not Likely to Adversely Affect

* The term "take" represents the more specific language of the Migratory Bird Treaty Act described above in Section 3.3.
** The term "take" represents the more specific language of the Bald and Golden Eagle Protection Act described above in Section 3.4.
*** The term "take" represents the more specific language of the Marine Mammal Protection Act described above in Section 3.5.

As described in Section 8.7, the take of migratory birds, Bald or Golden Eagles, or marine mammals is not anticipated as a result of this project.

9.2 INTERDEPENDENT AND INTERRELATED ACTIONS

The proposed project is limited to the construction of the tenth furnace and operation of the expanded ethylene cracker facility as outlined in Section 4.0. No additional interdependent or interrelated actions are proposed at this time.

9.3 CUMULATIVE EFFECTS

The project site is located within an industrial area. Multiple industrial facilities have historically been and continue to be operational within Port Arthur and Jefferson County, Texas. The area is likely to experience additional industrial development over time. In addition to the industrial facilities, the Port of Port Arthur is a constant source of barge and commercial vessel traffic that will continue to have an impact on the surrounding areas in the future.

As with the proposed expansion project, any new proposed developments may have the potential to impact federally-protected species. However, WGI is not aware of any specific projects planned for this area at this time.

No additional actions with the potential to impact federally-protected species are planned for the ethylene cracker facility at this time.

9.4 CONSERVATION MEASURES

The construction of the proposed expansion project will likely have no direct or indirect impact on federally-protected species habitat.

BFLP plans to utilize the BACT to the project control emissions and thus minimize impacts to the surrounding environment to the maximum extent practicable. The proposed emissions of each pollutant subject to PSD review are consistent with both the TCEQ BACT guidance and the most stringent limit in the RBLC; and, are considered to be the top level of control available for the new and modified facilities.

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[46]RPS. 31 October 2011. Modeling Methodology. Unpublished document.

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[49]Gary M. Lovett and Timothy H. Tear. *Effects of Atmospheric Deposition on Biological Diversity in the Eastern United States.* (Institute of Ecosystem Studies and The Nature Conservancy, 2007).

[50]Gary M. Lovett and Timothy H. Tear. *Threats from Above, Air Pollution Impacts on Ecosystems and Biological Diversity in the Eastern United States*. (Institute of Ecosystem Studies and The Nature Conservancy, 2008).

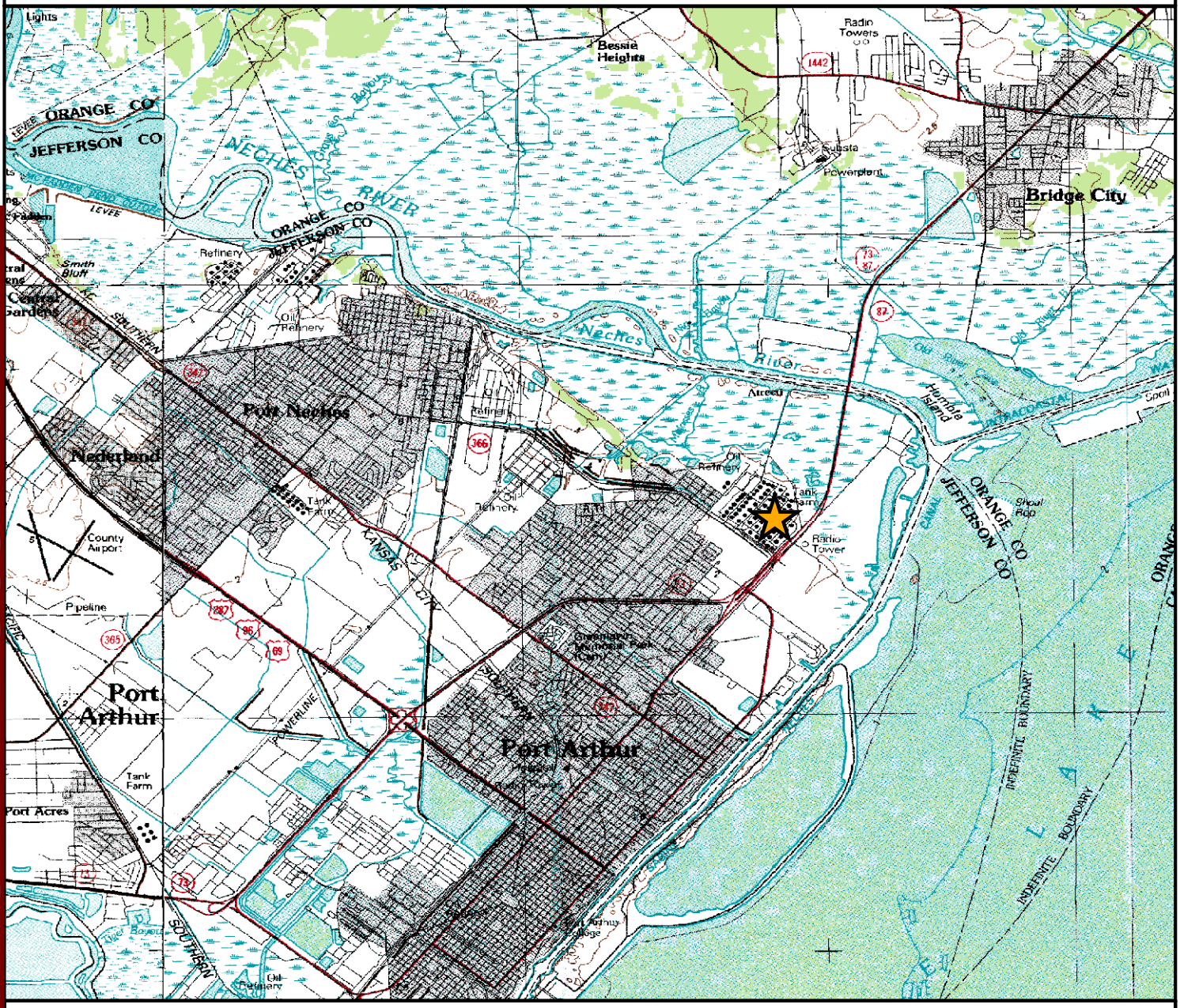
11.0 LIST OF PREPARERS

Jayme A. Shiner, Ecologist	PWS, B.S. General Biology
Scott W. Jecker, Senior Scientist	CWB, PWS, M.S. Wildlife Biology

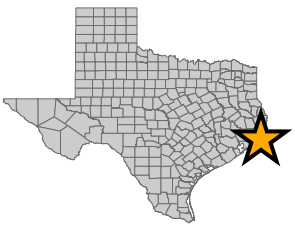
APPENDIX A

FIGURES 1-10

Figure 1
Project Location
BFLP Ethylene Cracker Expansion Project
Jefferson County, Texas



★ Project Location



Background Resources: USGS 100K DRG Port Acres, Beaumont East Port Arthur North, Terry	Surveyor(s): Jayme Shiner PWS	Project Number and Information: 1125 BFLP Ethylene Cracker Expansion Biological Assessment	Whitenton Group, Inc. ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XT UTM NAD 1983 Zone 15 North	Map Created: 06/28/2011 by Jayme Shiner		0 3,750 7,500 15,000 Feet

Figure 2
Construction Area - 2010 Aerial Photograph
BFLP Ethylene Cracker Expansion Project
Jefferson County, Texas

Highway

Major Road

Construction Area
(40 Feet X 76 Feet)

Background Resources: USGS 1 Meter DOQQ (2010) Port Arthur North (NE) ESRI StreetMap USA (2006)	Surveyor(s): Jayme Shiner PWS	Project Number and Information: 1125 BFLP Ethylene Cracker Expansion Biological Assessment	Whitenton Group, Inc. ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XT UTM NAD 1983 Zone 15 North	Map Created: 8/23/2011 by Jayme Shiner		0 125 250 500 Feet

Figure 3
Survey Area - 2010 Aerial Photograph
BFLP Ethylene Cracker Expansion Project
Jefferson County, Texas

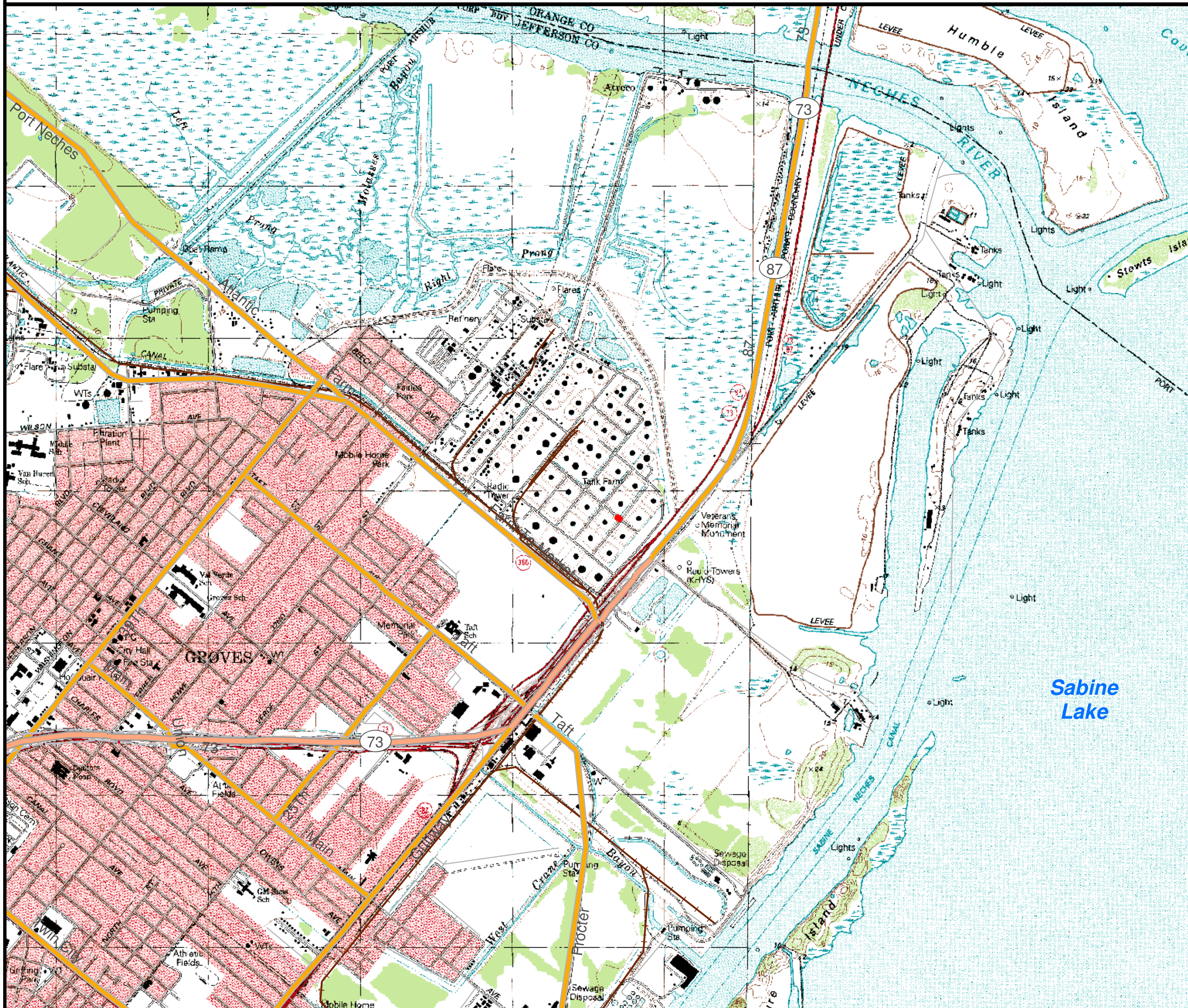
Highway

Major Road

Construction Area (40 Feet X 76 Feet)

Background Resources: USGS 1 Meter DOQQ (2010) Port Arthur North (NE, SE) West of Greens Bayou (NW, SW) ESRI StreetMap USA (2006)	Surveyor(s): Jayme Shiner PWS	Project Number and Information: 1125 BFLP Ethylene Cracker Expansion Biological Assessment	Whitenton Group, Inc. ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XT UTM NAD 1983 Zone 15 North	Map Created: 8/23/2011 by Jayme Shiner		0 1,250 2,500 5,000 Feet

Figure 4
Survey Area - 1993 Topographic Map
BFLP Ethylene Cracker Expansion Project
Jefferson County, Texas



Highway

Major Road

Construction Area
(40 Feet X 76 Feet)

Background Resources: USGS 24K DRG (1993) Port Arthur North West of Greens Bayou ESRI StreetMap USA (2006)	Surveyor(s): Jayme Shiner PWS	Project Number and Information: 1125 BFLP Ethylene Cracker Expansion Biological Assessment	Whitenton Group, Inc. ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XT UTM NAD 1983 Zone 15 North	Map Created: 8/23/2011 by Jayme Shiner		0 1,250 2,500 5,000 Feet

Figure 5
Survey Area - 2010 Aerial Photograph
BFLP Ethylene Cracker Expansion Project
FEMA Floodplain Data
Jefferson County, Texas

Highway

Major Road

Construction Area (40 Feet X 76 Feet)

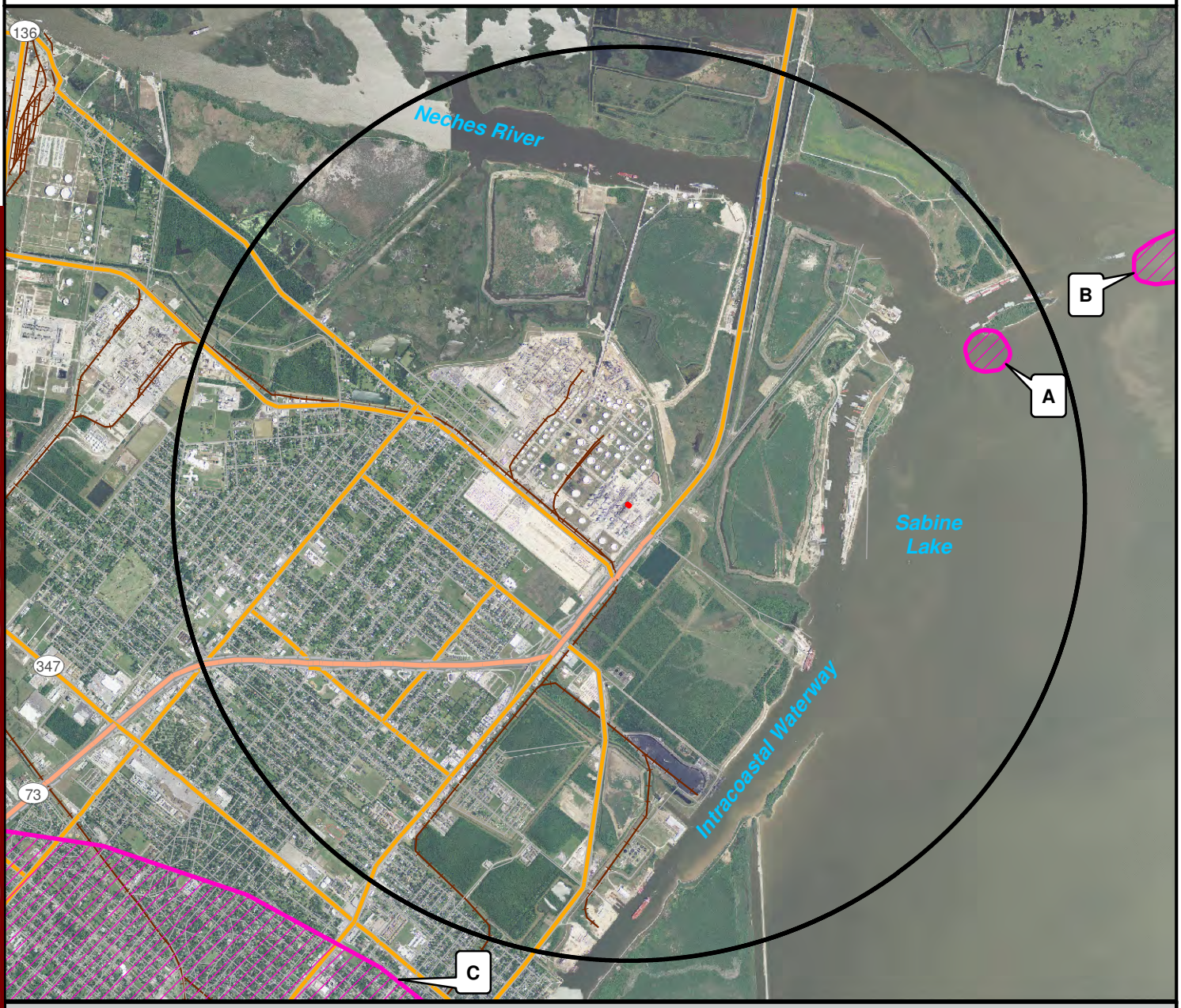
Designated FEMA 100-Year Floodplain

Background Resources: USGS 1 Meter DOQQ (2010) Port Arthur North (NE, SE) West of Greens Bayou (NW, SW) ESRI StreetMap USA (2006) FEMA Floodplain Data (1998)	Surveyor(s): Jayme Shiner PWS	Project Number and Information: 1125 BFLP Ethylene Cracker Expansion Biological Assessment	Whitenton Group, Inc. ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XT UTM NAD 1983 Zone 15 North	Map Created: 8/23/2011 by Jayme Shiner		0 1,250 2,500 5,000 Feet

Figure 6
Survey Area - 2010 Aerial Photograph
BFLP Ethylene Cracker Expansion Project
National Wetland Inventory Data
Jefferson County, Texas

Background Resources: USGS 1 Meter DOQQ (2010) Port Arthur North (NE, SE) West of Greens Bayou (NW, SW) ESRI StreetMap USA (2006) USFWS NWI Data (2009)	Surveyor(s): Jayme Shiner PWS	Project Number and Information: 1125 BFLP Ethylene Cracker Expansion Biological Assessment	Whitenton Group, Inc. ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XT UTM NAD 1983 Zone 15 North	Map Created: 8/23/2011 by Jayme Shiner		0 1,250 2,500 5,000 Feet

Figure 7
Survey Area - 2010 Aerial Photograph
BFLP Ethylene Cracker Expansion Project
Texas Natural Diversity Database Results
Jefferson County, Texas



Highway

Major Road

Construction Area (40 Feet X 76 Feet)

2.6-Mile Radius Boundary Around Construction Area

TNDD Polygons
A - Rookery
B - Rookery
C - Gulf Saltmarsh Snake (State - Listed Species)

Background Resources: USGS 1 Meter DOQQ (2010) Port Arthur North (NE, SE) West of Greens Bayou (NW, SW) ESRI StreetMap USA (2006) TPWD TND Data (2011)	Surveyor(s): Jayme Shiner PWS	Project Number and Information: 1125 BFLP Ethylene Cracker Expansion Biological Assessment	Whitenton Group, Inc. ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XT UTM NAD 1983 Zone 15 North	Map Created: 8/23/2011 by Jayme Shiner		0 2,500 5,000 Feet

Figure 8
Survey Area - 2010 Aerial Photograph
BFLP Ethylene Cracker Expansion Project
Observed Habitats
Jefferson County, Texas

Highway
Major Road
Construction Area (40 Feet X 76 Feet)
Riverine Habitat
Drainage Canals Habitat
Marshland Habitat
Open Water Habitat
Mixed Woodland Habitat
Pastureland Habitat

Background Resources: USGS 1 Meter DOQQ (2010) Port Arthur North (NE, SE) West of Greens Bayou (NW, SW) ESRI StreetMap USA (2006)	Surveyor(s): Jayme Shiner PWS	Project Number and Information: 1125 BFLP Ethylene Cracker Expansion Biological Assessment	Whitenton Group, Inc. ENVIRONMENTAL CONSULTANTS 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XT UTM NAD 1983 Zone 15 North	Map Created: 8/23/2011 by Jayme Shiner		0 0.5 1 Miles

Figure 9
Survey Area - 2010 Aerial Photograph
BFLP Ethylene Cracker Expansion Project
Piping Plover Habitat Evaluation Results
Jefferson County, Texas

- Highway
- Major Road
- Construction Area (40 Feet X 76 Feet)
- Action Area Boundary (Maximum Radius ~2.6 Miles)
- Piping Plover Habitat Evaluation Boundary
- Potential Piping Plover Roosting and Foraging Habitat

Background Resources:
USGS 1 Meter DOQQ (2010)
Port Arthur North (NE, SE)
West of Greens Bayou (NW, SW)
ESRI StreetMap USA (2006)

Surveyor(s):
Jayme Shiner PWS

Project Number and Information:
1125
BFLP Ethylene Cracker Expansion
Biological Assessment

GPS and Coordinate Type:
Trimble Geo XT
UTM NAD 1983
Zone 15 North

Map Created:
2/18/2012 by Jayme Shiner

Whitenton Group, Inc.
ENVIRONMENTAL CONSULTANTS
3413 Hunter Road San Marcos Texas 78666

0 0.5 1 Miles

N

Figure 10
Survey Area - 2010 Aerial Photograph
BFLP Ethylene Cracker Expansion Project
Action Area
Jefferson County, Texas

Highway
Major Road
Construction Area (40 Feet X 76 Feet)
Action Area Boundary (Maximum Radius ~2.6 Miles)
Riverine Habitat
Drainage Canals Habitat
Marshland Habitat
Open Water Habitat
Mixed Woodland Habitat
Pastureland Habitat

Background Resources:
USGS 1 Meter DOQQ (2010)
Port Arthur North (NE, SE)
West of Greens Bayou (NW, SW)
ESRI StreetMap USA (2006)

Surveyor(s):
Jayme Shiner PWS

Project Number and Information:
1125
BFLP Ethylene Cracker Expansion
Biological Assessment

GPS and Coordinate Type:
Trimble Geo XT
UTM NAD 1983
Zone 15 North

Map Created:
8/23/2011 by Jayme Shiner

Whitenton Group, Inc.
ENVIRONMENTAL CONSULTANTS
3413 Hunter Road San Marcos Texas 78666

0 0.5 1 Miles

N

APPENDIX B

FIGURE 1 – WATER USE

Figure 1

Water Losses & Make-up for 10th Furnace

	Typical Avg klb/hr	#10 Addn. klb/hr	New Est'd Total klb/hr
MP Steam Make-up to Dilution Steam	150	10	160
Steam Drum blowdown	30	3.8	33.8
Decoke losses to atmosphere	20	2	22
Steam drum water sampler	1.3	0.2	1.5
Totals	201.3	**16**	217.3

8% estimate increase for furnace area

est'd annual increase in fresh water consumption and water losses

32 gpm

recent estimated avg. annual fresh water consumption

6000 gpm

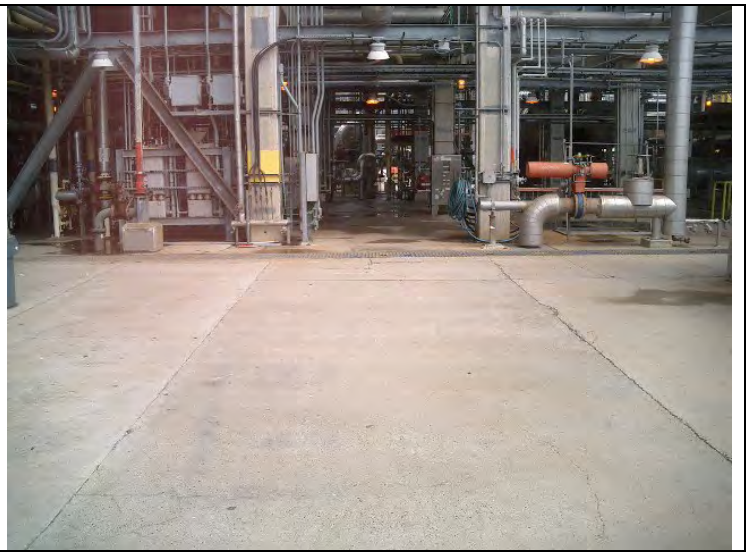
0.53% overall estimated increase site-wide

APPENDIX C

PHOTOGRAPHS

Whitenton Group, Inc.
ENVIRONMENTAL CONSULTANTS

PHOTOGRAPHIC LOG **1**

BFLP Ethylene Cracker Expansion Project 06/22/2011 Jefferson County, Texas View: East view of the proposed construction area.	
BFLP Ethylene Cracker Expansion Project 06/22/2011 Jefferson County, Texas View: North view of the proposed construction area.	
BFLP Ethylene Cracker Expansion Project 06/22/2011 Jefferson County, Texas View: West view of the area surrounding the proposed construction area.	

Whitenton Group, Inc.
ENVIRONMENTAL CONSULTANTS

PHOTOGRAPHIC LOG **2**

BFLP Ethylene Cracker Expansion Project

06/22/2011

Jefferson County, Texas

View: West view of an open water habitat (man-made retention pond) southeast of the ethylene cracker facility.

BFLP Ethylene Cracker Expansion Project

06/22/2011

Jefferson County, Texas

View: Southwest view of a man-made drainage canal southeast of the ethylene cracker facility.

BFLP Ethylene Cracker Expansion Project

06/22/2011

Jefferson County, Texas

View: Northeast view of the pastureland and mixed woodland habitats southeast of the ethylene cracker facility.

BFLP Ethylene Cracker Expansion Project

06/22/2011

Jefferson County, Texas

View: Southwest view of a marshland habitat northwest of the ethylene cracker facility.

BFLP Ethylene Cracker Expansion Project

06/22/2011

Jefferson County, Texas

View: South view of a marshland habitat northeast of the ethylene cracker facility.

BFLP Ethylene Cracker Expansion Project

06/22/2011

Jefferson County, Texas

View: North view of an area impacted by development (major roadway, man-made canal, and small boat dock facility) northeast of the ethylene cracker facility.

BFLP Ethylene Cracker Expansion Project

06/22/2011

Jefferson County, Texas

View: Northeast view of a developed marshland (man-made canal and residential and commercial development) northwest of the ethylene cracker facility.

BFLP Ethylene Cracker Expansion Project

06/22/2011

Jefferson County, Texas

View: Southeast view of a marshland habitat east of the ethylene cracker facility.

BFLP Ethylene Cracker Expansion Project

12/28/2011

Jefferson County, Texas

View: Southeast view of the rip rap that lines the shoreline of the Intracoastal Waterway on Pleasure Island.

BFLP Ethylene Cracker Expansion Project

12/28/2011

Jefferson County, Texas

View: Southeast view of marginal potential piping plover habitat on the northern end of Pleasure Island within the action area.

BFLP Ethylene Cracker Expansion Project

12/28/2011

Jefferson County, Texas

View: Northwest view of marginal potential piping plover habitat on the northern end of Pleasure Island within the action area.

BFLP Ethylene Cracker Expansion Project

12/28/2011

Jefferson County, Texas

View: South view of marginal potential piping plover habitat on the south bank of the Neches River within the action area.

APPENDIX D

FIELD SURVEY DATA SUMMARY

Whitenton Group, Inc.
ENVIRONMENTAL CONSULTANTS

FIELD NOTES SUMMARY

21 June 2011

Weather: high 90s, humid, overcast, <5 mph wind, <1 inch rainfall at ~7am

Surveyor: Jayme Shiner PWS

Site inspection at cracker facility in Port Arthur, TX.

Surveyed proposed project area. Adjacent to 9 existing furnace stacks. Site 100% concrete. No vegetation observed. Surveyed all areas safely accessible. Majority of facility is concrete, caliche, or industrial development. Drainage ditches lead to on-site detention pond or adjacent TOTAL Refinery. On-site detention pond is approximately 360 feet by 120 feet. No wildlife was observed. Photos taken of the project area taken by Ryan Yoes with an intrinsically safe camera.

Survey continued outside the boundaries of the cracker facility. Surveyed all publicly accessible, terrestrial areas within a 3-mile radius.

3413 Hunter Road • San Marcos, Texas 78666 • office 512-353-3344 • fax 512-212-4043
www.whitentongroup.com

Surveyed from D D 7 Levee Road until stopped by security gate.

Open Water (man-made pond). Vegetation: *Baccharis halimifolia, Iva frutescens, Triadica sebifera, Paspalum vaginatum,* and *Phragmites australis.* Photos taken.

Maintained pastureland. Vegetation: *Cynodon dactylon*. Unmaintained boundaries: *Solidago altissima* and *Baccharis halimifolia.* Photos taken.

Mixed woodlands. Primarily small, fragmented tracts. Dominant species were too distant from the public roadways to be identified. However, tree genera likely to be found include *Quercus* sp., *Triadica sebifera*, *Salix* sp., *Celtis* sp., *Ulmus* sp., and *Acer* sp.. Photos taken.

Drainage canals. Man-made drainage and flood control canals. This habitat was not accessible from a close enough vantage point to identify vegetation. However, dominant species likely to be found include *Iva frutescens*, *Paspalum vaginatum*, *Schoenoplectus* spp., *Juncus* sp., and *Rumex* sp.. Photos taken.

Surveyed Highway 87 to Old Ferry Road until private property.

Maintained pastureland. Same vegetation as listed above.

Marshland east of Hwy 87. This habitat is a mosaic of emergent herbaceous and shrub vegetation and open water. Vegetation: *Paspalum vaginatum*, *Phragmites australis*, *Baccharis halimifolia*, *Iva frutescens*, *Schoenoplectus robustus*, and *Schoenoplectus* spp.. Photos taken.

Marshland between Old Ferry Road and Hwy 87. This habitat is a monoculture of *Phragmites australis*. Photos taken.

Drove bridge over the Neches River. Not close vantage point. Portions of shoreline developed for vessel traffic (recreation or commercial).

North side of Neches River not easily observed. Limited to Hwy 87 at high speeds. Habitat appears to be marshland with similar characteristics noted above.

Surveyed from Rainbow Bridge Marina. Limited vantage point. Additional access roads blocked by gates.

Marshlands to the southeast, south, southwest, west, and northwest. Vegetation: *Paspalum vaginatum*, *Phragmites australis*, *Baccharis halimifolia*, *Iva frutescens*, *Schoenoplectus robustus*, and *Schoenoplectus* spp.. Photos taken.

Open water canal to the north (man-made marina). Developed. East bank lined with *Paspalum vaginatum, Phragmites australis, Baccharis halimifolia,* and *Iva frutescens.* Photos taken.

Areas north of cracker facility not accessible/visible.

Moved to Coke Road. Access to the north blocked by gate. View of man-made retention ponds. Wooded banks blocked view of marshland to the north. Photos taken.

Open Water (man-made pond). Dominant species were too distant from the public roadways to be identified. However, tree genera likely to be found include *Quercus* sp., *Triadica sebifera*, *Salix* sp., *Celtis* sp., *Ulmus* sp., and *Acer* sp.. Photos taken.

View from East Port Neches Avenue.

Mixed woodlands. Primarily small, fragmented tracts. Dominant species were too distant from the public roadways to be identified. However, tree genera likely to be found include *Quercus* sp., *Triadica sebifera*, *Salix* sp., *Celtis* sp., *Ulmus* sp., and *Acer* sp..

Open water canal to the north and south of roadway (man-made canal for small vessels). Surrounded by marshland. Vegetation: *Paspalum vaginatum*, *Phragmites australis*, *Baccharis halimifolia*, *Iva frutescens*, *Schoenoplectus robustus*, and *Schoenoplectus* spp.. Photos taken.

Continued northwest on E. Port Neches Ave. View limited to mixed woodlands.

Continued southwest on Hwy 87/73. Industrial, commercial, and residential development to the northwest, west, and southwest.

Surveyed from Taft Avenue/Proctor. Continuation of Taft Avenue blocked to east by security gate. Followed Proctor until Stadium Road.

Mixed woodlands, pastureland, drainage canals, and open waters (man-made ponds) observed from limited vantage points. No photos taken. Same vegetation communities noted above.

No good view of Intracoastal Waterway or Sabine Lake found.

No gps data taken. No survey permission for areas surrounding cracker facility.

A variety of migratory birds were observed within various habitats: herons, egrets, and a variety of songbirds.

28 December 2011

Weather: 50's, partly cloudy, >10mph winds, falling tide. Dark clouds rolled in towards the end of the survey.

Surveyors: Jayme Shiner PWS, Stanley Jones PhD, Marty Heaney

Started at Rainbow Bridge boat ramp and headed east towards Sabine Lake. Followed shoreline around to the south. Marginal potential piping plover roosting and foraging habitat on undeveloped portion of shoreline between Rainbow Bridge and Sabine Lake.

Photos taken.

Continued along the northwest bank of the Intracoastal Waterway. No habitat observed. Shoreline developed, lined with rip rap (or other erosion control measure), or buffered with seawall structure.

Active dredging of Intracoastal observed. Spoil being deposited on Pleasure Island. Photos taken.

Continued back up the Intracoastal to observe the southeast shoreline. Shoreline lined with rip rap. Northern end of Pleasure Island has areas of marginal potential foraging and roosting habitat. Photos taken.

Continued around the north point of Pleasure Island to observe the east shoreline of Pleasure Island. Marginal potential foraging and roosting habitat observed at the north end of island. Remainder of the shoreline is lined with rip rap or breakwater. Photos taken.

Dooms Island under water.

Continued between Humble Island and Stewts Island. Shoreline has marginal potential foraging and roosting habitat. However, shorelines utilized for temporary vessel

storage. Only the easternmost ends utilized by shorebirds. Photos taken.

Continued to survey the shorelines of Old River Cove. Marginal foraging and roosting habitat observed. Photos taken. Dark clouds moved in.

Continued to south shoreline of Stewts Island. Marginal foraging and roosting habitat observed. Photos taken, poor quality with low light.

Followed north bank of Neches River. Marginal foraging and roosting habitat observed. Photos taken.

Stopped just past Molasses Bayou and returned to follow the south bank of the Neches River. Marginal foraging and roosting habitat observed in undeveloped areas. Photos taken.

Returned to Rainbow Bridge boat ramp.

Shorelines observed ranged from 3-50 feet wide. Evidence of shoreline erosion observed throughout survey area. Shorelines under constant wave action. Most banks are steep. Unvegetated portions an average of 3 feet wide. Few small areas of flats observed. Few areas observed occupied by foraging or roosting birds. Top of banks are densely vegetated. Vegetation: *Paspalum vaginatum*, *Phragmites australis*, *Baccharis halimifolia*, *Iva frutescens*, *Triadica sebifera*, *Schoenoplectus* spp., and *Spartina alterniflora*.

Birds observed: hawks, herons, osprey, brown and white pelicans, gulls, black skimmers, and buffleheads. No piping plovers observed.

No gps data taken. No survey permission on shorelines.

APPENDIX E

TABLE 6 – MODELED EMISSION RATES AND RESULTS

Table 6
Modeled Emission Rates and Results
BFLP Effects Screen Limit Evaluation

		Emission Rates						Model Results		
			F-1			FURN-AMM	N-16			
Compound	CAS	wt% of VOC	Existing (lb/hr)	Proposed (lb/hr)	Increase (lb/hr)	Increase (lb/hr)	Increase (lb/hr)	Maximum Off-Property Conc. ($\mu g/m^3$)	ESL ($\mu g/m^3$)	Conc./ ESL %
AMMONIA	7664-41-7					0.020	0.000E+00	5.43	170	3.19%
METHANOL	000067-56-1	1.80%	0.166	0.170	0.004		0.000E+00	0.97	2620	0.04%
BENZENE	000071-43-2	0.70%	0.064	0.066	0.001		1.025E-03	0.38	170	0.22%
ETHYLENE	000074-85-1	40.71%	3.757	3.839	0.081		1.266E+00	22.45	1400	1.60%
ACETYLENE	000074-86-2	0.24%	0.022	0.023	0.000		0.000E+00	0.13	26600	0.00%
PROPANE	000074-98-6	0.84%	0.078	0.080	0.002		0.000E+00	0.46	Simple asphyxiant	--
ETHYLBENZENE	000100-41-4	0.03%	0.002	0.002	0.000		0.000E+00	0.01	740	0.00%
STYRENE	000100-42-5	0.05%	0.005	0.005	0.000		0.000E+00	0.03	110	0.03%
BUTANES	000106-97-8	9.50%	0.877	0.896	0.019		0.000E+00	5.14	23750	0.02%
BUTADIENE	000106-99-0	0.99%	0.091	0.093	0.002		0.000E+00	0.53	510	0.10%
TOLUENE	000108-88-3	0.78%	0.072	0.073	0.002		1.660E-03	0.42	640	0.07%
PENTANE	000109-66-0	0.30%	0.028	0.028	0.001		1.269E+00	0.61	4100	0.01%
PENTENE	000109-67-1	1.59%	0.146	0.149	0.003		0.000E+00	0.86	290	0.30%
HEXANE	000110-54-3	1.50%	0.138	0.141	0.003		8.788E-01	1.12	5300	0.02%
OCTANE	000111-65-9	1.42%	0.131	0.133	0.003		0.000E+00	0.77	3500	0.02%
NONANE (C9)	000111-84-2	1.53%	0.142	0.145	0.003		0.000E+00	0.83	10500	0.01%
PROPYLENE	000115-07-1	31.63%	2.920	2.983	0.063		0.000E+00	17.09	Simple asphyxiant	--
HEXENE	000592-41-6	0.00%	0.000011	0.00001	0.00000		0.000E+00	6.4E-05	70	0.00%
GASOLINE	008006-61-9	0.00%	0.000020	0.00002	0.00000		0.000E+00	1.2E-04	3500	0.00%
XYLENES (ISOMERS AND MIXTURE)	001330-20-7	0.14%	0.013	0.014	0.000		0.000E+00	0.08	350	0.02%
BUTYLENES	025167-67-3	5.20%	0.480	0.490	0.010		0.000E+00	2.81	160	1.76%
MAPD (MAPP, METHYLACETYLENE & PROPADIENE)	059355-75-8	0.24%	0.022	0.023	0.000		0.000E+00	0.13	16400	0.00%
Other VOCs		0.82%	0.076	0.077	0.002		0.000E+00	0.44		--
UNCLASSIFIED		0.00%	0.00015	0.00016	0.00000		0.000E+00	8.9E-04		--
2-Methylnaphthalene	91-57-6						1.172E-05	4.2E-06	30	0.00%
3-Methylchloranthrene	56-49-5						8.788E-07	3.1E-07	0.02	0.00%
7,12-Dimethylbenz(a)anthracene	57-97-6						7.812E-06	2.8E-06	0.5	0.00%
Acenaphthene	83-32-9						8.788E-07	3.1E-07	1	0.00%
Acenaphthylene	208-96-8						8.788E-07	3.1E-07	1	0.00%
Anthracene	120-12-7						1.172E-06	4.2E-07	0.5	0.00%
Benz(a)anthracene	56-55-3						8.788E-07	3.1E-07	0.5	0.00%
Benzo(a)pyrene	50-32-8						5.859E-07	2.1E-07	0.03	0.00%
Benzo(b)fluoranthene	205-99-2						8.788E-07	3.1E-07	0.5	0.00%
Benzo(g,h,i)perylene	191-24-2						5.859E-07	2.1E-07	0.5	0.00%
Benzo(k)fluoranthene	--						8.788E-07	3.1E-07	0.5	0.00%
Butane	106-97-8						1.025E+00	0.36	23750	0.00%
Carbon Dioxide	124-38-9						5.878E+04	20918.04	Simple asphyxiant	--
Chrysene	218-01-9						8.788E-07	3.1E-07	0.5	0.00%
Dibenzo(a,h)anthracene	53-70-3						5.859E-07	2.1E-07	0.5	0.00%
Dichlorobenzene	25321-22-6						5.859E-04	2.1E-04	720	0.00%
Ethane	74-84-0						1.514E+00	0.54	Simple asphyxiant	--
Fluoranthene	206-44-0						1.465E-06	5.2E-07	0.5	0.00%
Fluorene	86-73-7						1.367E-06	4.9E-07	10	0.00%
Formaldehyde	50-00-0						3.662E-02	1.3E-02	15	0.09%
Indeno(1,2,3-cd)pyrene	193-39-5						8.788E-07	3.1E-07	0.5	0.00%
Methane	74-82-8						1.106E+00	0.39	Simple asphyxiant	--
Mercury							4.930E-02	1.8E-02	0.25	7.02%
Naphthalene	91-20-3						2.978E-05	1.1E-05	440	0.00%
Nitrous Oxide	10024-97-2						1.058E+00	3.8E-01	4500	0.01%
Phenanathrene	85-01-8						8.300E-06	3.0E-06	0.5	0.00%
Propane	74-98-6						7.812E-01	0.28	Simple asphyxiant	--
Pyrene	129-00-0						2.441E-06	8.7E-07	0.5	0.00%

Maximum concentration per emission rate

F-1	270.2 ug/m3 / lb/hr
FURN-AMM	271.5 ug/m3 / lb/hr
N-16	0.35587 ug/m3 / lb/hr

APPENDIX F

TABLE 8 – MONITORING DATA SUMMARY

Table 8
Criteria Pollutant Monitoring Data Summary
BASF FINA Petrochemicals LP- 10th Furnace Project

NO_2 Background Concentrations

Monitor ID	Site Name	Year	Complete Days of Data	Hours of Data	1-Hour 98th (pbb)	Annual Avg. (pbb)
482450102	SETRPC 43 Jefferson Co Airport	2008	349	8268	35.8	5.9
		2009	350	8300	31.5	5.7
		2010	352	8289	35.0	5.6
				Three-Year Average (ppb)	**34**	**5.9**
				Three-Year Average (μg/m³)	**64.2**	**11.2**

Notes:
1. Raw monitoring data obtained from TCEQ Texas Air Monitoring Information System (TAMIS) Web Interface.
2. NO_2 averages and rounding follow procedures outlined in Appendix S of 40 CFR Part 50.

APPENDIX G

FIGURES 1-2 – SIGNIFICANT IMPACT AREAS

Note : All receptors with modeled concentrations greater than the Significant Impact Level (SIL) are within 4.2 KM of the center of BFLP

N

BASF Fina Petrochemicals, L.P.
Port Arthur, TX

Figure 1
1-Hour NO2 Receptors with Modeled Concentrations Greater Than Significant Impact Level (SIL)

RPS
Cielo Center
1250 S Capital of Tx Hwy
Building Three, Suite 200
Austin, Texas 78746

Note : All receptors with modeled concentrations greater than the Significant Impact Level (SIL) are within 0.6 KM of the center of BFLP

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BASF Fina Petrochemicals, L.P.
Port Arthur, TX

Figure 2
Annual NO2 Receptors with Modeled Concentrations Greater Than Significant Impact Level (SIL)

RPS
Cielo Center
1250 S Capital of Tx Hwy
Building Three, Suite 200
Austin, Texas 78746