WHITENTON group environmental consultants

Biological Assessment

Olefins Unit Expansion Project

Nueces County, Texas

Prepared for

Equistar Chemicals, LP

Prepared by

Whitenton Group, Inc.

October 2013

Revised February 2014

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ACRONYMS AND ABBREVIATIONS

°F	Degree Fahrenheit
AOI	Area of Impact
BA	Biological Assessment
BACT	Best Available Control Technology
BD	Butadiene
CO	Carbon Monoxide
CWS	Contaminated Water Sewer
EA	Extended Aeration
EPA	Environmental Protection Agency
Equistar	Equistar Chemicals, LP
ESA	Endangered Species Act
ESL	Effects Screening Levels
GHG	Greenhouse Gas
GLC	Ground Level Concentration
GLCmax	Maximum Ground Level Concentration
ISA	Integrated Science Assessment
Kg	Kilogram
mAOI	Maximum Area of Impact
MSS	Maintenance, Startup, and Shutdown
NAAQS	National Ambient Air Quality Standards
NCDC	National Climatic Data Center
NESHAP	National Emission Standards for Hazardous Air Pollutants
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxide
NOAA	National Oceanic and Atmospheric Administration
OWS	Oily Water Sewer System
PM	Particulate Matter
PM_{10}	Particulate Matter less than 10 microns in diameter
$PM_{2.5}$	Particulate Matter less than 2.5 microns in diameter
PSD	Prevention of Significant Deterioration
RACT	Reasonably Available Control Technology

RBLC	RACT/BACT/LAER Clearinghouse
RPS	RPS Group
SIL	Significant Impact Level
SO_2	Sulfur Dioxide
TCEQ	Texas Commission on Environmental Quality
TPDES	Texas Pollution Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
US	United States
USACE	US Army Corps of Engineers
USC	Ultra Selective Cracking
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VMR	Van Marion Retort
VOC	Volatile Organic Compound
WGI	Whitenton Group, Inc.

1.0 EXECUTIVE SUMMARY

Equistar Chemicals, LP (Equistar) operates a petrochemical manufacturing facility located in the Corpus Christi Complex in Corpus Christi, Nueces County, Texas. The petrochemical manufacturing facility consists of 2 chemical production units, a butadiene (BD) unit, and an olefins and aromatics unit. There is also a cogeneration facility at the site. The olefins and aromatics unit is commonly referred to as the Olefins Unit. Equistar proposes to expand the Olefins Unit production by increasing maximum furnace firing rates of 15 cracking furnaces and revising the tubing configuration of 7 of those furnaces within the existing Corpus Christi Complex.

The proposed Project Area is located approximately 2 miles south of the intersection of McKinzie Road and State Highway 407 and is situated between Violet Road and McKinzie Road in Nueces County, Texas.

Equistar's site is a major source for criteria pollutants and greenhouse gases (GHG). The net emissions increase of volatile organic compounds (VOC), nitrogen oxides (NO_x), and carbon monoxide (CO) will exceed their respective Prevention of Significant Deterioration (PSD) significance levels, so this project will be subject to PSD review for these pollutants. Since the project is a major modification for GHG, a PSD GHG permit is also be required, which was submitted on March 6, 2013. The United States (US) Environmental Protection Agency (EPA) is responsible for issuing GHG PSD permits in Texas.

This Biological Assessment (BA) is a complete evaluation of the potential environmental impacts the proposed project may have on federally-listed species and/or their potential habitat. Listed species evaluated in this document include federally-threatened, endangered, and candidate species. This BA includes a pedestrian listed-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 and operations information provided by Equistar and RPS Group (RPS), Equistar's air quality permitting consultant for the project.

Construction of the proposed olefin unit expansion, associated infrastructure, and auxiliary equipment will take place within the existing Equistar's Corpus Christi Complex. The total area of the project footprint, referred to as the "Project Area," is approximately 27.4 acres. The purpose of the project is to expand the existing Equistar Olefins Unit by increasing the capacity

of the existing 15 cracking furnaces and revising the tubing configuration of 7 of those furnaces. Additionally, all 15 furnaces will have new ultra-low NO_x burners added and will have the ability to utilize high hydrogen fuel gas for combustion heat.

Federally-listed species considered in this BA include the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, smalltooth sawfish, Gulf coast jaguarundi, ocelot, red wolf, West Indian manatee, Eskimo curlew, northern aplomado falcon, piping plover, red knot, Sprague's pipit, yellow-billed cuckoo, whooping crane, slender rush-pea, South Texas ambrosia, blue whale, finback whale, humpback whale, sei whale, and sperm whale. Three field surveys were completed: a pedestrian listed-species habitat evaluation of the proposed Project Area and the portions of the surrounding facility that are not restricted by stringent safety requirements; a windshield habitat evaluation of all publicly-accessible habitats within a 3-mile radius of the Project Area; and an aerial habitat evaluation of all areas within a 3-mile radius. Data were collected to describe resident vegetation communities and assess the potential for habitat and occurrence of listed species. Four habitat types were observed in the Action Area of the proposed Olefins Unit expansion: pastureland, cropland, shrubland, and riverine. The areas surrounding the project location have historically been impacted by agricultural, industrial, and residential activities.

In support of this BA, RPS performed dispersion modeling of air pollutants that will be emitted by the proposed project in accordance with PSD permit requirements. The project maximum ground level concentration (GLCmax) values are less than the significant impact levels (SILs) for all averaging periods of sulfur dioxide (SO_2), PM_{10} and $PM_{2.5}$. Accordingly, these predicted criteria pollutant emissions are considered insignificant for these averaging periods based on EPA's SIL analysis method with screening levels set to protect sensitive populations. Projected GLCmax values are above the SILs for the following: nitrogen dioxide (NO_2) (all averaging periods) and CO (all averaging periods). For the pollutants and averaging periods for which the dispersion modeling predicted a significant impact (concentrations above the SIL), the significant areas of impact (AOIs) located the farthest distance from the source in all directions were plotted to help define the Action Area, which has a maximum radius of approximately 1.3 miles (from the Plant fenceline).

In addition, the Action Area was determined based on the project footprint. No new outfall structures are proposed. The flow, temperature, or composition of the wastewater that is currently discharged from the existing permitted outfall location (Outfall 001) is not expected to

change as a result of the proposed project. Therefore, the location of Outfall 001 was not included within the Action Area. The linear facility associated with the proposed project consists of new electric lines that will be added to existing electric ducts and cable trays. Construction of the linear facility will be limited to the Project Area.

Based on the modeling results, the maximum predicted concentrations of all modeled non-criteria pollutants from project emissions are below the respective Effects Screening Level (ESL) and 13 of the 14 are well below the first screening level of 10% of the ESL. Short-term predicted concentrations for ethylene from project emissions were at 20.9% of the Texas Commission on Environmental Quality's (TCEQ) ESL. TCEQ requires additional evaluation for projects whose non-criteria pollutant impacts exceed 10% of the ESL. The final results of that evaluation have demonstrated that predicted concentrations are not expected to cause or contribute to adverse human health or welfare effects in order for the TCEQ air permit authorization to be issued. Accordingly, no adverse welfare impacts are expected to occur within the Action Area as the result of the additional emissions of these pollutants.

The Action Area has the potential to affect portions of 4 habitat types: pastureland, cropland, shrubland, and riverine.

Based on the information gathered for this BA and presented in Section 9.0, Whitenton Group, Inc. (WGI) biologists recommend that a finding of no effect be accepted for the following federally-listed threatened and endangered species: green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, smalltooth sawfish, Gulf coast jaguarundi, ocelot, red wolf, West Indian manatee, Eskimo curlew, northern aplomado falcon, piping plover, whooping crane, slender rush-pea, South Texas ambrosia, and the whales. No determination of effect is recommended for the following candidate species: Sprague's pipit, red knot, and yellow-billed cuckoo.

2.0 INTRODUCTION

Equistar operates a petrochemical manufacturing facility located in the Corpus Christi Complex in Corpus Christi, Nueces County, Texas. The petrochemical manufacturing facility consists of 2 chemical production units, a BD unit, and an olefins and aromatics unit. There is also a cogeneration facility at the site. The olefins and aromatics unit is commonly referred to as the

Olefins Unit. Equistar proposes to expand the Olefins Unit production by increasing maximum furnace firing rates of 15 existing cracking furnaces and revising the tubing configuration in 7 of those furnaces within the existing Corpus Christi Complex.

The proposed Project Area is located approximately 2 miles south of the intersection of McKinzie Road and State Highway 407 and is situated between Violet Road and McKinzie Road in Nueces County, Texas (Figures 1-5 – Appendix A).

Equistar's facility is a major source for criteria pollutants and GHG. Predicted increases in emissions of VOCs, NO_x, and CO will exceed their respective PSD significance levels; therefore, this project is subject to PSD review for these pollutants. In addition, while direct $PM_{2.5}$ emissions do not trigger PSD review, NO_x emissions are a precursor to the formation of $PM_{2.5}$. Therefore, a project is also subject to PSD review for $PM_{2.5}$ if NO_x levels trigger a PSD review. Because the facility is a major source for GHG, a PSD GHG permit will be required. The EPA is responsible for issuing GHG PSD permits in Texas.

BAs in support of the PSD GHG permit application are recommended by the EPA to evaluate the potential for impacts to federally-listed species from a project for which federal authorization must be obtained. This BA documents the complete evaluation of the potential effects of the proposed project on federally-listed species and/or their potential habitat. Listed species evaluated in this document include threatened, endangered, and candidate species. Federal agency regulations for listed species evaluated in this BA are described in Section 4.0.

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-listed species as a result of the proposed project. This BA includes a pedestrian listed-species habitat evaluation of the proposed construction area, a windshield survey of all observable and publicly-accessible habitats within a 3-mile radius of the Project Area, an aerial survey of habitats within a 3-mile radius of the Project Area, and an evaluation of potential environmental impacts based on air quality modeling results, construction and operations information, and wastewater and storm water information provided by Equistar and RPS.

The conclusion of this BA will include a recommended determination of effect on federally-listed endangered and threatened species and their habitat: "no effect," "may affect, not likely to adversely affect," or "may affect, likely to adversely affect." These 3 possible determinations, in accordance with guidance offered by the US Fish and Wildlife Service (USFWS) for the

purpose of Biological Assessments and Evaluations, are described in Section 4.1. A recommended determination of effect will not be included for species listed as candidate.

3.0 ACTION AREA

The BA process requires identification of the proposed project's "Action Area" within which the potential for effects on federally-listed species and their habitats are to be evaluated. "Action area" is defined in 50 CFR Section 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The limits of the project's Action Area were determined based on the dispersion modeling results, any earth disturbance footprint, and any wastewater or storm water discharge locations.

EPA has established SILs for each NAAQS. SILs are concentrations significantly below their corresponding NAAQS and constitute a de minimis threshold at or below which a potential impact is considered to be insignificant[1]. Based on the results described below in Section 8.1, the dispersion model predicts concentrations above the SILs at locations outside of the Corpus Christi Complex for specific pollutants and averaging periods. The coordinates of each receptor with modeled concentrations greater than the SIL for each pollutant were plotted to delineate the AOI. Locations with predicted concentrations above the SILs (represented by a blue dot) are shown on Figure 1 (Appendix B). [Note: If a location is identified as exceeding the SILs, it does not necessarily mean that the pollutant concentrations are expected to exceed the SILs at that location all of the time.] Accordingly, the AOI identifies locations where the SILs may be exceeded for 1 or more pollutants some of the time, but does not infer a frequency of occurrence.

The locations with impacts above the SILs located the farthest distance from the source in all directions were plotted to create a maximum AOI (mAOI) (theoretical) boundary. The furthest distance in any direction from the project emissions sources to concentrations above the SIL for these pollutants was determined to be 1.3 miles. This mAOI boundary was used to help define the Action Area for the BA.

Construction of the proposed olefin unit expansion, associated infrastructure, and auxiliary equipment will take place within the existing Equistar's Corpus Christi Complex. The total area of the project footprint, referred to as the "Project Area," is approximately 27.4 acres. Since this

mAOI boundary encompasses the Project Area, the Action Area for the BA was partially defined as the mAOI boundary.

The storm water outfall adjacent to the Corpus Christi Complex is also incorporated into the overall Action Area. No new outfall structures are proposed. The proposed project is not anticipated to change the flow, temperature, or composition of the wastewater that is currently discharged from the existing permitted outfall location (Outfall 001). Therefore, the location of Outfall 001 was not included within the Action Area. The linear facility associated with the proposed project consists of new electric lines that will be added to existing electric ducts and cable trays. Construction of the linear facility will be limited to the Project Area. The complete Action Area is demonstrated in Figures 2-5 (Appendix A).

Potential impacts to federally-listed species and/or their habitat by the proposed project were analyzed within the Action Area. The results of the analysis of potential impacts to federally-listed species are presented in Section 9.0 below.

4.0 AGENCY REGULATIONS

4.1 ENDANGERED SPECIES ACT

The USFWS and the National Oceanic and Atmospheric Administration - National Marine Fisheries Service (NOAA-NMFS) implement 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[2]. Candidate species are those "the USFWS has enough information to warrant proposing them for listing but is precluded from doing so by higher listing priorities[3]." Candidate species are not specifically protected by the ESA, but were evaluated in 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[4]."

BAs include one of 3 recommended determinations of effect on federally-listed endangered and threatened species and their habitat: "no effect," "may affect, not likely to adversely affect," or "may affect, likely to adversely affect." These 3 possible determinations, in accordance with guidance offered by the USFWS for the purpose of Biological Assessments and Evaluations, are summarized below[5]. A recommended determination of effects is not provided for candidate species.

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.

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 USFWS exempts the proposed action from formal 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 ESA requires that the federal action agency request initiation of formal consultation with the USFWS when a "may affect, likely to adversely affect" determination is made.

4.2 CLEAN AIR ACT 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 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 a 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 2 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[6].

The EPA has established NAAQS for 6 air pollutants, which are commonly referred to as "criteria pollutants". These 6 criteria pollutants are NO_2, ozone, SO_2, PM, CO, and lead[6]. 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[7].

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. A 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[1]. If an individual project involves an increase in emissions that results in predicted ambient impacts greater than the established SIL, the permit applicant would be required to perform additional analyses to 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[8].

The air quality analysis to demonstrate compliance with NAAQS 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.

5.0 PROJECT DESCRIPTION

5.1 PROJECT PURPOSE AND LOCATION

The purpose of the project is to expand the existing Equistar Olefins Unit at Corpus Christi Complex. The proposed Equistar Olefins Unit expansion will increase the capacity of 15 existing cracking furnaces and revise the tubing configuration of 7 of those furnaces. The cracking furnaces convert less valuable saturated hydrocarbons into ethylene and propylene, highly desirable basic building blocks of the petrochemical industry. The conversion takes place in the presence of dilution steam by rapidly raising the hydrocarbon/dilution steam temperature to cracking temperatures. The extreme temperature acts to destabilize the structure of the hydrocarbon molecule and initiate the rearrangement of the hydrocarbon molecular bonds. Two process flow diagrams for the proposed expansion project are provided as Figures 4-1 and 4-2 (Appendix C).

The proposed Project Area is located at 1501 McKinzie Road, approximately 2 miles south of the intersection of McKinzie Road and State Highway 407 (Leopard Street) in the City of Corpus Christi, Nueces County, Texas (Figure 1 – Appendix A).

Project location information:

USGS Quads	Latitude/Longitude
Annaville	27.810841, -97.592336

5.2 CONSTRUCTION INFORMATION

5.2.1 CONSTRUCTION DESCRIPTION

Construction of the proposed expansion to the Equistar Olefins Unit will take place on approximately 27.4 acres of the existing Corpus Christi Complex (Appendix A - Figures 2-5). The purpose of the project is to expand the existing Equistar Olefins Unit by adding additional capacity to 15 existing cracking furnaces and revising the tubing configuration of 7 of those furnaces. Additionally, all 15 furnaces will have new ultra-low NO_x burners added capable of burning higher hydrogen fuel gas for combustion heat. The capacity of 2 existing steam superheaters will also be increased, and they will be retrofitted with ultra-low NO_x burners capable of burning higher hydrogen fuel. Two fractionators and an acetylene converter will be added to the existing fractionation (distillation) section. The following changes to the Olefins Unit are proposed:

- Expand the capacity of all 15 existing cracking furnaces while installing ultra-low NO_x burners capable of burning gaseous fuels with higher hydrogen content
- Revise the tubing configurations of 7 of the existing furnaces
- Expand the capacity of 2 existing steam superheaters
- Install 2 additional fractionators and an acetylene converter in the existing fractionation section
- Existing compressors will be rebuilt or replaced in existing location
- Pump and piping installation
- Installation of new cooling tower cells to existing 15-cell cooling tower

The linear facility associated with the proposed project consists of new electric lines that will be added to existing electric ducts and cable trays. Construction of the linear facility will be limited to the Project Area.

The projected construction start date is anticipated for September 2014 (potentially sooner based on permit issuance). The anticipated operation start date for the majority of the project is on or about November 2015, although some parts of the project may start sooner depending on the schedule.

5.2.2 CONSTRUCTION ACTIVITIES AND SCHEDULE

Construction activities will be limited to the identified areas within the existing fence line. The total time estimated to complete the project is approximately 56-64 weeks and includes the following list of general construction activities:

- Expand the capacity of all 15 existing cracking furnaces while installing ultra-low NO_x burners capable of burning gaseous fuels with higher hydrogen content
- Revise the tubing configurations of 7 of the existing furnaces
- Expand the capacity of 2 existing steam superheaters while installing ultra-low NO_x burners capable of burning gaseous fuels with higher hydrogen content
- Existing compressors will be rebuilt or replaced in existing location
- Residue Gas Rectifier Tower with a maximum height of 60 feet
- Demethanizer Tower with a maximum height of 185 feet
- Installation of concrete footings and pilings. Pilings will be 10-32 feet deep
- Pump and piping installation
- Water line tie-in (approximately 50 linear feet at depth of 6 feet)
- Installation of electrical ducts and cable trays
- Installation of new cooling tower cells to existing 15-cell cooling tower which will be 57.5 feet tall. New cells will have concrete footings placed underneath at a depth of 1-6 feet. Pilings will also be used, which will be at a depth between 10-32 feet deep.
- Installation of additional lighting and electrical equipment on new towers and equipment

Construction of the proposed expansion of the Equistar Olefins Unit will not necessitate the construction of a new storm water or wastewater outfall structure. The existing outfall structure (Outfall 003) will be utilized for all storm water discharges, respectively, during construction.

The estimated number of personnel required for construction of the project will vary, but at peak construction as many as 2,300 personnel for a maximum timeframe of 56-64 weeks (based on a 50 hours per week schedule).

5.2.3 CONSTRUCTION EQUIPMENT REQUIRED

This section discusses the equipment required for completing the construction of the Equistar facility expansion. The schedule and final equipment list will be based on the final sizing and configuration of the equipment selected (per erection requirements).

- 7 - Large Cranes (200 tons, up to 300 feet tall)
- 6 - Small Cranes (30-40 tons)
- 6 - Carry Deck Cranes
- 24 - Welding Machines and Generators
- 2 - Heat Exchanger Bundle Extractors
- 4 - Fork Trucks
- 8 - Man Lifts
- 6 - Air Compressors
- 15 - Light Towers
- 2 - Excavators
- 6 - Back Hoes
- 3 - Water Trucks
- 2 - Cement Pump Trucks
- 8 - Pick Up Trucks
- 6 - Gator Personnel Vehicles

5.2.4 STORM WATER

Erosion and sedimentation controls will be utilized to protect water quality during the construction and operation of the proposed project, in accordance with Section 401 of the Clean Water Act and 30 Texas Administrative Code Chapter 279.

All storm water from construction (i.e., non-contaminated) of the expansion project will be discharged from the existing permitted Outfall 003 (Texas Pollution Discharge Elimination System (TPDES) Permit No. WQ0002075000) shown on Figures 2-5 (Appendix A). Equistar currently is in the process of renewing this TPDES permit. Per the TPDES permit, discharge from the outfall is sampled and monitored.

Additionally, the Equistar facility currently has an Oil and Hazardous Materials Spill Prevention, Control, and Countermeasure Plan in place, and the facility employees are trained to implement these plans. These plans will be utilized during construction.

5.2.5 CONSTRUCTION NOISE LEVELS

Project engineers estimate that fence line noise levels during construction should be comparable to noise levels from activities that currently take place at the Corpus Christi Complex.

5.3 OPERATION AND MAINTENANCE INFORMATION

5.3.1 OPERATION DESCRIPTION

The proposed Equistar facility expansion in the Corpus Christi Complex will increase the capacity of 15 existing cracking furnaces utilized for the production of products for the petrochemical industry. The tubing configurations will be revised in 7 of those furnaces. The process described in the following paragraphs will utilize hydrocarbon cracking technology to accomplish this. The maximum operating schedule is 24 hours a day, 7 days a week, and 52 weeks a year. The Plant has a 20-year design life, however with proper maintenance and engineering the Plant life could be extended.

The Ethylene Unit consists of 15 pyrolysis or cracking furnaces (13 ultra-selective cracking furnaces (USC) and 2 Van Marion Retort (VMR) furnaces). The USC cracking furnaces are capable of processing ethane, propane, butane, or liquid. The VMR furnaces process recycled ethane/propane. Simplified process flow diagrams are included as Figures 4-1 and 4-2 (Appendix C).

Required maintenance includes activities such as: Olefins Maintenance, Startup, and Shutdown (MSS) flaring, venting, catalyst handling activities, replacement of process and analyzer filters/screens, equipment calibration, valve and piping maintenance and replacement, spare pump start-up, compressor maintenance, and maintenance on light liquid pumps. These maintenance activities were included during the emission analysis.

5.3.2 WATER USE

The water source for project construction and normal operations will be provided by the City of Corpus Christi, Texas. The expansion project is expected to utilize an additional 2.0 million gallons per day of raw water.

5.3.3 WASTEWATER AND STORM WATER

The wastewater treatment unit at the Corpus Christi Complex treats storm water and process wastewater generated by the olefins and BD units. Wastewater is gathered from various areas of the Plant by 3 separate sewer collection systems – the oily water sewer system (OWS), the contaminated water sewer system (CWS), and the sanitary sewer system.

The OWS collects wastewater from various Olefins Unit processes including blowdowns, pumps, curbed raised hub areas around oil filters, the decoke pot, and furnace area drains. The collected water flows through the OWS into the Corrugated Plate Interceptor where oil and water are separated. Recovered oil is routed to Recovered Oil Holding Tank via the Recovered Oil Sump, where it will be stored prior to being pumped back to the Primary Fractionator for further processing. The water is routed to the Oily Water Sump, and thence to the Wastewater Storage Tanks via the Oily Water Holding Tank. Water draws from liquid feedstock tanks are routed to the National Emission Standards for Hazardous Air Pollutants (NESHAP) System, which strips benzene from the wastewater. Water exiting the NESHAP system is pumped to the Storm water Sump.

The CWS system, also called the Storm water Sewer, collects water from the olefins and BD unit concrete pads (rain water included), tank dike drains, boiler blowdowns, and process water blowdowns. The CWS flows into the Storm water Sump, thence to the Wastewater Storage Tanks. Other collection points for the CWS are the Flare Runoff Sump, the Feedstock Tank Runoff Sump, the Landfill Sump, the NESHAP System, and the Extended Aeration (EA) Plant. The caustic sewer is an isolated storm water collection system which services the caustic tower and associated pumps. Storm water is occasionally removed from this system via vacuum truck and discharged into the Storm water Sump.

The EA Treatment System is a domestic waste treatment plant that consists of a collection system with lift stations, a surge tank, and treatment sump (i.e., EA Plant). The surge tank collects the waste from all lift stations and is equipped with an aerator and 2 pumps. The EA Plant receives flow from the surge tank into the Aeration Zone section. Combined sludge and water gravity flow from the Aeration Zone into the Clarifier section. In the Clarifier section sludge is allowed to settle where it can be returned back to the Aeration Zone for reseeding. The separated clear water flows over a weir into the Chlorination Section. Chlorine tablets are used to disinfect the treated water prior to commingling with process wastewater downstream of the

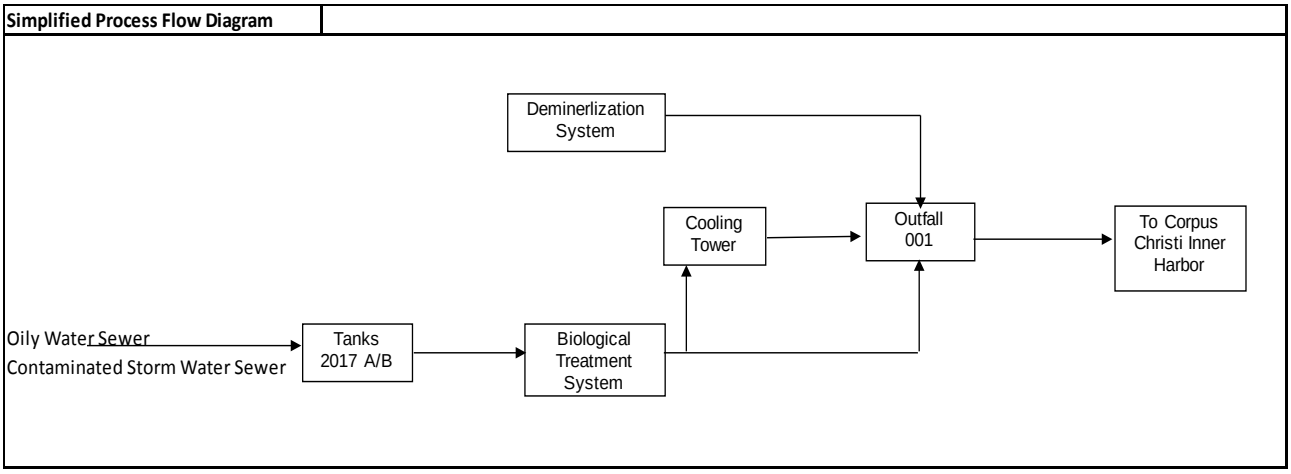
Storm water Sump. Sludge can occasionally be removed from the EA Plant via vacuum truck and placed into the Activated Sludge Basin.

The Wastewater Storage Tanks mark the initial stage in the wastewater treatment process. After exiting these storage tanks, the pH is adjusted in the Neutralization Basin. Then, the water flows into the Activated Sludge Basin. This is followed by flocculation and settling that occurs in the Lamella Clarifier. Sludge that settles to the bottom of the Lamella Clarifier can be recycled back to the Activated Sludge Basin. A side stream from the recycled sludge can be disposed of in an onsite landfill. Water from the Activated Sludge Basin drains to the southeast corner of the landfill and is then pumped back to the main header upstream of the Wastewater Storage Tanks.

Effluent from the Lamella Clarifier flows into the Clearwell Sump, where the water is then pumped to the Rotating Biological Contractor BioDisc Basin. Microorganisms on the BioDisc complete the bio-degradation and nitrification of the wastewater. Effluent from the BioDisc basin flows to the Final Clarifiers, where final settling of sludge occurs. The clarifiers are equipped with sludge removal pumps which pump the sludge to the Aerated Sludge Digester for further digestion prior to disposal in the landfill. The clarifier effluent then flows to the Hydrogen Peroxide Reactor where, if needed, hydrogen peroxide is injected to control sulfide levels. Water from the reactor flows into the Plant Effluent Sump. Effluent from the reactor can be diverted to the Wastewater Effluent Sump where it will normally be pumped back to the Olefin Unit cooling tower to be used as make-up water. The Plant Effluent Sump also receives water from the Demineralization Regeneration/Neutralization Sumps and cooling tower blowdown water from the olefins and BD units.

Due to water availability concerns along the Texas coastal bend following the recent drought conditions, water conservation measures are being adopted in association with the Olefins Unit Expansion Project. Any of the water conservation projects or combination of water conservation projects that Equistar will select will still result in no net change in the quantity (flow), temperature, or constituent concentrations of the wastewater that has historically been discharged from the existing permitted outfall (Outfall 001). A simplified process flow diagram (Diagram 1) of water sources comprising the makeup of Outfall 001 is included below. The contributing streams consist of the following 1) the Demineralization System, 2) the Biological Treatment System and 3) the Cooling Tower Blowdown System.

Diagram 1. Simplified Process Flow Diagram of Water to Outfall 001



Many alternatives exist for water conservation within the plant. Of those identified, the following two would have the greatest impact to overall water conservation:

- Recycling a greater amount of discharge water from the Biological Treatment System back to the Cooling Tower.
- Upgrading the Demineralization System thus improving the system and reducing average flow volumes to Outfall 001.

It is anticipated that the net effect of the water conservation measures incorporated in this proposed project is that Outfall 001 discharge will not be impacted by the project relative to historical discharge volumes and characteristics. Non-contaminated storm water will be discharged via Outfall 003, which discharges into an unnamed ditch. The unnamed ditch flows into Oso Creek. No additional discharge is expected into Outfall 003 from the proposed expansion as all new construction will occur within the existing Olefins Unit.

5.3.4 OPERATION NOISE LEVELS

Equistar's Process Change Authorization program ensures that additional equipment added as part of the proposed project will not produce noise levels greater than 90 decibels. Any equipment greater than 90 decibels will be evaluated on a case-by-case basis. The new equipment should not alter the preexisting noise exposure at or from the site.

6.0 BACKGROUND INFORMATION

6.1 GENERAL ENVIRONMENTAL INFORMATION

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

6.1.1 GENERAL REGION INFORMATION

The proposed construction site is within the Southern Subhumid Gulf Coastal Prairie[9]. The area in which the project is located is typical for this ecoregion.

This region borders a portion of the Gulf Coast in the state of Texas. The Gulf of Mexico influence creates multiple dynamic ecosystems within this ecoregion including bays, estuaries, salt marshes, and tidal flats. Inland ecosystems are typical of the Coastal Prairie and are composed of mixed brush and grassland communities. These ecosystems are home to a variety of nongame wildlife including several endangered species. This region is prime wintering grounds for migratory birds. The bays and estuaries are invaluable breeding grounds and fish hatcheries[10].

The majority of river basins in Texas drain towards the Gulf of Mexico, however the limited amount of rainfall in west Texas reduces the amount of fresh water inflow experienced along the southern Gulf Coast of Texas. This ecoregion also experiences more drought than other coastal areas to the north. Nonetheless, this region is ecologically diverse, particularly in areas adjacent to the coastline. Freshwater wetlands, marshes, swamps, inland prairies and scrub/shrub habitat are typical in the area[9].

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[9]. These land uses have reduced and fragmented the natural habitats throughout the region.

6.1.2 LAND USE

Nueces County is located within the Gulf Coast Prairies with almost 70% of the county considered prime farmland. Much of the natural areas have been converted to produce sorghum, cotton, hay, wheat, corn, watermelons, peaches, and pecans. Cattle are also raised for beef and dairy. Urban and industrial developments have increased in recent years, partly in

response to the growth of oil and gas in the region[9]. Land use types within the survey area consist of agriculture, urban development, potential wetlands, and scrub-shrub habitats (Figure 3 – Appendix A).

6.1.3 CLIMATE

According to the Texas Online Handbook, the climate in Nueces County is sub-humid tropical with an average annual rainfall of 30 inches. The mean temperature in July is 93 °F and 47 °F in January. The growing season lasts roughly 309 days per year[11].

As of 22 January 2013 the US Drought Monitor indicated the survey area was in D3 - Extreme drought conditions[12]. According to the National Weather Service/Advanced Hydrologic Prediction Service, the area has received approximately 0.5-1.5 inch of rain within the 30 days prior to the field survey conducted on 16 January 2012. This amount is 0.5-1 inch lower than the average rainfall for this area[13].

The NOAA – NCDC Hydrological Drought Index indicates that Nueces County has been impacted by drought four of the past 6 years (in August). The watersheds that contribute to the project region have been impacted by significant drought conditions for five out of the past 6 years. Long-term drought conditions have weakened many ecosystems across Texas[14]. While the coastline has not experienced as severe a deficiency in direct precipitation as have other areas of Texas, it is affected by the limited influx of freshwater from Texas' river basins.

6.1.4 TOPOGRAPHY

As part of the Gulf Coast of Texas, Nueces County is comprised of generally flat terrain, with elevations ranging from sea level to approximately 180 feet above sea level[11]. The Project Area is flat with an elevation of approximately 65 feet above sea level (Figures 3 and 5 – Appendix A).

According to the Federal Emergency Management Agency floodplain data, the Project Area is not within a designated 100-year floodplain. Floodplain designation is demonstrated in Figure 4 (Appendix A)[15].

6.1.5 GEOLOGY

The specific geologic formation found in the area is the Beaumont Formation from the Cenozoic Era[16].

The geologic units found within and surrounding the proposed Project Area are listed and described below in Table 1.

Table 1. Geologic Units Summary[17, 18]

Map Unit	Unit Name and Description	Rock Types
Qbc	Beaumont Formation, areas predominantly clay	Clay or mud, silt
Qbs	Beaumont Formation, areas predominantly sand	Sand, silt, clay or mud, gravel

6.1.6 SOILS

Dominant soils found in Nueces County are comprised of hypothermic, very dark loams to gray or cracking clayey soils[11]. The majority of soils have moderate to high shrink-swell potential and the soil types are poorly drained to well drained[19]. The Natural Resources Conservation Service soil units mapped within and surrounding the proposed Project Area are listed and described below in Table 2 (Appendix D).

6.1.7 WATER RESOURCES

Nueces County has abundant water resources, with its southern border on the Gulf of Mexico and extensive coastal lakes, marshes, estuaries and rivers. The Project Area is a part of the Nueces - Rio Grande Coastal Basin, which includes prominent water features such as the Nueces Bay, Corpus Christi Bay/Ship Channel, and Laguna Madre. The low, flat topography is prone to flooding. Surface waters in the general area include Tule Lake, Nueces River, Oso Creek, and Rincon Bayou[20].

Based on the background review, the water resources surrounding the Project Area include storm water retention ponds, canal, freshwater emergent wetland, riverine, and freshwater forested/scrub-shrub wetland.

The USFWS National Wetlands Inventory data within and immediately adjacent to the proposed Project Area is demonstrated in Figure 4 (Appendix A)[21].

6.1.8 VEGETATION

Historically, the native plant community of the area was composed of *Spartina* spp. (cordgrasses), *Distichlis* spp. (salt grasses), and *Zizaniopsis* sp. (marsh millet) along the coast and *Quercus* spp. (oaks), *Opuntia engelmanii* (prickly pear), *Acacia* spp., and *Prosopis glandulosa* (mesquite) in the central and western parts of the county[11]. Species such as *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (yellow indiangrass), *Sporobolus* spp. (tall dropseed), *Bouteloua* spp. (grama), *Eragrostis* spp. (lovegrass), *Hilaria* spp. (curly-mesquite), and *Setaria* spp. (bristlegrass) are common. Mesquite and *Acacia farnesiana* (huisache) are invasive species that are encroaching into the region[9].

Agriculture and urban and industrial development have replaced most of the native coastal prairie. Manicured lawns and gardens have introduced ornamental plant species. Remaining native vegetation consists of fragmented remnants of natural habitat[9].

6.2 FEDERALLY-LISTED SPECIES

6.2.1 THREATENED AND ENDANGERED SPECIES LIST

The USFWS, NOAA-NMFS, and the TPWD maintain lists of federally-listed species by county in Texas. Table 3 is a list of federal candidate, threatened, and endangered species identified by these agencies as having the potential to occur in Nueces County [22, 23, 24, 25]. For the purposes of this BA, federally-listed species mentioned by these 3 agencies will be discussed. State-listed species are not included in this report.

Table 3. List of Federal Threatened, Endangered, and Candidate Species for Nueces County, Texas [22, 23, 24, 25]

Common Name	Scientific Name	Species Group	USFWS List Status	NOAA List Status	TPWD List Status
Green sea turtle	*Chelonia mydas*	reptiles	T	T	LT
Hawksbill sea turtle	*Eretmochelys imbricata*	reptiles	E	E	LE
Kemp's ridley sea turtle	*Lepidochelys kempii*	reptiles	E	E	LE
Leatherback sea turtle	*Dermochelys coriacea*	reptiles	E	E	LE
Loggerhead sea turtle	*Caretta caretta*	reptiles	T	T	LT
Smalltooth sawfish	*Pristis pectinata*	fishes	-	E	LE
Gulf Coast jaguarundi	*Herpailurus yagouaroundi cacomitli*	mammals	E	-	-
Ocelot	*Leopardus pardalis*	mammals	E	-	LE
Red wolf	*Canis rufus*	mammals	-	-	LE
West Indian manatee	*Trichechus manatus*	mammals	E	E	LE
Eskimo curlew	*Numenius borealis*	birds	-	-	LE
Northern aplomado falcon	*Falco femoralis septentrionalis*	birds	E	-	LE
Piping plover	*Charadrius melodus*	birds	T	-	LT
Red knot	*Calidris canutus rufa*	birds	C	-	-
Sprague's pipit	*Anthus spragueii*	birds	C	-	C
Yellow-billed cuckoo	*Coccyzus americanus*	birds	C	-	-
Whooping crane	*Grus americana*	birds	E	-	LE
Slender rush-pea	*Hoffmannseggia tenella*	plants	E	-	LE
South Texas ambrosia	*Ambrosia cheiranthifolia*	plants	E	-	LE
Blue whale	*Balaenoptera musculus*	mammals	-	E	-
Finback whale	*Balaenoptera physalus*	mammals	-	E	-
Humpback whale	*Megaptera novaeangliae*	mammals	-	E	-
Sei whale	*Balaenoptera borealis*	mammals	-	E	-
Sperm whale	*Physeter macrocephalus*	mammals	-	E	-

Note: USFWS and NOAA List Status symbols: E - Endangered, T - Threatened, C - Candidate.

TPWD List Status Symbols: LE - Listed Endangered, LT - Listed Threatened, C - Candidate.

6.2.2 THREATENED AND ENDANGERED SPECIES DESCRIPTIONS

According to the USFWS, no critical habitat for federally-listed species is present within the Action Area or within 3 miles of the Project Area. The nearest critical habitat is for piping plovers, which is located more than 14 miles northeast of the Project Area[26].

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

Green Sea Turtle

The green sea turtle can grow to 4 feet in length and reported weights vary from 350-450 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[27,28].

Green sea turtles occupy 3 ecosystems according to their life stage: high-energy oceanic beaches, convergence zones in the pelagic habitat, and benthic feeding grounds in relatively shallow, protected waters. Females briefly occupy high-energy oceanic beaches during nesting and hatching activities. Hatchlings move out to the convergence zone until their carapace reaches approximately 7.8-9.8 inches in length. Juveniles and adults primarily occupy benthic feeding grounds in shallow, protected waters. Preferred feeding grounds include pastures of seagrasses and/or algae. They are also found over coral reefs, worm reefs, and rocky bottoms[28].

Green sea turtles have a worldwide distribution in tropical and subtropical waters. The nesting season in the southeastern US is June through September. Nesting is nocturnal and occurs in 2, 3, or 4-year intervals. Females may lay up to 9 clutches per season at 13-day intervals. Hatchlings typically emerge at night. In Florida, it is estimated that 5,000 females nested on beaches in the year 2010. Nesting occurs on high energy oceanic beaches with a sloping platform and minimal disturbance. Green sea turtles return to the same nesting site and are known to travel long distances between foraging areas and nesting beaches[27,28].

Hawksbill Sea Turtle

The hawksbill sea turtle is a small to medium-sized marine turtle with a reddish-brown carapace. The head is relatively small with a distinctive hawk-like beak. The adult hawksbill is commonly 2.5 feet in length and typically weighs 176 pounds or less[29,30].

Hawksbill hatchlings live in a pelagic environment, specifically in the weedlines that accumulate at convergence zones. Juveniles will return to a coastal environment when their carapace reaches approximately 7.8-9.8 inches in length. Juveniles, subadults, and adults will spend most of their time in their primary foraging habitat, coral reefs. Hawksbills primarily feed on sponges[29,30].

Hawksbill sea turtle nesting varies depending on locality but most nesting occurs between April and November yielding up to 200 eggs with each nest. Nesting is nocturnal and occurs every 2-3 years, 4-5 times per season, approximately every 14 days. Preferred nesting habitat includes low and high energy beaches in tropical oceans. Approximately, 15,000 females are estimated to nest each year worldwide[29,30].

The hawksbill is found in tropical and subtropical waters of the Atlantic, Pacific, and Indian Oceans. Hawksbills are typically associated with rocky areas and coral reefs in water less than 65 feet. Mexico is now considered the most important region for hawksbills in the Caribbean. The hawksbill sea turtle is an occasional visitor to the Texas coast[29,30].

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle is considered the smallest sea turtle with an olive-gray carapace, a triangular shaped head, and a hooked beak. Adults can grow to 2 feet in length and weigh between 70-108 pounds. This turtle is a shallow water benthic feeder with a diet consisting primarily of crustaceans (i.e., shrimp and swimming crabs), Cnidarians (jellyfish), gastropods (snails), and echinoderms (sea stars)[31,32].

Kemp's ridleys occupy 3 ecosystems according to life stage: terrestrial zone, neritic zone (nearshore marine environment), and oceanic zone. The terrestrial zone is occupied briefly during nesting and hatching activities. Hatchlings move out to the oceanic zone

for an average of 2 years. Juveniles and adults primarily occupy the neritic and oceanic zones[31,32].

Most nesting occurs on the eastern coast of Mexico, however a small number consistently nest at Padre Island National Seashore in Texas and various other locations along the Gulf and lower Atlantic coasts. Nesting occurs from April to July during daylight hours. Large numbers of females emerge for a synchronized nesting event referred to as "arribada". Arribadas are thought to be caused by strong winds or changes in barometric pressure. Females may breed annually and nest an average of 2.5 times per season at intervals of 14-28 days[31,32].

The Kemp's ridley turtles range includes the Gulf of Mexico and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland[31,32].

Leatherback Sea Turtle

The leatherback sea turtle is the largest sea turtle. The carapace of adult female leatherback turtles range from 4-6 feet and leatherback sea turtles can weigh up to 2,000 pounds. The turtle lacks a "normal" turtle shell and is covered by firm, rubbery skin that is approximately 1.5 inches thick. Coloration is predominantly black with varying degrees of pale spotting; including a notable pink spot on the dorsal surface of the head in adults. Diet is primarily jellyfish, siphonophores, and salpae, but it is also known to feed on members of echinoideans (sea urchins), cephalopods (squid), crustaceans, ascidiacean (tunicates), osteichthyes (bony fish), cyanobacteria (blue-green algae), and floating seaweed[33,34].

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[34].

In the US, nesting occurs from March to July. Females nest 5-7 times per season at 10-day intervals. Most leatherbacks return to their nesting beaches at 2 to 3-year intervals[34].

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[33,34].

Loggerhead Sea Turtle

The loggerhead sea turtle is reddish-brown marine turtle characterized by a large head with blunt jaws. Adults on average weigh 255 pounds and are 3 feet in length. Adult loggerheads feed on jellyfish, salps, mollusks, benthic crabs, *Janthina* spp. (snails), and *Lepas* spp. (barnacles)[35,36].

Loggerheads occupy 3 ecosystems according to life stage: terrestrial zone, neritic zone, and oceanic zone. The terrestrial zone is occupied briefly during nesting and hatching activities. Hatchlings move out to the oceanic zone until their carapace reaches approximately 3-25 inches in length. Juveniles and adults primarily occupy the neritic zone (nearshore marine environment)[35,36].

The nesting season in the US is April through September. Nesting occurs every 2-3 years and is mostly nocturnal. Females can nest up to 5 times per season at intervals of approximately 12-15 days. Hatchling emergence is mostly nocturnal. Loggerheads nest on oceanic beaches between the high tide line and dune fronts and occasionally on estuarine shorelines with suitable sand. Females prefer narrow, steeply sloped, coarse-grained beaches[35,36].

Distribution of the loggerhead includes the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Although the majority (~80%) of nesting activity in the US occurs in south Florida, loggerheads nest along the Gulf and Atlantic coastlines from Texas to Virginia. Loggerheads are considered an occasional visitor to Texas[35,36].

Smalltooth Sawfish

Smalltooth sawfish are large elasmobranchs. They have a body similar to shark with ventral gill slits like a ray. Most notable is the long, flat snouts with pairs of teeth along the edges. Smalltooth sawfish can grow up to 25 feet in length[37].

The toothed snout is used to locate, stun, and kill fish and crustaceans. These sawfish are ovoviviparous, usually with litters of 15-20 pups[38].

Preferred habitat includes shallow coastal seas and estuaries with muddy and sandy bottoms. They are typically found close to shore, in sheltered bays and on shallow banks[37,38].

The US population of smalltooth sawfish is found in the Gulf of Mexico and Atlantic Ocean. Historically, these sawfish could be found throughout the Gulf of Mexico. Today, their range has shrunk to peninsular Florida[37].

Gulf Coast Jaguarundi

Jaguarundis are diurnal small cats, weighing between 8-20 pounds. They have a slender build, long neck, short legs, a long tail, and a small, flattened head. Their fur may be either red or gray colored[39].

Historically, the Gulf Coast jaguarundi was found from the Lower Rio Grande Valley in southern Texas to Veracruz, Mexico. They inhabit dense, thorny brushlands/woodlands and bunchgrass pastures adjacent to dense brush or woody cover. Jaguarundis have been observed spending half their time in tall, dense grass habitats. Typical thorn-scrub habitat consists of the following species: *Condalia hookeri* (brasil), *Schaefferia cuneifolia* (desert yaupon), *Lycium berlandieri* (wolfberry), *Ziziphus obtusifolia* (lotebush), *Castela erecta* (amargosa), *Aloysia gratissima* (white-brush), *Acacia greggii* (catclaw), *Acacia rigidula* (blackbrush), *Lantana achyranthifolia* (lantana), *Guajacum angustifolium* (guayacan), *Leucophyllum frutescens* (cenizo), *Forestiera angustifolia* (elbowbush), and *Diospyros texana* (Texas persimmon). Trees that may be interspersed within the thornscrub include mesquite, *Quercus stellata* (live oak), *Ebenopsis ebano* (ebony), and *Celtis laevigata* (hackberry). River and creek riparian habitat may also be used[39].

Gulf Coast jaguarundis are solitary, except during the mating season from November to December. They may have up to 2 litters per year, each with 1-4 young. Jaguarundis are predators with a diverse diet of birds, small mammals, and reptiles[39].

Ocelot

Ocelots are a medium-sized cat comparable in size to the bobcat. These cats weigh between 15 – 35 pounds and are up to 41 inches long. The short fur of the ocelot varies from pale gray to cinnamon. The undersides of the cat are white. Blotched spotting on

the fur is bordered with black or solid black. Black stripes run from the eyes to the back of the head and across the cheeks. The tail is ringed or marked with dark bars[40].

Historically ocelots were found throughout south Texas, the southern Edwards Plateau, and the coastal plains. Currently, their distribution in the US is limited to the extreme southern tip of Texas and Arizona. The range of the ocelot is reduced because of continued habitat loss. Ocelots prefer dense, thorny thickets and rocky areas. Individuals have varying home ranges, estimated between 500-4,500 acres in size[40].

Ocelots are carnivores that feed on small mammals, birds, and some reptiles. Females create their dens in caves, hollow trees, or dense brush and will give birth every other year to 1-2 kittens. Kittens will stay with the mother for up to 2 years. The estimated population of ocelots in Texas is approximately 50 individuals[41].

Red Wolf

The red wolf is one of the world's most endangered canids. Their fur is a reddish color and they are smaller in size than the gray wolf. The average adult red wolf grows up to 5 feet in length and 45-80 pounds[42].

Red wolves are thought to prefer warm, moist, and densely vegetated habitat. They also can be found in pine forests, bottomland hardwood forests, coastal prairies, and marshes[43]. Little information is available describing red wolf preferred habitat characteristics.

Originally, the red wolves were found throughout the southeastern US. The USFWS declared the red wolf extinct in the wild in 1980. In 1987, captive individuals were released to the wild in North Carolina[44]. This reintroduced population is estimated at 100-120 individuals[42].

Red wolves feed on Lagomorphs (rabbits), *Odocoileus* sp. (deer), *Procyon lotor* (raccoons), and Rodentia (rats and mice). They live in packs of 5-8, which typically consist of 1 breeding pair and their offspring[44].

West Indian Manatee

The West Indian manatee is a large, fusiform-shaped, marine mammal. The adult manatee may grow up to 10 feet in length and up to 2,200 pounds. The manatee has dark gray, rubber-like skin. Manatees have forelimbs shaped like a paddle, no hind limbs, and a horizontal, flat, spatulate tail. Manatees breathe surface air with nostrils located on the upper snout. Manatees also have very small eyes and minute ears. Manatees are herbivores and opportunistic. Their diet consists of a wide variety of submerged, floating, and emergent vegetation. Seagrasses appear to be a dominant food source in coastal areas[45].

West Indian manatees have both opportunistic and predictable migration patterns, which are dependent on water temperature. They are able to travel long distances, typically in a north-south direction, according to seasonal temperature changes. In autumn and winter when water temperatures drop below 68 °F, manatees congregate in natural and artificial warm-water refuges. Most manatees return to the same warm water refuges each year. During mild winters, manatees will leave the warm-water refuge to feed on nearby grassbeds. As the water temperature rises in spring and summer, some manatees will remain near their wintering grounds and others will migrate up the coast or into river and canal systems. Manatees prefer depths ranging from 3-7 feet, but can be found in shallow areas down to 1.5 feet. Preferred feeding grounds are shallow grassbeds adjacent to deep channels in both coastal and riverine habitats. Manatees will seek freshwater drinking sources, but are not dependent upon fresh drinking water[45].

Mating and calving are not seasonally or habitat dependent. One or more males are attracted to females in heat to form a mating herd for up to 4 weeks. Length of gestation is thought to be between 11-14 months. Typical litter size is one and calves remain with the mother for 1-2 years after birth. Manatees reach sexual maturity at approximately age 5 years and can live in excess of 50 years[45].

Distribution is limited to warm coastal waters in the Gulf of Mexico including the US and Mexico, Central America, the north and northeastern coast of South America, and islands throughout the Caribbean Sea[46]. Manatee protection is not as well-supported in areas outside of the US, which results in smaller populations. The Florida coast supports

the largest known population of West Indian manatees of any location within the species range[45].

Northern Aplomado Falcon

The northern aplomado falcon is a subspecies of the aplomado falcon. It is larger and has a longer wingspan than the aplomado falcon. Its length is approximately 14-17 inches. The upper coloration is light gray and the underside has a black belly-band. The tail is banded black and white. Sexes are similar in appearance. This subspecies is currently found only in Texas, Guatemala, and Mexico[47].

The northern subspecies prefers coastal prairies and desert grasslands with scattered *Yucca* spp. (yuccas) and mesquites. They also utilize oak woodlands and riparian gallery forests that are within desert grasslands. Its diet consists mostly of birds and insects, but also small mammals and reptiles. The birds are capable of long pursuits of prey, such as *Columba livia* (pigeons) and *Zenaida* spp. (doves). Mated pairs remain together year-round and hunt cooperatively[47].

Eskimo Curlew

The Eskimo curlew is a migratory bird that is approximately 12-14 inches long with a slightly down-curved bill. These birds have brown feathers with streaking on the sides of the face and neck. The undersides of their wings have cinnamon-colored feathers[48].

Its breeding habitat consists of treeless dwarf shrub-graminoid tundra and grassy meadow habitat. Non-breeding birds utilize a variety of habitats, including grasslands, pastures, plowed fields, intertidal flats, and sand dunes[48].

Eskimo curlews migrate from nesting grounds in the Alaskan and Canadian Arctic across the North American prairies to South America. This species is known to migrate north through the mid-western US, including Texas during the spring. Their diet consists of *Empetrium nigrum* (crowberry), *Vaccinium* sp. (blueberries), Orthopterans (grasshoppers), Annelids (earthworms), and other insects[48].

Piping Plover

Piping plovers are small, migratory shorebirds approximately 5-7 inches in length with a wingspan of approximately 15 inches. These birds have a short, black and orange bill that varies in color depending on the time of year, orange legs, pale gray back and dorsal wings, white undersurface, and black breastband[49].

Three main breeding populations of piping plovers have been distinguished by geographic region within the US: Great Lakes, Northern Great Plains, and American Atlantic. These 3 populations winter on beaches and barrier islands in the South Atlantic, Gulf of Mexico, and Caribbean coasts, including the Bahamas and West Indies. Piping plovers from these 3 regions primarily winter along coastal areas of the US from North Carolina to Texas[50]. 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[51].

Wintering habitat includes foraging and roosting habitat types. Preferred foraging habitat includes wet sand in the wash zone, bare to sparsely vegetated, intertidal ocean beaches, wrack lines, shorelines of streams, ephemeral ponds, lagoons, salt marshes, emergent seagrass beds, wash-over passes, mudflats, sandflats, or algal flats. Most preferred foraging habitats are dynamic systems that fluctuate with the tide and wind. Their diet consists of invertebrates such as marine worms, fly larvae, beetles, crustaceans, and mollusks. Piping plovers demonstrate high winter site fidelity[49]. Preferred roosting habitat is adjacent to foraging habitat and includes sandy beaches, often with cover such as driftwood, seaweed clumps, small dunes, and debris that is used for shelter from wind and extreme temperatures[52]. Critical habitat for wintering piping plovers has been designated in several areas along the Texas coast[53]. Piping plovers are known to occupy similar habitats as other shorebirds such as *Tringa semipalmata* (willets), *Arenaria interpres* (ruddy turnstones), *Limnodromus scolopaceus* (dowitchers), *Calidris* spp. (sandpipers), *Haematopus palliatus* (American oystercatchers), and other plovers[51].

Whooping Crane

The whooping crane is a large bird that stands approximately 5 feet tall and weighs approximately 14-16 pounds. Adult birds have long necks and legs, a white body, a red crown, black primary feathers, and a long, pointed beak. Juveniles are reddish-cinnamon in color[54,55].

Whooping cranes are migratory with the main population breeding in Wood Buffalo National Park in Alberta, Canada (May to October) and wintering on the Texas coast (November to March). During breeding, whooping cranes demonstrate high site fidelity, using the same areas each year. Nests are typically constructed within tall rushes or sedges of marshes, sloughs, or along lake margins. Females lay 2 eggs per season. Parents share rearing duties although the female take the primary role in raising the young[54,55].

Migration occurs twice per year during daylight hours. The main population typically remains within a 200-mile migration pathway from Canada to Texas, and they regularly stop to feed and rest along the way. Whooping cranes use a variety of habitats during migration, including inland marshes, lakes, wetlands, ponds, wet meadows, rivers, and agricultural fields[54,55].

The wintering population primarily occupies habitat in or near the Aransas National Wildlife Refuge near Rockport, Texas. However, the birds have been expanding their winter range due to population increases and climate change[56]. Winter habitat includes brackish bays, marshes, and salt flats[54,55].

Whooping cranes are omnivorous with a diet of crustaceans, mollusks, amphibians, fish, acorns, and berries[54,55].

Slender Rush-pea

The slender rush-pea is a perennial legume in the Fabaceae family. The stems are 0.3-0.6 inches long and the inflorescence consists of 3-5 orange flowers about 0.2 inches long. Flowers bloom from March to June. Legumes are 0.4-0.6 inches long and contain 2-4 seeds. Leaves are bipinnately compound with oblong leaflets 0.08-0.16 inches long and 0.04-0.08 inches wide[57, 58].

Slender rush-pea is found in bare patches or among low native grasses in disturbed clayey soils of blackland prairies and creek banks of the Gulf Coastal Prairie[57]. It is also found along mowed road ROWs[58]. The slender rush-pea is negatively affected by encroachment of competing plant species, such as *Bothriochloa ischaemum var. songarica* (King Ranch bluestem), *Dichanthium annulatum* (Kleberg bluestem), and *Cynodon dactylon* (bermudagrass)[58].

Commonly associated shrub and tree species include blackbrush, huisache, amargosa, *Celtis pallida* (spiny hackberry), brasil, *Parkinsonia aculeate* (retama), mesquite, desert yaupon, and *Yucca treculeana* (spanish dagger). Associated cacti include *Opuntia leptocaulis* (tasajillo), prickly pear, and *Ferocactus setispinus* (twisted rib). Native grasses associated with the slender rush-pea include *Bouteloua ridgidiseta* (Texas grama), *Buchloe dactyloides* (buffalograss), and *Stipa leucotricha* (Texas speargrass)[58].

South Texas Ambrosia

The South Texas ambrosia is a perennial, herbaceous plant in the Asteraceae family. It stands 4-12 inches in height. The plant has silvery to grayish-green leaves about 3 inches long and 1.5 inches wide. Flower heads are inconspicuous terminal racemes. South Texas ambrosia spreads via rhizomes that allow a single individual to be represented by hundreds of stems[59,60].

The South Texas ambrosia can be associated with the federally-listed species, slender rush-pea. Associated native grasses include Texas grama, buffalograss, *Nassella leucotricha* (Texas wintergrass), and *Pleuraphis mutica* (tobosa). Associated native woody species can include mesquite, huisache, *Acacia schaffneri* (huisachillo), brasil, spiny hackberry, and lotebush[59].

South Texas ambrosia occurs in open grasslands or savannahs on soils varying from clay loams to sandy loams. Mowing, with consideration to cut height and frequency, is believed to promote growth of South Texas ambrosia. Fire may also promote growth. Tall grasses and non-native vegetation negatively affects the growth of South Texas ambrosia. Currently, South Texas ambrosia is known to occur within 6 locations in Nueces and Kleberg counties[59].

Blue Whale

Blue whales are considered baleen whales and are the largest of all whales. These whales may weigh up to 330,000 pounds and reach lengths up to 108 feet. Females tend to be larger than the males. Blue whales have a long, slender body mottled with a gray pattern that appears light blue when seen through the water. Key identifying characteristics of the blue whale include a broad, flat rostrum and a proportionately smaller dorsal fin than other baleen whales[61,62].

Little information is available concerning the life history of blue whales. Blue whales are thought to inhabit all oceans but occurrence is likely influenced by the presence of food. Few records exist that demonstrate occurrence in the Gulf of Mexico. Sightings in the Gulf of Mexico consist of stranded whales with the most recent observation in 1940 along the coast of Texas[63]. Blue whales may occur in coastal waters but are believed to more frequently use off-shore waters. Blue whales are migratory, moving to colder waters during the spring and summer and to more temperate waters in the fall and winter. Mating and parturition occur in temperate waters during winter months. Typically, 1 calf is born after a 10-12 month gestation period, and it is nursed for 6-7 months. It is reasoned that sexual maturity occurs between 5-15 years of age[61,63,62].

As a baleen whale, blue whales have baleen, keratinized transverse plates that are used to filter water for food (i.e., zooplankton). Euphasiids (krill) comprise the largest component of their diet. Fish and other select crustaceans (copepods) are also consumed in small amounts[61,62].

Finback Whale

Finback whales are the second-largest species of whale, weighing between 80,000-160,000 pounds and have lengths between 75-85 feet. These baleen whales have sleek, streamlined bodies, a V-shaped head, and a tall, curved dorsal fin. They are large, fast swimmers. Finback whales are dark gray with a white underbelly. The lower jaw and the baleen plates are bi-colored with gray or black on the left side and cream white on the right side. The tongue is oppositely colored. Many individuals have several light-gray, V-shaped "chevrons" behind their head. Individuals can be identified by the size and shape of their dorsal fin and by the pattern of chevrons and streaks of lighter coloration on their back[64,65].

Finback whales are found in deep, offshore waters of all major oceans, most often in the temperate to polar latitudes. They are rarely found within the tropics. There are distinct populations in the North Atlantic Ocean, North Pacific Ocean, and Southern Hemisphere and these populations are thought to rarely, if ever, interact. These populations differ in the amount of travel that they exhibit, which may be directly related to local food abundance. Fin whales have a complex, not completely understood migratory pattern. The consensus is that these whales move into and out of high-latitude feeding areas. Movement may be affected by prey availability, climate, reproductive condition, etc[64,65]. Finback whales are not abundant in the Gulf of Mexico. One young individual was stranded on the beach in Gilchrist, Chambers County, Texas on 21 February 1951. This is the only recorded observation of finback whales in Texas[66].

During the summer, finback whales will consume large amounts of prey at higher latitudes, and then fast or selectively feed when at lower latitudes in the winter. Their diet primarily consists of krill, squid, and small, schooling fish such as *Mallotus villosus* (capelin), *Clupea harengus* (herring), and *Ammodytes* spp. (sand lance). Finback whales' distribution along the eastern US is strongly correlated with the availability of sand lance. Fish are more often consumed during pre-spawning, spawning, and post-spawning adult stages on the continental shelf and in coastal waters[64,65].

Although social and mating systems of finback whales are not well known, finback whales are known to form social groups of 2-7 whales. Reproduction maturity is believed to occur between 6-12 years and females give birth at 3-year intervals. Mating and calving occur from November to March. Females give birth to a single calf, after 11 months of gestation[64,65].

Humpback Whale

Humpback whales are characterized by long pectoral fins, which can reach up to 15 feet in length, a thick body, and fewer throat grooves as compared to other baleen whales. Humpback whales may weigh between 50,000-80,000 pounds and have a length up to 60 feet. Adult females are typically larger than males. Their body and baleen plates are grayish-black; however white pigmentation may be present on their pectoral fins, belly, and tail flukes. The pigmentation on the undersides of their tail flukes can be used to

identify individual whales. Humpback whales also have numerous knobby structures, called dermal tubercles, on the dorsal surface of the snout, chin, and mandible[67,68,69].

Humpback whales inhabit all major oceans particularly over continental shelves. Humpback whales occur at higher latitudes during the summer and in temperate and tropical zones during winter. They may migrate long distances between winter and summer habitats or migrate throughout their summer range. Generally humpback whales stay near the surface of the ocean during migration. During the winter and reproductive periods, humpback whales tend to demonstrate site fidelity to mate and reproduce. Shallow waters are most often used while feeding and calving[68,69].

Humpback whales from the Atlantic population may infrequently stray into the Gulf of Mexico during the breeding season or on their return migration northward. The only known occurrence along the Texas Coast is of a young, immature individual observed at the inshore side of Bolivar Jetty near Galveston, Texas in 1992[67].

Humpback whales are known to frequently breach the surface water. They commonly slap their tail flukes on the surface and are known to spyhop, a behavior where an individual lifts its head out of the water in order to look around. These displays of behavior may be a form of communication[67].

Humpback whales' diet consists of krill, herring, sand lance, and capelin. It also includes *Scomber sombrus* (mackerel), *Pollachius virens* (small pollock), and *Melanogrammus aeglefinus* (haddock). Humpback whales have unique means of foraging by using techniques such as "bubble netting" and synchronized feeding lunges. Bubble netting is when humpback whales expel columns of air bubbles to concentrate krill or fish for easier consumption. They may also opportunistically feed on prey around fishing boats[67,68,69].

Humpback whales congregate in groups of up to 200 individuals and mate, which usually occurs once every 2 years. Gestation lasts for about 11 months, and weaning occurs between 6-10 months after birth. Calving grounds are commonly near offshore reef systems, islands, or continental shores[67,68,69].

Sei Whale

Sei whales are members of the baleen whale family and can reach lengths of 40-60 feet and weigh up to 100,000 pounds. Sei whales have long, slender bodies that is dark bluish-gray dorsally and pale-colored ventrally. They often have mottling or white spots on the body that may be the result of pits or wounds. Sei whales have very fine bristles on the baleen, short ventral grooves, and prominent, curved-backward dorsal fins. Sei whales have 30-65 ventral pleats. Sei whales differ from other whales by rarely raising their flukes above water and never breaching[70,71].

Sei whales are widely distributed across the globe; however they are not known to stay in any particular area year-round. Sei whales tend to migrate to higher latitudes during the summer for feeding and to temperature or subtropical waters during the winter, although the polar latitudes are not as high as other baleen whales. Sei whales are highly mobile and their occurrences in an area are unpredictable. The North Atlantic population is usually observed in deeper waters over the continental slope and tends to avoid semi-enclosed waters, such as the Gulf of Mexico. These whales may travel singly or in groups of 2-50 individuals[70,71].

Sei whales's diet consists primarily of zooplankton and micronekton, which includes calanoid copepods and krill. They may dive for up to 20 minutes looking for food and use gulping and skimming as foraging strategies. Feeding typically occurs at dawn[70,71].

Sei whales reach sexual maturity at 6-12 years of age. Gestation lasts approximately 11-13 months, and parturition typically occurs in November-December. Females typically breed every 2-3 years and will give birth to a single calf. Calves are weaned in the summer/fall months, approximately 6-9 months after birth[70,71].

Sperm Whale

Sperm whales are classified as odontocetes or toothed whales. Males are significantly larger than females and may weigh up to 125,000 pounds and reach lengths up to 52 feet. Sperm whales have a disproportionately large head, which can make up one third of the total body length. They are also distinguished by a blowhole on the left side of the head and a rod-shaped lower jaw with many teeth. No functional teeth are present on the upper jaw. The bodies of sperm whales are dark gray on their back and white on the

underside. Their dorsal fin is short and thick. It is not pointed or curved and there are knuckles along the spine. They have the largest brain of any animal on Earth[72, 73].

Sperm whales inhabit are cosmopolitan in all deep ice-free waters and are thought to inhabit the entire Atlantic basin, including the Gulf of Mexico. Occurrence in the Gulf of Mexico is strongly correlated with mesoscale physical features, such as Loop Current eddies and Mississippi Canyon. Research suggests these whales move along the shelf break in the Gulf of Mexico and may be present year-round[74]. Female sperm whales and their young are more often found in lower latitudes while males can often be found at polar latitudes during parts of the year. Distribution is dependent on their food source and suitable conditions for breeding, and varies with the sex and age composition of the group[73].

Sperm whales will dive deeply to forage for cephalopods (squids and octopus), bottom-dwelling fish, *Cyclopterus lumpus* (lumpsuckers), rays, sharks, and many other bony fishes[72,73].

Breeding season occurs from March to June in the North Atlantic. Females sexually mature between 7-13 years of age and males do not mature until they reach their twenties. Females enter estrous synchronously which maximizes the reproductive success for traveling males. Gestation is approximately 15 months, resulting in the birth of a single calf. Birthing intervals are approximately every 4-6 years[73].

Sperm whales have strong family bonds, particularly between the females. Typically, 12 females will form a pod while males are more likely to separate themselves from the family unit. Young males will leave the family unit between 4-21 years of age[72,73].

6.2.3 CANDIDATE SPECIES DESCRIPTIONS

Red Knot

Red knots are long-distance migratory birds that travel bi-annually between their breeding areas in the central Canadian Arctic and wintering areas in southern South America. Red knots have a wingspan of 20 inches, short thick legs, and a tapered straight bill. Its plumage is gray during the non-breeding season, but its head and breast turn a reddish color during the breeding season[75,76].

During the breeding season, males and females have simultaneous arrivals in the arctic. Nest sites are typically found on dry, slightly elevated tundra locations, on wind-swept ridges or slopes with little vegetation, and near wetlands. The clutch size is usually 4 eggs. The breeding season occurs from May to July[76].

Red knots are long-distance travelers and use a limited number of stopover sites during migration. Stopover habitat includes intertidal, marine habitats that are near coastal inlets, estuaries, and bays. The diet of migrating red knots includes *Limulus polyphemus* (horseshoe crab) eggs, bivalves, polychaete worms, amphipods, and crustaceans[76].

Red knots may be found in Texas anytime of the year with the greatest numbers occurring during winter (January) and during spring passage (April to May). Between 1985 and 1996, approximately 3,000 individuals were recorded on the Bolivar flats. This population has declined significantly to about 300 individuals. Red knots have been observed utilizing sandy beaches, tidal mudflats, and salt marshes when in Texas[76].

Sprague's Pipit

Sprague's pipits are small, migratory passerines with a relatively narrow bill and yellowish to pale brown legs. Their underparts are buffy with broad black streaks. The upper mandible is dark and contrasts with the pale lower mandible[77].

The only population of Sprague's pipit occurs within North America. Known breeding sites are located in Canada, Montana, North and South Dakota, and Minnesota. Nests are a cup shape on the ground, made of woven dried grasses. Average clutch size is 4.6 eggs and young are cared for by the female for approximately 25 days until fledging[77].

Wintering grounds are located in Arizona, New Mexico, Texas, Oklahoma, Arkansas, Louisiana, and Mexico. Migration occurs in April to May and September to November. In Texas, preferred wintering habitat includes grass-forb prairies dominated by little bluestem and *Andropogon* spp. (bluestem) grasses that are about 8 inches in height. They have also been found in old rice fields that have been re-planted with bermudagrass, on turf grass farms, golf courses, and recently burned pastures. Food primarily consists of arthropods and sometimes seeds[77].

Yellow-billed Cuckoo

The yellow-billed cuckoo is a migratory, medium-sized bird characterized by a zygodactyl foot (2 toes point forward and 2 toes point backwards), a blue-black bill with yellow on the base of the mandible, and a narrow yellow eye ring. It is 12 inches in length and weighs approximately 2 ounces[78].

East of the continental divide, yellow-billed cuckoos breed from the north-central US and south-central Canada to the southeastern US, Greater and Lesser Antilles, and northern Mexico. Yellow-billed cuckoos migrate to South America for the winter[78].

Yellow-billed cuckoos nest between June and August. Nesting habitat includes large patches of riparian habitat that is comprised of *Populus* spp. (cottonwoods), *Salix* spp. (willows), and a dense understory. The eastern population is believed to use more habitat types, which include other broad-leaved woodlands. Clutch size is typically 2-3 eggs per season and the young fledge approximately 17 days after hatching. Yellow-billed cuckoos usually raise their own young, but they are also known to be facultative brood parasites where they lay eggs in other cuckoos or bird species nests. Cuckoos are insectivorous[78].

This species is thought to be declining in west Texas; however it is considered to be widespread and uncommon to common in central and east Texas[78].

6.2.4 TEXAS NATURAL DIVERSITY DATABASE RESULTS

A records review of the Texas Natural Diversity Database[79] was completed for the survey area by the TPWD on 3 January 2013. Element of Occurrence records for South Texas ambrosia (EO ID 1470) and slender rush-pea (ID 4299) were noted within 3 miles of the Project Area. No other federally-listed species were identified in the Action Area or within 3-miles of the Project Area.

7.0 LISTED SPECIES HABITAT EVALUATION

WGI completed a listed species habitat evaluation on 16 January 2013 to determine if habitat within the Project Area was likely to support any of the federally-listed species potentially occurring in Nueces 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 3-mile radius of the Project Area. The majority of the land within the 3-mile radius is privately-owned and is not visible or accessible from public areas. An aerial survey of the 3-mile radius was conducted to observe and assess the inaccessible areas for listed species habitat.

Data were collected to describe resident vegetation communities and assess the potential for occurrence of listed species. The dominant habitats observed are described below and demonstrated in Figure 5 (Appendix A). Photographs of the proposed Project Area and the Action Area are included as Appendix E. A summary of the field survey data is provided in Appendix F.

7.1 PLANT COMMUNITIES OBSERVED

The proposed Project Area is located within an existing industrial facility. The Project Area has previously been disturbed by industrial development including facilities, access roads, and parking lots with 1 vegetated area consisting of maintained grasses and an isolated patch of mesquite trees.

The area to the north of the project site is agricultural (corn and cotton) and residential. Land to the east, west, and south of the proposed site is agricultural land utilized for the cultivation of corn and cotton with a few scattered homes.

The dominant habitats observed in the Action Area include: pastureland, cropland, shrubland, and riverine. These habitats have historically been impacted by residential, industrial, and agricultural development.

Pastureland – This habitat is maintained or otherwise previously disturbed by agricultural development. Dominant species observed included bermudagrass.

Cropland – This habitat consisted primarily of rows of cultivated cotton and corn.

Shrubland – This habitat includes small, non-contiguous tracts. This habitat is subject to disturbance associated with utility lines, residential, industrial, and agricultural development. Dominant species observed included *Bothriochloa ischaemum* (yellow bluestem), *Aristida purpurea* (purple threeawn), mesquite, retama, and *Zanthoxylum fagara* (lime prickly ash).

Riverine – This habitat includes Oso Creek, a perennial stream. This habitat is subject to disturbance from agricultural practices on adjacent land. Dominant species observed on the banks included *Paspalum denticulatum* (longtom), *Fraxinus texensis* (Texas ash), mesquite, retama, and hackberry.

7.2 LISTED SPECIES HABITAT ANALYSIS

The proposed Project Area consists of existing industrial facilities and their associated access roads and parking areas, with 1 vegetated area consisting of maintained grasses and an isolated patch of mesquite trees. Habitat types observed within the Action Area include pastureland, cropland, shrubland, and riverine. The areas surrounding the project location have historically been impacted by agricultural, industrial, and residential activities.

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

The pastureland habitat observed in the Action Area is maintained and disturbed. The observable quality of this habitat is low. Select pastureland areas, particularly maintained road ROWs, have the potential to support the slender rush-pea and South Texas ambrosia. This potential is analyzed more specifically in Section 9.7.

The cropland areas are regularly plowed and cultivated for cotton and corn. The potential exists for whooping cranes to utilize the corn fields for forage. This potential is analyzed more specifically in Section 9.7.

The shrubland habitat areas are primarily small, fragmented tracts. Habitat characteristics including low density, small tract size, fragmentation, and heavy disturbance make these shrubland areas unsuitable to support ocelots or Gulf Coast jaguarundis. These areas are not likely to support any federally-listed species.

The riverine habitat area includes Oso Creek. The riverine habitat area is not likely to support any federally-listed species.

8.0 AIR QUALITY ANALYSIS

RPS completed detailed pollutant emission calculations for the proposed project in connection with its PSD review and GHG permit[80]. Table 1-1 (Appendix H) is the Project Emissions Summary provided in the application that Equistar submitted to the TCEQ for a permit to authorize non-GHG emissions from the project.

Additionally, RPS performed dispersion modeling of the proposed emissions of air pollutants from the proposed project to support the BA. This section provides the results and evaluation of the dispersion modeling.

8.1 AIR DISPERSION MODELING RESULTS

An AOI analysis was conducted as part of the required PSD and State NAAQS review for the emissions of criteria pollutants: NO_2, SO_2, PM_{10}, $PM_{2.5}$, and CO. A health effects evaluation was performed for emissions of non-criteria pollutants from the proposed new sources using TCEQ ESLs[81].

The predicted emissions were compared to the SILs for all criteria pollutants[82]. A SIL is a concentration, established by the EPA, below which the project emissions are considered to have no significant contribution to the total ambient air quality concentration. If the GLCmax predicted by the modeling of the project emissions is below the SIL, then the modeled source impacts are considered insignificant and no further analysis is required for the pollutant and averaging period. If the predicted project GLCmax is above the SIL, then further analysis is typically necessary to demonstrate that the project will not cause or contribute to the violation of an applicable standard. Air pollution standards are shown in Table 4 (Appendix G)[82].

8.1.1 CRITERIA POLLUTANT DISPERSION MODELING RESULTS AND EVALUATION

Table 4 (Appendix G) shows the maximum predicted concentrations due to the expansion project for each pollutant and averaging period[80]. There is a decrease in the total short-term $PM_{2.5}$ and the short-term and annual PM_{10} emissions; therefore, no modeling analysis was required.

Predicted project GLCmax values are less than the SILs for the following NAAQS: 1-Hour SO_2, 3-Hour SO_2, 24-Hour SO_2, annual SO_2, 24-Hour PM_{10}, 24-Hour $PM_{2.5}$ (State NAAQS and Increment Regulation), and Annual $PM_{2.5}$ (State NAAQS and Increment Regulation). Predicted

project GLCmax values are also less than the SIL applicable to the TCEQ 30-minute SO_2 standard. These GLCmax values for the proposed project are considered insignificant, as SILs are a small fraction of the NAAQS and TCEQ SO_2 standard levels, which are set to protect the most sensitive human populations. Therefore, GLCmax values less than the SILs are not expected to impact federally-listed species and will be excluded from further analysis.

Project impacts for the following pollutants and averaging periods are greater than the designated SIL: 1-Hour CO, 8-Hour CO, 1-Hour NO_2, and annual NO_2.

The dispersion model predicts concentrations above the SILs at locations outside of the Corpus Christi Complex for specific pollutants and averaging periods. The coordinates of each receptor with modeled concentrations greater than the SIL for each pollutant were plotted to delineate the AOI. Locations with predicted impacts above the SILs (represented by a blue dot) are shown on Figure 1 (Appendix B). [Note: If a location is identified as exceeding the SILs, it does not mean that the pollutant concentrations are expected to exceed the SILs at that location all of the time.] Accordingly, the AOI identifies locations where the SILs may be exceeded for one or more pollutants some of the time, but does not infer a frequency of occurrence.

The locations with impacts above the SILs located the farthest distance from the source in all directions were plotted to create a mAOI boundary. The furthest distance in any direction from the project emissions sources to concentrations above the SIL for these pollutants was determined to be 1.3 miles. Since this mAOI boundary includes all other project areas including the project footprint and storm water outfall location, the Action Area for the BA was defined as the mAOI boundary.

8.1.2 NON-CRITERIA POLLUTANTS MODELING RESULTS AND EVALUATION

In addition to the air quality analysis performed for criteria pollutants, RPS performed dispersion modeling and evaluated the potential for impacts from the other (non-criteria) pollutants that will be emitted by the proposed project. This effects evaluation was performed in accordance with TCEQ air permitting guidelines for the assessing non-criteria pollutants. The predicted concentrations were compared with TCEQ ESLs[81].

The objective of an effects evaluation is to establish off-property GLCs of constituents resulting from the proposed emissions and to evaluate these GLCs for the potential to cause adverse health or welfare effects. Air dispersion modeling is used to predict the GLCmax of a

constituent that could occur during a 1-hour (short-term) period, and the annual (long-term) average GLCmax. The maximum possible level of emissions (worst-case scenario emissions) are modeled in order to evaluate maximum potential exposure levels. The GLCmax is evaluated first, and, if needed, the GLC at the maximally affected non-industrial receptor and at the maximally affected industrial receptor are further evaluated.

ESLs are not standards or emission limits, but rather are guideline concentrations that TCEQ has developed to evaluate off-property ambient air concentrations of constituents. ESLs are very conservatively based on a constituent's potential to cause adverse health effects, odor nuisances, vegetation effects, or materials damage. Health-based ESLs are set at levels lower than levels reported to produce adverse health effects, and are set to protect the general public, including sensitive subgroups such as children, the elderly, or people with existing respiratory conditions. In developing ESLs, TCEQ factors in a margin of safety to account for potential cumulative exposure (exposure to multiple airborne constituents) and aggregate exposure (exposure to a single airborne constituent multiple times or from multiple sources). If an air concentration of a constituent is below the ESL for a given constituent, adverse effects are not expected. If the concentration of a constituent is above the ESL, it is not indicative that an adverse effect will occur, but rather that further evaluation is warranted, as described in *Modeling and Effects Review Applicability: How to Determine the Scope of Modeling and Effects Review for Air Permits*[82].

A comparison of the modeled concentrations of the project's non-criteria pollutant emissions to TCEQ established ESLs is shown in Table 5 (Appendix G). Based on these results, the maximum predicted concentrations of all modeled pollutants from project emissions are below the respective ESL and 13 of the 14 are well below the first screening level of 10% of the ESL. Short-term predicted concentrations for ethylene from project emissions were at 20.9% of the TCEQ's ESL. TCEQ requires additional evaluation for projects whose non-criteria pollutant impacts exceed 10% of the ESL. The final results of that evaluation have demonstrated that predicted concentrations are not expected to cause or contribute to adverse human health or welfare effects in order for the TCEQ air permit authorization to be issued. Accordingly, no adverse welfare impacts are expected to occur within the Action Area as the result of the additional emissions of these pollutants.

9.0 EFFECTS OF THE PROPOSED ACTION

This section presents the results of the analysis of potential effects on federally-listed species as a result of the proposed ethylene expansion project. The following potential effects sources are included in the analysis: air quality, water quality, noise pollution, infrastructure-related disturbance, human-related disturbance, and federally-listed 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.

9.1 AIR EMISSIONS EFFECTS BACKGROUND RESEARCH

Resources were searched extensively for data, documentation, or research regarding the potential effects of NO_2, PM, and SO_2 (criteria pollutants with potential depositional impacts to flora and fauna) on flora and fauna. WGI biologists also specifically searched for information regarding 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 and 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 affect 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 regarding specific concentrations at which potential effects occur on a long-term or short-term basis. A list of research resources is available upon request.

Air emissions effects vary greatly between regions due to differences in biota, climate, geochemistry, and hydrology. Therefore, the estimation of potential impacts on flora and fauna is highly variable and dependent upon site-specific conditions[83].

According to a publication focused on the effects of air emissions on biodiversity, in general, air emissions have 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 quality 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[84].

Nitrogen Dioxide and Sulfur Dioxide

According to the EPA's Integrated Science Assessment (ISA) for Oxides of Nitrogen and Sulfur, sufficient evidence is present to demonstrate a causal relationship between deposition of nitrogen and sulfur, acidification, and effects on biogeochemistry related to terrestrial and aquatic ecosystems and to biota in these systems. The Nature Conservancy and the Institute of Ecosystem Studies have published 2 documents that describe the known effects of airborne nitrogen, sulfur, and other airborne pollutants on various ecosystems in the eastern US. Airborne NO_2 and SO_2 are known to be converted into acid particles or acid precipitation. Both forms are deposited onto soils, vegetation, and surface waters[85,86].

The potential effects of airborne SO_2 on flora are acute. The SO_2 gas is absorbed into the leaves and causes reducing conditions, which is toxic when the gas concentration exceeds the capacity of the tissue. The toxic conditions kill the local plant cells. The limiting concentration is similar for many diverse species, including aquatics. Generally, significant concentrations of SO_2 gas can be added to plant systems before toxicity occurs. Depending of the extent of injury, uninjured tissue maintains or regains function and develops normally[87].

The potential effects of airborne NO_2 and SO_2 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 sulfur can result in sulfate leaching, which can cause acidification of soils and surface waters as well as the release of calcium, and magnesium. 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[86]. 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[85]. 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[86,88]. Additional potential terrestrial ecosystem effects include reduced forest productivity and increased vulnerability to pests and pathogens[86].

The potential effects of airborne NO_2 and SO_2 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[86]. 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. Low alkalinity waters are more susceptible to adverse effects from acidification. A pH value of 6.0 is often considered the level below which biota are at risk from acidification. Biological effects are primarily attributable to a combination of low pH and high inorganic aluminum concentration (between 2.0 and 7.5 micromoles per liter). 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, in estuarine ecosystems, nitrogen from atmospheric and non-atmospheric sources contributes to increased phytoplankton and algal productivity, leading to eutrophication. Estuary eutrophication is an ecological problem indicated by water quality deterioration, resulting in numerous adverse effects including hypoxic zones, species mortality, and harmful algal blooms. Increased sulfur concentrations can increase the production of specific bacteria, which can convert inorganic mercury to methyl-mercury, especially in wetlands. Methyl-mercury does not appear to impact flora, but is toxic to fauna[86]. Methyl-mercury is a powerful toxin that can bioaccumulate to toxic amounts in food webs at higher trophic levels (e.g., Osteichthyes (bass and perch), Mammalia (otters), or Aves (kingfishers)).

Particulate Matter

PM is a mixture of airborne particles resulting from fossil fuel combustion or a breakdown of crustal matter, and residual water soluble materials after evaporation of water from aqueous aerosols. The atmosphere can also transform VOC, NO_2, and SO_2 into PM. PM is a broad term

referring to an assortment of particles that vary in their formation, chemical properties, size, mass, toxicity, and atmospheric reactivity.

Fine particles can remain in the atmosphere for days to weeks and travel through the atmosphere hundreds to thousands of kilometers, while most coarse particles typically deposit to the earth within minutes to hours and within tens of kilometers from the emission source. The potential effects of dispersed particles on aquatic ecosystems include acidification, eutrophication, and impacts to ecosystem diversity[89]. The potential effects of dispersed particles on terrestrial ecosystems include nutrient depletion in soils and damage to crops and sensitive plant species[89]. PM is also responsible for the creation of haze (i.e., reduced visibility) and has been linked to physiological effects, such as respiratory and cardiovascular dysfunctions[90,91]. Other documented adverse effects included the blinding and/or death of cattle by smoke (i.e., PM) and the occurrence of fluorosis, a teeth and bone disease, when exposed to atmospheric fluoride[92]. Mortality of birds and a decrease in nesting has been linked to SO_2, known to be capable of transforming into PM. In addition, a recent study has shown that exposure to PM can affect the genetics of an individual thus resulting in unknown long term effects[93]. Limited research is available about threshold limit values (e.g., the maximum amount of exposure without adverse effects) on sensitive wildlife populations[91,94].

9.2 AIR QUALITY EFFECTS

9.2.1 EMISSIONS

RPS completed detailed emission calculations for the expansion project in accordance with the Air Permit Application requirements[80]. A summary of the total proposed annual emissions of each constituent that would be emitted by the project are provided in Table 1-1 (Appendix G).

RPS also performed dispersion modeling of the emissions of constituents from the proposed project in accordance with PSD and State Permit requirements. The results of the modeling are provided as a summary of the maximum predicted concentrations in Table 4 (Appendix G).

Equistar will utilize BACT to control emissions from the project and thus minimize impacts to the surrounding environment to the maximum extent practicable.

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 expansion project.

9.2.2 FUGITIVE DUST

Dust will be emitted during the site work phase of the project. This emission will be minimal and temporary. Dust emissions are expected to be negligible after the site work activities are completed.

9.2.3 IMPACTS OF AIR POLLUTION SOURCES ON FLORA AND FAUNA

The current secondary NAAQS provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings[82]. Air pollution effects vary greatly between regions due to differences in biota, climate, geochemistry, and hydrology. Because of this variation, models were developed by the EPA and were based on ecosystems that are considered the most sensitive to nitrogen and/or sulfur deposition effects. For more information regarding these case studies and analysis, refer to the EPA's Risk and Exposure Assessment for Review of the Secondary NAAQS for Oxides of Nitrogen and Oxides of Sulfur[95]. For the purposes of this BA, the most conservative and appropriate information was used to analyze potential impacts within the project area.

There is sufficient evidence to infer a causal link between nitrogen/sulfur deposition and the resulting acidification and its effects on biota[96]. The data presented in Table 6 below is taken directly from EPA's ISA for Oxides of Nitrogen and Sulfur detailing select exposure rates and related ecological effects. Nitrogen and sulfur deposition may adversely affect aquatic and terrestrial nutrient balances, acidification, availability of methyl mercury, and net primary production. This may result in declines in species fitness and richness, changes in species competition, increased susceptibility to stress/disease, habitat degradation, alterations to fire regimes, etc.

Table 6. Relationships Between Deposition Levels and Ecological Effects[96]

Kilogram Nitrogen/Hectare/Year	Ecological Effect
~1.5	Altered diatom communities in high elevation freshwater lakes and elevated nitrogen in tree leaf tissue high elevation forests in the western US
3.1	Decline of some lichen species in the western US
4	Altered growth and coverage of alpine plant species in the western US
5	Onset of decline of species richness in grasslands of the US and United Kingdom
5.5 - 10	Onset of nitrate leaching in forests of the eastern US
5-10	Multiple effects in tundra, bogs, and freshwater lakes in Europe
5-15	Multiple effects in arctic, alpine, subalpine and scrub habitats in Europe

The current secondary NAAQS were largely based on the data and models presented in the EPA's ISA and Risk and Assessment publication seeking to minimize these impacts. 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 or fauna.

The Action Area is shown in Figures 2-5 (Appendix A). The Action Area has a maximum radius of approximately 1.3 miles and includes 5 observed habitat types: pastureland, cropland, shrubland, and riverine.

9.3 WATER QUALITY EFFECTS

9.3.1 WASTEWATER

Due to water availability concerns along the Texas coastal bend following the recent drought conditions, water conservation measures are being adopted in association with the Olefins Unit Expansion Project. Any of the water conservation projects or combination of water conservation projects that Equistar will select will still result in no net change in the quantity (flow),

temperature, or constituent concentrations of the wastewater that has historically been discharged from the existing permitted outfall (Outfall 001). A description and diagram of these water conservation efforts is provided in Section 5.3.3.

Since there will be no net change to the wastewater currently being discharged from Outfall 001, no impacts to federally-listed species are anticipated as a result of wastewater from the proposed expansion project.

9.3.2 STORM WATER

For the Olefins Unit expansion project, non-process area storm water from around the olefins manufacturing facility collects and discharges via Outfall 003, an unnamed ditch that eventually flows into Oso Creek. According to the TCEQ, the ditch has no significant aquatic life use; and Oso Creek has limited aquatic life use[97]. Per the TCEQ's fact sheet for TPDES permit WQ0002075000, effluent limitations and/or conditions for Outfall 003 are in compliance with state water quality standards and the applicable water quality plan. The effluent limits were established to maintain and protect existing instream uses. No biomonitoring was required.

No federally-listed species habitat was observed near Outfall 003, and discharges will be within effluent limitations. Therefore, no impacts to federally-listed threatened or endangered species are anticipated from Outfall 003 discharges.

9.4 NOISE EFFECTS

Equistar's project engineers estimate that noise levels during construction should be comparable to noise levels from activities that currently take place at the Plant.

No noise effects to federally-listed species are expected as a result of the construction and operation of the proposed expansion project.

9.5 INFRASTRUCTURE-RELATED EFFECTS

The Project Area includes developed industrial areas. No impacts to natural areas are anticipated. No impacts to federally-listed species as a result of the proposed expansion project are anticipated.

9.6 HUMAN ACTIVITY EFFECTS

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

No additional effects to federally-listed species are expected as a result of the increase in human activity associated with the proposed expansion project.

9.7 FEDERALLY-LISTED SPECIES EFFECTS

9.7.1 THREATENED OR ENDANGERED SPECIES

9.7.1.1 Green Sea Turtle

Potential to Occur in the Action 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[28].

Habitat with the potential to support green sea turtles is not located within the Action Area. The nearest tidally-influenced waterway that could potentially support foraging green sea turtles is located approximately 5 miles northeast in the Inner Harbor. The closest known green sea turtle nesting location is the Padre Island National Seashore, approximately 32 miles southeast of the Project Area[98]. Designated-USFWS critical habitat for the green sea turtle is Culebra Island, Puerto Rico and its surrounding waters[26].

Potential nesting and foraging habitats for the green sea turtle do not exist within the Action Area. Therefore, green sea turtles will not occur in the Action Area.

Potential Effects to Green Sea Turtles

The green sea turtle will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance. All construction and noise associated with the proposed project will occur at least 5 miles from the nearest potential sea turtle occurrence.

Since no potential green sea turtle habitat or occurrence has been identified within the air emissions mAOI, no impacts to these sea turtles are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the green sea turtle are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with the operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to green sea turtles due to wastewater or storm water discharge are anticipated.

No direct or indirect effects to green sea turtles are anticipated.

Determination of Effect

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

9.7.1.2 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[29].

Habitats with the potential to support hawksbill sea turtles are not located within the Action Area. The USFWS-designated critical habitat for the hawksbill sea turtle are the Mona and Monito Islands, Puerto Rico and their surrounding waters[26]. The most recent recorded observation of hawksbill sea turtles occurred in 1998 when a nest was noted at the Padre Island National Seashore[99].

Potential foraging or nesting habitat for hawksbill sea turtles is not present within the Action Area. Therefore, hawksbill sea turtles will not occur in the Action Area.

Potential Effects to Hawksbill Sea Turtles

The hawksbill sea turtle will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance. All construction and noise associated with the proposed project will occur at least 5 miles from the nearest potential sea turtle occurrence.

Since no potential hawksbill sea turtle habitat or occurrence has been identified within the air emissions mAOI, no impacts to these sea turtles are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the hawksbill are anticipated from project non-criteria pollutant air emissions.

Contaminated process wastewater associated with the operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex Unit. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to hawksbill sea turtles due to wastewater or storm water discharge are anticipated.

No direct or indirect effects to hawksbill sea turtles are anticipated.

Determination of Effect

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

9.7.1.3 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[31].

Habitat with the potential to support Kemp's ridley sea turtles is not located within the Action Area. The nearest tidally-influenced waterway that could potentially support Kemp's ridley sea turtles is located approximately 5 miles northeast of the proposed project. The closest known Kemp's ridley sea turtle nesting location is in Corpus Christi Bay near Burleson Beach Park[100]. USFWS-designated critical habitat is not yet designated for this species[26].

No potential foraging or nesting habitat for Kemp's ridley sea turtles is present within the Action Area. Therefore, the Kemp's ridley sea turtle will not occur in the Action Area.

Potential Effects to Kemp's Ridley Sea Turtles

The Kemp's ridley sea turtle will not be directly impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance. All construction and noise associated with the proposed project will occur at least 5 miles from the nearest potential sea turtle occurrence.

Since no potential Kemp's ridley sea turtle habitat or occurrence has been identified within the air emissions mAOI, no impacts to these sea turtles are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the Kemp's ridley are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with the operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential

habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to Kemp's ridley sea turtles due to wastewater or storm water discharge are anticipated.

No direct or indirect effects to Kemp's ridley sea turtles are anticipated.

Determination of Effect

The proposed action will have no effect on the Kemp's ridley sea turtle.

9.7.1.4 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 minimal. Preferred beaches have deep, unobstructed oceanic access on continental shorelines. Juveniles and adults are pelagic and primarily occupy deep water habitat[33].

Habitats with the potential to support leatherback sea turtles are not located within the Action Area. The nearest tidally-influenced waterway with the potential to support leatherback sea turtles is located approximately 5 miles from the proposed project. The nearest known nesting site for leatherback sea turtles was identified in 2008 at Padre Island National Seashore, more than 67 miles south of the Project Area[100]. This is the only known nesting site for a leatherback sea turtle in Texas since the 1930s[101].

USFWS-designated critical habitat for the leatherback sea turtle includes the coastal waters adjacent to Sandy Point, St. Croix, the US Virgin Islands, and the US West Coast[26].

No potential foraging or nesting habitat for leatherback sea turtles is present within the Action Area. Therefore, the leatherback sea turtle will not occur in the Action Area.

Potential Effects to Leatherback Sea Turtles

The leatherback sea turtle will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance. All construction and noise associated with the proposed project will occur at least 5 miles from the nearest potential sea turtle occurrence.

Since no potential leatherback sea turtle habitat or occurrence has been identified within the air emissions mAOI, no impacts to these sea turtles are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the leatherback are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with the operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to leatherback sea turtles due to wastewater or storm water discharge are anticipated.

No direct or indirect effects to leatherback sea turtles are anticipated.

Determination of Effect

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

9.7.1.5 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[35].

Habitat with the potential to support foraging or nesting loggerhead sea turtles is not located within the Action Area. The nearest tidally-influenced waterway with the potential to support loggerhead sea turtles is located approximately 5 miles northeast of the proposed project. The closest known loggerhead sea turtle nesting location is on Mustang Island, approximately 28

miles east of the Project Area[98]. USFWS-designated critical habitat is not yet designated for this species[26].

No potential habitat for the loggerhead sea turtle is present within the Action Area. Therefore, the loggerhead sea turtle will not occur in the Action Area.

Potential Effects to Loggerhead Sea Turtles

The loggerhead sea turtle will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance. All construction and noise associated with the proposed project will occur at least 5 miles from the nearest potential sea turtle occurrence.

Since no potential loggerhead sea turtle habitat or occurrence has been identified within the air emissions mAOI, no impacts to these sea turtles are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the loggerhead are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with the operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to loggerhead sea turtles due to wastewater or storm water discharge are anticipated.

No direct or indirect effects to loggerhead sea turtles are anticipated.

Determination of Effect

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

9.7.1.6 Smalltooth Sawfish

Potential to Occur in the Action Area

Preferred habitat includes shallow coastal seas and estuaries with muddy and sandy bottoms. They are typically found close to shore, in sheltered bays and on shallow banks[37]. Known locations of smalltooth sawfish are restricted to portions of southern Florida[37].

No habitat with the potential to support the smalltooth sawfish was observed within Action Area. The nearest suitable habitat for the smalltooth sawfish is located more than 5 miles from the proposed project. No USFWS-designated critical habitat is located in Texas[26].

Smalltooth sawfish will not occur within the Action Area.

Potential Effects to Smalltooth Sawfish

The smalltooth sawfish will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance. All construction and noise associated with the proposed project will occur at least 5 miles from the nearest potential sea turtle occurrence.

Since no potential smalltooth sawfish habitat or occurrence has been identified within the air emissions mAOI, no impacts to these sawfish are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the smalltooth sawfish are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with the operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to smalltooth sawfish due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to the smalltooth sawfish are anticipated.

Determination of Effect

The proposed action will have no effect on the smalltooth sawfish.

9.7.1.7 Gulf Coast Jaguarundi

Potential to Occur in the Action Area

Gulf Coast jaguarundis inhabit dense, thorny brush and adjacent grasslands. They can be found in the South Texas Brush Country and Rio Grande Plains. Gulf Coast jaguarundis have a limited range within south Texas because of habitat loss and fragmentation[39].

No habitat with the potential to support Gulf Coast jaguarundis were observed within the Action Area. One small tract shrubland was observed within the Action Area. This tract was small in size, was not contiguous with potential habitat or adjacent to grasslands, lacked the preferred shrub density, and is subject to human disturbance. USFWS-designated critical habitat is not yet designated for this species[26].

Gulf Coast jaguarundis would not likely occur within the Action Area.

Potential Effects to the Gulf Coast Jaguarundi

Gulf Coast jaguarundis will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance.

Since no potential jaguarundi habitat has been identified within the air emissions mAOI, no impacts to jaguarundis are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to jaguarundis are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with the operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-

contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to jaguarundis due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to jaguarundis are anticipated.

Determination of Effect

The proposed action will have no effect on the Gulf Coast jaguarundi.

9.7.1.8 Ocelot

Potential to Occur in the Action Area

Ocelots typically occur in dense, thorny thickets and rocky areas. They feed on small mammals, birds, and some reptiles. Females create their dens in caves, hollow trees, or dense brush[40].

No habitat with the potential to support the ocelot was observed within the Action Area. One small tract shrubland was observed within the Action Area. This tract was small in size, was not contiguous with potential habitat, lacked the preferred shrub density, and is subject to human disturbance. USFWS-designated critical habitat is not yet designated for this species[26].

Ocelots would not likely occur within the Action Area.

Potential Effects to Ocelot

The ocelot will not be directly impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance.

Since no potential ocelot habitat has been identified within the air emissions mAOI, no impacts to ocelots are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the ocelot are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with the operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation

measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to ocelots due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to ocelots are anticipated.

Determination of Effect

The proposed action will have no effect on the ocelot.

9.7.1.9 Red Wolf

Potential to Occur in the Action Area

Red wolves are a very rare species in the wild. Only 1 known population exists in the wild and is located in North Carolina. Red wolves are thought to prefer brushland, forests, swamps, and prairies[42].

No habitat with the potential to support the red wolf was observed within the Action Area. One small tract shrubland was observed within the Action Area. This tract was small in size, was not contiguous with potential habitat, and is subject to human disturbance. USFWS-designated critical habitat is not yet designated for this species[26]. Red wolves are known to be limited in the wild to select locations in North Carolina[42]. No known observations of the red wolf in or near the Project Area have been found.

Red wolves would not likely occur within the Action Area.

Potential Effects to Red Wolves

The red wolf will not be directly impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance.

Since no potential red wolf habitat has been identified within the air emissions mAOI, no impacts to these wolves are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ

guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the red wolf are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with the operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to red wolves due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to red wolves are anticipated.

Determination of Effect

The proposed action will have no effect on the red wolf.

9.7.1.10 West Indian Manatee

Potential to Occur in the Action Area

West Indian manatees are found in shallow, slow-moving rivers, estuaries, saltwater bays, canals and coastal areas. Typically, they occur in Florida, but they may migrate during the summer months, dependent on water temperature[102]. Manatees prefer depths ranging from 3-7 feet, but can be found in shallow areas down to 1.5 feet. Preferred feeding grounds are shallow grassbeds adjacent to deep channels in both coastal and riverine habitats. Manatees are herbivores feeding on over 60 different species of aquatic plants[103].

The nearest tidally-influenced waterway is located approximately 5 miles from the proposed project. No potential habitat for the manatee is present within the Action Area. Therefore, the West Indian manatee will not occur in the Action Area.

Potential Effects to West Indian Manatee

The West Indian manatee will not be directly impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance. All construction and noise associated with the proposed project will occur at least 5 miles from the nearest potential manatee occurrence.

Since no potential manatee habitat or occurrence has been identified within the air emissions mAOI, no impacts to these manatees are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the manatee are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to West Indian manatees due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to West Indian manatees are anticipated.

Determination of Effect

The proposed action will have no effect on the West Indian manatee.

9.7.1.11 Eskimo Curlew

Potential to Occur in the Action Area

Eskimo curlews breed in Canada and the northern US and winter in South America. Therefore, breeding and wintering habitat were excluded from this analysis. Non-breeding birds utilize a variety of habitats, including grasslands, pastures, plowed fields, and less frequently, marshes and mud flats[48].

Although some habitat characteristics that could support the curlew such as pastures and plowed fields were observed within the Action Area, Eskimo curlews are extremely rare. It is estimated that the population is less than 50 individuals and may even be extinct[104]. There are no known extant populations of Eskimo curlews. The last confirmed record of an Eskimo curlew in Texas was in 1962 in Galveston County, Texas[105]. Another possible sighting was noted in 1981 of a flock of 23 birds in Galveston Bay on Atkinson Island[106]. USFWS-designated critical habitat is not yet designated for this species[26].

Given the extreme rarity of Eskimo curlews, Eskimo curlews would not likely occur within the Action Area.

Potential Effects to Eskimo Curlew

The Eskimo curlew will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance.

Since the Eskimo curlew is highly unlikely to occur within the air emissions mAOI and the concentration of emissions within the mAOI would be low and infrequent, no impacts to these birds are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the curlew are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to Eskimo curlews due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to Eskimo curlews are anticipated.

Determination of Effect

The proposed action will have no effect on the Eskimo curlew.

9.7.1.12 Northern Aplomado Falcon

Potential to Occur in the Action Area

Northern aplomado falcons are found in desert grasslands, savannahs, and coastal prairies in Latin America and in Texas, New Mexico, and Arizona[107]. This falcon requires open grasslands with scattered trees or shrubs. They do not build their own nests but use stick nests constructed by other birds[47].

Habitat within the Action Area is comprised primarily of croplands, which is not preferred habitat for northern aplomado falcons. Remnant grasslands are present, but they are fragmented into small parcels. These areas are also subject to human disturbance. Northern aplomado falcons can be sensitive to disturbance; therefore suitable habitat for northern aplomado falcons is not present within the Action Area.

The northern aplomado falcon has declined significantly along the Texas coast due mostly to the loss of native grassland prairies. Efforts have been made to reintroduce this species to King Ranch in Kleberg County (approximately 23 miles southwest of the Project Area), to Laguna Atascosa National Wildlife Refuge in Cameron County, and to Mustang Island State Park in Nueces County (approximately 26 miles east of the Project Area)[108]. USFWS-designated critical habitat is not yet designated for this species[26].

Northern aplomado falcons are not likely to occur in the Action Area.

Potential Effects to Northern Aplomado Falcon

The northern aplomado falcon will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance.

Since these falcons are unlikely to occur within the air emissions mAOI and the concentration of emissions within the mAOI would be low and infrequent, no impacts to these birds are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the falcons are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to aplomado falcons due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to northern aplomado falcons are anticipated.

Determination of Effect

The proposed action will have no effect on the northern aplomado falcon.

9.7.1.13 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[49].

No habitat with the potential to support the piping plover was observed within the Action Area. The nearest tidally-influenced waterway is located approximately 5 miles from the proposed project. The closest USFWS-designated critical habitat for piping plover is approximately 14 miles northeast of the Project Area.

Piping plovers are not likely to occur within the Action Area.

Potential Effects to Piping Plovers

The piping plover will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance.

Since no potential piping plover habitat has been identified within the air emissions mAOI, no impacts to these birds are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to these plovers are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to piping plovers due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to piping plovers are anticipated.

Determination of Effect

The proposed action will have no effect on the piping plover.

9.7.1.14 Whooping Crane

Potential to Occur in the Action Area

Whooping cranes are migratory birds and their breeding habitat is known to be in the northern US and Canada[54]. Therefore, the consideration of potential nesting habitat was excluded from this analysis. In the winter, whooping cranes are found in estuarine marshes, shallow bays, and tidal flats[109]. Their wintering habitat is known to be limited to the Aransas National Wildlife Refuge near Rockport, Texas (approximately 36 miles northeast of the Project Area), although whooping cranes are reported to be broadening their winter range to include additional coastal habitats in part to increasing population numbers and in response to climate/habitat change[110].

During migration, whooping cranes opportunistically utilize stopover habitat. These cranes prefer to feed and roost in wetlands, rivers, and upland grain fields with other bird species[54]. Migration flights generally occur between 1,000-6,000 feet during day-time hours, however they will fly at low altitudes during brief rest periods and at the start and end of a daily flight[111]. Potential habitat within the Action Area would be limited to temporary foraging and roosting habitat during migration.

Whooping cranes are a rare species in the wild. In 2012, only 245 individuals were observed in the Aransas Refuge in Texas[112].

The Project Area is located approximately 36 miles southwest of the Aransas National Wildlife Refuge and is within the designated migration corridor (Appendix A – Figure 6). Habitat with the potential to support wintering whooping cranes is not located within or near the Action Area. While the corn fields (cropland) observed within the Action Area have the potential to provide forage for whooping cranes during migration, whooping cranes have not been recorded and are not known to occur within or near the Action Area[113]. According to the National Audubon Society's Christmas Bird Count, no whooping cranes have been observed in the Action Area despite more than 9,000 survey hours within the last 50 years[114]. The closest recorded observation of a whooping crane to the Action Area is approximately 33 miles to the northeast near Egery Island in Copano Bay[113]. Based on research and available information, the potential for whooping cranes to fly near the Action Area would be very low.

Whooping cranes are unlikely to occur within the Action Area. Any potential occurrence of whooping cranes near the Action Area would likely be limited to flight (migration) above the Action Area.

Potential Effects to Whooping Cranes

Whooping cranes are highly unlikely to occur within the Action Area. The Action Area is located at the south and west edge of the migration corridor; therefore, the potential for whooping crane collision with new infrastructure was considered.

Low light conditions may increase the potential for whooping crane collisions with new fencelines, new powerlines, or new tall and narrow infrastructure such as communication towers and wind turbines. The majority of recorded collisions are associated with powerlines and fencelines[111]. No records of collisions with flare stacks or existing facilities have been found.

Further, whooping cranes are known to avoid existing, well-lit infrastructure and human disturbance[111].

Although whooping cranes have not been observed at or near the facility, measures have been implemented to reduce the likelihood of any potential impacts in the event that they do occur. The towers that are proposed for the expansion project will be less than 200 feet tall, will be shorter in height than the existing, adjacent towers, will be located within the existing well-lit complex, and will be fitted with safety lighting similar to the existing towers and in accordance with the Federal Aviation Administration and USFWS guidelines[115]. One new tower will be constructed for the proposed project, which is a demethanizer tower at an approximate height of 185 feet. This tower will be constructed adjacent to existing, well-lit towers which vary in height from 150 to 350 feet. Electrical power will be located within the existing facility in below ground electrical ducts and in cable trays that are 2-3 feet wide and below existing equipment height. In addition, flags will be attached to the boom of construction cranes (maximum 300 feet tall) to increase visibility. Federal Aviation Administration lighting will be included on crane booms 200 feet high and higher. An incident reporting system is in place to document environmental incidents, which will include identification of whooping cranes. Equistar personnel will be given awareness information on whooping crane identification and on proper incident reporting protocol in the unlikely event that a whooping crane would be identified. The Corpus Christi Complex has an environmental scientist on call 24 hours a day and 7 days a week that can direct the protocol and notify the proper agencies in the event of an incident.

No direct effects to whooping cranes are anticipated due to the following: new construction will take place within the existing facility; USFWS-suggested conservation measures will be implemented; no cranes or other wading birds have collided with existing facility infrastructure; and no whooping cranes are known to occur and are unlikely within the Action Area.

Since the whooping crane is highly unlikely to occur within the air emissions mAOI and the concentration of emissions within the mAOI would be low and infrequent, no impacts to these birds are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to whooping cranes are anticipated from project non-criteria pollutant air emissions.

No direct effects from noise pollution or human disturbance are anticipated.

All contaminated process wastewater associated with operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to whooping cranes due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to whooping cranes are anticipated.

Determination of Effect

The proposed action will have no effect on the whooping crane.

9.7.1.15 Slender Rush-pea

Potential to Occur in the Action Area

The slender rush-pea is an early successional perennial[57]. It is typically found in barren openings or in areas with low native grasses on clayey soils of blackland prairies and creek banks of the Gulf Coastal Prairie[57]. It can be found in prairies, roadsides, or open areas with shrubs, cacti, and low growing grasses. Non-native species, such as King Ranch bluestem or bermudagrass, typically out-compete the slender rush-pea[58].

Habitat characteristics with the potential to support slender rush-pea were identified within select portions of the Action Area. These habitat characteristics were observed within the mowed public road ROWs, excluding those subject to grading maintenance. These habitats are small and fragmented.

The nearest recorded occurrence of the slender rush-pea is located approximately 2 miles west of the Action Area[79]. This record was from a type specimen collected in 1931, and follow-up surveys in the 1980s failed to confirm an extant population in the area[57]. There are 2 known extant populations located in the southern portion of Nueces County, which is more than 14 miles south of the Action Area.

Given that the slender rush-pea is known from only 2 extant populations in Nueces County and that the potential habitat areas within the Action Area are small and fragmented, the slender rush-pea may occur but is unlikely to occur in the Action Area.

Potential Effects to Slender Rush-peas

The slender rush-peas will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance.

Since the slender rush-pea is unlikely to occur within the air emissions mAOI and the concentration of emissions within the mAOI would be low and infrequent, no impacts to slender rush-peas are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to slender rush-peas are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to slender rush-peas due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to the slender rush-pea are anticipated.

Determination of Effect

The proposed action will have no effect on the slender rush-pea.

9.7.1.16 South Texas Ambrosia

Potential to Occur in the Action Area

South Texas ambrosia occurs in open grasslands or savannahs on soils varying from clay loams to sandy loams. Its current distribution is known in only 6 locations within Nueces and Kleberg

counties, Texas[59]. South Texas ambrosia is thought to be intolerant to plowing, blading, or discing, but lesser disturbance activities, such as mowing and fire, may enhance growth[59,60].

Characteristics with the potential to support South Texas ambrosia was identified in select habitats within the Action Area. These habitat characteristics were observed within the mowed public road ROWs, excluding those subject to grading maintenance. These habitats are small and fragmented.

The nearest known occurrence of the South Texas ambrosia is located approximately 0.4 miles south of the Action Area for the proposed project. This population was last observed in 2000 and beetle damage was noted. The population was not observed during surveys completed in and around this location in 2008 and 2009[79].

Given the known population nearest to the Action Area has not been observed since 2000 and the potential habitat areas are small and fragmented, the South Texas ambrosia may occur, but is unlikely to occur within the Action Area.

Potential Effects to South Texas Ambrosia

The South Texas ambrosia will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance.

Since the concentration of emissions within the mAOI would be low and infrequent, no impacts to the South Texas ambrosia are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to these ambrosias are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to South Texas ambrosia due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to the South Texas ambrosia are anticipated.

Determination of Effect

The proposed action will have no effect on the South Texas ambrosia.

9.7.1.16 Whales

Potential to Occur in the Action Area

For this impact analyses, the whales listed in this report have been combined into a single category for analysis (i.e., impacts were not distinguished between species). In general, whales are found in marine open water at varying depths and in different proximities to the coastal shelf. Depending on the specific species, their diets may include fish, plankton, cephalopods, sharks, skates, crustaceans, and krill. Whales associated with Texas are typically found in the Gulf of Mexico[65,69,71,73].

No habitats with the potential to support whales were observed within the Action Area. The nearest potential habitat for whales is more than 20 miles east of the Project Area in the Gulf of Mexico.

No habitat with the potential to support whales is present within the Action Area. Therefore, whales will not occur in the Action Area.

Potential Effects to Whales

Whales will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance.

Since no potential whale habitat has been identified within the air emissions mAOI, no impacts to whales are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the whales are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures

incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to whales due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to whales are anticipated.

Determination of Effect

The proposed action will have no effect on whales.

9.7.2 CANDIDATE SPECIES

9.7.2.1 Red Knot

Potential to Occur in the Action Area

Red knots are long-distance migrants between the arctic (breeding habitat) and South America (winter habitat). Since their breeding range is not within the Action Area, consideration of potential nesting habitat was not included in this analysis. Some red knots may remain in Texas during the winter; however most use the area only during migration. Red knots use limited stopover locations during migration, including the Bolivar peninsula in Texas. They have been found using sandy beaches, tidal mudflats, and salt marshes[76].

No habitat with the potential to support red knots was observed in the Action Area. Land use surrounding the facility is primarily agricultural land that is unsuitable for red knots.

Red knots demonstrate high site fidelity. Red knots are known to frequent Suter Wildlife Refuge and Mustang Island, approximately 16 and 26 miles from the Project Area, respectively[116]. Red knots may incidentally occur in areas surrounding these known stopover sites during migration. There are no records of red knots occurring within the Action Area. The nearest known record of a red knot is more than 3 miles from the Project Area.

Red knots may incidentally occur within the Action Area, but occurrences are likely to be rare and temporary.

Potential Effects to Red Knots

The red knot will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance.

Since no potential red knot habitat has been identified within the air emissions mAOI, no impacts to these birds are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the red knot are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to red knots due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to red knots are anticipated.

9.7.2.2 Sprague's Pipit

Potential to Occur in the Action Area

Sprague's pipits 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 undisturbed mid-grasslands with intermediate thickness[77].

No habitat with the potential to support the Sprague's pipit was observed within the Action Area. The habitats observed surrounding the proposed project are impacted by agriculture. Remnant grasslands were highly fragmented and disturbed. Sprague's pipits are an uncommon to rare winter resident in the Corpus Christi region but are known from the coastal bend area which is more than 3 miles from the Project Area[117].

Sprague's pipits would not likely occur within the Action Area.

Potential Effects to Sprague's Pipits

The Sprague's pipit will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance.

Since no potential pipit habitat has been identified within the air emissions mAOI, no impacts to these birds are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the Sprague's pipit are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to Sprague's pipits due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to Sprague's pipits are anticipated.

9.7.2.3 Yellow-billed Cuckoo

Potential to Occur in the Action Area

Yellow-billed cuckoos are migratory birds that breed in the US, Canada, and northern Mexico. Nesting habitat includes large patches of riparian or broad-leaved woodland habitat that is comprised of cottonwoods, willows, and a dense understory.

No habitat with the potential to support yellow-billed cuckoos was observed in the Action Area. Land use surrounding the facility is primarily impacted agricultural land that is unsuitable for yellow-billed cuckoos. The nearest record of a yellow-billed cuckoo was more than a mile north of the Project Area[118].

Yellow-billed cuckoos would not likely occur within the Action Area.

Potential Effects to Yellow-billed Cuckoos

The yellow-billed cuckoo will not be impacted by construction activities associated with the completion of the proposed project, noise pollution, or human disturbance.

Since no potential cuckoo habitat has been identified within the air emissions mAOI, no impacts to these birds are anticipated from project criteria pollutant air emissions. Since the predicted non-criteria pollutant routine and MSS emissions concentrations are below TCEQ guideline levels and no emissions of mercury or other heavy metals are anticipated, no impacts to the yellow-billed cuckoo are anticipated from project non-criteria pollutant air emissions.

All contaminated process wastewater associated with operation of the expansion project will be treated by the wastewater treatment unit at the Corpus Christi Complex. It is anticipated that the proposed project wastewater combined with the proposed water conservation measures incorporated in this project will result in no net change to the wastewater discharge flow, temperature, and composition at Outfall 001 relative to historical discharge. Non-contaminated storm water will be discharged via Outfall 003 into an unnamed ditch. Potential habitat for federally-listed species was not was not identified within or near the unnamed ditch. No impacts to yellow-billed cuckoos due to wastewater or storm water discharge are anticipated.

No direct or indirect impacts to yellow-billed cuckoos are anticipated.

10.0 CONCLUSIONS

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

10.1 DETERMINATION OF EFFECT

The recommended determinations of effect for all federally-listed species with the potential to occur within habitat located within the Action Area are summarized below in Table 7.

Table 7. Determination of Effect Summary

Federally-Listed Species	Determination of Effect
Green sea turtle	No Effect
Hawksbill sea turtle	No Effect
Kemp's ridley sea turtle	No Effect
Leatherback sea turtle	No Effect
Loggerhead sea turtle	No Effect
Smalltooth sawfish	No Effect
Gulf Coast jaguarundi	No Effect
Ocelot	No Effect
Red wolf	No Effect
West Indian manatee	No Effect
Northern aplomado falcon	No Effect
Eskimo curlew	No Effect
Piping plover	No Effect
Whooping crane	No Effect
Slender rush-pea	No Effect
South Texas ambrosia	No Effect
Blue whale	No Effect
Finback whale	No Effect
Humpback whale	No Effect
Sei whale	No Effect
Sperm whale	No Effect

10.2 INTERDEPENDENT AND INTERRELATED ACTIONS

The proposed project includes the construction of an expansion of the facility as outlined in Section 5.0. No additional interdependent or interrelated actions are proposed at this time.

10.3 CUMULATIVE EFFECTS

The project site is located within an industrial area surrounded primarily by cropland. The area has historically experienced a significant decline in native coastal prairies in the region and is mostly industry, residential, and cropland.

As with the proposed ethylene expansion project, any new proposed developments may have the potential to impact federally-listed 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-listed species are planned for the Corpus Christi Complex at this time.

10.4 CONSERVATION MEASURES

Equistar plans to utilize the BACT to the project control emissions and thus minimize impacts to the surrounding environment to the maximum extent practicable.

New water conservation programs are proposed in association with the Olefins Unit Expansion Project to conserve water and prevent any potential impacts to federally-protected species.In addition, measures will be implemented to minimize potential whooping crane collisions as a result of the construction of the proposed project. These measures include additional use of lighting, flagged crane booms, and an incident reporting system.

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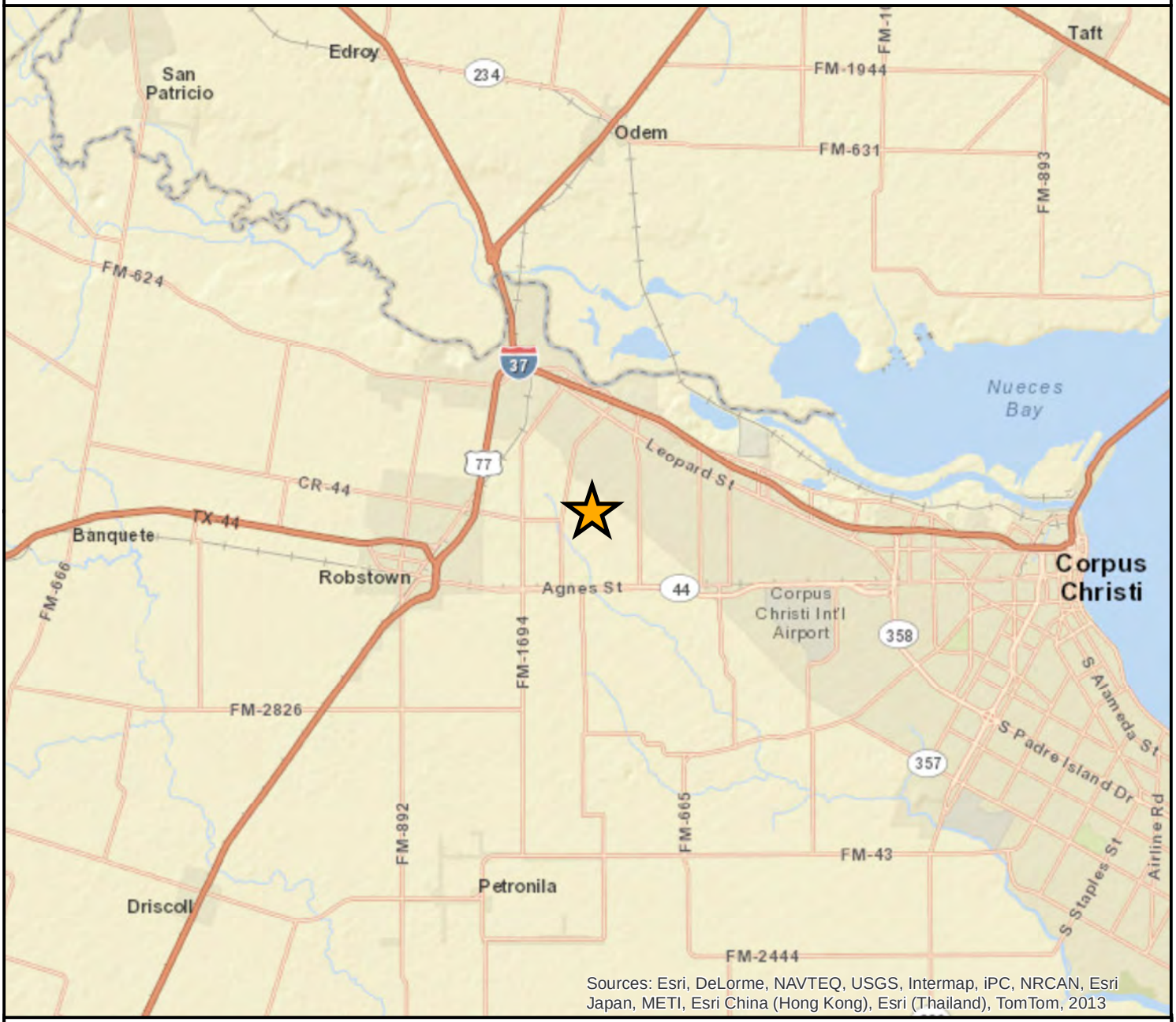
Mark A. Pillion, Environmental Scientist	B.S. Physical Geography

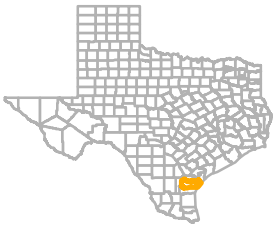
APPENDIX A

FIGURES

Figure 1
Project Location
Olefins Plant Expansion Project
Nueces County, Texas

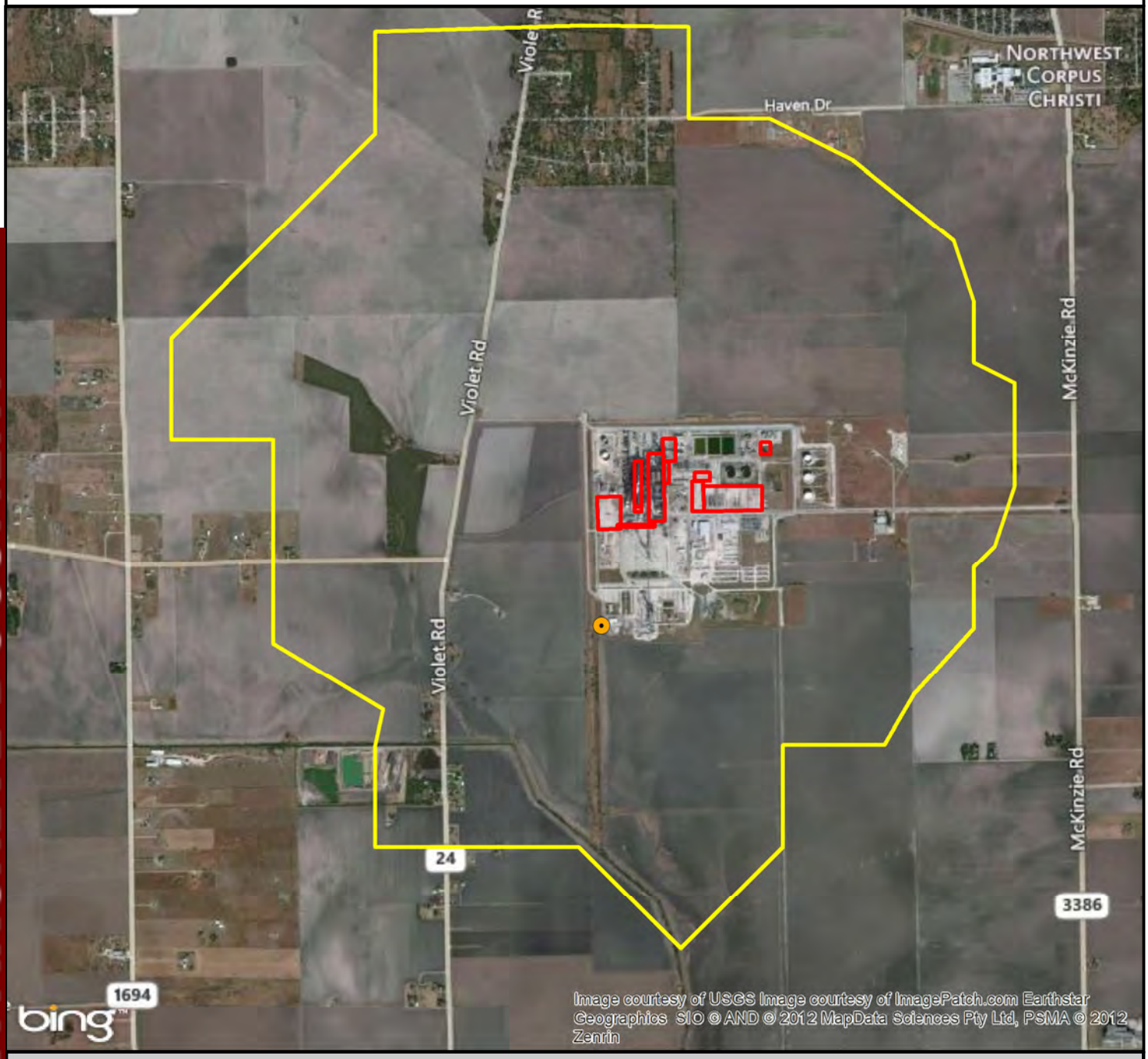


Project Location



Background Resources: ESRI USA Roads Basemap	Surveyor(s): Scott Jecker CWB, PWS Bryan Whisenant	Project Number and Information: 1279 Olefins Plant Expansion Project Biological Assessment	WHITENTON group environmental consultants 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XH 6000 Series UTM NAD 1983 Zone 14 North	Map Created: 02/21/2013 by M. Pillion		Miles 0 3 6 N

Figure 2
Project and Action Areas
Olefins Plant Expansion Project
Nueces County, Texas

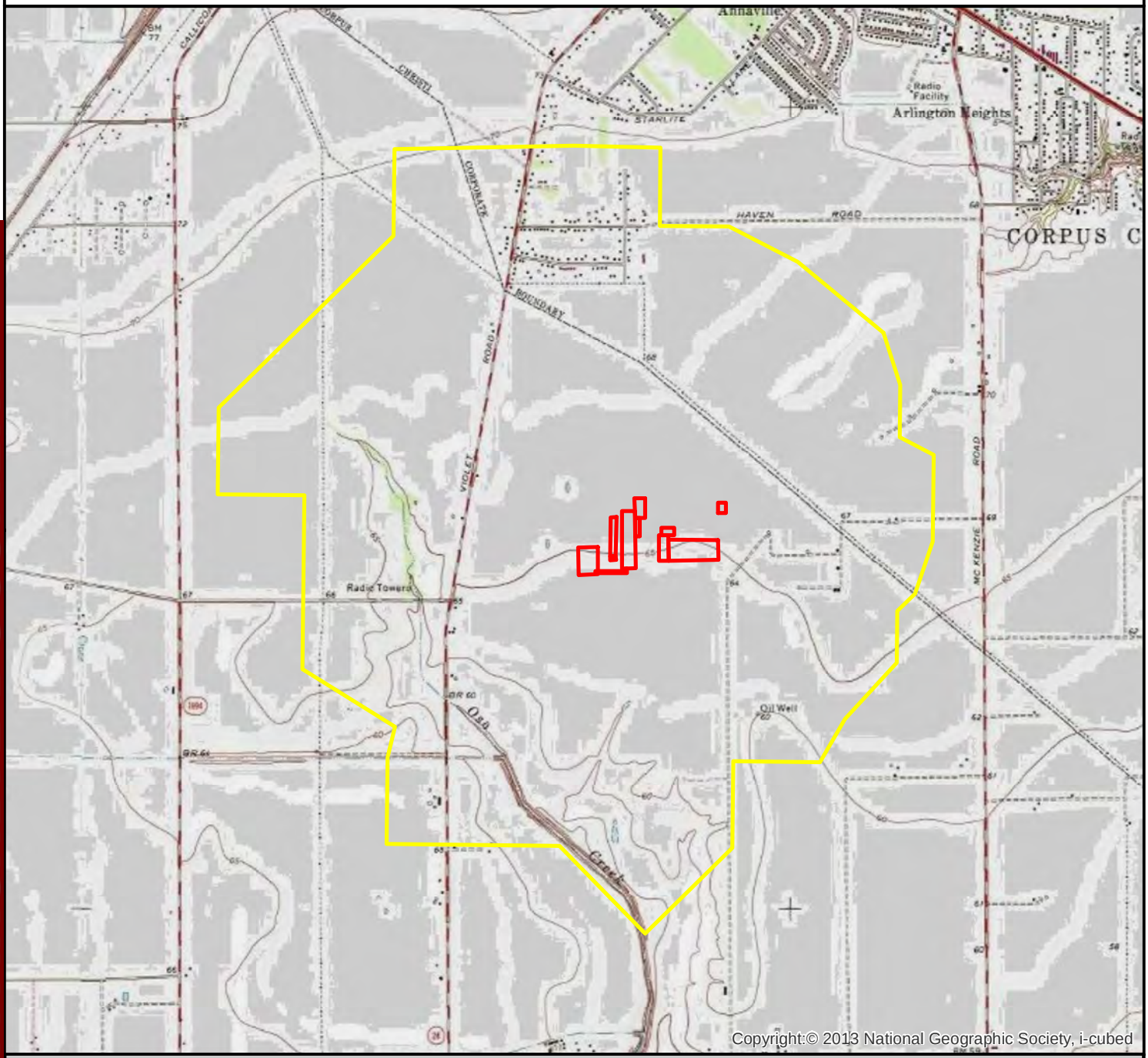


Project Area (~27.4 Acres) **Action Area (~1.3 Mile Maximum Radius)**

Existing Outfall 003

Background Resources: Bing Aerial Hybrid	Surveyor(s): Scott Jecker CWB, PWS Bryan Whisenant	Project Number and Information: 1279 Olefins Plant Expansion Project Biological Assessment	WHITENTON group environmental consultants 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XH 6000 Series UTM NAD 1983 Zone 14 North	Map Created: 2/11/2014 by D. Scott		Feet 0 1,500 3,000 N

Figure 3
Project Area and Action Area - Topographic Map
Olefins Plant Expansion Project
Nueces County, Texas

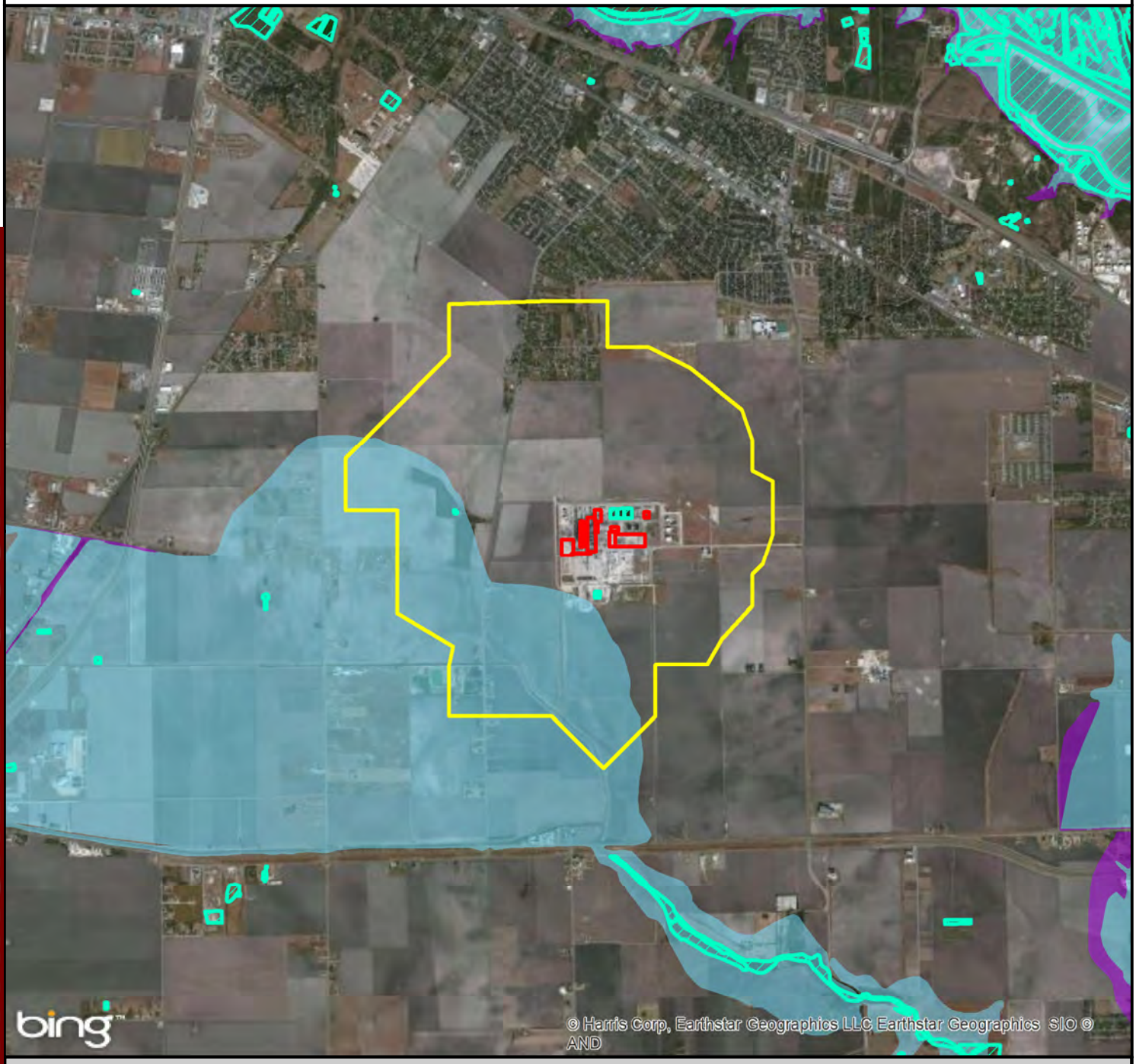


Project Area (~27.4 Acres)

Action Area (~1.3 Miles Maximum Radius)

Background Resources: ESRI USA Topographic Maps	Surveyor(s): Scott Jecker CWB, PWS Bryan Whisenant	Project Number and Information: 1279 Olefins Plant Expansion Project Biological Assessment	WHITENTON group environmental consultants 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XH 6000 Series UTM NAD 1983 Zone 14 North	Map Created: 10/30/2013 by M. Pillion		Miles 0 0.5 1 N

Figure 4
National Wetland Inventory and FEMA Floodplain Data
Olefins Plant Expansion Project
Nueces County, Texas



Project Area (27.4 Acres)

Action Area (~1.3 Mile Maximum Radius)

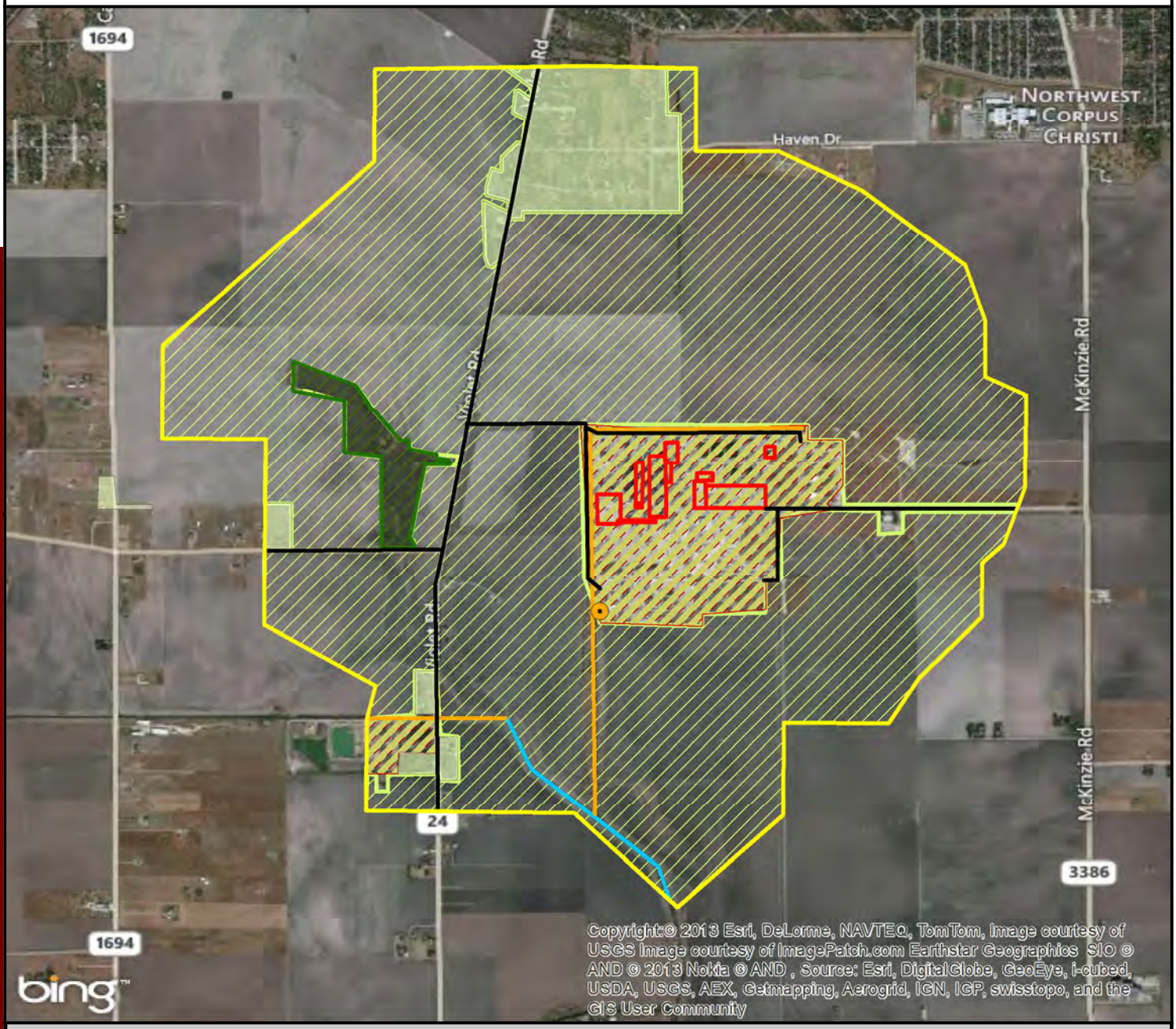
100-Year Floodplain

500-Year Floodplain

NWI Polygon

Background Resources: ESRI Aerial Imagery	Surveyor(s): Scott Jecker CWB, PWS Bryan Whisenant	Project Number and Information: 1279 Olefins Plant Expansion Project Biological Assessment	WHITENTON group environmental consultants 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XH 6000 Series UTM NAD 1983 Zone 14 North	Map Created: 10/30/2013 by M. Pillion		Miles 0 0.5 1 N

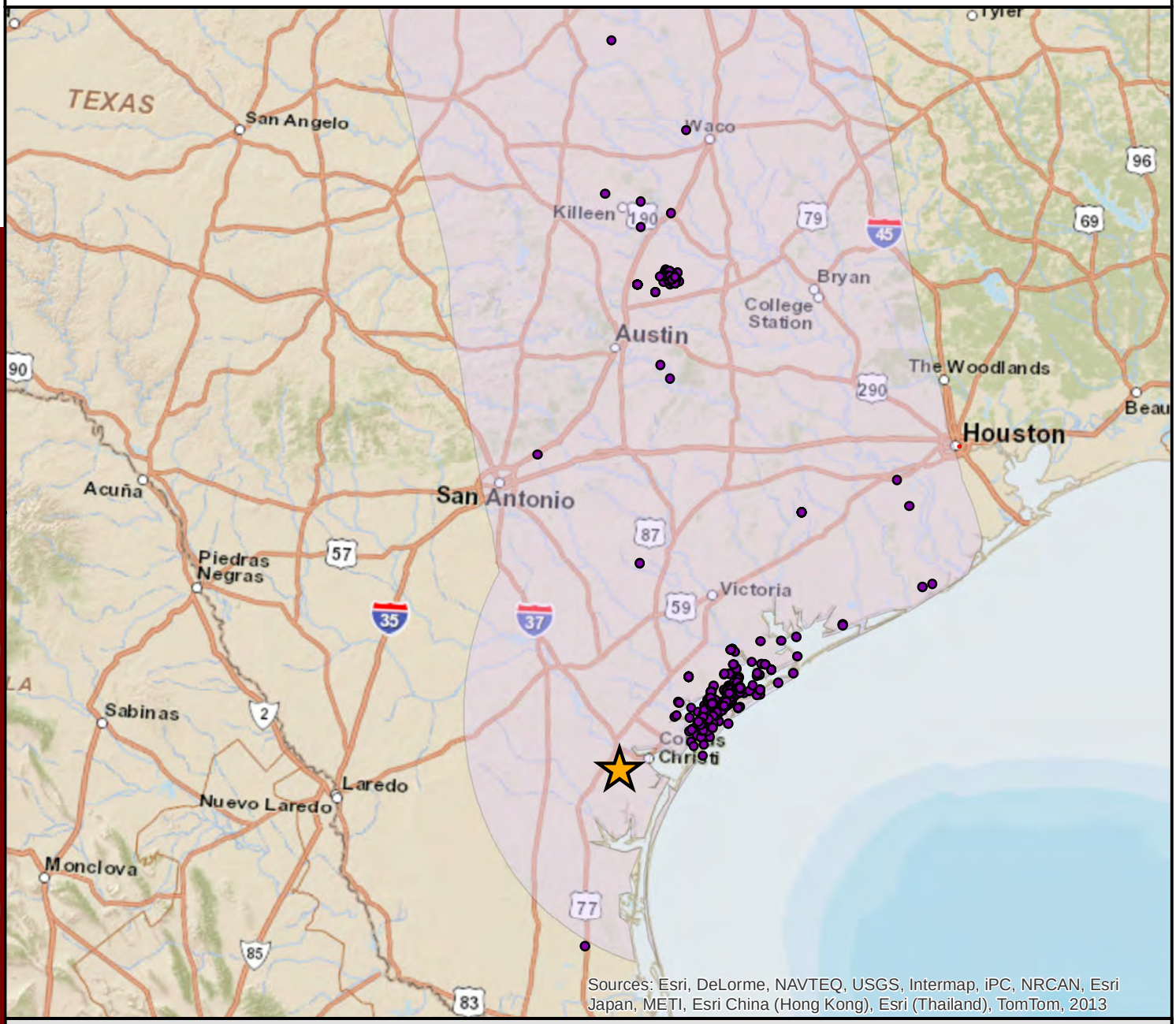
Figure 5
Observed Habitats
Olefins Plant Expansion Project
Nueces County, Texas



Project Area	Residential	Existing Outfall 003	
Action Area	Industrial	Roads	
Shrubland	Cropland	Riverine	
		Canal	

Background Resources: Bing Aerial Hybrid	Surveyor(s): Scott Jecker CWB, PWS Bryan Whisenant	Project Number and Information: 1279 Olefins Plant Expansion Project Biological Assessment	WHITENTON group environmental consultants 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble Geo XH 6000 Series UTM NAD 1983 Zone 14 North	Map Created: 2/11/2014 By D. Scott		Feet 0 2,000 4,000 N

Figure 6
Whooping Crane Locations
Olefins Plant Expansion Project
Nueces County, Texas



Project Location

Known Whooping Crane Sightings

Whooping Crane Migration Corridor

Background Resources: ESRI Street Basemap	Surveyor(s): Scott Jecker CWB, PWS Bryan Whisenant	Project Number and Information: 1279 Olefins Plant Expansion Project Biological Assessment	WHITENTON group environmental consultants 3413 Hunter Road San Marcos Texas 78666
GPS and Coordinate Type: Trimble GEO XH 6000 Series UTM NAD 83 Zone 14 North	Map Created: 08/22/2013 by D. Scott		Miles 0 50 100

APPENDIX B

FIGURE 1-6 (RPS)

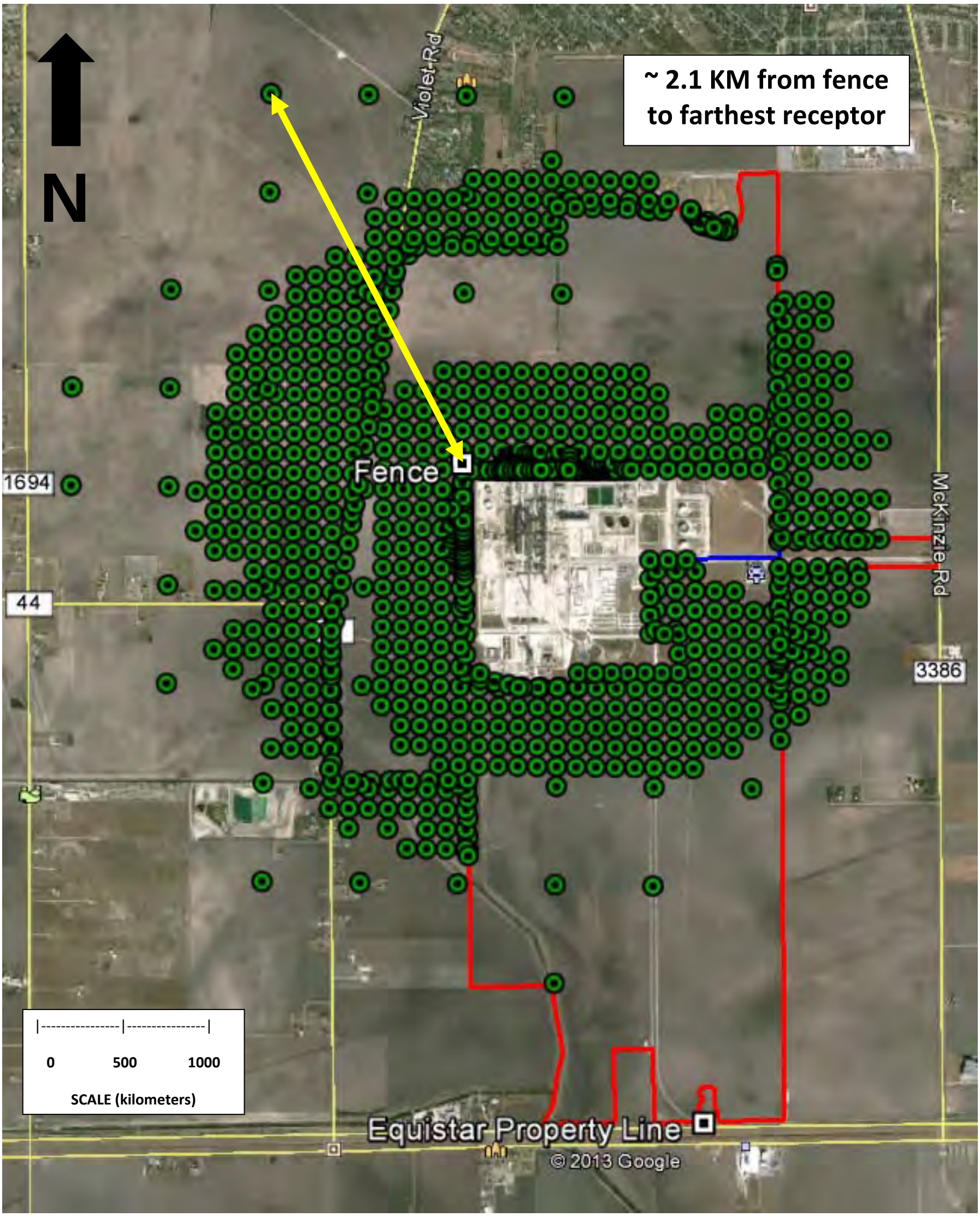


Figure 1
Receptors over Significant Impact Levels (SILs)

Equistar Chemicals LP - Olefins Plant Expansion
Corpus Christi, Nueces County, Texas

RPS

Cielo Center, 1250 South Capital of Texas Highway
Building Three, Suite 200
Austin, Texas, 78746

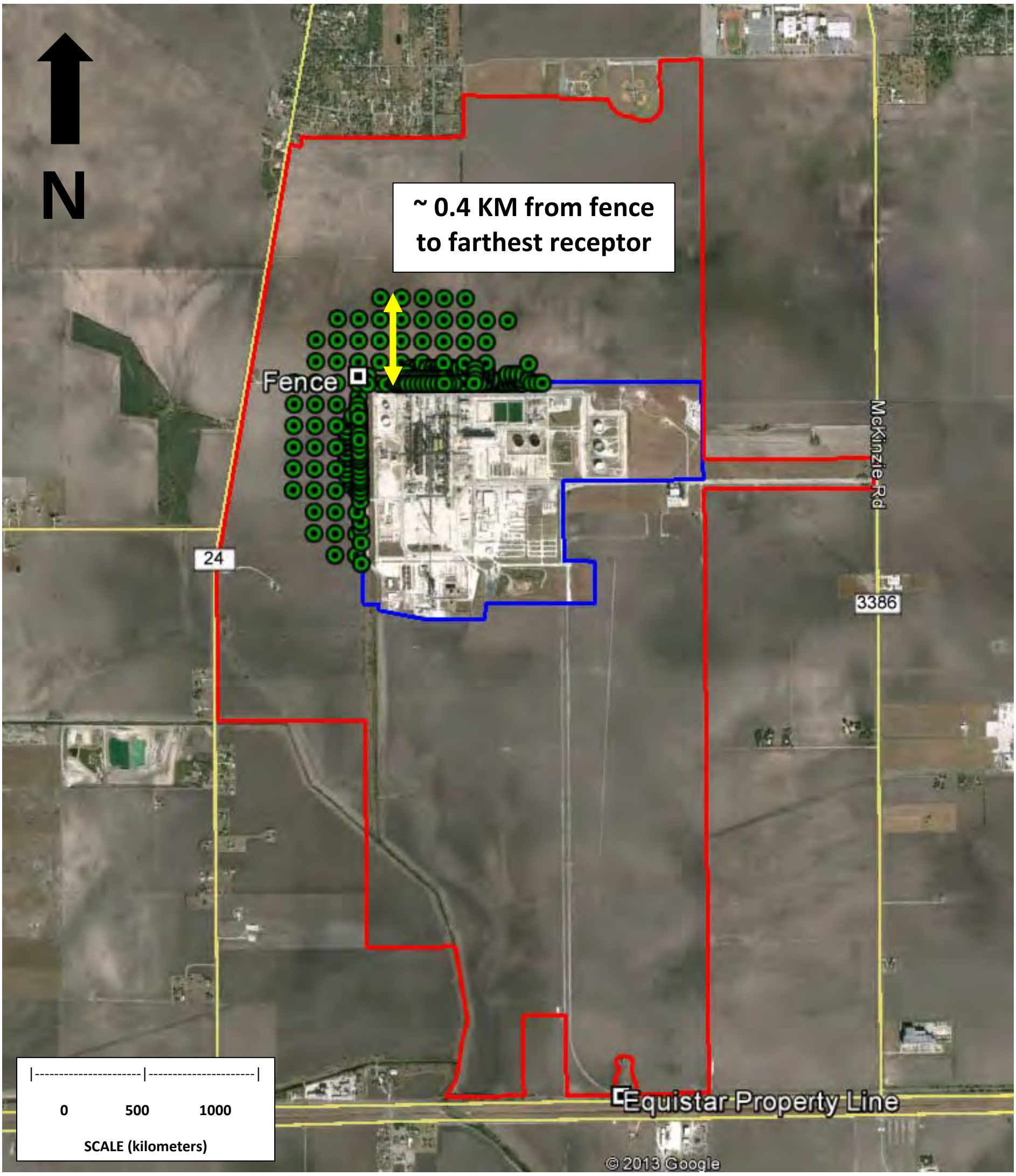


Figure 2
1-hour CO Receptors over SIL

Equistar Chemicals LP - Olefins Plant Expansion
Corpus Christi, Nueces County, Texas

RPS
Cielo Center, 1250 South Capital of Texas Highway
Building Three, Suite 200
Austin, Texas, 78746

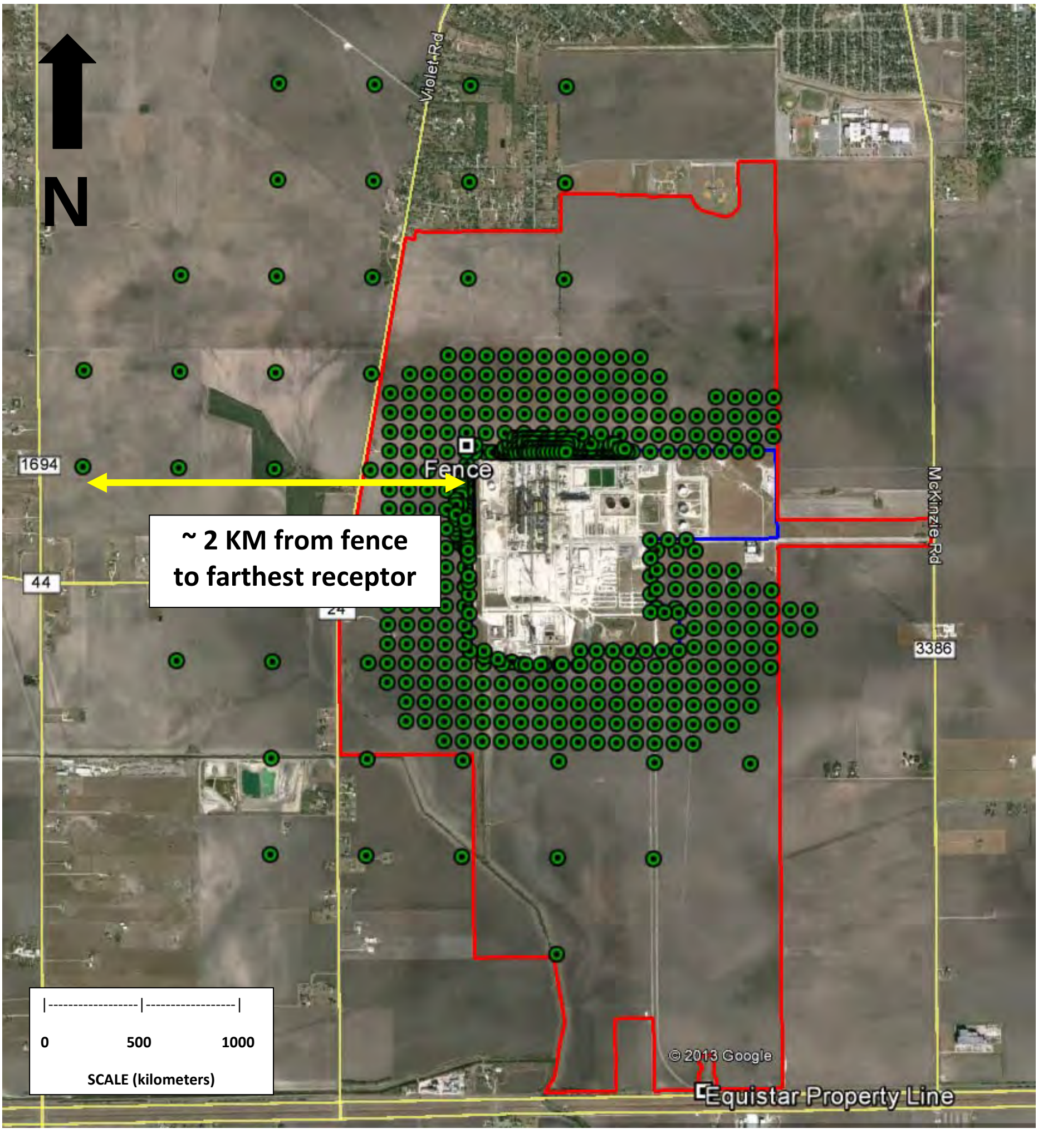


Figure 3
8-hour CO Receptors over SIL

Equistar Chemicals LP - Olefins Plant Expansion
Corpus Christi, Nueces County, Texas

RPS
Cielo Center, 1250 South Capital of Texas Highway
Building Three, Suite 200
Austin, Texas, 78746

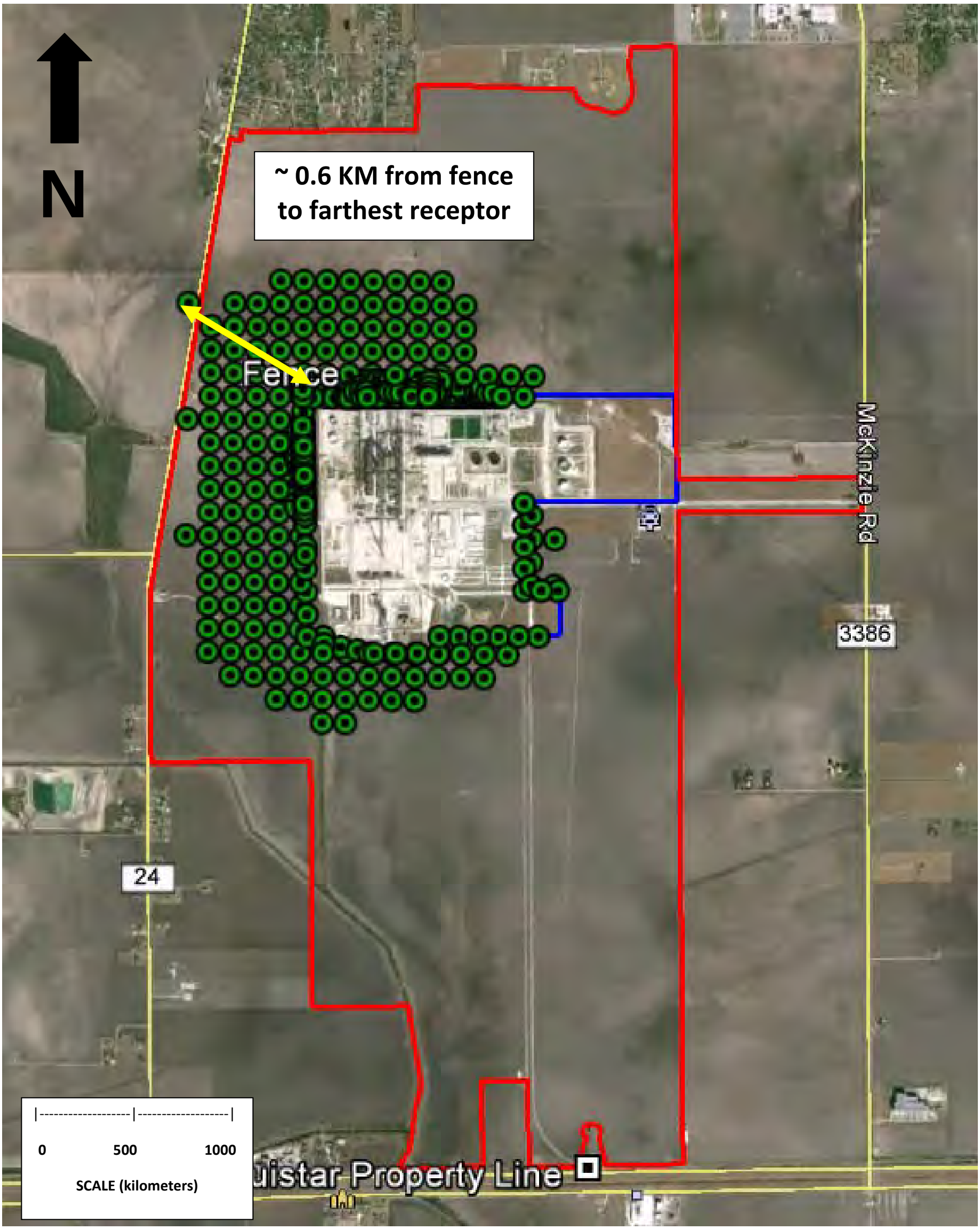


Figure 4
1-hour NO_2 Receptors over SIL

Equistar Chemicals LP - Olefins Plant Expansion
Corpus Christi, Nueces County, Texas

RPS

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Building Three, Suite 200
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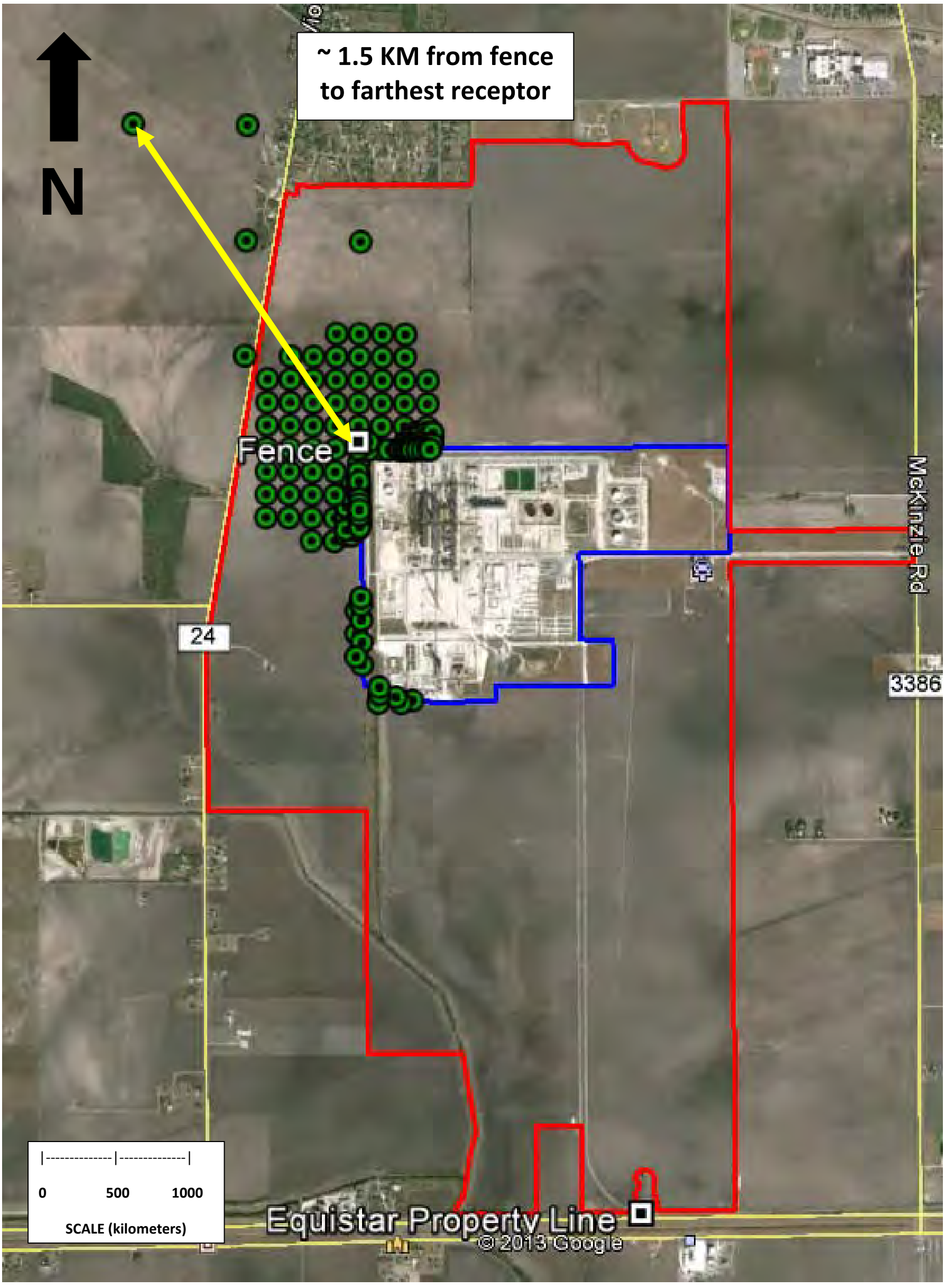

Figure 5
Annual NO_2 Receptors over SIL

Equistar Chemicals LP - Olefins Plant Expansion
Corpus Christi, Nueces County, Texas

RPS

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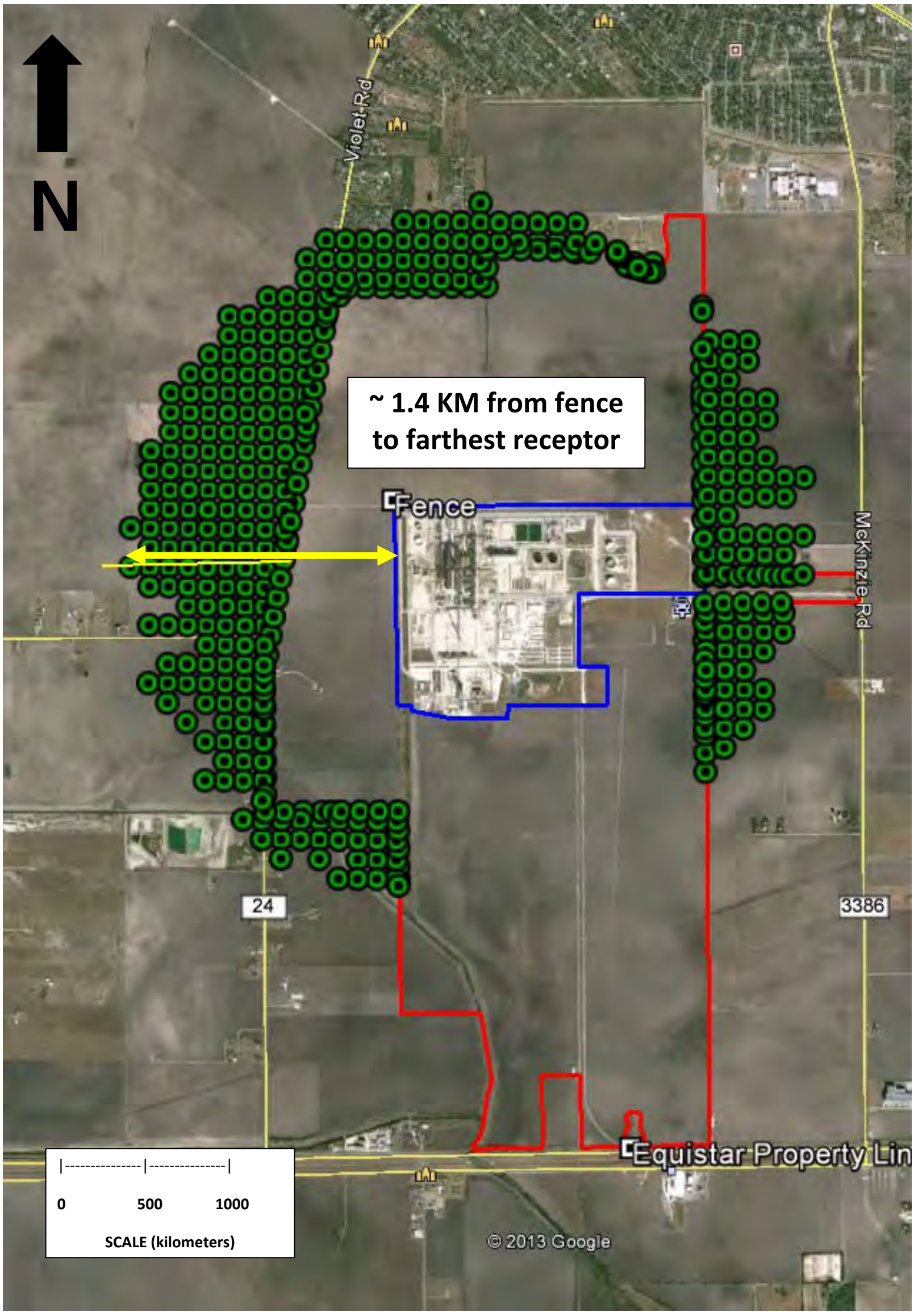

Figure 6
1-hour Ethylene Receptors over 10% of ESL

Equistar Chemicals LP - Olefins Plant Expansion
Corpus Christi, Nueces County, Texas

RPS
Cielo Center, 1250 South Capital of Texas Highway
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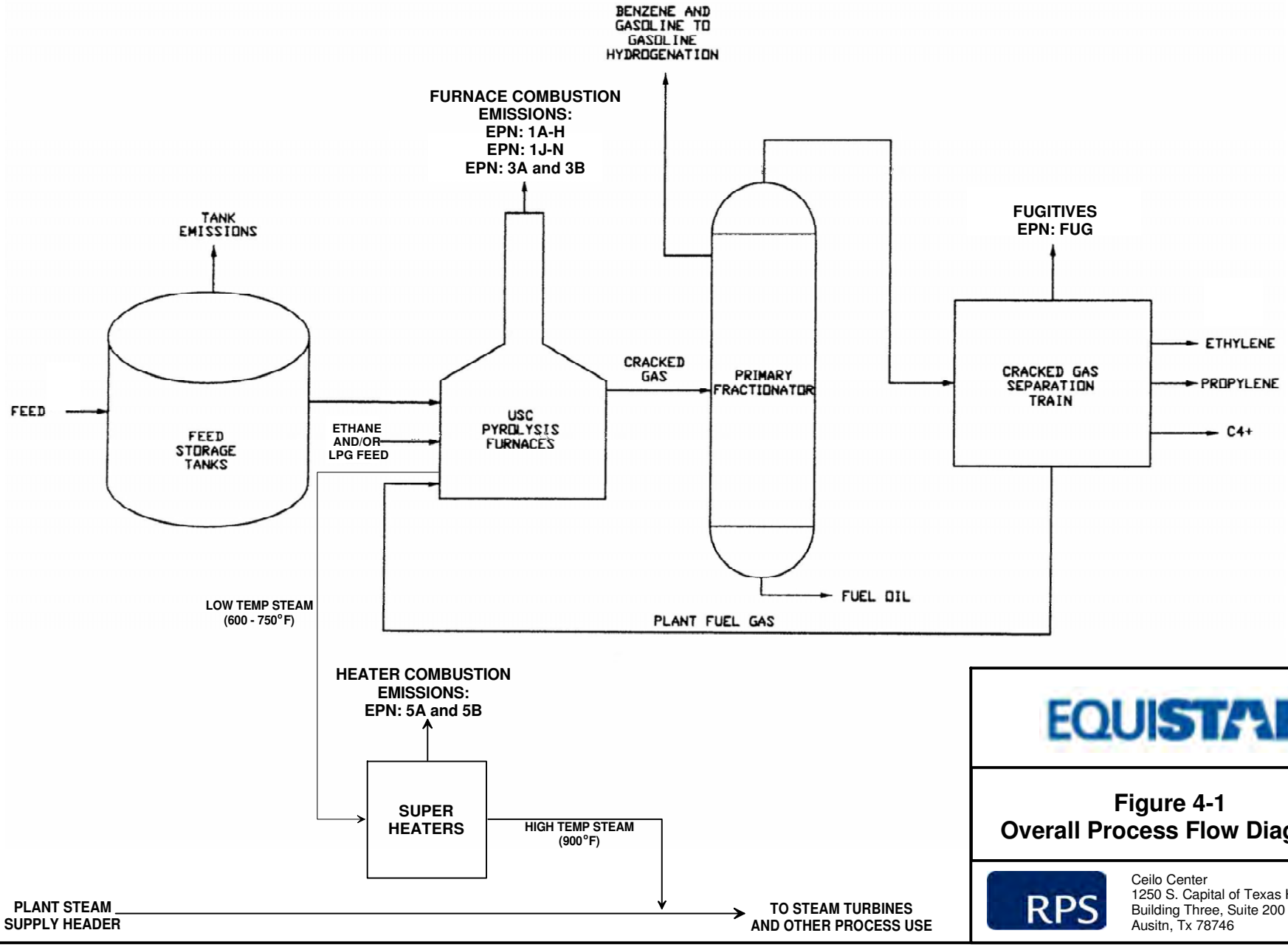
APPENDIX C

FLOW DIAGRAMS

ETHYLENE UNIT



EQUISTAR

Figure 4-1
Overall Process Flow Diagram

RPS
Ceilo Center
1250 S. Capital of Texas Highway
Building Three, Suite 200
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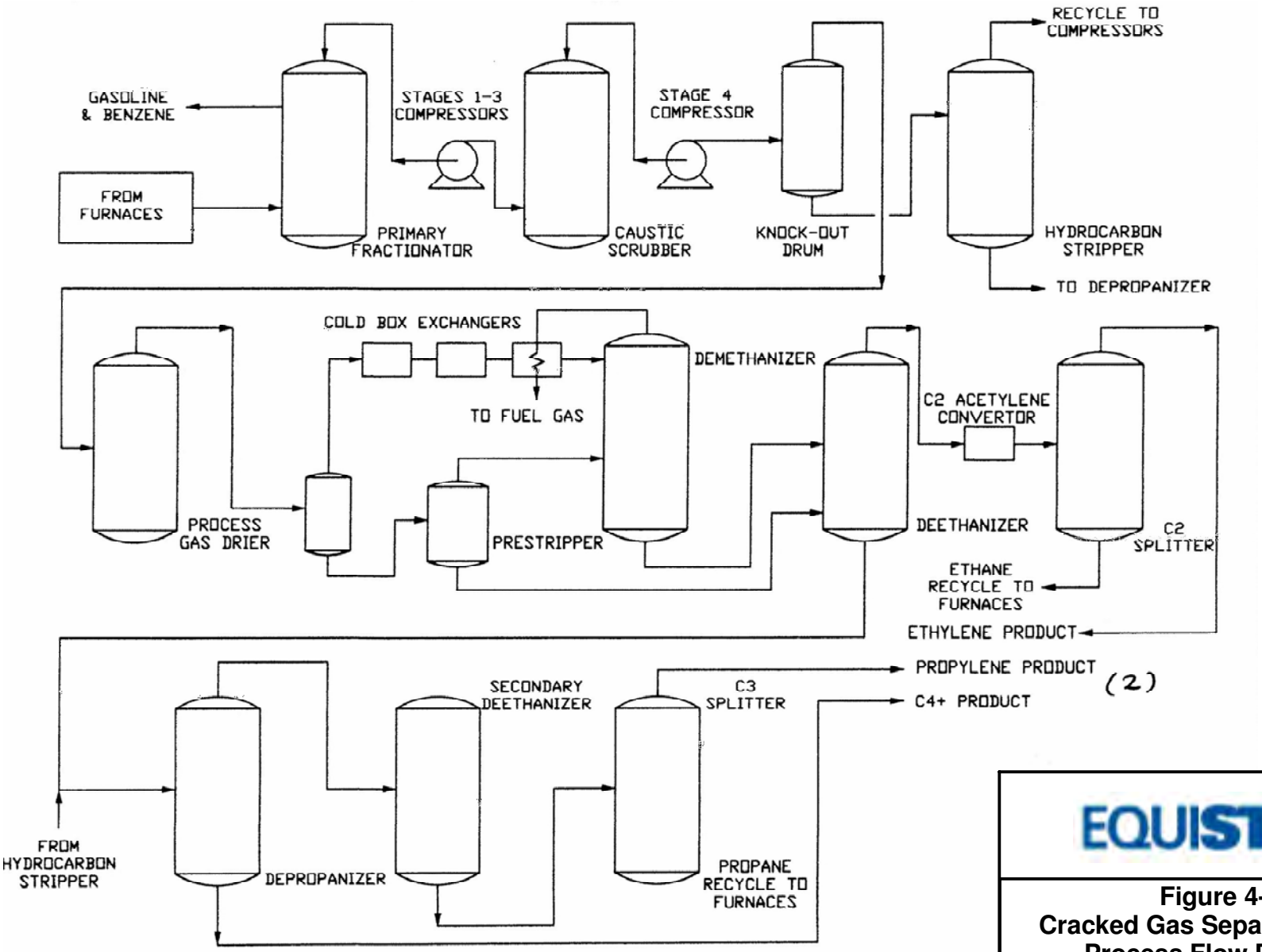
CRACKED GAS SEPARATION TRAIN



EQUISTAR

Figure 4-2
Cracked Gas Separation Train
Process Flow Diagram

RPS
Ceilo Center
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Building Three, Suite 200
Ausitn, Tx 78746

APPENDIX D

SOILS TABLE

Table 2 - NRCS Soils Data
Olefins Unit Expansion Project

NRCS Map Unit Symbol	NRCS Map Unit Name	NRCS Hydric Soil	Potential T&E Species Habitat
Nueces County Soils			
Ba	Edroy clay, 0-1% slopes	Yes	Yes*^
CaA	Clareville loam, 0-1% slopes	No	Yes^
CaB	Clareville loam, 1-3% slopes	No	Yes^
CcA	Raymondville complex, 0-1% slopes	No	Yes*^
Of	Orelia fine sandy loam, 0-1% slopes	No	Yes^
VcA	Victoria clay, 0-1% slopes	No	Yes*^
VcB	Victoria clay, 1-3% slopes	No	Yes*^
Vd2	Monteola clay, 0-5% slopes	No	Yes*^

*slender rush pea, South Texas ambrosia

APPENDIX E

PHOTOGRAPHIC LOG

WHITENTON group environmental consultants

PHOTOGRAPHIC LOG **1**

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: West view of the Project Area.

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: South view of the Project Area.

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: West view of the Project Area.

WHITENTON group environmental consultants

PHOTOGRAPHIC LOG 2

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: East view of the Project Area.

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: South view of Outfall 003.

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: West view of shrubland habitat.

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

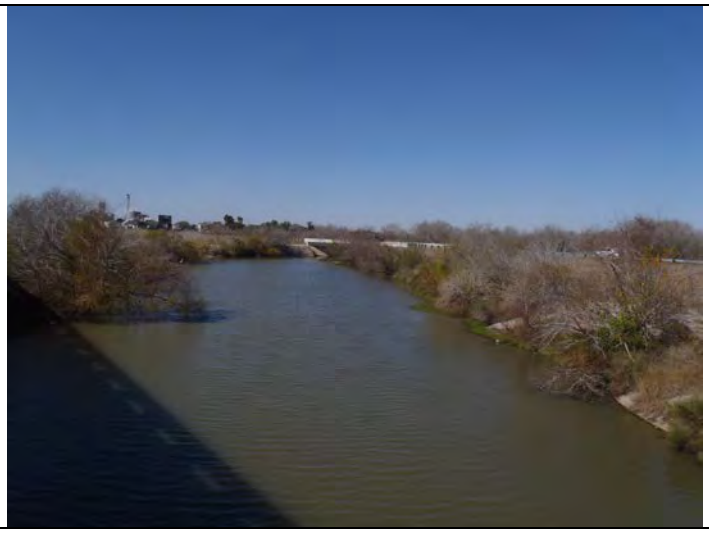
View: South view of cropland.

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: North view of Oso Creek.



Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: Aerial view (northwest) of the Project Area and northern portion of the Action Area.

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: Northeast view of the western portion of the Action Area. View of cropland, drainage ditch, and small tract shrubland.

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: Northeast view of the north and east portions of the Action Area. View of cropland and residential development.

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: North view of the southern portion of the Action Area. View of cropland, drainage ditch, and Oso Creek.

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: North view of the northern portion of the Action Area. View of cropland.

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: Northeast view of the western portion of the Action Area. View of cropland and drainage ditch.

Equistar's Olefins Plant Expansion Project

1/16/2013

Nueces County, Texas

View: Northeast view of the southern portion of the Action Area. View of cropland, drainage ditch, and Oso Creek.

APPENDIX F

FIELD DATA SUMMARY

16 January 2013

Surveyors: Scott Jecker PWS, Bryan Whisenant

Site inspection at Equistar Corpus Christi Complex in Nueces County, TX.

Surveyed the Corpus Christi Complex (CCC). The following notes for 16 January 2013 describe general habitat descriptions. The project site is within the CCC which is highly industrial with little natural vegetation present. The only natural vegetation within the project site includes an area of regularly maintained grasses (*Cyondon dactylon*) and a cluster of mesquite trees (*Prosopis glandulosa*). Majority of facility is concrete, caliche, or industrial development. A drainage ditch was noted on the western boundary of the CCC.

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

Headed north on McKinzie Road. Observed agriculture fields (corn) and residential housing.

Agriculture fields observed (corn and cotton fields). Photos taken.

McKinzie Road to I-37 to the west. Observed residential communities and shrubland habitat.

Shrubland. Vegetation: *Bothriochloa ischaemum* (yellow bluestem), *Aristida purpurea* (purple threeawn), *Prosopis grandulosa* (mesquite), *Parkinsonia aculeata* (retama), and *Zanthoxylum fagara* (lime prickly ash). Photos taken.

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From I-37 to I-69 to the south. Observed shrubland, pastureland, cropland, and some development.

Shrubland. Vegetation: As noted above.

Pastureland: Vegetation: disturbed-*Cynodon dactylon*

Cropland: corn/cotton

From I-69 to east on 44 to south on FM 1694 to east on CR 34. Observed Robtown-residential and commercial development, RR and croplands.

From CR 34 to north on CR 61 to west on 44 towards FM1694. Double-back on 44 towards FM 2292 heading north. Observed croplands, pasturelands, and riverine habitat. Croplands and pasturelands described above.

Riverine-Oso Creek. Vegetation: Dominant species observed on the banks included *Paspalum denticulatum* (longtom), *Fraxinus texensis* (Texas ash), mesquite, retama, and *Celtis laevigata* (sugarberry). Photos taken.

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North on FM 2292 to west on Leopard St. then south on Violet Rd. Observed cropland, pastureland, and residential communities. Description same as above.

Headed south on Violet St to 44 east and then north on McKinzie Rd. Mostly cropland and residential housing noted. Few pasturelands observed. Description as above.

Headed back to airport to begin aerial survey.

Flew in from the southeast at a safe altitude, but low enough to observe features Circled clockwise twice (one inner loop, one outer loop). Observed habitat types, new development not on recent aerial or satellite imagery, Corpus Christi Canal, and land use not visible from public roadways. Photos taken. A sample of photos included below.

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APPENDIX G

EMISSIONS SUMMARY TABLES

APPENDIX H

EMISSIONS SUMMARY TABLES

Table 1-1 Project Emissions Summary

Equistar Chemicals LP - Olefins Plant Expansion
Corpus Christi, Nueces County, Texas

Table 1(a) Sources - Proposed

EPN	FIN	Source Name	Nox		NOx (decoking)		CO		VOC		PM		PM10		PM2.5		SO2	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
1A	B-1601A	U.S.C. FURNACE "A"	11.28	49.41	9.40	-	6.74	29.52	1.01	4.44	0.94	4.12	0.94	4.12	0.94	4.12	0.11	0.48
1B	B-1601B	U.S.C. FURNACE "B"	11.28	49.41	9.40	-	6.74	29.52	1.01	4.44	0.94	4.12	0.94	4.12	0.94	4.12	0.11	0.48
1C	B-1601C	U.S.C. FURNACE "C"	17.40	76.21	14.50	-	10.40	45.54	1.56	6.85	1.45	6.35	1.45	6.35	1.45	6.35	0.17	0.75
1D	B-1601D	U.S.C. FURNACE "D"	17.40	76.21	14.50	-	10.40	45.54	1.56	6.85	1.45	6.35	1.45	6.35	1.45	6.35	0.17	0.75
1E	B-1601E	U.S.C. FURNACE "E"	17.40	76.21	14.50	-	10.40	45.54	1.56	6.85	1.45	6.35	1.45	6.35	1.45	6.35	0.17	0.75
1F	B-1601F	U.S.C. FURNACE "F"	17.40	76.21	14.50	-	10.40	45.54	1.56	6.85	1.45	6.35	1.45	6.35	1.45	6.35	0.17	0.75
1G	B-1601G	U.S.C. FURNACE "G"	17.40	76.21	14.50	-	10.40	45.54	1.56	6.85	1.45	6.35	1.45	6.35	1.45	6.35	0.17	0.75
1H	B-1601H	U.S.C. FURNACE "H"	17.40	76.21	14.50	-	10.40	45.54	1.56	6.85	1.45	6.35	1.45	6.35	1.45	6.35	0.17	0.75
1J	B-1601J	U.S.C. FURNACE "J"	17.40	76.21	14.50	-	10.40	45.54	1.56	6.85	1.45	6.35	1.45	6.35	1.45	6.35	0.17	0.75
1K	B-1601K	U.S.C. FURNACE "K"	11.28	49.41	9.40	-	6.74	29.52	1.01	4.44	0.94	4.12	0.94	4.12	0.94	4.12	0.11	0.48
1L	B-1601L	U.S.C. FURNACE "L"	11.28	49.41	9.40	-	6.74	29.52	1.01	4.44	0.94	4.12	0.94	4.12	0.94	4.12	0.11	0.48
1M	B-1601M	U.S.C. FURNACE "M"	17.40	76.21	14.50	-	10.40	45.54	1.56	6.85	1.45	6.35	1.45	6.35	1.45	6.35	0.17	0.75
1N	B-1601N	U.S.C. FURNACE "N"	17.40	76.21	14.50	-	10.40	45.54	1.56	6.85	1.45	6.35	1.45	6.35	1.45	6.35	0.17	0.75
3A	B-1602A	V.M.R. FURNACE "A"	7.60	33.30	6.34	-	4.54	19.89	0.68	2.99	0.63	2.77	0.63	2.77	0.63	2.77	0.07	0.33
3B	B-1602B	V.M.R. FURNACE "B"	7.60	33.30	6.34	-	4.54	19.89	0.68	2.99	0.63	2.77	0.63	2.77	0.63	2.77	0.07	0.33
5A	B-1604A	STEAM S. HEATER "A"	8.74	38.26	-	-	5.22	22.86	0.79	3.44	0.73	3.19	0.73	3.19	0.73	3.19	0.09	0.38
5B	B-1604B	STEAM S. HEATER "B"	8.74	38.26	-	-	5.22	22.86	0.79	3.44	0.73	3.19	0.73	3.19	0.73	3.19	0.09	0.38
9A	L-1663C	SOUTH DECOKING CYCLONE	0.00	0.00	-	-	1932.94	135.80	0.05	0.02	11.63	1.37	3.58	0.43	3.58	0.43	0.00	0.00
9B	L-1663D	NORTH DECOKING CYCLONE	0.00	0.00	-	-	1999.16	133.80	0.04	0.02	12.47	1.35	3.84	0.42	3.84	0.42	0.00	0.00
12	L-2010	Olefins COOLING TOWER	0.00	0.00	-	-	0.00	0.00	2.92	12.79	4.05	15.33	4.05	15.33	1.20	4.55	0.00	0.00
12B	L-2010B	Olefins COOLING TOWER B-Cells	0.00	0.00	-	-	0.00	0.00	2.02	3.72	1.20	4.54	1.20	4.54	0.36	1.35	0.00	0.00
FUG	FUG	Fugitive Emissions	0.00	0.00	-	-	0.00	0.00	7.96	34.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Table 1(a) Total:	**234.40**	**1026.65**	**180.77**	**0.00**	**4072.16**	**883.01**	**34.05**	**143.69**	**48.88**	**108.13**	**32.20**	**106.27**	**28.50**	**92.30**	**2.30**	**10.07**

Table 1(a) Sources - Current Permit

EPN	FIN	Source Name	NOx		NOx (decoking)		CO		VOC		PM		PM10		PM2.5		SO2	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
1A	B-1601A	U.S.C. FURNACE "A"	27.10	118.71	0.00	0.00	11.98	52.48	0.78	3.44	1.08	4.75	1.08	4.75	1.08	4.75	0.09	0.39
1B	B-1601B	U.S.C. FURNACE "B"	27.10	118.71	0.00	0.00	11.98	52.48	0.78	3.44	1.08	4.75	1.08	4.75	1.08	4.75	0.09	0.39
1C	B-1601C	U.S.C. FURNACE "C"	27.10	118.71	0.00	0.00	11.98	52.48	0.78	3.44	1.08	4.75	1.08	4.75	1.08	4.75	0.09	0.39
1D	B-1601D	U.S.C. FURNACE "D"	27.10	118.71	0.00	0.00	11.98	52.48	0.78	3.44	1.08	4.75	1.08	4.75	1.08	4.75	0.09	0.39
1E	B-1601E	U.S.C. FURNACE "E"	27.10	118.71	0.00	0.00	11.98	52.48	0.78	3.44	1.08	4.75	1.08	4.75	1.08	4.75	0.09	0.39
1F	B-1601F	U.S.C. FURNACE "F"	27.10	118.71	0.00	0.00	11.98	52.48	0.78	3.44	1.08	4.75	1.08	4.75	1.08	4.75	0.09	0.39
1G	B-1601G	U.S.C. FURNACE "G"	27.10	118.71	0.00	0.00	11.98	52.48	0.78	3.44	1.08	4.75	1.08	4.75	1.08	4.75	0.09	0.39
1H	B-1601H	U.S.C. FURNACE "H"	27.10	118.71	0.00	0.00	11.98	52.48	0.78	3.44	1.08	4.75	1.08	4.75	1.08	4.75	0.09	0.39
1J	B-1601J	U.S.C. FURNACE "J"	27.10	118.71	0.00	0.00	11.98	52.48	0.78	3.44	1.08	4.75	1.08	4.75	1.08	4.75	0.09	0.39
1K	B-1601K	U.S.C. FURNACE "K"	27.10	118.71	0.00	0.00	11.98	52.48	0.78	3.44	1.08	4.75	1.08	4.75	1.08	4.75	0.09	0.39
1L	B-1601L	U.S.C. FURNACE "L"	27.10	118.71	0.00	0.00	11.98	52.48	0.78	3.44	1.08	4.75	1.08	4.75	1.08	4.75	0.09	0.39
1M	B-1601M	U.S.C. FURNACE "M"	27.30	119.58	20.88	13.15	20.36	89.19	1.33	5.84	1.84	8.07	1.84	8.07	1.84	8.07	0.15	0.67
1N	B-1601N	U.S.C. FURNACE "N"	27.30	119.58	20.88	7.52	20.36	89.19	1.33	5.84	1.84	8.07	1.84	8.07	1.84	8.07	0.15	0.67
3A	B-1602A	V.M.R. FURNACE "A"	8.67	37.98	0.00	0.00	7.28	31.90	0.48	2.09	0.66	2.89	0.66	2.89	0.66	2.89	0.05	0.24
3B	B-1602B	V.M.R. FURNACE "B"	8.67	37.98	0.00	0.00	7.28	31.90	0.48	2.09	0.66	2.89	0.66	2.89	0.66	2.89	0.05	0.24
5A	B-1604A	STEAM S. HEATER "A"	6.25	27.36	0.00	0.00	5.25	22.98	0.34	1.50	0.47	2.08	0.47	2.08	0.47	2.08	0.04	0.17
5B	B-1604B	STEAM S. HEATER "B"	6.25	27.36	0.00	0.00	5.25	22.98	0.34	1.50	0.47	2.08	0.47	2.08	0.47	2.08	0.04	0.17
9A	L-1663C	SOUTH DECOKING CYCLONE	0.00	0.00	0.00	0.00	1674.80	80.06	0.03	0.02	9.91	0.80	3.05	0.25	3.05	0.25	0.00	0.00
9B	L-1663D	NORTH DECOKING CYCLONE	0.00	0.00	0.00	0.00	906.86	66.37	0.03	0.02	6.82	0.66	2.10	0.21	2.10	0.21	0.00	0.00
12	L-2010	Olefins COOLING TOWER	0.00	0.00	-	-	0.00	0.00	2.92	12.79	34.86	105.75	33.37	103.54	5.63	20.78	0.00	0.00
12B	L-2010B	Olefins COOLING TOWER B-Cells	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FUG	FUG	Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Existing MAERT Total:	**382.54**	**1675.65**	**41.76**	**20.67**	**2779.22**	**1011.85**	**15.87**	**69.53**	**69.41**	**185.53**	**56.34**	**182.32**	**28.60**	**99.57**	**1.47**	**6.45**

Proposed Changes in Allowable Emissions

	NOx		NOx (decoking)		CO		VOC		PM		PM10		PM2.5		SO2	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Existing MAERT Total:	**(148.14)**	**(649.00)**	**139.01**	**(20.67)**	**1292.93**	**(128.83)**	**18.18**	**74.16**	**(20.53)**	**(77.39)**	**(24.14)**	**(76.05)**	**(0.09)**	**(7.27)**	**0.83**	**3.62**

Note: (1) The emissions are listed with two digits past the decimal point consistent with TCEQ practice. Underlying data may not be accurate to the resulting apparent number of significant digits.
(2) PM, PM_{10}, and $PM_{2.5}$ emissions for the existing cooling tower cells are authorized, but not listed in the current permit per past TCEQ practice.

Table 4 Criteria Pollutant Modeling Results for Biological Assessment
Equistar Chemicals LP - Olefins Plant Expansion
Corpus Christi, Nueces County, Texas

Constituent	Regulation	Averaging Period	Area of Impact (AOI)		
			Project GLCmax[3]	SIL[2]	Less than SIL?
			$\mu g/m^3$	$\mu g/m^3$	yes/no
CO	NAAQS	1-hour	2769.7	2000	no
		8-hour	2644.8	500	no
NO_2	NAAQS	1-hour	15.9	7.5	no
		Annual	4.6	1	no
$PM_{2.5}$	NAAQS	24-hour	0.71	1.2	yes
		Annual	< 0.00001	0.3	yes
$PM_{2.5}$	Increment	24-hour	0.74	1.2	yes
		Annual	< 0.00001	0.3	yes
PM_{10}	State NAAQS	24-hour	0.71	1.2	yes
SO_2	Property Line Reg II (TAC Ch 112)	30-min[1]	0.3	20.4	yes
	State NAAQS	1-hour	0.3	7.8	yes
		3-hour	0.3	25	yes
		24-hour	0.2	5	yes
		Annual	0.03	1	yes

1 - The EPA's AERMOD model calculates concentrations for a minimum time interval of 1-hour. Per TCEQ guidance, the model-predicted 1-hour concentration is compared to the 30-minute standard.

2- The significant impact level (SIL) represents a level below which no significant impact on air quality is expected.

3 - The Project GLCmax is the maximum concentration predicted for each constituent and averaging period.

Table 5 Non-Criteria Pollutant Modeling Results for Biological Assessment
Equistar Chemicals LP - Olefins Plant Expansion
Corpus Christi, Nueces County, Texas

Constituent	CAS #	Averaging Period	ESL	De Minimis per MERA[1] Step 4?	GLCmax	% of ESL
			$\mu g/m^3$	yes/no	$\mu g/m^3$	$\mu g/m^3$
1,3-Butadiene	106-99-0	1-hour	510	Cannot use Step 4	0.8	0.2%
		Annual	9.9		0.01	0.1%
1-Butene	106-98-9	1-hour	820	no	0.5	0.06%
Ethylene	74-85-1	1-hour	1400	Cannot use Step 4	292.2	20.9%
		Annual	34		1.5	4%
1-Hexene	592-41-6	1-hour	480	no	0.8	0.2%
Benzene	71-43-2	1-hour	170	Cannot use Step 4	7.3	4.3%
		Annual	4.5		0.004	0.08%
Hexane	110-54-3	1-hour	5300	Cannot use Step 4	0.5	0.01%
		Annual	200		0.007	0.003%
Propadiene	463-49-0	1-hour	1100	Cannot use Step 4	0.03	0.003%
		Annual	1100		0.0002	0.00001%
Toluene	108-88-3	1-hour	3470	no	0.60	0.0173%
Isotbutylene	115-11-7	1-hour	3000	no	0.60	0.0200%
Acetylene	74-86-2	1-hour	26600	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Methylacetylene	74-99-7	1-hour	16400	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Isobutene	115-11-7	1-hour	3000	no	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Cis-2-Butene	590-18-1	1-hour	4800	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
trans-2-Butene	624-64-6	1-hour	4800	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Isobutane	75-28-5	1-hour	23000	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
n-Butane	106-97-8	1-hour	66000	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Cyclopentadiene	542-92-7	1-hour	2000	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Isoprene	78-79-5	1-hour	60	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
cis-1,3-Pentadiene	--	1-hour	50	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
1-Pentene	109-67-1	1-hour	290	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Isopentane	78-78-4	1-hour	3800	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
n-Pentane	109-66-0	1-hour	4100	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Biphenyl	92-52-4	1-hour	2.3	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Cumene	98-82-8	1-hour	230	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Ethylbenzene	100-41-4	1-hour	740	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Methanol	67-56-1	1-hour	2620	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
1-Methyl Naphthalene	90-12-0	1-hour	30	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Naphthalene	91-20-3	1-hour	200	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
1-Propanol	71-23-8	1-hour	230	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Ethylbenzene (Styrene)	100-42-5	1-hour	110	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
1,2,3-Trimethylbenzene	108-67-8	1-hour	1250	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Xylene	106-42-3	1-hour	250	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Dicyclopentadiene	77-73-6	1-hour	60	yes	Per MERA[1] Step 4, the emissions are "de minimis"; therefore, no modeling required.	
Nitrogen	Per MERA[1] Appendix B, no impacts review required for simple asphyxiants.					
Hydrogen	Per MERA[1] Appendix B, no impacts review required for simple asphyxiants.					
Carbon Dioxide	Per MERA[1] Appendix B, no impacts review required for simple asphyxiants.					
Methane	Per MERA[1] Appendix B, no impacts review required for simple asphyxiants.					
Ethane	Per MERA[1] Appendix B, no impacts review required for simple asphyxiants.					
Propylene	Per MERA[1] Appendix B, no impacts review required for simple asphyxiants.					
Propane	Per MERA[1] Appendix B, no impacts review required for simple asphyxiants.					

1 - MERA refers to the TCEQ's Modeling Effects Review and Applicability Flowchart (APDG 5874v3