Biological Assessment

Ascend Performance Materials
Chocolate Bayou Plant

C3 Petrochemicals LLC
PDH Project Brazoria County, Texas

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Acronyms

AOF	Active Operational Facility
Ascend	Ascend Performance Materials Texas, Inc.
BACT	Best Available Control Technology
BA	Biological Assessment
BOD	Biological Oxygen Demand
BNWR	Brazoria National Wildlife Refuge
C3 Petrochemicals	C3 Petrochemicals, LLC
CAA	Clean Air Act
CCR	Continuous Catalyst Regeneration
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
COD	Chemical Oxygen Demand
dB	Decibel
DMDS	Dimethyl Disulfide
ESA	Endangered Species Act
Facility	Chemical Manufacturing Complex
FM	Farm to Market Road
GHG	Greenhouse Gas
HP	High Pressure
Inc.	Incorporated
LLC	Limited Liability Corporation
LRRT	Outer Coastal Plain Land Resource Region
MSS	Maintenance, Startup, and Shutdown
NAAQS	National Ambient Air Quality Standards
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxide
NRCS	Natural Resources Conservation Service
PDH Unit	Propane Dehydrogenation Manufacturing Unit
PM	Particulate Matter Emissions
Project	Propane Dehydrogenation Manufacturing Unit Infrastructure and Operations
PSA	Pressure Swing Absorption
PSD	Prevention of Significant Deterioration
PSV	Pressure Safety Valve
RACT	Reasonably Available Technology
RBLC	RACT/BACT/LAER Clearinghouse
SCR	Selective Catalytic Reduction
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
TXNDD	Texas Natural Diversity Database
TRC	TRC Environmental Corporation
TSS	Total Suspended Solids
U.S.C.	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compound

Section 1
Executive Summary

C3 Petrochemicals, LLC (C3 Petrochemicals) is planning to build a new propane dehydrogenation manufacturing (PDH) unit (Project) near the city of Alvin, Brazoria County, Texas. The C3 Petrochemicals PDH unit will be located on land owned by and leased from Ascend Performance Materials Texas, Inc. (Ascend) at its existing Chocolate Bayou chemical manufacturing complex (Facility). The Ascend Facility is located on Farm-to-Market road (FM) 2917, approximately eight miles south of the intersection of Highway 35 and FM 2917.

This new PDH unit will use propane as its raw material, which will be dehydrogenated to produce polymer-grade and chemical grade propylene. This propylene product will be sold and used in existing processes at the adjacent Ascend Facility and distributed to additional customers via pipeline. The Project's air emission sources will primarily consist of a series of heaters and boilers, and a flare.

Pursuant to the federal Clean Air Act (CAA), C3 Petrochemicals is seeking a permit under the U.S. Environmental Protection Agency's (USEPA) Greenhouse Gas (GHG) Prevention of Significant Deterioration (PSD) Program to authorize construction of the Project. The purpose of this Biological Assessment (BA) is to determine whether any species (or critical habitat) listed as threatened or endangered under the federal Endangered Species Act (ESA) and that occur in Brazoria County, Texas may be affected by USEPA's issuance of the permit, and if so, to what extent. Potential impacts to cultural resources and essential fish habitat will be discussed under separate cover.

This BA is based on the best science available, including, the results of a desktop and on-site inspection of the area affected by the action, the views of recognized experts on the species at issue, a review of literature and other information, and an analysis of the effects of the action on the species and habitat. This BA was prepared in accordance with guidelines provided in 50 Code of Federal Regulations (CFR) Section (§) 402.12.

Construction impacts at this previously disturbed and developed site are expected to be minor and temporary due to the nature of the Project. (Potential effects of the project are discussed in more detail in Section 8.)

Air emissions modeling demonstrates that all concentrations of pollutants are below the USEPA Significant Impact Levels (SILs) at the Ascend Facility property boundary line with the exception of Particulate Matter smaller than 2.5 microns ($PM_{2.5}$). The SIL is the concentration of

a pollutant, below which USEPA has determined the impact to be de minimis or insignificant. This BA evaluates the likelihood of adverse effects to listed species resulting from USEPA's issuance of the federal GHG permit.

No native habitat remains within the Project site due to historical disturbances and development activities over the past several decades. For all of the reasons set forth in this assessment, it is our conclusion that no species listed under the ESA for Brazoria County, Texas will be affected by the Project and therefore a *no effect* determination is warranted.

Section 2
Introduction

C3 Petrochemicals is planning to build a new PDH unit. The C3 Petrochemicals PDH unit will be located on land owned by Ascend at its existing Chocolate Bayou Facility. The Ascend Facility is located adjacent to the eastern bank of Chocolate Bayou, a tidally influenced tributary to Galveston Bay. The Ascend Facility is located on FM 2917, approximately eight miles south of the intersection of Highway 35 and FM 2917 (Alvin, Brazoria County, Texas). The C3 Petrochemicals PDH unit will be constructed on a previously disturbed and developed parcel located in the northeastern portion of the Facility. The parcel will be leased from Ascend and the Project facilities will be constructed and owned by C3 Petrochemicals. Figure 1 (Appendix A) is an area map that depicts the boundary of the Ascend Facility, the C3 Petrochemicals Project location, and the surrounding environs.

This new PDH unit will use propane as its raw material, which will be dehydrogenated to produce polymer-grade and chemical grade propylene. This propylene product will be sold and used in existing processes at the adjacent Ascend Facility and distributed to additional customers via pipeline. The Project operations will primarily consist of pre-treatment, the PDH reaction; catalyst regeneration, pressure swing adsorption (PSA), and support operations.

The project will be constructed within the previously disturbed and developed Active Operational Facility (AOF) portion of the Ascend Facility property most recently leased and operated by Equistar Chemical Company. The size of the Project will consist of a 300-foot by 750-foot area (approximate area of direct construction impact) illustrated on Figure 2 (Appendix A). Construction activities will include site preparation, steel erection, equipment installation, tying-in to existing facility utilities, and commissioning/start-up. Construction laydown areas will be constructed on present grazing land, historically used for agriculture, on the Ascend Chocolate Bayou Facility property.

The purpose of this BA is to determine whether any species (or critical habitat) listed as threatened or endangered under the ESA and that occur in Brazoria County, Texas are likely to be affected by USEPA's issuance of the federal GHG permit. This research looked at impacts from the Project within 479 meters of the centroid of construction. The Action Area, and Ascend Facility property line, is illustrated in Figure 3 (Appendix A).

2.1 Action Area

Air emissions modeling demonstrates that all concentrations of air pollutants, with the exception of $PM_{2.5}$ are below the USEPA SILs at the Ascend Facility property line. The SIL is the concentration of a pollutant, below which USEPA has determined the impact to be de minimis or insignificant. The SIL for $PM_{2.5}$ was modeled to be a 479 meter radius around the centroid of construction (Action Area). Accordingly, this BA evaluates the likelihood of adverse effects to listed species resulting from USEPA's issuance of the federal GHG permit within the Action Area (Appendix A). Detailed information regarding air pollutants is in Section 7.1. This BA is based on the best science available, including, the results of an on-site inspection of the area affected by the action (Action Area), the views of recognized experts on the species at issue, a review of literature, mapping data, and an analysis of the effects of the action on the species and habitat.

2.2 Possible Determinations

This BA was prepared in accordance with guidelines provided in 50 CFR Section § 402.12. The United States Fish and Wildlife Service (USFWS) provide the following possible determinations to be used for BAs.

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 for the Service unless the National Environmental Policy Act analysis is an Environmental Impact Statement.

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). Insignificant effects relate to the size of the effects and should not reach the scale where take occurs. Discountable effects are those that are extremely unlikely to occur. This conclusion is usually reached through the informal consultation process, and written concurrence from the Service exempts the proposed action from formal consultation.

May Affect, likely to Adversely Affect- A "may affect, likely to adversely affect" determination means that all adverse effects cannot be avoided. A combination of beneficial and adverse effects is still "likely to adversely affect" even if the net effect is neutral or positive. Section 7 of the Endangered Species Act

requires that the federal action agency request initiation of formal consultation with the Service when a "may affect, likely to adversely affect" determination is made (USFWS, 2012a).

Section 3
Agency Regulations

3.1 Clean Air Act

Air quality standards have been established under the CAA for the protection of human health. These standards are known as National Ambient Air Quality Standards (NAAQS). The USEPA has set these NAAQS to be the maximum concentration of a given pollutant in the air for a set time period. "The Clean Air Act identifies two types of national ambient air quality standards. Primary standards provide public health protection, including protecting the health of 'sensitive' populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings" (USEPA, 2012a).

Table 1 NAAQS for Criteria Pollutants as set by the USEPA as of December, 2012 lists the pollutants for which NAAQS have been set.

Table 1
NAAQS for Criteria Pollutants as set by the USEPA as of December 2012

Pollutant	Primary / Secondary	Average Time	Concentration Level	Form
Carbon Monoxide	Primary	8-hour	9 ppm	Not to be exceeded more than once per year
		1-hour	35 ppm	
Lead	Primary and Secondary	Rolling 3 month average	0.15 $\mu g/m^3$	Not to exceed
Nitrogen Dioxide	Primary	1-hour	75 ppb	98th percentile, averaged over 3 years
	Primary and Secondary	Annual	53 ppb	Annual mean
Ozone	Primary and Secondary	8-hour	0.075 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particulate Pollution $PM_{2.5}$	Primary	Annual	12 $\mu g/m^3$	Annual mean, averaged over 3 years
	Secondary	Annual	15 $\mu g/m^3$	
	Primary and Secondary	24-hour	35 $\mu g/m^3$	98th percentile, averaged over 3 years
Particulate Pollution PM_{10}	Primary and Secondary	24-hour	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide	Primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3-hour	0.5 ppm	Not be exceeded more than once per year

Areas meeting these NAAQS's are designated as being "in attainment;" areas not meeting these NAAQS's are designated as being in "non-attainment" (for a given pollutant). The USEPA has established regulations for the PSD of ambient air quality in attainment areas, thus reducing the chance of attainment areas becoming non-attainment areas. The USEPA established PSD Increments or the maximum allowable rise in criteria pollutant concentrations that will not cause or contribute to the area being in non-attainment, to manage the attainment areas. For a PSD permit to be issued the applicant must demonstrate to the USEPA that the 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" (USEPA, 2012b).

3.2 Endangered Species Act

The ESA was passed by Congress in 1973 to protect species that are threatened with or in danger of extinction. The ESA prohibits the "take" of listed species and protects the critical habitats of listed species. Take is defined by the ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in such conduct" (ESA § 3(19)).

The ESA charges the USFWS and the National Marine Fisheries Service (NMFS) with determining which species are eligible for listing as "endangered" or "threatened." Endangered is defined by the ESA as "any species which is in danger of extinction throughout all or a significant portion of its range" (16 United States Code [U.S.C.] § 1532(6); 50 CFR § 424.02 (e)) and threatened is defined as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C. § 1532(20); 50 CFR § 424.02 (m)). The ESA is administered by the USFWS for land species and by NMFS for marine species, including marine mammals.

Section 4
Project Description

4.1 Project Purpose and Location

C3 Petrochemicals is planning to build a new PDH unit for the manufacturing of propylene. The introduction provides detailed location information in reference to the closest populous area of Alvin, Texas. Figures 1 through 4 (Appendix A) illustrate the location of the Project Location and the defined Action Area on aerial and topographic maps. The Project is located within the United States Geological Survey (USGS) 7.5' Quadrangle Maps of Hoskins Mound and Mustang Bayou. The Centroid of Construction is at a Latitude of 29.257192 N and a Longitude of -95.215707" W.

4.2 Construction Information

Construction of the proposed expansion, associated infrastructure, and auxiliary equipment will take place within the AOF in an area which was formerly the site of an Olefins Facility most recently owned and operated by Equistar Chemical Company (equipment dismantled to ground, foundations left in place). The construction area is approximately 300 feet by 750 feet on which the existing foundation will be demolished and new foundations will be constructed. The existing foundations will be demolished and the area backfilled with approved select material and graded to allow installation of new concrete mat and pier foundations for the expansion. The proposed construction activities include the installation within the 300 foot by 750 foot construction area of approximately 150 reinforced concrete mat, pier, and spread footing foundations comprised of approximately 16,000 cubic yards of concrete. Additionally, an approximately 400 foot by 800 foot area outside of the construction area will be disturbed and used as a temporary equipment laydown and contractor parking facility. The laydown and parking area will require clearing a portion of the Ascend Facility property currently used for cattle grazing and historically used for agriculture. The temporary laydown and parking area will be grubbed to remove vegetation, back filled with stabilized select material, graded, and covered with gravel.

4.2.1 Construction Activities and Schedule

The total time estimated to complete the construction of the Project is approximately 30 months and includes the following list of general construction activities:

- Demolition of existing slab and excavation of foundations

- Backfill and grading of construction area
- Grubbing, backfill, and grading of laydown and parking area
- Placement of new foundations
- Erection of new process equipment piping, electrical, and instrumentation installation
- Installation of interconnecting piping
- Installing final piping tie-ins to existing equipment including existing utility lines
- Completion of instrumentation and electrical work
- Insulation
- Painting

4.2.2 Construction Equipment Required

Equipment required to complete construction activities over the life of the Project are listed below. (The impacts of construction are discussed in detail in Section 8.)

- Bulldozers
- Backhoes
- Other earth moving equipment
- Concrete trucks
- Smooth drum and sheep's foot rollers
- Bobcats
- Dump trucks
- Cranes (800 ton) for major lifts
- Small cranes/rigs (10 - 80 ton)
- Fork trucks / lull lift trucks
- Welding machines and generators
- Air compressors

- High-pressure hydro pumps
- Man lifts
- 15-ton cherry pickers
- Other miscellaneous construction equipment

4.3 Operation

This PDH unit will operate on demand. The sale of propylene and other products will vary in response to marketplace and customer demands. Therefore, actual production rates may vary.

Major components of the PDH process at the proposed new unit include:

- Feed Pre-Treatment;
- Heavies Removal;
- PDH Reaction;
- Catalyst Regeneration;
- Reactor Effluent Compression;
- Gas Separation;
- Hydrogen Pressure Swing Adsorption; and
- Support Operations such as unloading and storing miscellaneous raw materials, product storing, product loading, fuel gas system, steam generation, cooling water system, flare, and routine maintenance, startup, and shutdown activities.

C3 Petrochemicals has submitted to Texas Commission on Environmental Quality (TCEQ) a state air preconstruction permit application to authorize the construction of the PDH unit and other associated activities as described above. Each part of the chemical manufacturing process and associated emissions are identified in the following discussion of the PDH process.

4.3.1 Production Operations

Feed Pre-Treatment

Before propane enters the PDH Reaction section of the unit, impurities and moisture are removed by drying. A small volume of waste water will be generated from the regeneration of the feed driers. This waste water will be disposed offsite or hard-piped and transferred to the existing Ascend Facility waste water treatment plant.

Heavies Removal

After Feed Pre-treatment, propane feed is routed to a series of columns. Heavier components are drawn off as bottom fraction (C4+ fraction). Butanes will be stripped and sold as product. Residual materials collected from the bottom of the Depropanizer columns (C5+) will be stored as liquids.

The overhead product (propane) is routed to the PDH Reaction section.

PDH Reaction

Dehydrogenation of propane to propylene takes place in two identical, parallel reaction trains. Each reaction train consists of four reactors in series which utilize a catalyst. Each of these reactors will have an associated gas-fired heater (EPNs PDH-H10, PDH-H201, PDH-H102, PDH-H202, PDH-H103, PDH-H203, PDH-H104 and PDH-H204).

In addition to the desired propylene product, other hydrocarbons such as ethane, ethylene, and methane as are also produced in the reaction train. The reaction products from each reaction train are routed to the Compression section of the Facility.

Each reactor train will have a charge heater and three interheaters. Oxides of nitrogen (NO_X) emissions generated by these heaters will be controlled via the use of ultra-low NO_X burners and selective catalytic reduction (SCR).

Continuous Catalyst Regeneration

Coke forms on the surface of the catalyst over time. The continuous catalyst regeneration (CCR) section of the PDH process is designed to replenish the catalyst's activity in a continuous operation. Each reaction train will be equipped with a dedicated CCR section. Each CCR vent is equipped with a scrubber. Spent caustic from these scrubbers will be disposed offsite or hard-piped for treatment in the existing waste water treatment plant at the Ascend Facility.

Reactor Effluent Compression

The hot reactor effluent from the fourth reactor is cooled and dried before entering the separation section. A caustic stream is used to aid in the removal of impurities and this caustic stream is transferred to short-term storage and ultimately disposed offsite or in the existing deepwell injection system at the Ascend Facility. The dried, compressed reactor effluent is then sent to a separation system to separate hydrogen and methane from heavier hydrocarbons.

Gas Separation

In this section, uncondensable process gas components like hydrogen and methane are separated from the propane and propylene hydrocarbon phase. The hydrocarbon phase is condensed. The hydrogen and methane remain in the gas phase. Hydrocarbons condensed in the Gas Separation step are further separated into methane, C_2 and C_3 products. The gas phase from this step is sent to the hydrogen PSA Unit.

Hydrogen Pressure Swing Adsorption

The Hydrogen Pressure Swing Adsorption Unit takes feed from the Gas Separation section of the Facility and produces saleable H_2 gas. This high-purity H_2 gas is also utilized in other sections of the Project. The remaining tail gas from the PSA unit is blended into the Fuel Gas system.

Raw Material and Product Storage

Primary feeds to the PDH process include propane, ammonia for the SCR Units, dimethyl disulfide (DMDS) injected in the reaction section of the Project, solvent injection for the Compression section of the Facility, chlorine injection for the CCR units, caustic solution used in the CCR vent scrubber, and caustic solution used to scrub the reactor dryer of the PDH unit.

Other chemicals on-site are those used for boiler feed water treatment and cooling water treatment. These are either stored in atmospheric tanks or isotainers.

Propylene product will be stored in a sphere and will be purchased by the Ascend Facility and transferred off-site to other customers via pipeline. C_2 and H_2 products will also be transferred off-site via pipeline. C_4 products will be stored in spheres and loaded into barges. C5+ heavies from the process will be stored in a horizontal tank that vents to the PDH flare.

Raw Material and Product Loading/Unloading

Volatile organic compounds (VOCs) unloaded at the PDH unit include DMDS and solvent. Both will be received via tank truck. Dry couplings or the equivalent will be used and unloading emissions controlled by the PDH flare. With the exception of butane, all products will be transferred from the PDH unit via pipeline. Butane will be loaded into barges as discussed in the previous section.

Fuel Gas System

The Fuel Gas System is utilized to provide fuel for combustion in the two PDH Reaction trains and steam generators. Gaseous fuels include natural gas, methane, and tail gas from the PSA section of the Project.

Steam Generation

The Steam Generator at the PDH unit will produce high pressure (HP) steam for various heating purposes in the unit. Emissions of NO_X from these boilers will be controlled via the use of ultra-low NO_X burners and SCR.

Cooling water system

The PDH unit will utilize a single cooling tower. Several of the heat exchangers on the loop in VOC service will be operated with a water-side pressure that is less than 5 psig greater than the

process-side pressure. Therefore, the cooling water system is considered to be a potential source of VOC emission as well as PM.

Flare

The PDH unit will utilize one ground flare for the control of intermittent process vent streams such as the emergency venting of pressure safety valves (PSVs) in the PDH unit. It is also utilized during process clearing and venting for routine maintenance, startup and shutdown.

Wastewater storage and treatment

The PDH unit will generate three waste water streams. These will be disposed offsite or hard-piped for treatment or disposal at the Ascend Facility. Waste water from reactor effluent dryer regeneration will be disposed offsite or in the existing deepwell injection disposal system at the Ascend Facility. The other two waste water streams will be disposed offsite or treated in the existing Ascend Facility waste water treatment plant.

4.3.2 Routine maintenance, startup and shutdown activities

Planned and predictable maintenance, startup and shutdown (MSS) activities at the PDH unit will be conducted in a way that will minimize emissions to the atmosphere. This will generally be accomplished by emptying vessels and pipelines before opening them.

4.4 Emissions

Several components of the PDH unit project will be sources of emissions. These will include heaters, boilers, a cooling tower, storage tanks, process vents, analyzer vents, process fugitives, a process flare, routine maintenance, startup, and shutdown emissions.

Annual emissions of criteria pollutants, ozone precursors, and GHG associated with the Project are shown in Table 2 below.

Table 2

Annual Emissions of Criteria Pollutants, Ozone Precursors, and GHG Associated with the Project

Pollutant	Emission Rate, T/yr
NO_X	53.2
CO	323.6
VOC	20.1
SO_2	4.0
PM_{10}	46.3
$PM_{2.5}$	41.5
CO_2	795,115
N_2O	1.4
CH_4	15.8
CO_2e	795,881

Section 5
Environmental Setting

5.1 General Regional Information

The facility is located within the Texas Gulf Coastal Plain, which is situated within the Outer Coastal Plain Land Resource Region (LRRT). This area is composed of grasslands and riparian bayous with topography gently sloping to the coast. Historic elevations within the Action Area range from five to approximately 20 feet above sea level. Development has increased the elevation of portions of the Action Area to as much as 33 feet. The Action Area, through which Chocolate Bayou flows from northwest to southeast, is historically agricultural. Presently the land use varies from areas of continued agricultural and grazing use, to residential and industrial use. The chemical complex comprising the AOF has been in operation for over 50 years.

The watershed of Brazoria County is composed of the Brazos River and the San Bernard River along with numerous smaller creeks and bayous, such as Chocolate Bayou, that either drain into the aforementioned rivers or go directly into coastal bays. Brazoria County encompasses a portion of West Galveston Bay and all of Christmas and Drum Bays. All of these are part of the larger Galveston Bay complex.

Brazoria County is located on the Upper Texas Coast. It is bounded to the north by Harris (County Seat Houston), Fort Bend (County Seat Richmond) and Wharton (County Seat Wharton) Counties. To the east and west the county is bounded by Galveston (County Seat Galveston) and Matagorda (County Seat Bay City) Counties, respectively. The southern boundary of the county is the Gulf of Mexico.

5.1.1 Land Use

Brazoria County was traditionally a rural agricultural county, with large portions of land being used for rice, cattle, and hay production. In recent years urban sprawl from the Houston metroplex has seen Brazoria County cities such as Pearland and Alvin grow significantly in size. Large areas of former agricultural lands have been developed for residential or commercial purposes. Brazoria County experienced a 29.53% increase in population between the 2000 and 2010 census counts and this is one of the fastest growing counties in the state (Texas State Historical Association, 2012).

The land proposed to be used for the Project is currently used for industrial purposes and has been for the past 50 years. The land surrounding the Project is a mix of other industrial/chemical facilities, agriculture, open water, and coastal marsh. Peterson Landing is an unincorporated community situated across Chocolate Bayou, and west, from the Ascend Facility and outside the Action Area.

5.1.2 Climate

Brazoria County averages 57 inches of precipitation per year (USDA, 1981). This is composed almost exclusively of rain as snow fall is rare. Summers are long and hot with average highs being 91 degrees Fahrenheit (°F); however highs above 100°F are not uncommon. Winters are mild with an average high temperature of 43°F. Colder temperatures, as low as, 20°F or even in the teens do occur, however their duration is typically short. Southerly winds dominate with southeast being the predominate direction. North winds are almost exclusively correlated with frontal passage.

As of January, 2013, Brazoria County is under a D1- moderate drought (USDA, 2012). This is a substantial improvement over 2011 when the Action Area was under a D4-exceptional drought (the most severe level) (USDA, 2012). Texas has been in a drought five of the last seven years. Droughts coupled with salt water intrusion from the 2008 land fall of Hurricane Ike have severely damaged many coastal marshes and estuary ecosystems along the Upper Texas coast.

5.1.3 Topography

Topography in Brazoria County ranges from sea level on the coast to 146 feet above sea level at the Damon Mound in the west central part of the county. Historic elevations within the Action Area range from ten feet to approximately twenty feet above sea level. Development has increased the elevation of portions of the Action Area to as much as 33 feet. The Action Area has been altered due to past agricultural use, including rice cultivation, and the construction of the industrial facilities including the Ascend Facility. The Federal Emergency Management Administration floodplain maps show that the entire facility is within the 100-year floodplain of Chocolate Bayou.

5.1.4 Geology

The specific geologic formation found in this area according to the USGS is the Beaumont Formation, from the Quaternary Period within the Cenozoic Era. The Beaumont Formation is predominantly sand; yellowish to brownish-gray, fine to fine quartz sand intermixed and interbedded with minor fine gravel and silt. The Beaumont Formation forms poorly defined

meander-belt ridges and pimple mounds and is interfingered with the Lissie Formation (USDA, 1981).

5.1.5 Soils

According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), soils in the county are mostly alluvial loams and clays. They are highly productive. Approximately 70 percent of the county was considered prime farm land (Kleiner, 2012). There are 6 soil types mapped within the Action Area. These are represented in Table 3 (NRCS, 1981) and Figure 5 (Appendix A).

Table 3

Soils Found Within the Action Area

NRCS Map Unit Symbol	NRCS Map Unit Name	NRCS Map Unit Characteristics	USDA Classification				NRCS Hydric Soil
			Depth to Restrictive Feature	Drainage	Permeability	Landform	
13	Edna Fine Sandy Loam	0-1% slopes, not flooded	> 80 inches	Somewhat Poorly Drained	Moderate	Flats on Coastal Plains	Yes
15	Edna-Aris Complex	0-1% slopes, not flooded	> 80 inches	Somewhat Poorly Drained	Moderate	Flats on Coastal Plains	Yes
21	Ijam Clay	0-1% slopes, rarely flooded	> 80 inches	Poorly Drained	Moderate	Flats on Coastal Plains / Lagoons	Yes
22	Ijam-Urban Land Complex	0-1% slopes, rarely flooded	> 80 inches	Poorly Drained	Moderate	Flats on Lagoons	Yes
24	Lake Charles Clay	0-1% slopes, not flooded	> 80 inches	Moderately Well Drained	Low	Flats on Coastal Plains	Yes
28	Leton-Aris Complex	0-1% slopes, occasionally flooded	> 80 inches	Poorly Drained	Moderate	Flats on Coastal Plains	Yes

5.1.6 Water Resources

The southern boundary of the county is the Gulf of Mexico. The Brazos River splits the county into east and west halves. The San Bernard River flows through the western part of the county. These two rivers make up the majority of the watershed in the county. Other minor drainages

such as Halls Bayou, Oyster Bayou, Persimmon Bayou, Chocolate Bayou, and Jones Creek flow directly into the bay.

The Project is located within the existing developed portion of the Ascend property, which is situated on the left descending bank of Chocolate Bayou. Chocolate Bayou empties into Chocolate Bay, which is part of the Galveston Bay system. The Brazos River is approximately 21 miles to the west of the Project. The San Bernard is even farther away at 30 miles west of the Project. In Brazoria County there are numerous stock tanks, irrigation canals, farm ponds, and emergent wetlands.

5.1.7 Vegetation

Native vegetation found in Brazoria County was typical for the Texas Gulf Coastal Plain. Bluestem (*Andropogon gerardii*), Eastern gamagrass (*Tripsacum dactyloides*), switchgrass (*Panicum virgatum*), and yellow Indian grass (*Sorghastrum nutans*) were common tall grass prairie species that dominated pre-agricultural Brazoria County. After European settlement, most native prairie was converted to agricultural (rice or cattle production) purposes.

Existing riparian areas are comprised of water oak (*Quercus nigra*), willow oak (*Quercus phellos*), black willow (*Salix nigra*), and river birch (*Betula nigra*). Typical freshwater emergent marshes contain Gulf coast spikerush (*Eleocharis cellulosa*), smartweed (*Polygonum hydropiperoides*), bulrush (*Scirpus californicus*), and green flat sedge (*Cyperus virens*). Brackish marshes along the Brazoria County coast are dominated by cordgrass (*Spartina patens*), Gulf cordgrass (*Spartina spartinae*), batis (*Batis maritima*), and annual glasswort (*Salicornia bigelovii*).

5.2 Protected Species

5.2.1 Threatened or Endangered Species

This section will focus on federal-listed threatened, endangered, or candidate species for Brazoria County. Candidate species do not currently carry regulatory protection; however because they might be listed in the future they are included in this analysis. Because of discrepancies between the USFWS list of federally protected species known or suspected to inhabit Brazoria County and the Texas Parks and Wildlife Department (TPWD) list, all species that are federally-listed on either agency's list have been included in TRC's analysis.

Table 4
Federally-Listed Threatened, Endangered, or Candidate Species for Brazoria County, Texas[+]

Common Name	Scientific Name	Listing Status
Birds		
Eskimo Curlew	*Numenius borealis*	E*
Piping Plover	*Charadrius melodus*	T
Sprague's Pipit	*Anthus spragueii*	C*
Whooping Crane	*Grus americana*	E
Fish		
Sharpnose Shiner	*Notropis oxyrhynchus*	C*
Smalltooth Sawfish	*Pristis pectinata*	E*
Mammals		
Jaguarundi	*Herpailurus yaguarondi*	E*
Louisiana Black Bear	*Ursus americanus luteolus*	T*
Ocelot	*Leopardus pardalis*	E*
Red Wolf	*Canis rufus*	E*
West Indian Manatee	*Trichechus manatus*	E
Mollusks		
Smooth pimpleback	*Quadrula houstonensis*	C*
Texas fawnsfoot	*Truncilla macrodon*	C*
Reptiles		
Atlantic Hawksbill Sea Turtle	*Eretmochelys imbricate*	E
Green Sea Turtle	*Chelonia mydas*	T
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E
Leatherback Sea Turtle	*Dermochelys coriacea*	E
Loggerhead Sea Turtle	*Caretta caretta*	T*

** Not on USFWS list but is on TPWD list as federally-listed*
DL= De-listed, LE/E= Endangered, T= Threatened, C= Candidate species.
[+]USFWS 2013

5.2.2 Listed Species Descriptions

Species descriptions, unless otherwise noted, are based on information provided by the USFWS Species by County report for Brazoria County, Texas (USFWS 2013).

Piping Plover

The piping plover is listed as Threatened by the USFWS in Brazoria County. Piping plovers *(Charadrius melodus)* are small shorebirds approximately seven inches long with sand-colored plumage on their backs and crown and white underparts. Breeding birds have a single black breast band, a black bar across the forehead, bright orange legs and bill, and a black tip on the bill. During winter, the birds lose the black bands, the legs fade to pale yellow, and the bill becomes mostly black.

The piping plover is a migratory North American shorebird. Piping plovers breed in three geographic regions within North America: the Atlantic Coast, the Northern Great Plains, and the Great Lakes. However, piping plovers from all three breeding populations winter along the South Atlantic, Gulf Coast, and Caribbean beaches and barrier islands, primarily on intertidal beaches with sand and/or mud flats with no or sparse vegetation. Piping plovers spend more than 70% of the year on the wintering grounds. Texas is estimated to harbor more than 35% of the known overwintering populations of piping plovers. Piping plovers generally begin arriving on the Texas coast in mid-July. The number of plovers appears to increase on the Texas coast through October. Plovers begin migrating from Texas towards their breeding grounds in late February. Most birds are gone from Texas by mid-May, although a few birds can be found along the coast year round.

In Texas, piping plovers stay almost exclusively on bare sandy beaches and do not appear to travel inland to any extent. There are several populations of piping plovers along the Texas coast; the closest known population to the Action Area is on San Luis Pass, thirteen miles to the south of the Project.

Eskimo Curlew

The Eskimo curlew is not listed by USFWS for Brazoria County. It is included in this discussion because it is listed by TPWD as federally-listed.

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

Eskimo curlews are the smallest and most gregarious of the four Western Hemisphere curlew species. Measuring 12-14 inches (30-36 cm) in length and weighing one pound (.45 kg), adults are mottled brown on the back, with a

white throat and yellowish-buff undersides. A buff-white eyebrow divides the dark crown from the eye line and the bill is thin, curving downward approximately two inches in length. Cinnamon colored wing linings are visible in flight and the stilt-like legs are dark green to blackish-gray. The Eskimo curlew feeds on berries, insects, ants, snails, and grasshoppers. Their voice is a melodious, whistling "tee-tee-tee."

During late August the curlew migrates as far south as Argentina, and returns Northward in February; arriving in Texas around March, and continuing as far north as Alaska. The Eskimo curlew breeds in the arctic tundra with simple nests in depressions along the bare ground.

Sprague's Pipet

The Sprague's pipet is listed as a Candidate species by the USFWS in Brazoria County. It is included in this analysis as a conservative measure.

This small passerine is found in well-drained, open grasslands and fields. It is distinguished from other passerines by its characteristic slender shape, relatively narrow bill, and thin, high-pitched calls and songs of pipits. It is distinguishable from American pipit (*Anthus rubescens*) by its buffy brown upper parts with broad blackish streaking, yellowish to pale pinkish brown legs, and a dark upper mandible that contrasts with a pale lower mandible. Males and females are cryptically colored and similar in appearance.

Sprague's pipets breed in the native prairie of the Great Plains, including the southern portions of Alberta, Saskatchewan, and Manitoba in Canada, and Montana, North and South Dakota, and Minnesota in the US where it makes a canopy of dead grass to cover its nest on the ground. It winters in Arizona, New Mexico, Texas, Oklahoma, Arkansas, Mississippi, Louisiana, and northern Mexico.

The Sprague's pipit leaves the wintering grounds in April, arriving on breeding grounds in late April to mid-May. It leaves the breeding grounds anywhere from September through November and will arrive in wintering grounds over the same period. It prefers well-drained areas of open grassland with native grasses of intermediate height and thickness with moderate litter depths. This species is a ground feeder that eats mainly arthropods, but occasionally seeds during migration.

Whooping Crane

The whooping crane is listed as Endangered by the USFWS and as inhabiting Brazoria County.

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

Whooping cranes are a long-lived species; current estimates suggest a maximum longevity in the wild of at least 30 years. There is only one self-sustaining wild population, the Aransas-Wood Buffalo National Park population, which nests in the area of Wood Buffalo National Park in Canada, and winters in coastal marshes surrounding Aransas National Wildlife Refuge in Texas. Whooping cranes migrate throughout the central portion of the state from the eastern panhandle to the Dallas-Fort Worth area and south through the Austin area to the central coast during October-November and again in April.

Brazoria County is on the extreme eastern edge of the migration corridor for the whooping crane. Data from the USFWS shows that 90% of all whooping crane sightings on the Texas coast occur to south of Brazoria County. Consultation with the USFWS Clear Lake office as part of the preparation of this BA was conducted and the USFWS had no concerns for the whooping crane as a result of the Project. This is based on the lack of habitat within the Action Area and the fact that the Project will be replacing a unit in the same footprint of a previous operating unit; in other words there will be no new strike hazards or impacts to native habitat as a result of the project.

Sharpnose Shiner

The sharpnose shiner is not listed by the USFWS but is listed by TPWD as a federal candidate species. Though it is listed as a candidate species because it might be listed in the future it is included in this analysis as a conservative measure.

The sharpnose shiner can reach up to 3.74 inches (95 mm) (Page and Burr, 1991). It is straw color with silvery sides, has dorsal scales outlined with pigments, and ventral white scales without pigments. The sharpnose shiner has a laterally compressed body, broad body depth, and a pointed snout. They feed on a variety of aquatic invertebrates as well as insects that enter its waters from river and stream banks as well as riparian areas.

The sharpnose shiner is endemic to the Brazos River drainage. The sharpnose shiner is usually found in sand and gravel runs of medium to large rivers. The species was most abundant at downstream sites where current velocity and depth were greatest; there is a progressive decrease in abundance at upstream sites (Ostrand and Wilde 2002).

Smalltooth Sawfish

The smalltooth sawfish is not listed by NMFS for Brazoria County but is listed as federally endangered on the TPWD list. Jurisdiction for the listing of this species resides with NMFS not TPWD but is included in this discussion as a conservative measure.

The smalltooth sawfish is one of only two species of sawfishes in the U.S. Sawfish are in the same group of fish such as sharks and skates whose skeletons are made of cartilage. The smalltooth sawfish can reach lengths up to 25 feet (7m) and average 18 feet (5.5m) (NMFS, 2012).

Smalltooth sawfish inhabit shallow saline to brackish waters close to shore with muddy to sandy substrates. Historically smalltooth sawfish were found throughout the Gulf of Mexico, however the only known population in the U.S. is near the peninsula of Florida (NMFS, 2012).

Jaguarundi

The jaguarundi is not listed by the USFWS in Brazoria County but is listed as federally endangered on the TPWD list. The jaguarundi is included in this analysis as a conservative measure.

The jaguarundi is a member of the cat family. Their coats are brown to gray in color. Jaguarundi typically weigh between eight and 16 pounds and are found throughout Central and South America. Their historic range may have extended into the Upper Texas Coast; however their current range in Texas is restricted to the Lower Rio Grande Valley.

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

Louisiana Black Bear

The Louisiana black bear is not listed by the USFWS for Brazoria County. It is listed by the TPWD as federally threatened in Brazoria County and therefore it is included in this analysis as a conservative measure.

The Louisiana black bear is a subspecies of the American black bear. This bear has a black coat with a yellowish brown to white on the muzzle. Body lengths range from four to seven feet long with males reaching weights up to 400 pounds. Females are typically smaller at 120-180 pounds.

Louisiana black bears are opportunistic omnivores. A large portion of their diet consists of acorns, berries, insect larvae, and carrion. The Louisiana black bear was historically found throughout Mississippi, Louisiana, and Eastern Texas. Today established populations are restricted to the Tensas and Atchafalaya River basins of Eastern Louisiana. The population appears to be expanding as occasional sightings have occurred in Northeast Texas and Western Mississippi. These are likely juvenile males seeking out new home ranges.

Louisiana black bears prefer large tracts of mature hardwood forests with limited human development. Louisiana black bears have a large home range, especially males which will travel long distances in search of a mate.

There are no known populations of Louisiana black bear in Brazoria County.

Ocelot

The ocelot is not listed by the USFWS for Brazoria County. It is listed by the TPWD as federally threatened and therefore it is included in this analysis as a conservative measure.

Ocelots are members of the cat family. Their coat is a creamy tan color with reddish brown spots that are outlined in black. Two distinct black stripes extend from the inside corner of the eyes to the back of the head. Ocelots tend to be bobcat sized with typical lengths reaching 30-41 inches long with weight ranging from 15-30 pounds. From a distance they can be mistaken for bobcats.

The ocelot is distributed over South and Central America, Mexico, and small areas of southwestern Texas.

Ocelots are primarily nocturnal spending the days resting in thick cover. They are solitary and territorial, usually meeting only to mate. In Texas, breeding occurs in the spring. Females have a gestation period of 72-80 days and produce litters of 1-3 kittens a year.

Ocelots primarily feed on small prey such as snakes, lizards, birds, rabbits, and other small rodents.

The ocelot's preferred habitat is dense, thorny, low brush composed of spiny hackberry, lotus bush, and black brush.

Red Wolf

The red wolf is not listed by the USFWS for Brazoria County. It is listed by the TPWD as federally threatened and therefore it is included in this analysis as a conservative measure.

The red wolf is a smaller cousin of the gray wolf. As the name implies the red wolf has a coat that is brown to reddish in color. The red wolf weighs 45-80 pounds, stands approximately 26 inches tall at the shoulder and measures four feet in length (USFWS, 2007). The red wolf feeds mostly on mammals including rabbits, deer, small pigs, and opossums.

Historically the red wolf was found throughout much of Texas. The species was declared extinct in Texas in 1980. There are no known populations of red wolf in Brazoria County or in Texas.

West Indian Manatee

The West Indian manatee is listed as federally Endangered by the USFWS for Brazoria County.

The West Indian manatee is a large gray colored marine mammal. The West Indian manatee is found in warm tropical and subtropical waters of the Gulf of Mexico. They average 10 feet (three meters) in length and weigh 1,000 pounds (450 kilograms).

Manatees are slow moving and spend most of their time slowly moving through shallow waters feeding on aquatic vegetation. The West Indian

manatee has been documented along the Upper Texas coast, however these occurrences are rare. The lack of substantial amounts of sea grass along most of the Texas coast due to high turbidity levels possibly reduces the attractiveness of the Texas coast to manatees.

Smooth Pimpleback

The smooth pimpleback is not listed by the USFWS for Brazoria County. It is listed by the TPWD as federally threatened and therefore it is included in this analysis as a conservative measure.

Smooth pimplebacks are small freshwater bivalves. The external coloration of smooth pimplebacks ranges from dark brown to black, and internally they are white. The shells of smooth pimplebacks are nearly round, solid, and approximately 2.5 inches (65 mm) in length.

Smooth pimplebacks are native to the Brazos and Colorado River drainage basins of central Texas. They prefer small to moderate size streams and rivers as well as moderate size reservoirs and have been found on mud, sand, and gravel in water as shallow as three to four centimeters. While smooth pimplebacks can survive in low-flow areas they appear intolerant of dramatic water level fluctuations.

Texas Fawnsfoot

The Texas fawnsfoot is not listed by the USFWS for Brazoria County. It is listed by the TPWD as federally threatened and therefore it is included in this analysis as a conservative measure.

The Texas fawnsfoot is a freshwater bivalve. Externally, Texas fawnsfoot mussels range from gray-green, greenish-brown, orange-brown, to dark brown, often with greenish rays, zig-zags, or chevrons. This mussel's nacre is white. They have ovate to long ovate shells that are slightly compressed. Males have more pointed posteriors than females, and they have a shell length of at least 55 millimeters that ranges from thin to moderately thick. The Texas fawnsfoot has unsculptured disks with slightly elevated beaks and shallow beak cavities. The lateral teeth are relatively short and the pseudocardinal teeth are triangular and compressed.

Historically, the Texas fawnsfoot is only known to occur in the Colorado and Brazos River drainages of Central Texas. Little is known about the species'

habitat, but they appear to prefer rivers and larger streams. As living specimens have not been found in reservoirs, Texas fawnsfoots are likely intolerant of impoundments. The species probably prefers sand, gravel, and perhaps sandy-mud bottoms in moderate flows.

Atlantic Hawksbill Sea Turtle

The Atlantic hawksbill is listed as endangered by USFWS in Brazoria County. This sea turtle is a small to medium-sized marine turtle having an elongated oval shell with overlapping scutes on the upper shell (carapace), a relatively small head with a distinctive hawk-like beak, and flippers with two claws. General coloration is brown with numerous splashes of yellow, orange, or reddish-brown on the carapace. The bottom shell (plastron) is yellowish with black spots on the intergular and postanal scutes. Juveniles are black or dark brown with light brown or yellow coloration on the edge of the shell, limbs, and raised ridges of the carapace. As an adult, the hawksbill may reach up to three feet in length and weigh up to 300 pounds, although adults more commonly average about two and a half feet in length and typically weigh around 176 pounds or less. It is the only sea turtle with a combination of two pairs of prefrontal scales on the head and four pairs of costal scutes on the carapace. The hawksbill feeds primarily on sponges and is most often associated with the coral reef community.

The hawksbill turtle lives in clear offshore waters of mainland and island shelves. They are more common where coral reef formations are present. The hawksbill turtle nests on sandy beaches, often in the proximity of coral reefs. The hawksbill turtle are the most tropical of all sea turtles. They are found primarily in warmer waters and are only an occasional visitor to the Texas coast.

Green Sea Turtle

The green sea turtle is listed as threatened by the USFWS in Brazoria County. The green sea turtle grows to a maximum size of about four feet and a weight of 440 pounds. It has a heart-shaped shell, small head, and single-clawed flippers. Color is variable. Hatchlings generally have a black carapace, white plastron, and white margins on the shell and limbs. The adult carapace is smooth, keelless, and light to dark brown with dark mottling; the plastron is whitish to light yellow. Adult heads are light brown with yellow markings. Identifying characteristics include four pairs of costal scutes, none of which

borders the nuchal scute, and only one pair of prefrontal scales between the eyes. Green sea turtle hatchlings eat a variety of plants and animals, but adults feed almost exclusively on sea grasses and marine algae.

The green sea turtle feeds in shallow water areas with abundant sea grasses or algae. The species migrates from nesting areas to feeding grounds, which are sometimes several thousand miles away. The green sea turtle migrates along the coasts, but some populations are known to migrate across the ocean from nesting area to feeding grounds.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle is listed as endangered by the USFWS in Brazoria County. The Kemp's ridley sea turtle feeds in shallow water areas with abundant sea grasses or algae. The species migrates from nesting areas to feeding grounds, which are sometimes several thousand miles away. Kemp's ridley sea turtle primarily migrates along the coasts, but some populations are known to migrate across the ocean from nesting area to feeding grounds. The major nesting beaches are always found in places where the seawater temperature is greater than 77° F. As a species that migrates long distances, this species faces special problems associated with differing attitudes toward conservation in different countries.

The Kemp's ridley sea turtle is found in the coastal waters and bays of the Gulf of Mexico and Atlantic Ocean. They prefer open ocean and gulf waters with the females only coming ashore to lay eggs in beach sand. The juvenile Kemp's ridley sea turtle will float on large mats of sargassum.

The Kemp's ridley, the most endangered sea turtle species, is the most common nester on Texas beaches. Last year, a record 40 sea turtle nests were documented in Texas -- 38 of them Kemp's ridley nests. The range of their nesting seems to have increased beyond Padre Island as well. In 2002, biologists found Kemp's ridley nests as far north as Galveston Island (TPWD, 2002).

Leatherback Sea Turtle

The leatherback sea turtle is listed as endangered by the USFWS in Brazoria County. The leatherback is the largest of all sea turtle species, with weights of 1,300 pounds (590 kg) and a carapace length of up to eight feet (2.4 m). This

turtle is unique because of the smooth leathery skin covering its carapace. Research on captive turtle species indicates that Leatherbacks grow faster than any other marine turtle.

Leatherbacks feed mainly on pelagic (open ocean) soft-bodied invertebrates such as jellyfish and tunicates. Their diet may also include squid, fish, crustaceans, algae, and floating seaweed. The highest concentrations of these prey animals are often found in areas where deep water comes to the surface (upwelling areas) and where ocean currents converge.

The leatherback is a highly pelagic species that moves into coastal waters only during the reproductive season. Although small groups may move into coastal waters following concentrations of jellyfish, they seldom travel in large groups. Leatherbacks primarily inhabit the upper reaches of the open ocean, but they also frequently descend into deep waters from 650 to 1650 feet (200-500 meters) in depth.

Leatherbacks have pointed tooth-like cusps and sharp edged jaws that are perfectly adapted for a diet of soft-bodied pelagic (open ocean) prey, such as jellyfish. A leatherback's mouth and throat also have backward-pointing spines that help retain such gelatinous prey.

The leatherback sea turtle is a rare visitor to Texas coastal beaches.

Loggerhead Sea Turtle

The loggerhead sea turtle is not listed by the USFWS for Brazoria County. It is listed by the TPWD as federally threatened and therefore it is included in this analysis as a conservative measure.

Loggerheads were named for their relatively large heads, which support powerful jaws and enable them to feed on hard-shelled prey, such as whelks and conch. The top shell (carapace) is slightly heart-shaped and reddish-brown in adults and sub-adults, while the bottom shell (plastron) is generally a pale yellowish color. The neck and flippers are usually dull brown to reddish brown on top and medium to pale yellow on the sides and bottom.

In the southeastern United States, mating occurs in late March to early June. Females lay three to five nests between late April and early September. The eggs incubate approximately two months before hatching sometime between late June and mid-November. Hatchlings lack the reddish-brown coloration of

adults and juveniles. Their flippers are dark gray to brown above with white to white-gray margins. The coloration of the plastron is generally yellowish to tan.

Loggerheads are capable of living in a variety of environments, such as in brackish waters of coastal lagoons, river mouths, and tropical and temperate waters above 50°F. In Texas, they are found in the Gulf of Mexico and are occasional visitors to the Texas coast. Only minor and solitary nesting has been recorded along the coasts of the Gulf of Mexico.

Section 6
Protected Species Habitat Evaluation

TRC Environmental Corporation (TRC) conducted a habitat evaluation of the Action Area to determine if suitable habitat was present to support federally-listed threatened, endangered, or candidate species. The survey, which took place on January 18, 2013, consisted of a pedestrian habitat evaluation within the Ascend property line, and a visual survey of surrounding areas. The day of the survey was approximately 65°F and the skies were clear with light and variable winds.

The property to the south, not owned by Ascend, was similarly evaluated in June of 2012 by qualified biologists. Evaluations of properties to the west and north were carried out from the Ascend property line and from aerial photography as there is no pedestrian access. No areas of Critical Habitat, as designated by the USFWS, are present within the Action Area.

6.1 Plant Communities Observed

Desktop research and field surveys were conducted to determine the presence and habitat value of plant communities in the Action Area. Field surveys took place on January 18, 2013. The Action Area is the area within 479 meters of the centroid of construction. The Construction Area is a cement pad with little to no vegetation present. To the immediate north and east of the Construction Area, previously developed land has partially revegetated. To the northeast of the Construction Area lies Monsanto Reservoir. The Construction Area is located centrally, and slightly north, within the previously disturbed and developed portion of the Ascend property, Figures 1 through 6. (Appendix A).

To the south of the Ascend property is an existing industrial facility, INEOS. On the INEOS property cattle graze on undeveloped land outside their operating facility. To the north of the Ascend property is cleared graded land which has revegetated. To the east, across FM 2917, lies row crop agricultural land. Chocolate Bayou forms the western boundary of the Ascend property, but outside the Action Area. To the west of Chocolate Bayou, and to the north, there is a small residential neighborhood. The majority of land to the west of Chocolate Bayou is used for agriculture and grazing. To the southwest of the Ascend Chocolate Bayou facility property line, 6.05 kilometers from the center of the Action Area, is the northeastern corner of Brazoria National Wildlife Refuge (BNWR).

The dominant habitats within the Action Area are discussed below.

Open Water- The Monsanto Reservoir is a man-made water body in the northwest section of the Ascend Facility. The western half of the reservoir is located within the Action Area. It is fenced with 6-foot chain link and the landform constructed to create the reservoir is approximately 30 feet higher than historic elevations. The banks are graded, compacted gravel. At the time field surveys were carried out the staff gauge in the reservoir indicated the water level was a depth of 10 feet. This reservoir is the source of process water for the Ascend Facility. There is a canal running along the north and west border of the Monsanto Reservoir. This has connectivity with New Bayou and Mustang Bayou.

Cattle Pasture- Bermudagrass (*Cynodon dactylon*) is the dominant species within the areas used for cattle pasture. Wild rose (*Rosa multiflora*) is also prominent.

Revegetated open space – Within the active Ascend Facility and in other areas of the Ascend property, previously developed land has revegetated due to lack of use. These areas have revegetated predominately as stands of Bermudagrass, with common ragweed (*Ambrosia artemisiifolia*) and Brazilian verbena (*Verbena brasiliensis*) being the other most common species. The majority of these areas are underlain by crumbling asphalt or concrete surfaces.

Landfills – Several historic, present, and future landfills for sanitary and industrial waste are present in the south central and southeast areas on the Ascend Facility. These landfills are covered and planted with Bermudagrass and maintained in perpetuity.

6.2 Habitat Evaluation

The Monsanto Reservoir is fenced, gated, and locked. There is no vegetative cover, and steep sides, around the fenced Monsanto Reservoir thus it is unlikely any terrestrial animal species would be able to access, or be comfortable approaching, its edges. The depth of the reservoir does not provide forging habitat for wading birds. Fish eating species, such as brown pelican likely would feed along Chocolate Bayou and not within the reservoir. The lack of shallow water also prevents aquatic vegetation growth and cover for fish eggs or fry. Overall, Monsanto Reservoir provides low quality habitat to semi-aquatic and terrestrial species.

An anhinga (*Anhinga anhinga*) was observed near one of the landfill borrow pits that had filled with water. Steep sides, little vegetative cover, and the fluctuations in water level due to rainfall, followed by evaporation, make this unsuitable for aquatic species and poor habitat for semi-aquatic species. This borrow pit can dry up in the summer and is therefore unacceptable habitat for aquatic species.

Cattle pastures are located on the non-forested, non-industrial areas of the Ascend property. The habitat value of cattle pastures is generally considered lower than native prairies, although

certain migratory birds may utilize these areas for feeding and raptors may hunt along edges and brushy areas in these fields. Active grazing was observed during field surveys.

The revegetated open space, which is mostly underlain with gravel, deteriorating asphalt or cement, or part of an active landfill operation, provides little to no cover for wildlife species. The majority of these areas are maintained through mowing. Other revegetated areas have overgrown with rose canes and this may provide temporary cover for wildlife. Common European house sparrows (*Passer domesticus*) were observed in these areas.

Section 7
Air Quality Results

7.1 Defining the Action Area

Air emissions modeling demonstrate that concentrations of pollutants are below the USEPA SILs as ground level at all points throughout the facility, with the exception of $PM_{2.5}$. This is demonstrated in Table 5 below. The Action Area has been determined to be the area within a 479 meter radius of the centroid of construction. This BA evaluates the probability, or likelihood, of effects to listed species resulting from air emissions and deposition from the project within the Action Area.

7.2 Maximum Predicted Project Emissions Impacts

Air quality results are summarized in the table below:

Table 5
Maximum Predicted Project CO, NO_2, $PM_{2.5}$, PM_{10}, and SO_2 Impacts

Criteria Air Pollutant	Averaging Period	USEPA/TCEQ Significant Impact Level (µg/m³)	Maximum Predicted Project Impact (µg/m³)	Percent of Applicable Significant Impact Level (%)	Is the Maximum Predicted Project Impact Above the Applicable Significant Impact Level?
CO	8-Hour	500	28.13	5.63	NO
CO	1-Hour	2,000	47.83	2.39	NO
NO_2	Annual	1	0.17	17.00	NO
NO_2	1-Hour	7.54	7.09	94.03	NO
$PM_{2.5}$	Annual	0.3	0.20	66.67	NO
$PM_{2.5}$	24-hour	1.2	1.31	109.17	YES
PM_{10}	Annual	1	0.38	38.00	NO
PM_{10}	24-hour	5	2.81	56.20	NO
SO_2	Annual	1	0.02	2.00	NO
SO_2	24-hour	5	0.16	3.20	NO
SO_2	3-hour	25	0.43	1.72	NO
SO_2	1-hour	7.8	0.55	7.05	NO

[a]The maximum project impact predicted using one year (1988) of TCEQ-provided IAH/LCH (Houston, Texas/Lake Charles, Louisiana) meteorological data for a medium roughness length location.

[b]The USEPA-recommended 1-hour NO_X-to-NO_2 conversion rate of 0.8 was used to scale the 1-hour and annual NO_2 concentrations.

[c]The maximum project impact predicted using a five-year (1987-1991) concatenated TCEQ-provided IAH/LCH meteorological data record for a medium roughness length location.

[d]The maximum project impact predicted using five individual years (1987-1991) of TCEQ-provided IAH/LCH meteorological data record for a medium roughness length location.

Section 8
Effects of the Proposed Action

8.1 Air Pollution Effects Background Research

Air emissions modeling conducted for this project demonstrates that all concentrations of pollutants are below their applicable SILs at ground level at all locations within the facility with the exception of $PM_{2.5}$. The Action Area is that area within a 479 meter radius of the centroid of construction. No critical habitat exists within the Action Area for any listed or candidate species in Brazoria County under the ESA, and TRC's habitat assessment has concluded that suitable nesting, foraging and breeding habitat for federally protected species is not found within the Action Area. It is TRC's opinion that air emissions from the project will have no effect on any such species.

Chocolate Bayou is to the west of the Action Area and therefore the project will have no effect on listed aquatic species if they were to be present within Chocolate Bayou.

8.2 Water Quality Impacts

8.2.1 Water Use

Process water is supplied to the facility from the canal located on the northern boundary of the property which flows into Monsanto Reservoir. This water is supplied by a water supply company (Gulf Coast Water Authority). Ascend and C3 Petrochemicals estimate a 64% increase (five million gallons/day) in water use above current levels associated with the PDH unit.

8.2.2 Water Impacts

Wastewater from the Project will either be discharged to the existing, permitted on-site wastewater treatment facility or to the existing, on-site permitted deepwell injection facility. The increase in wastewater influent resulting from the Project is expected to be approximately 30,000 gallons per day (increase of 2.4%), which the existing wastewater treatment facility has the capacity to accept and treat. Table 6 shows facility water quality parameters with corresponding permit limits. Ascend's Texas Pollution Discharge Elimination System (TPDES) Permit Number is WQ0000001000, and USEPA ID Number is TX0003875.

Table 6

2012 TCEQ Monitored Water Pollutant Concentrations (with Permit Limits in Parenthesis) for the Ascend Chocolate Bayou Facility*

Date	Max Temperature (◦F)	BOD	BOD	pH	pH
	(100◦F)	Actual Mean mg/L	Actual Max mg/L	Min (6.0)	Max (9.0)
1/12	78	3.83	4.25	6.9	8.6
2/12	77	3.46	3.84	6.8	8.9
3/12	85	3.01	4.01	7.2	9.0
4/12	89	6.22	7.87	7.2	8.9
5/12	92	8.65	10.52	7.3	8.7
6/12	97	6.32	6.59	7.1	8.8
7/12	100	6.19	8.45	7.0	8.9
8/12	96	8.20	10.52	7.3	8.7
9/12	93	7.39	8.77	7.1	8.6
10/12	87	3.77	6.70	7.3	8.9
11/12	82	4.00	4.49	7.2	8.5
12/12	79	4.82	6.04	7.4	8.5

*COD and TSS limits and reporting are not required by TCEQ for Outfall 001, the ultimate outfall from the Ascend facility to Chocolate Bayou.

Table 7 shows permit limits and results for TPDES priority pollutants in 2012.

Table 7
Permit Discharge Parameters for TPDES Priority Pollutants

Effluent Characteristic/ Parameters	2012 Result	Discharge Limit
	mg/l	mg/l
Benzene	BDL	0.204
Ethylbenzene	BDL	0.162
Phenol	BDL	0.039
Toluene	BDL	0.120

BDL = Below Detection Limits

Treated process wastewater effluent to Chocolate Bayou will not materially change as a result of the Project. The Project will not materially affect water quality in Chocolate Bayou for parameters required to be monitored by Ascend Facility because the existing wastewater treatment facility has the capacity to treat the additional wastewater from the Project. The PDH unit wastewater flows would, to some extent, replace influent streams from the recent operations of Equistar Chemical Company on and about the same parcels of land. Current impacts to Chocolate Bayou based on all monitored parameters, including flow, temperature, biological oxygen demand (BOD), pH, and all priority pollutant concentrations are not expected to materially change from the operation of the Project. Chocolate Bayou is outside of the Action Area but impacts from wastewater will be discussed further for listed aquatic species that could be in Chocolate Bayou.

The permitted discharge of waste water to Chocolate Bayou exits the waste water treatment facility into a canal (Figure 7). This canal enters a barge slip through a concrete weir preventing marine life (fish, sea turtles, and invertebrates) from entering this freshwater canal. The Chocolate Bayou barge slip contains approximately 134,649,360 cubic feet of water. The increased flow from the permitted outfall into the barge slip is estimated to be approximately 30,000 gallons per day. On a daily contribution from the PDH plant would be 1:4488 gallons.

Due to the low volume of treated discharge relative to the volume of water in the barge canal and Chocolate Bayou there is no measureable change in water quality at the discharge location and therefore no impact to aquatic life or listed species would be anticipated. TRC discussed the location and volume of discharge with the National Marine Fisheries service for potential impacts to EFH and sea turtles. Based on the discharge being treated and the lack of sea turtle habitat the National Marine Fisheries Service did not express any concerns with the Project.

8.2.3 Stormwater Impacts

8.2.3.1 Stormwater Discharge Associated with Project Construction

Stormwater within the AOF drains to the facility's existing segregated stormwater system. Prior to undertaking construction of the Project, C3 Petrochemicals will obtain coverage under the Texas General Permit for Stormwater Discharges Associated with Construction Activity and will maintain a site-specific Stormwater Pollution Prevention Plan. The construction contractor for this Project will use appropriate best management practices to manage stormwater runoff related to construction. The Project will be constructed on a portion of the facility that presently has a concrete slab; therefore runoff volume associated with the Project will not materially increase the overall volume of water going through the stormwater system. Within the stormwater system water velocity will decrease to allow suspended solids to fall out of solution. Due to settling and additional treatment stormwater effluent into Chocolate Bayou will have lower turbidity levels than Chocolate Bayou, which is a naturally turbid waterbody. Chocolate Bayou is outside of the Action Area but impacts from stormwater will be discussed further for listed aquatic species that could be in Chocolate Bayou.

8.2.3.2 Stormwater Discharges Associated with Project Operation

Once the Project has been fully constructed, instances of potential stormwater contamination (first flush) would be routed to the waste treatment plant; additional stormwater will drain into the facility's existing stormwater system; and stormwater discharges will be managed pursuant to the Texas Multi-Sector General Permit for Stormwater Discharges Associated with Industrial Activity and site-specific Stormwater Pollution Prevention Plan. Such stormwater management is consistent with the historical operations on and about these same parcels by Equistar Chemical Company. The increase in wastewater associated with the Project, as discussed above, will not account for an increase in stormwater associated from the Project. Chocolate Bayou is outside of the Action Area but impacts from stormwater will be discussed further for listed aquatic species that could be in Chocolate Bayou.

8.3 Noise Impacts

The location of the proposed Project is within the developed portion of an existing manufacturing facility with a current noise action level of 85 dB. The increase in noise level is expected to be minimal and only associated with construction. Noise levels during construction or operations will not exceed 100 dB. Based on the rate at which sound waves dissipate over distance, noise levels associated with the operation of the Project will be less

than 85 dB at the AOF boundary. The sound levels are expected to be consistent with the historical and recent operations on and about the same parcels by Equistar Chemical Company.

Habitat for listed threatened or endangered species is not present within the Action Area and therefore noise associated with construction will have no effect on listed species and therefore will not be discussed further in this report.

8.4 Infrastructure Related Impacts

The Project will be constructed within an existing industrial facility with extensive industrial infrastructure. New infrastructure erected for the PDH unit will not exceed the footprint of recent prior infrastructure. Habitat for listed threatened or endangered species is not present within the Action Area. As a result, infrastructure impacts associated with construction and operation of the Project will have no effect on any listed or candidate species under the ESA for Brazoria County. For this reason infrastructure related impacts will not be discussed further. There will be no increase in barge traffic on Chocolate Bayou as a result of the Project. In fact barge traffic will decrease. The PDH plant will generate less than 10 barge shipments per year. The unit which was originally operating at the same location as the proposed PDH plant generated more than 1,000 barges per year. This means the PDH barge traffic will be 1/100th of the impact from the previous operation. Therefore the predicted impact from barge traffic resulting from the Project will be insignificant.

8.5 Human Activity Effects

Construction and operation of the Project will not require additional human activity compared to typical operation and maintenance activities that have historically occurred and will continue to occur at the Ascend Facility on a routine basis. Habitat for listed threatened or endangered species is not present within the Action Area. As a result, human activities impacts associated with construction and operation of the Project will have no effect on any listed or candidate species under the ESA for Brazoria County. For this reason human activity effects will not be discussed further.

8.6 Species Effects Analysis

The Texas Natural Diversity Database (TXNDD) is a repository for threatened, endangered, and rare species occurrences. The TXNDD plots these occurrences on United States Geological Survey 7.5 minute quadrangle maps. For the purpose of this BA the Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps were investigated. Each encompasses an area of 65 square miles for a total of 130 square miles.

8.6.1 Piping Plover

Regional Sightings

Piping plover occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list a piping plover sighting within the 130 square mile search area.

Habitat in Action Area

Piping plovers are small migratory shorebirds that winter along the Texas Coast. While on the wintering ground piping plovers prefer bare sandy beaches and bay flats for feeding and roosting and avoid areas with vegetation. The Action Area comprises a 479 meter radius from the centroid of construction, not containing the bare sandy shores or beaches. The shoreline of Chocolate Bayou, which is outside the Action Area, is dominated by bushes and does not contain the bare sandy shores that are the preferred piping plover habitat. Therefore even if a piping plover where within the 130 square mile search area there is no suitable habitat for piping plovers in the Action Area or in or around Chocolate Bayou. TRC concludes that the Action Area does not contain suitable nesting or foraging habitat for piping plover.

Potential Impacts

In TRC's opinion, based on the lack of sightings and the lack of suitable habitat in the Action Area the Project will have no impact on piping plover.

Potential Effects

The Project will have "*no effect*" on piping plover.

8.6.2 Eskimo Curlew

Regional Sightings

The last Eskimo curlew to be identified in Texas occurred in 1962. This species is assumed to be extirpated from Texas. Eskimo curlew occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list an Eskimo curlew sighting within the 130 square mile search area.

Habitat in Action Area

Eskimo curlew habitat is comprised of bare sandy shores. The Action Area comprises a 479 meter radius from the centroid of construction, not containing the bare sandy shores utilized by Eskimo curlews. The shoreline of Chocolate Bayou, which is outside the Action Area, is dominated by shrub scrub cover and does not contain the bare sandy shores that comprise Eskimo curlew habitat. As a result, even if the Eskimo curlew had been sighted within the 130 square mile search area and was therefore not assumed to be extirpated in Texas, there is no suitable habitat for Eskimo curlews in the Action Area or in or around Chocolate Bayou. TRC concludes that the Action Area does not contain suitable nesting or foraging habitat for Eskimo curlews.

Potential Impacts

In TRC's opinion, based on a lack of sightings of this species in Texas for the past 51 years, and a lack of suitable habitat in the Action Area the Project will have no impact on Eskimo curlew.

Potential Effects

The Project will have "*no effect*" on Eskimo curlew.

8.6.3 Sprague's Pipet

Regional Sightings

Sprague's pipet occurrence records were requested from TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records so not list a Sprague's pipet sighting within the 130 square mile search area.

Habitat in Action Area or Chocolate Bayou

Sprague's pipet habitat is typically associated with well-drained native prairies. The Action Area comprises a 479 meter radius from the centroid of construction, not containing native prairie due to historic land use changes to agriculture and later industrial. As a result, even if the Sprague's pipet had been sighted within the 130 square mile search area and was therefore there is no suitable habitat for Sprague's pipets in the Action Area. TRC concludes that the Action Area does not contain suitable foraging habitat for Sprague's pipets.

Potential Impacts

In TRC's opinion, based on a lack of sightings and a lack of suitable habitat in the Action Area, Sprague's pipet will not be impacted by Project construction or operation.

Potential Effects

This species is a candidate species and therefore an effects determination is not appropriate.

8.6.4 Whooping Crane

Regional Sightings

Whooping crane occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list a whooping crane sighting with the 130 square mile search area.

The only wild, self-sustaining population of whooping cranes (and the only population that winters in Texas) migrates from their nesting grounds in the area of Wood Buffalo National Park in Canada, to their wintering grounds in the coastal marshes surrounding Aransas National Wildlife Refuge along the middle Texas coast. The population's migration route to and from its wintering grounds takes it

through the central portion of the state, from the eastern panhandle to the Dallas-Fort Worth area, and then south through the Austin area.

Although the USFWS lists the whooping crane as occurring in Brazoria County, the County lies on the extreme eastern edge of the population's migratory route. The Christmas Bird Count, an annual survey conducted by the Audubon Society, has never recorded a whooping crane in Brazoria County (Audubon, 2012). The Christmas Bird Count for Brazoria County began in 1958.

The rareness of whooping crane sightings in Brazoria County is further supported by the Mid-Coast National Wildlife Refuge Bird List, which lists the whooping crane as "rare." Importantly, the Mid-Coast Bird List covers three separate refuges, located in Brazoria and Matagorda Counties. Matagorda County lies to the west of Brazoria County, and therefore is closer to the Central Texas whooping crane migration route. The Mid-Coast Bird List is based in part on the Christmas Bird Count discussed above, which has never recorded a whooping crane for Brazoria County, making it highly likely that the whooping crane's description as "rare" is based on historical sightings in Matagorda County, rather than Brazoria County.

Accordingly, although Brazoria County sits along the extreme eastern edge of the whooping crane's Central Texas migration route, historical sightings are extremely rare even in Matagorda County, further to the west.

Habitat in Action Area

Whooping crane habitat is generally comprised of gently sloping coastal prairies interspersed with emergent wetlands. The Action Area comprises a 479 meter radius from the centroid of construction, not containing native coastal prairies due to historic changes to agriculture and later to industrial. As a result, even if the whooping crane had been sighted in the 130 square mile search area, or during the annual bird counts discussed above, there is no habitat for whooping cranes in the Action Area. TRC concludes that the Action Area does not contain suitable foraging habitat for whooping cranes.

Potential Impacts

In TRC's opinion, based on a lack of sightings and a lack of any sizeable suitable habitat in the Action Area, the whooping crane will not be impacted by Project construction or operation.

Potential Effects

The Project will have "*no effect*" on whooping crane.

8.6.5 Sharpnose Shiner

Regional Sightings

Sharpnose shiner occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list a sharpnose shiner sighting within the 130 square mile search area.

Habitat in Action Area or Chocolate Bayou

The sharpnose shiner is a small fish that is endemic to the Brazos River drainage, a freshwater river system. Within this system, the sharpnose shiner is most often found in areas with sand or gravel substrates. The Action Area comprises a 479 meter radius from the centroid of construction, not containing any such habitat. Chocolate Bayou is outside the Action Area but mentioned here as it is the nearest waterbody to the Project is a brackish drainage dominated by silt and mud substrates, and is not part of the Brazos River drainage system. It is unlikely that sharpnose shiner would inhabit Chocolate Bayou in the vicinity of the project. There is not appropriate habitat for the sharpnose shiner within the Action Area. TRC concludes that the Action Area does not contain suitable habitat for sharpnose shiner.

Potential Impacts

Chocolate Bayou is located outside the Action Area but was analyzed for impacts to listed aquatic species because waste water discharges from the Project will flow into Chocolate Bayou. The wastewater and stormwater discharges associated with the Project will have no additional impact on Chocolate Bayou. The sharpnose shiner prefers sand and gravel substrates; and Chocolate Bayou is highly turbid with a clay substrate. Therefore the sharpnose shiner would not be found in such conditions and will not be impacted by the Project.

Based on the lack of sightings, the lack of suitable habitat, and the lack of any Project impacts to Chocolate Bayou, sharpnose shiner will not be impacted by Project construction or operation.

Potential Effects

This species is a candidate species and therefore an effects determination is not appropriate.

8.6.6 Smallmouth Sawfish

Regional Sightings

Smallmouth sawfish occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list a smalltooth sawfish sighting within the 130 square mile search area. Historically smallmouth sawfish were found throughout the Gulf Coast region. However, today the only known population in the Gulf Coast region is around the peninsula of Florida (NMFS, 2012). As a result, smalltooth sawfish are considered extirpated along the Texas Gulf Coast.

Habitat in Action Area or Chocolate Bayou

Smalltooth sawfish inhabit shallow tropical marine waters close to shore and typically over sand or mud substrates. The Action Area comprises a 479 meter radius from the centroid of construction, and does not contain any marine habitats. Chocolate Bayou, located outside the Action Area but is mentioned here as it is the nearest waterbody to the Project, is highly turbidity and does not provide smalltooth sawfish habitat. TRC concludes that the Action Area does not contain suitable habitat for smalltooth sawfish.

Potential Impacts

Chocolate Bayou is located outside the Action Area but was analyzed for impacts to listed aquatic species because waste water discharges from the Project will flow into Chocolate Bayou. Stormwater and wastewater discharges along will have no additional impact on Chocolate Bayou. The smalltooth sawfish inhabits marine waters and would not be found in the brackish conditions within Chocolate Bayou, and therefore will not be impacted by the Project.

Potential Effects

The Project will have "*no effect*" on smalltooth sawfish.

8.6.7 Jaguarundi

Regional Sightings

Jaguarundi occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. Based on TXNDD records, a single jaguarundi sighting within the 130 square mile search area was recorded in the Brazoria National Wildlife Refuge in 1987. The northeast corner of the BNWR is 6.05 km from the centroid of construction. The sighting is questionable due to a lack of suitable habitat anywhere in Brazoria County, the fact that the jaguarondi is often confused with the much more abundant and non-listed, bobcat, and the lack of any other confirmed sightings.

Habitat in Action Area

Jaguarundi habitat is comprised of dense, thorny thickets commonly found in extreme south and southwestern Texas, along the Mexican border. Typical vegetation composing jaguarundi habitat is cacti, mesquite, cat claw vine, and other semi-arid brush species. The Action Area comprises a 479 meter radius from the centroid of construction, and does not contain suitable habitat for jaguarundi.

Potential Impacts

The Action Area does not contain suitable habitat for jaguarundis. In TRC's opinion, based on the lack of jaguarundi habitat in the Action Area and the questionable nature of the one sighting in the last 15 years, the jaguarundi will not be impacted by Project construction or operation.

Potential Effects

The Project will have "*no effect*" on jaguarundi.

8.6.8 Louisiana Black Bear

Regional Sightings

Louisiana black bear occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list a Louisiana black bear sighting within the 130 square mile search area.

Habitat in Action Area

The Louisiana black bear was historically found throughout Mississippi, Louisiana, and extreme eastern Texas. Their habitat consists of large tracts of bottomland hardwood forests. The Action Area comprises a 479 meter radius from the centroid of construction, not containing habitat suitable for Louisiana black bears. TRC

concludes that the Action Area does not contain suitable habitat for Louisiana black bears.

Potential Impacts

In TRC's opinion, based on the lack of sightings and the lack of suitable habitat in the Action Area the Louisiana black bear will not be impacted by Project construction or operation.

Potential Effects

The Project will have "*no effect*" on Louisiana black bear.

8.6.9 Ocelot

Regional Sightings

Ocelot occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list an ocelot sighting within the 130 square mile search area.

Habitat in Action Area

The ocelot is a small feline that is endemic to south Texas through South America. Brazoria County is on extreme northern end of the historic range for ocelots. The ocelot depends on thick brush habitat for hunting. The clearing of brush to make way for agriculture and other land uses has reduced the availability of habitat. Currently ocelots are only known to be found in extreme south Texas in the Rio Grande valley. The Action Area comprises a 479 meter radius from the centroid of construction, and does not contain habitat suitable for ocelots. There are no known populations or sightings of ocelots in Brazoria County. TRC concludes that the Action Area does not contain suitable habitat for ocelots.

Potential Impacts

In TRC's opinion, based on the lack of suitable habitat and the lack of sightings in the Action Area, ocelots will not be impacted by Project construction or operation.

Potential Effects

The Project will have "*no effect*" on ocelots.

8.6.10 Red Wolf

Regional Sightings

The red wolf historically was found throughout the majority of Texas. The last known wild red wolf in Texas was in 1980 and the species is currently considered extirpated from the state. Red wolf occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list a red wolf sighting within the 130 square mile search area.

Habitat in Action Area

The historic habitat for the red wolf is similar to that of the coyote; that is they are adaptable to a variety of habitats including forests, swamps, prairies, and riparian areas. The Action Area comprises a 479 meter radius from the centroid of construction, and does not contain habitat suitable for red wolves. TRC concludes that the Action Area does not contain habitat for red wolves.

Potential Impacts

Based on the lack of sightings, the species extirpation from Texas, and the lack of habitat within the Action Area this species will not be impacted by Project construction or operation.

Potential Effects

The Project will have "*no effect*" on the red wolf.

8.6.11 West Indian Manatee

Regional Sightings

West Indian manatee occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list a West Indian manatee sighting within the 130 square mile search area.

Habitat in Action Area or Chocolate Bayou

The West Indian manatee is a large marine mammal that feeds on submerged marine aquatic grasses in tropical waters. The vast majority of West Indian manatees are found in Florida waters. The Action Area comprises a 479 meter radius from the

centroid of construction, and does not contain habitat suitable for West Indian manatees. Chocolate Bayou, located outside the Action Area, is a turbid brackish bayou that has little if any submerged aquatic grasses. This lack of sea grasses results in a lack of habitat suitable for West Indian manatees. TRC concludes that the Action Area does not contain suitable foraging habitat West Indian manatees.

Potential Impacts

The Action Area and Chocolate Bayou do not provide habitat for the West Indian manatee. Chocolate Bayou is located outside the Action Area but was analyzed for impacts to listed aquatic species because waste water discharges from the Project will flow into Chocolate Bayou. Given that the waste water and stormwater discharges associated with the Project will have no additional impact on Chocolate Bayou, these would have no effect on the West Indian Manatee. The West Indian manatee inhabits marine waters with little to no turbidity which fosters growth of aquatic grasses. Therefore West Indian manatee would not be found in the brackish, turbid, conditions within Chocolate Bayou, and will not be impacted by the Project. The West Indian manatee, therefore, will not be impacted by Project construction or operation.

Potential Effects

The Project will have "*no effect*" on the West Indian manatee.

8.6.12 Smooth Pimpleback

Regional Sightings

Smooth pimpleback occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list a smooth pimpleback sighting within the 130 square mile search area.

Habitat in Action Area or Chocolate Bayou

Smooth pimplebacks are small freshwater mollusks that are native to the middle reaches of the Brazos and Colorado Rivers in Central Texas. They typically are found in small to moderate size streams and rivers with mud, sand, and gravel substrates. The Action Area comprises a 479 meter radius from the centroid of construction and does not contain suitable habitat for this species. The brackish to saline waters of Chocolate Bayou do not provide the freshwater habitat necessary for smooth

pimplebacks. TRC concludes that the Action Area does not contain habitat for smooth pimplebacks.

Potential Impacts

Chocolate Bayou is located outside the Action Area but was analyzed for impacts to listed aquatic species because waste water discharges from the Project will flow into Chocolate Bayou. The Action Area or Chocolate Bayou does not contain suitable habitat for the smooth pimpleback. In TRC's opinion, based on the lack of sightings and lack of suitable habitat in the Action Area or in Chocolate Bayou, the smooth pimpleback will not be impacted by Project construction or operation.

Potential Effects

This species is a candidate species and therefore an effects determination is not appropriate.

8.6.13 Texas Fawnsfoot

Regional Sightings

Texas fawnsfoot occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list a Texas fawnsfoot sighting within the 130 square mile search area.

Habitat in Action Area or Chocolate Bayou

The Texas fawnsfoot is a freshwater mollusk found only in the Colorado and Brazos Rivers of Central Texas. Living specimens have not been found in reservoirs; it appears that the Texas fawnsfoot is intolerant of impoundments. The Action Area comprises a 479 meter radius from the centroid of construction, and does not contain the freshwater riverine habitat suitable to support Texas fawnsfoot. Chocolate Bayou in the vicinity of the Project is a brackish environment, and would be unsuitable habitat for this freshwater mussel. TRC concludes that the Action Area does not contain suitable habitat for the Texas fawnsfoot.

Potential Impacts

Chocolate Bayou is located outside the Action Area but was analyzed for impacts to listed aquatic species because waste water discharges from the Project will flow into Chocolate Bayou. In TRC's opinion, based on the lack of sightings and a lack of suitable habitat, brackish not freshwater, in the Action Area or in Chocolate Bayou, the Texas fawnsfoot will not be impacted by Project construction or operation.

Potential Effects

This species is a candidate species and therefore an effects determination is not appropriate.

8.6.14 Atlantic Hawksbill Sea Turtle

Regional Sightings

Atlantic hawksbill sea turtle occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list an Atlantic hawksbill sea turtle sighting within the 130 square mile search area.

Habitat in Action Area of Chocolate Bayou

The Atlantic hawksbill sea turtle is a small to medium sized marine turtle. The hawksbill sea turtle lives in clear ocean waters typically far off shore. They are more common in areas where coral reefs are present. Their main food source consists of sponges. The hawksbill is the most tropical of all sea turtle species making them rare visitors to the subtropical shores of Texas. The Atlantic hawksbill sea turtle will come ashore to lay eggs on clean sandy beaches.

The Action Area comprises a 479 meter radius from the centroid of construction and does not contain the marine habitat, or wide sandy beaches, that would support the Atlantic hawksbill sea turtle. TRC concludes that the Action Area does not contain suitable nesting or foraging habitat for Atlantic hawksbill sea turtles.

Potential Impacts

Chocolate Bayou is located outside the Action Area but was analyzed for impacts to listed aquatic species because waste water discharges from the Project will flow into Chocolate Bayou. Chocolate Bayou due to its high turbidity does not support coral reef development and the associated sponge species on which the Atlantic hawksbill sea turtle feeds. Because of the lack of food for Atlantic hawksbill sea turtle in Chocolate Bayou, this waterbody does not provide habitat for the hawksbill sea turtle. Additionally there are no clean sandy beaches in the Action Area. Given that the waste water and stormwater discharges associated with the Project will have no additional impact on Chocolate Bayou, in the unlikely event an Atlantic hawksbill sea turtle were to be in Chocolate Bayou it would still not be affected by discharges associated with the project. Hypothetically, if an errant individual (healthy) turtle, however, found its way to Chocolate Bayou it would shortly leave the area, as

suitable feeding and nesting habitat is not present, thus limiting any potential impact. The Atlantic hawksbill, therefore, will not be impacted by Project construction or operation.

In TRC's opinion, due to the lack of sightings, the lack of this species' primary food source, the lack of sizeable sandy beaches along the Chocolate Bayou shorelines, and the lack of clear warm ocean waters, the Atlantic hawksbill sea turtle will not be impacted by Project construction or operation.

Potential Effects

The Project will have "*no effect*" on the Atlantic hawksbill sea turtle.

8.6.15 Green Sea Turtle

Regional Sightings

Green sea turtle occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records list two sightings of green sea turtle have been recorded within the 130 square mile search area, both in 2007. Both sightings were made in Lost Bay, and were 8.63 and 11.66 kilometers from the Action Area Figure 6 (Appendix A).

Neither sighting took place in Chocolate Bayou. Also both sightings recorded a carapace, or shell, length of around 10 inches. The adult green sea turtle typically has a carapace length of between 31-44 inches. This means that these two sightings (possibly the same turtle) were juveniles. Juveniles tend to wander around considerably more than adults in search of feeding and nesting areas. Because there are only two recorded sightings within the 130 square mile search area, it seems quite likely that these sightings were of one juvenile turtle seeking out new nesting or feeding opportunities in areas that, as discussed below, do not provide suitable habitat.

Habitat in Action Area or Chocolate Bayou

Chocolate Bayou is located outside the Action Area but was analyzed for impacts to listed aquatic species because waste water discharges from the Project will flow into Chocolate Bayou. The green sea turtle feeds in shallow water areas with abundant sea grasses and algae. The turtle migrates from nesting areas to feeding grounds, which are sometimes several thousand miles away. Most migrate along the coasts, but some populations are known to migrate across the ocean from nesting area to feeding grounds. The green sea turtle nests on bare sandy beaches. The Action Area

comprises a 479 meter radius from the centroid of construction and does not contain any habitat suitable for green sea turtles. As noted above, because of its high turbidity, Chocolate Bayou has a limited, if any, littoral zone, that is, the zone in which sun light penetrates to the bottom. This lack of sun light prevents rooted aquatic vascular plants, including sea grasses, from becoming established. In addition, the shoreline of Chocolate Bayou is dominated by scrub shrub vegetation and does not contain the sandy shores that comprise nesting habitat for the green sea turtle.

Potential Impacts

The Action Area and Chocolate Bayou do not provide nesting or feeding habitat for the green sea turtle. Hypothetically, were a green sea turtle present in Chocolate Bayou, it would not be impacted by wastewater and stormwater discharges associated with the Project, as they will have no additional impact on Chocolate Bayou. Hypothetically, if an errant individual (healthy) turtle found its way to Chocolate Bayou, it would shortly leave the area, as suitable feeding and nesting habitat is not present, thus limiting any potential impact.

In TRC's opinion, based on the lack of sightings in the Action Area or Chocolate Bayou, the lack of suitable habitat nesting or feeding habitat in the Action Area or in Chocolate Bayou, and the lack of any Project impacts on Chocolate Bayou, the green sea turtle will not be impacted by Project construction or operation.

Potential Effects

The Project will have "*no effect*" on the green sea turtle.

8.6.16 Kemp's Ridley Sea Turtle

Regional Sightings

Kemp's ridley sea turtle occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list a Kemp's ridley sea turtle sighting within the 130 square mile search area.

Habitat in Action Area or Chocolate Bayou

Kemp's ridley sea turtle typically feed on sea grasses and algae found in shallow clear coastal waters. This turtle often migrates long distances across the ocean between feeding and nesting areas. Nesting occurs on clean sandy beaches.

The Action Area comprises a 479 meter radius from the centroid of construction and does not contain habitat suitable for the Kemp's ridley sea turtle. Chocolate Bayou has high turbidity levels and does not contain sea grass on which the Kemp's ridley sea turtle feeds. Chocolate Bayou is marshy and dominated by wetland plants and does not contain the sandy shores that comprise nesting habitat for that the Kemp's ridley sea turtle needs for nesting. TRC concludes that the Action Area and Chocolate Bayou do not contain suitable nesting or foraging habitat for Kemp's ridley sea turtles.

Potential Impacts

Chocolate Bayou is located outside the Action Area but was analyzed for impacts to listed aquatic species because waste water discharges from the Project will flow into Chocolate Bayou. The Action Area and Chocolate Bayou do not contain suitable habitat for the Kemp's ridley sea turtle. The water in Chocolate Bayou is highly turbid and unsuitable to a species adapted to clear water, and, also due to the turbidity, its preferred food would not be available. However, if a Kemp's ridley sea turtle were to swim into Chocolate Bayou it would not be impacted by wastewater and stormwater discharges associated with the Project, as they will have no additional impact on Chocolate Bayou. Hypothetically, if an errant individual (healthy) turtle, however, found its way to Chocolate Bayou it would shortly leave the area, as suitable feeding and nesting habitat is not present, thus limiting any potential impact.

In TRC's opinion, based on the lack of sightings, the lack of suitable feeding or nesting habitat within the Action Area or in Chocolate Bayou, and the lack of any Project impacts on Chocolate Bayou the Kemp's Ridley sea turtle will not be impacted by Project construction or operation.

Potential Effects

The Project will have "*no effect*" on the Kemp's ridley sea turtle.

8.6.17 Leatherback Sea Turtle

Regional Sightings

Leatherback sea turtle occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The TXNDD records do not list a Leatherback sea turtle sighting within the 130 square mile search area.

Habitat in Action Area or Chocolate Bayou

The leatherback sea turtle is a highly pelagic species that only moves into coastal waters for breeding. The remainder of the year this turtle inhabits the open ocean. The Leatherback sea turtle is a rare visitor to Texas coastal beaches.

The Action Area comprises a 479 meter radius from the centroid of construction and does not contain habitat for the leatherback sea turtle. The shoreline of Chocolate Bayou vegetated by emergent wetland plants and does not contain clean beaches that comprise leatherback sea turtle nesting habitat. TRC concludes that the Action Area and Chocolate Bayou do not contain suitable nesting or foraging habitat for leatherback sea turtles.

Potential Impacts

Chocolate Bayou is located outside the Action Area but was analyzed for impacts to listed aquatic species because waste water discharges from the Project will flow into Chocolate Bayou. The Action Area and Chocolate Bayou do not provide suitable habitat to support leatherback sea turtle feeding or nesting. Hypothetically, were a leatherback sea turtle present in Chocolate Bayou, it would not be impacted by wastewater and stormwater discharges associated with the Project, as they will have no additional impact on Chocolate Bayou. Hypothetically, if an errant individual (healthy) turtle, however, found its way to Chocolate Bayou it would shortly leave the area, as suitable feeding and nesting habitat is not present, thus limiting any potential impact.

In TRC's opinion, based on the lack of sightings, the lack of suitable habitat for nesting or feeding in the Action Area or in Chocolate Bayou, and the lack of any Project impacts on Chocolate Bayou, the leatherback sea turtle will not be impacted by Project construction or operation.

Potential Effects

The Project will have "*no effect*" on the leatherback sea turtle.

8.6.18 Loggerhead Sea Turtle

Regional Sightings

Loggerhead sea turtle occurrence records were requested from the TXNDD for Hoskins Mound and Mustang Bayou USGS 7.5 minute quadrangle maps. The

TXNDD records do not list a loggerhead sea turtle sighting within the 130 square mile search area.

Habitat in Action Area or Chocolate Bayou

The Loggerhead sea turtle was named for its large head, which supports it powerful jaw which it uses to feed on hard shelled mollusks, such as whelks. They are found throughout the open ocean of the Gulf of Mexico but are rare visitors to the Texas coast. Only rare, solitary, nesting along the Gulf Coast has been recorded.

The Action Area comprises a 479 meter radius from the centroid of construction and does not contain habitat to support the loggerhead sea turtle. Whelks, the prey species for the loggerhead sea turtle, are found in high salinity habitats with sea grasses. Chocolate Bayou is a turbid brackish waterway that does not have high enough salinity levels to support whelks or the water clarity to support sea grasses. Because Chocolate Bayou does not provide habitat for prey species it does not provide habitat for the loggerhead sea turtle. Chocolate Bayou is marshy and dominated by wetland plants and does not contain the sandy shores that comprise nesting habitat for loggerhead sea turtle for nesting.

Potential Impacts

Chocolate Bayou is located outside the Action Area but was analyzed for impacts to listed aquatic species because waste water discharges from the Project will flow into Chocolate Bayou. The Action Area and Chocolate Bayou do not provide suitable habitat for feeding or nesting of the loggerhead sea turtle. If a leatherback sea turtle were present in Chocolate Bayou, it would not be impacted by wastewater and stormwater discharges associated with the Project, as they will have no additional impact on Chocolate Bayou. Hypothetically, if an errant individual (healthy) turtle, however, found its way to Chocolate Bayou it would shortly leave the area, as suitable feeding and nesting habitat is not present, thus limiting any potential impact.

In TRC's opinion, based on the lack of sightings, the lack of suitable habitat for nesting or feeding in the Action Area or in Chocolate Bayou, and the lack of any Project impacts on Chocolate Bayou, the loggerhead sea turtle will not be impacted by Project construction or operation.

Potential Effects

The Project will have "*no effect*" on the loggerhead sea turtle.

Section 9
Conclusions

This section provides a summation of findings and recommended determination of effect (direct, indirect, and cumulative) on federally-protected species that have the potential to occur in Brazoria County, Texas. These conclusions have been drawn based on TRC's understanding and investigation of the Project; and TRC's review of protected species that could occur (based on federal and state information) within the Action Area.

9.1 Determination of Effect

Based on research of literature, agency data base review, and field investigation, it is recommended that USEPA make the following determination for federally-listed species in Brazoria County, Texas within the Action Area for this Project.

Table 8
Recommended Determination of Effect on Listed Species

Common Name	Recommended Determination of Effects*
Piping Plover	No Effect
Eskimo Curlew	No Effect
Sprague's Pipit	No Effect
Whooping Crane	No Effect
Sharpnose Shiner	No Effect
Smalltooth Sawfish	No Effect
Jaguarundi	No Effect
Louisiana Black Bear	No Effect
Ocelot	No Effect
Red Wolf	No Effect
West Indian Manatee	No Effect
Smooth Pimpleback	No Effect
Texas Fawnsfoot	No Effect
Atlantic Hawksbill Sea Turtle	No Effect
Green Sea Turtle	No Effect
Kemp's Ridley Sea Turtle	No Effect

Table 8
Recommended Determination of Effect on Listed Species

Common Name	Recommended Determination of Effects*
Leatherback Sea Turtle	No Effect
Loggerhead Sea Turtle	No Effect

*effects determinations were made based on consultation with U.S. Fish and Wildlife, National Marine Fisheries, and field observations from TRC biologists.

9.2 Interdependent and Interrelated Actions

As part of the Project several pipelines will be constructed, owned, and operated by other companies. The biological and cultural analysis for these lines are presented under separate cover. Impacts to the environment will be limited by placing the pipelines in previously disturbed maintained pipeline right of ways to the extent practicable. Impacts to aquatic resources will be avoided by drilling under the resource. In addition to pipelines a section of existing 138kv powerline will be rerouted. This line is within the existing operating facility.

9.3 Cumulative Effects

The land use surrounding the Project is a mix of agriculture, cattle grazing, industrial, and residential. Although there is the potential for future development of the surrounding area, C3 Petrochemicals is not aware of any future State, Tribal, local or private actions that are reasonably certain to occur in the Action Area. In any event, a cumulative effects analysis is not necessary insofar as no listed resources will be adversely affected and a formal consultation is not required for the Project.

9.4 Conservation Measures

C3 Petrochemicals will utilize Best Available Control Technology (BACT) to reduce emissions of air pollutants and, therefore, reduce the impacts to the environment. The predicted emission concentration for each pollutant subject to PSD review is in line with the TCEQ BACT guidance and the most stringent limit in the RACT/BACT/LAER Clearinghouse (RBLC).

The construction and operation of the Project will have no direct or indirect impact on federally-protected species or their habitats.

Section 10
References

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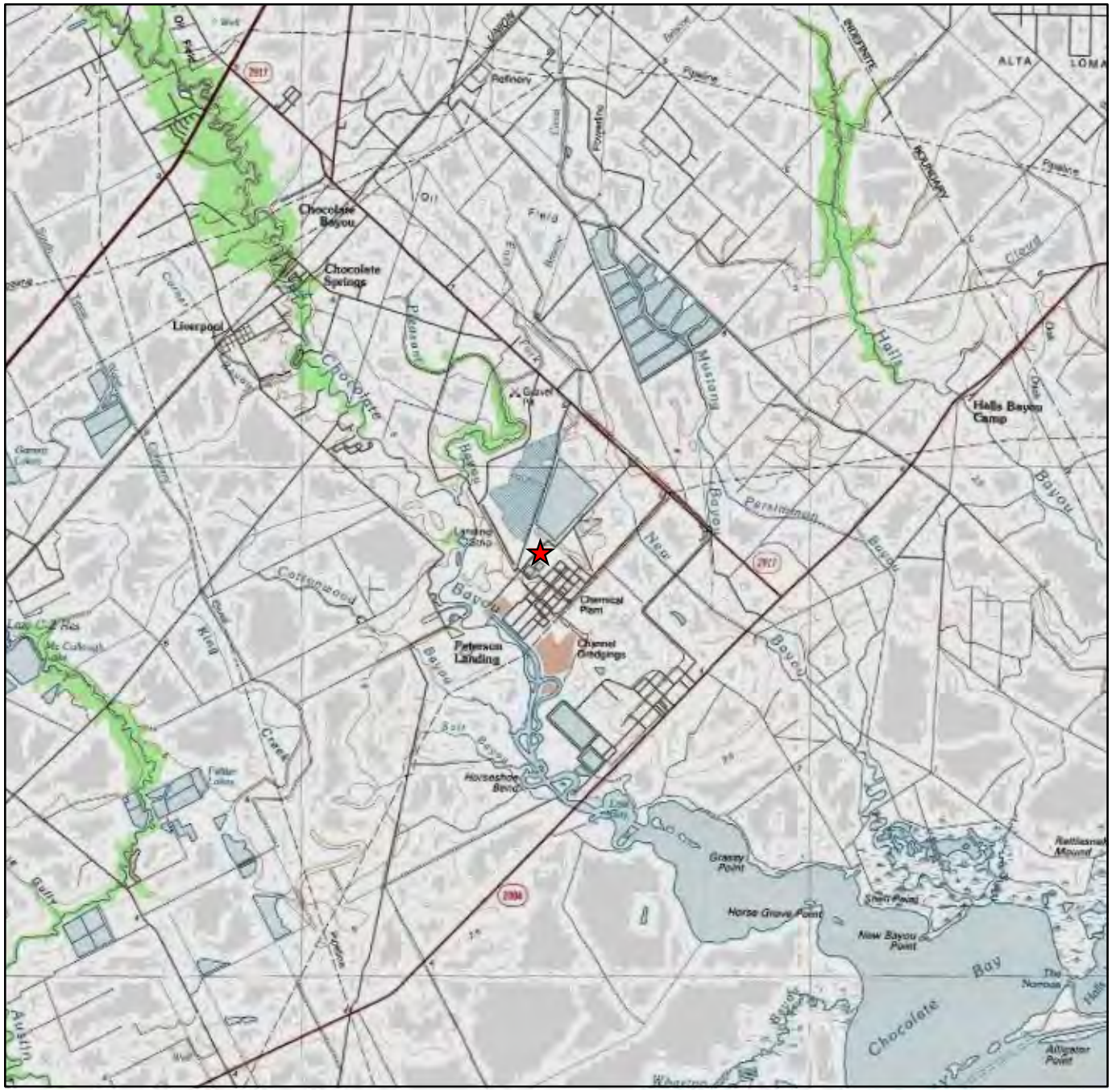
Section 11
List of Preparers

- Elizabeth Saxton, Ecologist, TRC
- Michael Robbins, Project Manager, TRC

Appendix A
Figures

TRC - GIS



BASE MAP: USGS 100k TOPOGRAPHIC QUADRANGLE SERIES: ANGLETON, TX. (1984)

★ C3 PETROCHEMICALS PDH PROJECT LOCATION

N

0 3 6 Kilometers

TRC
10011 Meadowglen Lane
Houston, TX 77042
Phone: 713.244.1000

C3 Petrochemicals, LLC
PDH Project

PROJECT LOCATION
BIOLOGICAL ASSESSMENT
ALVIN, BRAZORIA COUNTY, TEXAS

DRAWN BY:	RNCARR
APPROVED BY:	NSYLVESTER
PROJECT NO:	199212.0000.0000
FILE NO.	199212_1_Project_Location.mxd
DATE:	MARCH 2013

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FIGURE 1

TRC - GIS

BASE MAP: NATIONAL AGRICULTURE IMAGERY PROGRAM (2012)

C3 PETROCHEMICALS PDH PROJECT CONSTRUCTION AREA: 300' X 750'

ASCEND CHOCOLATE BAYOU FACILITY PROPERTY LINE

N

0 300 600

Feet

TRC

10011 Meadowglen Lane
Houston, TX 77042
Phone: 713.244.1000

C3 Petrochemicals, LLC
PDH Project

CONSTRUCTION AREA - 2012 AERIAL PHOTOGRAPH
BIOLOGICAL ASSESSMENT
ALVIN, BRAZORIA COUNTY, TEXAS

DRAWN BY:	RNCARR
APPROVED BY:	NSYLVESTER
PROJECT NO:	199212.0000.0000
FILE NO.	199212_2_Aerial.mxd
DATE:	MARCH 2013

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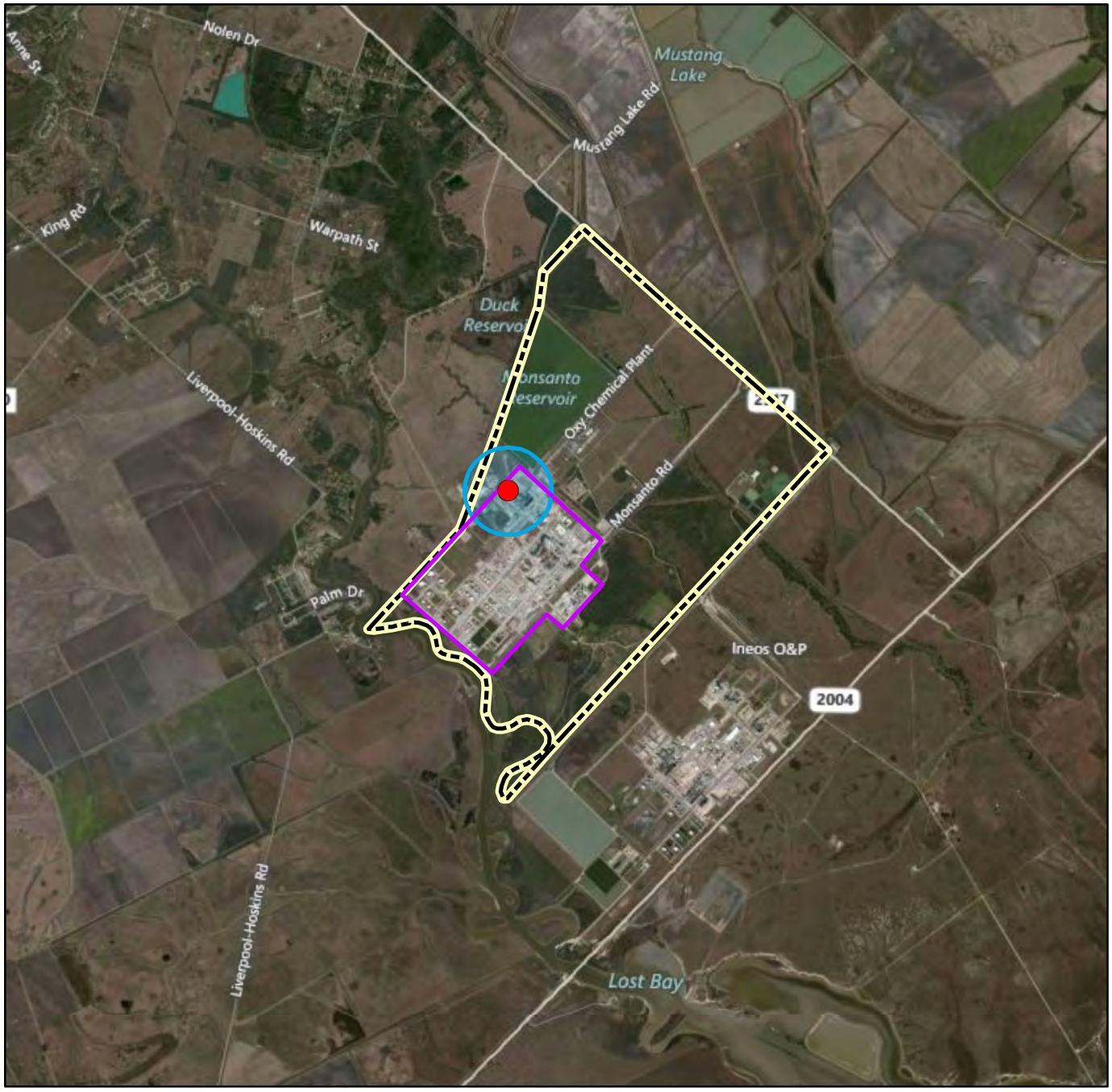
FIGURE 2

TRC - GIS



BASE MAP: ESRI ONLINE DATA
BING HYBRID (2011)

N

0 2 4 Kilometers

C3 PETROCHEMICALS PDH PROJECT CENTROID OF CONSTRUCTION AREA 300'X750' (N.T.S.)

ASCEND CHOCOLATE BAYOU FACILITY PROPERTY LINE

ACTIVE OPERATIONAL FACILITY

ACTION AREA

TRC
10011 Meadowglen Lane
Houston, TX 77042
Phone: 713.244.1000

C3 Petrochemicals, LLC
PDH Project

ACTION AREA - 2011 AERIAL PHOTOGRAPH
BIOLOGICAL ASSESSMENT
ALVIN, BRAZORIA COUNTY, TEXAS

DRAWN BY:	RNCARR
APPROVED BY:	NSYLVESTER
PROJECT NO:	199212.0000.0000
FILE NO.	199212_3.mxd
DATE:	OCTOBER 2013

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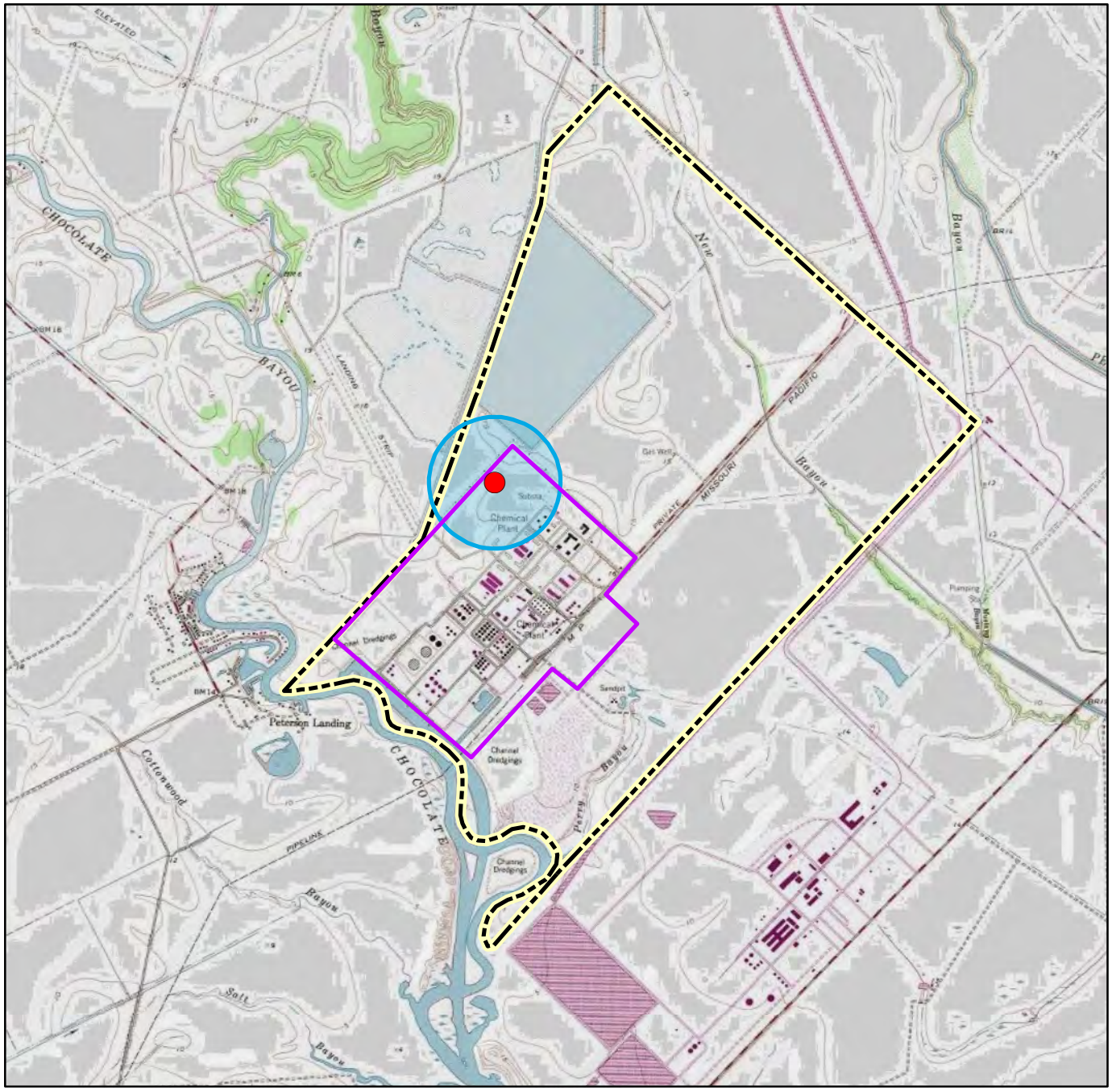
FIGURE 3

TRC - GIS



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES:
HOSKINS MOUND AND MUSTANG BAYOU, TX

N

0 1.5 3 Kilometers

C3 PETROCHEMICALS PDH PROJECT CENTROID OF CONSTRUCTION AREA 300'X750' (N.T.S.)

ASCEND CHOCOLATE BAYOU FACILITY PROPERTY LINE

ACTIVE OPERATIONAL FACILITY

ACTION AREA

TRC
10011 Meadowglen Lane
Houston, TX 77042
Phone: 713.244.1000

C3 Petrochemicals, LLC
PDH Project

ACTION AREA - 1974 TOPOGRAPHIC MAP
BIOLOGICAL ASSESSMENT
ALVIN, BRAZORIA COUNTY, TEXAS

DRAWN BY:	RNCARR
APPROVED BY:	NSYLVESTER
PROJECT NO:	199212.0000.0000
FILE NO.	199212_4.mxd
DATE:	OCTOBER 2013

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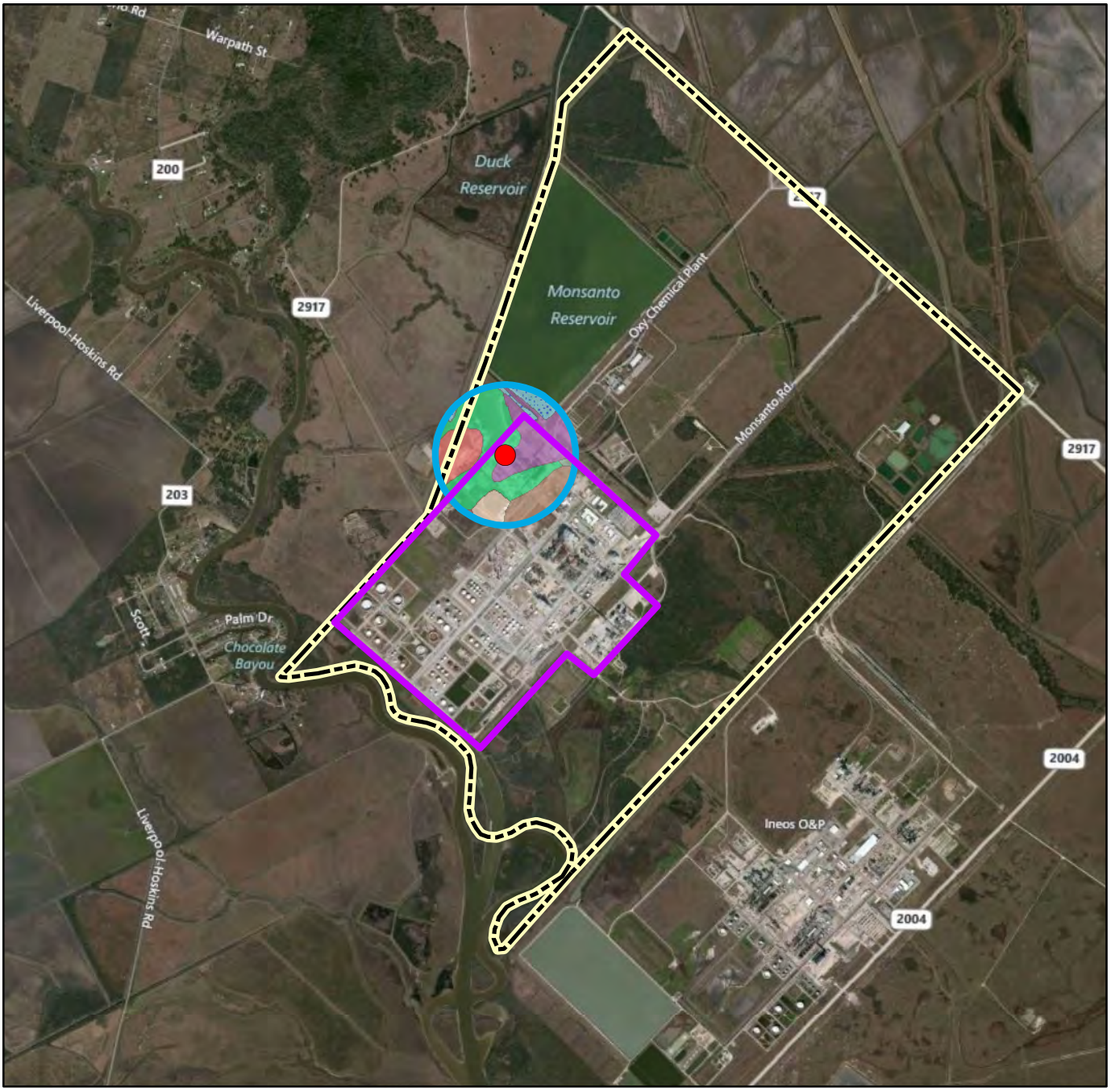
FIGURE 4

TRC - GIS



C3 PETROCHEMICALS PDH PROJECT CENTROID OF CONSTRUCTION AREA 300'X750' (N.T.S.)
ASCEND CHOCOLATE BAYOU FACILITY PROPERTY LINE
ACTIVE OPERATIONAL FACILITY
ACTION AREA

SOILS WITHIN ACTION AREA
WATER
EDNA FINE SANDY LOAM, 0 TO 1 PERCENT SLOPES
EDNA-ARIS COMPLEX
IJAM CLAY
IJAM-URBAN LAND COMPLEX
LAKE CHARLES CLAY, 0 TO 1 PERCENT SLOPES
LETON-ARIS COMPLEX

0 1 2 3 Kilometers

N

SOURCE: USDA SOIL SURVEY, BRAZORIA COUNTY (2009)
BASE MAP: ESRI ONLINE DATA BING HYBRID (2011)

TRC
10011 Meadowglen Lane
Houston, TX 77042
Phone: 713.244.1000

C3 Petrochemicals, LLC
PDH Project

SOIL SURVEY
BIOLOGICAL ASSESSMENT
ALVIN, BRAZORIA COUNTY, TEXAS

DRAWN BY:	RNCARR
APPROVED BY:	NSYLVESTER
PROJECT NO:	199212.0000.0000
FILE NO.	199212_5_Soils.mxd
DATE:	OCTOBER 2013

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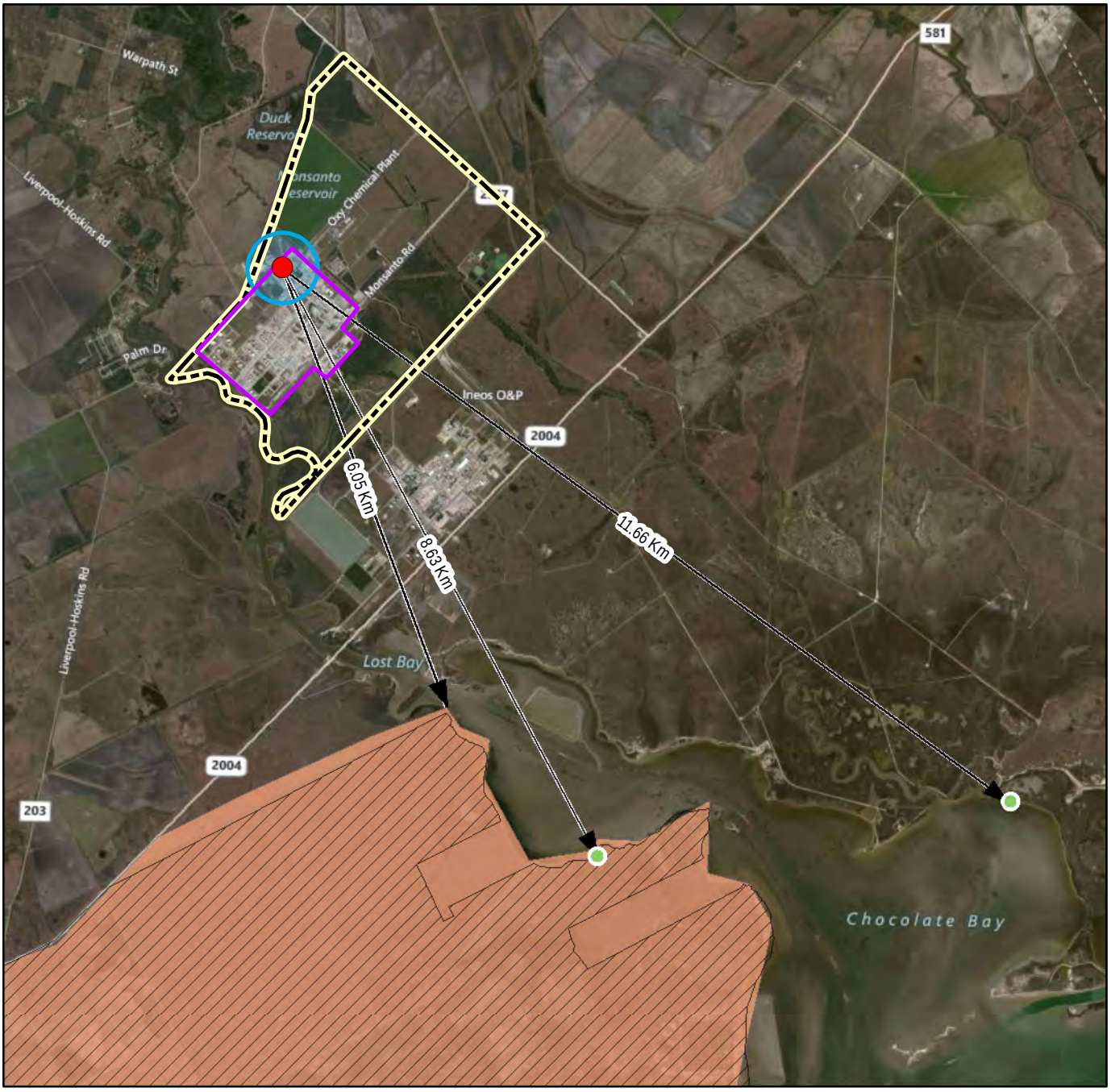
FIGURE 5

TRC - GIS



C3 PETROCHEMICALS PDH PROJECT CENTROID OF CONSTRUCTION AREA 300'X750' (N.T.S.)

ASCEND CHOCOLATE BAYOU FACILITY PROPERTY LINE

ACTIVE OPERATIONAL FACILITY

ACTION AREA

BRAZORIA NATIONAL WILDLIFE REFUGE

JAGUARUNDI

GREEN SEA TURTLE

N

0 3 6 Kilometers

SOURCE: TXNDD POLYGONS
BASE MAP:ESRI ONLINE DATA
BING HYBRID (2011)

TRC
10011 Meadowglen Lane
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Phone: 713.244.1000

C3 Petrochemicals, LLC
PDH Project

TEXAS NATURAL DIVERSITY DATABASE OCCURRENCES
BIOLOGICAL ASSESSMENT
ALVIN, BRAZORIA COUNTY, TEXAS

DRAWN BY:	RNCARR
APPROVED BY:	NSYLVESTER
PROJECT NO:	199212.0000.0000
FILE NO.	199212_6_Natural_Diversity.mxd
DATE:	OCTOBER 2013

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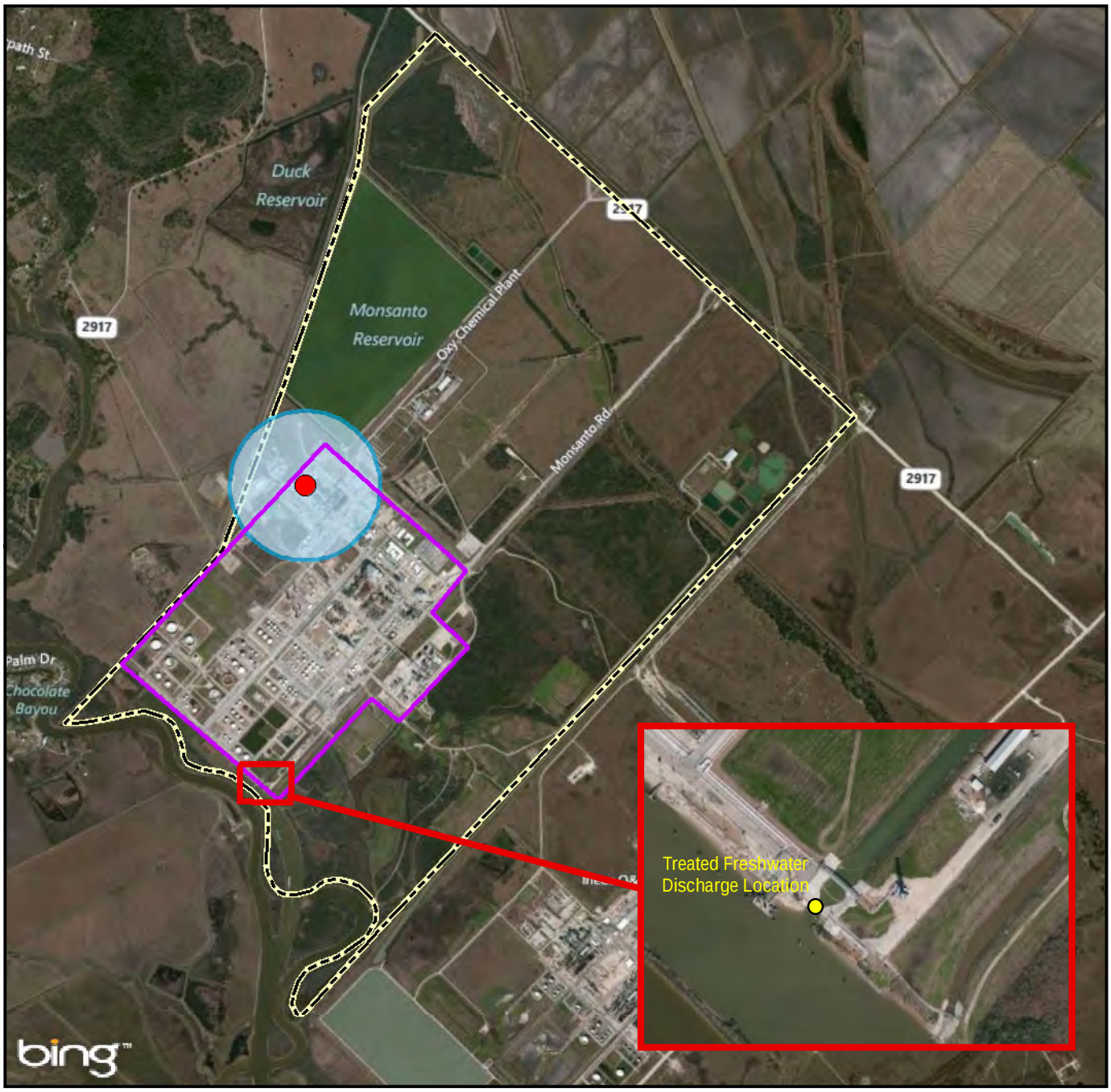
FIGURE 6

TRC - GIS



C3 PETROCHEMICALS PDH PROJECT CENTROID OF CONSTRUCTION AREA 300'X750' (N.T.S.)

ASCEND CHOCOLATE BAYOU FACILITY PROPERTY LINE

ACTIVE OPERATIONAL FACILITY

ACTION AREA

N

0 0.5 1 2 Kilometers

BASE MAP:ESRI ONLINE DATA
BING HYBRID (2011)

V:\PROJECTS\AUGUSTA\ENVIRON\Ascend\199212_7_Freshwater_Discharge.mxd

TRC
10011 Meadowglen Lane
Houston, TX 77042
Phone: 713.244.1000

C3 Petrochemicals, LLC
PDH Project

TREATED FRESHWATER DISCHARGE LOCATION
ALVIN, BRAZORIA COUNTY, TEXAS

DRAWN BY:	RNCARR
APPROVED BY:	NSYLVESTER
PROJECT NO:	199212.0000.0000
FILE NO.	199212_7_Freshwater_Discharge.mxd
DATE:	MARCH 2014

FIGURE 7

Appendix B
Photolog

C3 Petrochemicals PDH Project - Ascend Chocolate Bayou Facility - Photographic Log

Project: C3 Petrochemicals PDH Project - Ascend Chocolate Bayou Facility	
Client: C3 Petrochemicals, LLC	**County, State**: Brazoria County, TX
Feature: Construction Area **Date:** 01/18/2013 **Comments:** **Photo 1** Photo facing south looking across the Construction Area.	
Feature: Construction Area **Date:** 01/18/2013 **Comments:** **Photo 2** Photo facing north looking across the Construction Area.	

C3 Petrochemicals PDH Project - Ascend Chocolate Bayou Facility - Photographic Log

Project: C3 Petrochemicals PDH Project - Ascend Chocolate Bayou Facility	
Client: C3 Petrochemicals, LLC	**County, State**: Brazoria County, TX
Feature: Revegetated Area **Date:** 01/18/2013 **Comments:** **Photo 3** Previously developed portion of the facility that has revegetated, looking northwest. This area is approximately 800 feet north of the Construction Area.	
Feature: Abutting Property **Date:** 01/18/2013 **Comments:** **Photo 4** View of adjoining property north of the Ascend facility, taken from the Ascend Property Fence.	

C3 PETROCHEMICALS PDH PROJECT - ASCEND CHOCOLATE BAYOU FACILITY - PHOTOGRAPHIC LOG

Project: C3 Petrochemicals PDH Project - Ascend Chocolate Bayou Facility	
Client: C3 Petrochemicals, LLC	**County, State**: Brazoria County, TX
Feature: Chocolate Bayou **Date:** 01/18/2013 **Comments:** **Photo 5** Photo taken facing west. View of the north end of a man-made canal that borders the Chocolate Bayou Facility. **Outside of Action Area.**	
Feature: Chocolate Bayou **Date:** 01/18/2013 **Comments:** **Photo 6** South end of Ascend's materials transportation dock on the canal. Photo facing west and looking toward Chocolate Bayou. **Outside of Action Area.**	

C3 Petrochemicals PDH Project - Ascend Chocolate Bayou Facility - Photographic Log

Project: C3 Petrochemicals PDH Project - Ascend Chocolate Bayou Facility	
Client: C3 Petrochemicals, LLC	**County, State**: Brazoria County, TX
Feature: Outflow **Date:** 01/18/2013 **Comments:** **Photo 7** Photo facing southwest of treated wastewater and storm water outfall. **Outside of Action Area.**	
Feature: Outflow **Date:** 01/18/2013 **Comments:** **Photo 8** Photo facing south of Ascend's treated wastewater and rainwater outfall. The barge unloading area is visible on the right and Chocolate Bayou is visible in the distance. **Outside of Action Area.**	

C3 PETROCHEMICALS PDH PROJECT - ASCEND CHOCOLATE BAYOU FACILITY - PHOTOGRAPHIC LOG

Project: C3 Petrochemicals PDH Project - Ascend Chocolate Bayou Facility	
Client: C3 Petrochemicals, LLC	**County, State**: Brazoria County, TX
Feature: Vegetation **Date:** 01/18/2013 **Comments:** **Photo 9** Photo facing west of typical maintained vegetated areas.	
Feature: Chocolate Bayou **Date:** 01/18/2013 **Comments:** **Photo 10** Photo facing south southwest from the east bank of Chocolate Bayou at southern edge of Ascend's property, showing cement pad from previous industrial development and lack of riverine marsh. **Outside of Action Area.**	

C3 Petrochemicals PDH Project - Ascend Chocolate Bayou Facility - Photographic Log

Project: C3 Petrochemicals PDH Project - Ascend Chocolate Bayou Facility	
Client: C3 Petrochemicals, LLC	**County, State**: Brazoria County, TX
Feature: Active Grazing **Date:** 01/18/2013 **Comments:** **Photo 11** Photo facing east of cattle grazing in pasture on the Ascend property.	
Feature: Water Source **Date:** 01/18/2013 **Comments:** **Photo 12** Photo facing east from northeast bank of Monsanto Reservoir.	

C3 Petrochemicals PDH Project - Ascend Chocolate Bayou Facility - Photographic Log

Project: C3 Petrochemicals PDH Project - Ascend Chocolate Bayou Facility	
Client: C3 Petrochemicals, LLC	**County, State**: Brazoria County, TX
Feature: Monsanto Reservoir	
Date: 01/18/2013	
Comments: **Photo 13** Photo facing southwest from northeast bank of Monsanto Reservoir. The Chocolate Bayou Facility is in the distance.	