Biological Assessment

Chocolate Bayou Cracking Furnace Project
Alvin, Brazoria County, Texas

August 2012

TRC Environmental Corp.| INEOS USA LLC

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Prepared For
INEOS USA LLC

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Acronyms

AVO	Audio, Visual, and Olfactory
BACT	Best Available Control Technology
BA	Biological Assessment
BNWR	Brazoria National Wildlife Refuge
CO	Carbon Monoxide
CO_2e	Carbon Dioxide Equivalent
ESA	Endangered Species Act
EPA	Environmental Protection Agency
FM	Farm to Market Road
GHG	Greenhouse Gas
HHV	Higher Heating Value
INEOS	INEOS USA LLC
LAER	Lowest Achievable Emission Rate
LDAR	Leak Detection and Repair Program
MMBtu	Million Metric British Thermal Units
NAAQS	National Ambient Air Quality Standards
NH_3	Ammonia
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxide
NSR	New Source Review
PPMv	Parts Per Million by Volume
PSD	Prevention of Significant Deterioration
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
TNDD	Texas Natural Diversity Database
TPDES	Texas Pollution Discharge Elimination System
TPY	Tons Per Year
TRC	TRC Environmental Corp.
TPWD	Texas Parks and Wildlife Department
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compound

Section 1
Executive Summary

INEOS USA LLC (INEOS) currently operates an olefins manufacturing facility (No. 2 Olefins Unit) in Alvin, Brazoria County, Texas. INEOS is proposing to install and operate one (1) new cracking furnace at the No. 2 Olefins Unit. The purpose of the cracking furnace project (Project) is to allow an increase in capacity by ensuring that unit rates are maximized during periods when a furnace is off-line for decoking. INEOS expects to increase ethylene production capacity by approximately 150 million pounds per year. The Project will primarily consist of one cracking furnace, a new decoke cyclone/stack (dedicated to the new furnace), and fugitive emissions components. The new furnace will be rated at 495 MMBtu/hr (Higher Heating Value (HHV)) to produce ethylene. The Project will occupy a 60-foot by 100-foot area (the Project Area). The Project is located on Farm to Market Road (FM) 2004 approximately 2 miles south of the intersection of FM 2917 and FM 2004 in Alvin, Brazoria County, Texas.

Pursuant to the federal Clean Air Act (CAA), INEOS is seeking a permit under the U.S. Environmental Protection Agency's (EPA) 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) that occur in Brazoria County, Texas (or any candidate for listing under the ESA that occurs in Brazoria County) will be affected by EPA's issuance of the permit, and if so, to what extent.

This BA is based on the best science available, including, the results of a field survey of the area potentially 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 potential effects of the action on the species and habitat. This BA was prepared in accordance with guidelines provided in 50 C.F.R Part 402.12.

Modeling demonstrates that all concentrations of pollutants are below the EPA Significant Impact Levels (SILs) at ground level at all points throughout the facility. However, as a conservative measure, INEOS has defined the Action Area as encompassing all of the area inside INEOS' property boundary. Accordingly, this BA evaluates the likelihood of effects to species resulting from air deposition within INEOS' property boundary ("fence line").

Based on the analysis set forth in this BA, no habitat exists within the Action Area or the surrounding area for any species listed as threatened or endangered under the ESA that occurs in Brazoria County (or for any candidate for listing under the ESA that occurs in Brazoria

County). Chocolate Bayou, an adjacent waterway located entirely outside of the Action Area (which, as noted above, was set conservatively as the plant boundary, even though modeling demonstrates that all concentrations of pollutants are below the SIL at ground level at all points throughout the facility), provides no habitat for any species listed as threatened or endangered under the ESA that occurs in Brazoria County (or for any candidate for listing under the ESA that occurs in Brazoria County). Nevertheless, as a conservative measure, this BA evaluates the potential impact of the facility's wastewater and storm water discharges on Chocolate Bayou.

For all of the reasons set forth in this assessment, no species listed as threatened or endangered under the ESA that occurs in Brazoria County (or any candidate for listing under the ESA that occurs in Brazoria County) will be affected by the Project.

Section 2
Introduction

INEOS operates a chemical manufacturing facility that is located adjacent to the left descending bank of Chocolate Bayou, a tidally influenced tributary to Galveston Bay. The INEOS facility is located on the northwest side of Texas Highway Number FM 2004, approximately 2 miles southwest from the intersection of FM 2004 and FM 2917 (Alvin, Brazoria County, Texas). Figure 1 (Appendix A) is an area map that depicts the approximate boundary of the INEOS site and the surrounding environs. The existing facility has been in operation for over 40 years. For the purpose of this analysis the life of the Project is expected to be 20 years.

INEOS is proposing to add one (1) olefins furnace at the Chocolate Bayou facility. The purpose of the Project is to manufacture olefins, a group of chemicals that is used as a raw material in the production of many useful industrial products. The new furnace will receive feedstock (ethane, propane, and/or liquids such as refinery raffinate or debutanized natural gasoline) via existing pipelines and thermally "crack" them at high temperatures. This creates various olefin products, ranging from hydrogen to pyrolysis gasoline. These various products will be separated by distillation in the existing No. 2 Olefins unit. The furnace will be equipped with a selective catalytic reduction (SCR) unit to reduce NO_x emissions. The furnace will require periodic decoking to remove coke buildup along its tube length. Decoking is conducted by substituting the furnace feed with steam and air to combust the coke to carbon dioxide. The decoke vent is routed through a cyclone to remove any solids before venting to the atmosphere. Solid waste from the decoke operation will be landfilled. There will be only a minimal increase in the volume of this coke material. It is estimated that 22 tpy of coke (increase of 5% for the facility) will break off during the decoking process.

Maintenance, Startup, and Shutdown emissions will be generated from cleaning piping, vessels, exchangers, and pumps/compressors for maintenance. The new furnace and associated equipment will be connected to the existing No. 2 Olefins flare (EPN DDM-3101, Permit No. 95).

The additional furnace will be constructed within the already developed portion of the INEOS facility. The Project Area will consist of only a 60 -foot by 100 -foot area (actual area of direct construction impact). Construction activities will include site preparation, steel erection, equipment installation; tying-in to existing plant utilities, and commissioning/start-up.

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 (or any

candidate for listing under the ESA that occurs in Brazoria County) will be affected by EPA's issuance of the GHG PSD permit.

This BA is based on the best science available, including the results of a field survey of the area potentially 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 potential effects of the action on listed or candidate species and critical habitat. Modeling demonstrates that all concentrations of pollutants are below the SILs at ground level at all points throughout the facility. However, as a conservative measure, INEOS has defined the Action Area as encompassing all of the area inside INEOS' property boundary. The SIL is the concentration of a pollutant, below which EPA has determined the impact to be insignificant. Accordingly, this BA evaluates the likelihood of effects to species resulting from air deposition within INEOS' property boundary.

This BA was prepared in accordance with guidelines provided in 50 C.F.R Part 402.12. U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) guidance provides for use of the following possible determinations 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 significant (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 Clean Air Act (CAA) for the protection of public health and welfare. These standards are known as National Ambient Air Quality Standards (NAAQS). NAAQS represent 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" (EPA, 2012a).

The table below shows the pollutants for which NAAQS have been set.

Table 1
NAAQS for Criteria Pollutants as set by the EPA as of October, 2011 (EPA, 2012a)

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 ug/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 and Secondary	Annual	15 ug/m^3	Annual mean, averaged over 3 years

Table 1
NAAQS for Criteria Pollutants as set by the EPA as of October, 2011 (EPA, 2012a)

Pollutant	Primary / Secondary	Average Time	Concentration Level	Form
		24-hour	35 ug/m^3	98th percentile, averaged over 3 years
Particulate Pollution PM_{10}	Primary and Secondary	24-hour	150 ug/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 the NAAQS for any given criteria pollutant are designated as being "in attainment;" areas not meeting any NAAQS are designated as being in "non-attainment" for that pollutant. EPA has established regulations for prevention of significant deterioration (PSD) of ambient air quality in attainment areas, thus reducing the chance of attainment areas becoming non-attainment areas. EPA 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 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" (EPA, 2012b).

3.2 Endangered Species Act (ESA)

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 FWS and the 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 U.S.C. § 1532(6);

50 C.F.R. § 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 C.F.R. § 424.02 (m)). The ESA is administered by the FWS for land species and marine mammals and by NMFS for marine species (except for marine mammals).

Section 4
Project Description

4.1 Project Purpose and Location

INEOS operates a chemical manufacturing facility that is located adjacent to the left descending bank of Chocolate Bayou, a tidally influenced tributary to Galveston Bay. The INEOS facility is located on the northwest side of Texas Highway Number FM 2004, approximately two (2) miles southwest from the intersection of FM 2004 and FM 2917. Figure 1 is an area map that depicts the approximate boundary of the INEOS site and the surrounding environs.

Project location information:

USGS Quad	Latitude/ Longitude
Hoskins Mound	29 13′ 50.39″ N / -95 11′ 25.57″ W

INEOS is proposing to add an additional furnace at the Chocolate Bayou facility. The purpose of the Project is to meet customer demands for olefins, a group of chemicals that is used as raw materials in the production of many useful industrial products. The Project involves constructing an additional furnace at the Chocolate Bayou facility. The additional furnace will receive feedstock (ethane, propane, and/or liquids such as refinery raffinate or debutanized natural gasoline) and thermally "crack" them at high temperatures. This creates various olefin products, ranging from hydrogen to pyrolysis gasoline. These various products will be separated by distillation in the existing No. 2 Olefins unit. The furnace will be equipped with SCR to reduce NO_x emissions. The furnace will undergo periodic decoking to remove coke from the tubes by combusting it with air in the presence of steam.

Maintenance, Startup, and Shutdown emissions will be generated from cleaning piping, vessels, exchangers, and pumps/compressors for maintenance. The new furnace and associated equipment will be connected to the existing No. 2 Olefins flare (EPN DDM-3101, Permit No. 95). The additional furnace will be constructed within the already developed portion of the INEOS facility. The furnace will be located in areas previously cleared and graded.

4.2 Construction Information

Construction activities, including site preparation, steel erection, equipment installation, utility tie-ins, and start-up will take place within the existing facility in an area approximately 60 feet

by 100 feet (the Project Area). No additional earth disturbance will be required outside of the Project Area, which is currently graveled. The existing graveled area will be scraped and graded to allow installation of auger cast concrete piles and a new mat and pier foundation for the furnace. The proposed construction activities include the installation of approximately 92 steel-reinforced concrete piles 18-inches in diameter to a depth of 93 feet, plus 40 additional 18-inch diameter piles installed to a depth of 25 feet to support the pipe rack running from the Project Area across the existing plant road to the west and into the existing process area of the plant. The projected construction start date is 01 October 2012. The projected operation start date is November 2013.

4.2.1 Construction Activities and Schedule

The total time estimated to complete the construction of the expansion project is approximately 72 weeks and includes the following list of general construction activities.

- demo of abandoned furnace in path of future pipe rack
- demo slab & excavation of furnace plot
- install auger cast piles
- place concrete for furnace structure
- erect furnace (in modules) & furnace piping, electrical, instrumentation installation
- install interconnecting piping from pipe rack to furnace
- final piping tie-ins to existing equipment including existing utility lines
- completion of instrumentation & electrical work
- insulation
- touch-up painting

4.2.2 Construction Equipment Required

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

- 1 bulldozer - 8 weeks
- 2 backhoes - 8 weeks
- 1 mixer truck - 8 weeks
- 1 smooth drum roller - 8 weeks
- 1 Bobcat - 12 weeks

- 2 7-yard dump trucks - 8 weeks
- one large crane (800 ton) for major lifts - 24 weeks
- 2 to 3 small rigs (10 - 80 ton) - 20 to 30 weeks
- 2 fork trucks / lull - 50 weeks
- 10 to 12 welding machines and generators - 40 weeks
- 2 air compressors - 28 weeks
- 2 high-pressure hydro pumps - 28 weeks
- 2 manlifts - 32 weeks
- 2 15-ton cherry pickers - 44 weeks

4.3 Operation

The proposed Project involves constructing an additional furnace at the existing Chocolate Bayou facility. The additional furnace will receive feedstock (ethane, propane, and/or liquids such as refinery raffinate or debutanized natural gasoline) and thermally "crack" it at high temperatures. This creates various olefins products, ranging from hydrogen to pyrolysis gasoline. These various products will be separated by distillation in the existing No. 2 Olefins unit. The furnace will be equipped with SCR unit that will use ammonia to reduce NOx emissions. The furnace will undergo periodic decoking to remove coke from the tubes by combusting it with air in the presence of steam. Maintenance, Startup, and Shutdown emissions will be generated from clearing piping, vessels, exchangers, and pumps/compressors for maintenance. The new furnace and associated equipment will be connected to the existing No. 2 Olefins flare (EPN DDM-3101, Permit No. 95).

Water is supplied to the facility from a canal located on the northern boundary of the property. This water is purchased from Gulf Coast Water Authority (GCWA), a private water supply company. GCWA keeps the water in the canal at a constant level and INEOS's use is metered as water is pumped from the canal to the facility.

Based on the incremental increase in production resulting from the Project, as well as INEOS's experience operating virtually identical furnaces at the same facility, INEOS engineers have estimated a 0.5% increase in water use above current levels associated with the additional furnace. In the course of normal Project operations, this water, like water currently used at the facility, will either be consumed during the process, released to the atmosphere as water vapor, or carried through the process sewer to the facility's wastewater treatment plant and subsequently discharged through the facility's permitted outfall to Chocolate Bayou.

Wastewater from Project operations will be discharged through the facility's process sewer to the existing, permitted on-site wastewater treatment facility. In addition, storm water from the Project Area will drain to the facility's segregated storm water sewer during construction, and then to the process sewer during operation. The wastewater treatment facility and the storm water retention system have the capacity to accept and treat these additional streams.

4.4 Emissions Controls

The only new and modified sources associated with the cracking furnace project are the cracking furnace, the decoke cyclone/stack, and the fugitive components.

Predicted emissions concentrations from the Project are shown in table 2 below.

Table 2. Modeled Emissions for all Pollutants Associated with the Project.

Pollutant	Concentration (lb/hour)	Concentration (ton/year)
NO_X	14.85	21.68
CO	125.24	97.88
VOC	4.75	20.41
H_2S	0.003	0.02
SO_2	6.79	1.49
NH_3	4.79	10.55
PM	5.26	13.07
PM_{10}	4.7	10.32
$PM_{2.5}$	2.18	5.88
CO_2	63,551	214,592
N_2O	1.49	6.51
CH_4	1.82	8
CO_2e	64,051	216,778

Section 5
Background Information

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 area range from sea level at Chocolate Bayou to five feet above sea level on the north side of the facility. The area has been altered due to past rice cultivation and the construction of the facility itself. The facility itself has been in operation for over 40 years.

The watershed of Brazoria County is composed of the Brazos River and the San Bernard River along with numerous smaller creeks and bayous 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 which 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 used for rice, cattle, and hay production. In recent years, urban sprawl from the Houston metroplex has seen the populations of Brazoria County cities such as Pearland and Alvin grow significantly. Large areas of former agricultural production are now used 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 encompassing the Project and Actions Areas is currently used for industrial purposes and has been for the past 40 years. The surrounding land is a mix of other industrial/chemical facilities, agriculture, open water and coastal marsh.

5.1.2 Climate

Brazoria County averages 57 inches of precipitation per year. 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 average 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 March, 2012, Brazoria County is under a D1- moderate drought. This is a substantial improvement over 2011 when the County 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 area surrounding the Project ranged from sea level at Chocolate Bayou to five feet above sea level on the north side of the INEOS property. The Action Area has been altered due to past rice cultivation and the construction of the facility itself (figure 4). The Federal Emergency Management Administration floodplain maps show that the entire facility is within the 100-year floodplain of Chocolate Bayou (Figure 5).

5.1.4 Geology

The specific geologic formation found in this area according to the United States Geologic Survey ("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.

5.1.5 Soils

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 ten soil types mapped within the fenceline represented in table 3 (NRCS, 1981) and Figure 6.

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	Drainage	Permeability	Landform	
6	Bacliff Clay	0-1% slopes rarely flooded	Deep & Very Deep	Poorly Drained	Low	Flats on Coastal Plains	Yes
7	Bernard Clay Loam	0-1% slopes, not flooded	Moderately Deep to Very Deep	Somewhat Poorly Drained	Low	Meander Scrolls on Coastal Plains	No
8	Bernard-Edna Complex	0-1% slopes, not flooded	Moderately Deep to Very Deep	Somewhat Poorly Drained	Low	Meander Scrolls on Coastal Plains	No
13	Edna Fine Sandy Loam	0-1% slopes, not flooded	Deep & Very Deep	Somewhat Poorly Drained	Low	Flats on Coastal Plains	No
15	Edna-Aris Complex	0-1% slopes, not flooded	Deep & Very Deep	Somewhat Poorly Drained	Low	Flats on Coastal Plains	No
21	Ijam Clay	0-1% slopes, rarely flooded	Moderately Deep	Poorly Drained	Low	Dredge Spoil Banks on Lagoons	Yes
22	Ijam-Urban Land Complex	0-1% slopes, rarely flooded	Moderately Deep	Poorly Drained	Low	Dredge Spoil Banks on Lagoons	Yes
25	Lake Charles Clay	1-8% slopes, not flooded	Deep & Very Deep	Moderately well Drained	Low	Flats on Coastal Plains	No
27	Leton Loam	0-1% slopes, occasionally flooded	Deep & Very Deep	Poorly Drained	Moderately Low	Flats on Coastal Plains	Yes

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	Drainage	Permeability	Landform	
28	Leton-Aris Complex	0-1% slopes, occasionally flooded	Deep & Very Deep	Poorly Drained	Moderately Low	Flats on Coastal Plains	Yes
W	Water	N/A	N/A	N/A	N/A	N/A	No

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 facility on the eastern 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 Barnard 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. Most native prairie has been 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 Gulfcoast 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 species listed and threatened or endangered under the ESA that occur in Brazoria County, as well as species that are candidates for listing under the ESA that occur in 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 as a conservative measure. Discrepancies exist between the FWS list and federally-listed species on the Texas Parks and Wildlife Department (TPWD) website. As a conservative measure, we have included all species that are listed as federally protected on either agency's list.

Table 4
Federally-Listed Threatened, Endangered, or Candidate Species for Brazoria County, Texas.

Common Name	Scientific Name	Listing Status
Birds		
Piping Plover	*Charadrius melodus*	E
Eskimo Curlew	*Numenius borealis*	E*
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

Table 4
Federally-Listed Threatened, Endangered, or Candidate Species for Brazoria County, Texas.

Common Name	Scientific Name	Listing Status
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 or as a candidate species.*
E= Endangered, T= Threatened, C= Candidate species.

5.2.2 Listed Species Descriptions

Piping Plover

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 very sparse vegetation. Piping plovers spend more than 70% of the year on the wintering grounds. Texas is estimated to winter more than 35% of the known population 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 toward 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 exclusively on bare sandy beaches and do not 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, eleven miles to the south.

Eskimo Curlew

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

Eskimo curlews 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 1 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 (2) 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. 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 not listed by FWS for Brazoria County. Although FWS has authority over the status of this species, it is included in this discussion as a conservative measure because it is described on the TPWD website as a candidate species. Assuming the TPWD website is accurate, candidate species do not currently carry regulatory protection; however, because they might be listed in the future they are 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 their characteristic slender shape, relatively narrow bill, and thin, high-pitched calls and songs of pipits. It is distinguishable from American pipit (*Anthus rubescens*) by its buffy brown upper parts with broad blackish streaking, yellowish to pale pinkish brown legs, and a dark upper mandible that contrasts with a pale lower mandible. Males and females are cryptically colored and similar in appearance.

Sprague's 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 occurs only in North America and is North America's tallest bird, with males approaching 5 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.

Sharpnose Shiner

The sharpnose shiner is not listed by FWS for Brazoria County. Although FWS has authority over the status of this species, it is included in this discussion as a conservative measure because it is described on the TPWD website as a candidate species. Assuming the TPWD website is accurate, candidate species do not currently carry regulatory protection; however, because they might be listed in the future they are 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 and

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 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. Although NMFS has authority over the status of this species, it is included in this discussion as a conservative measure because it is described on the TPWD website as federally-listed.

The smalltooth sawfish is one of only two species of sawfishes in the U.S. Sawfish are in the same group of fish such as sharks and skates whose skeletons are made of cartilage. The smalltooth sawfish can reach lengths up to 25 feet (7m) and average 18 feet (5.5m) (NNFS, 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 FWS for Brazoria County. Although FWS has authority over the status of this species, it is included in this discussion as a conservative measure because it is described on the TPWD website as federally-listed.

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

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

Louisiana Black Bear

The Louisiana Black Bear is not listed by FWS for Brazoria County. Although FWS has authority over the status of this species, it is included in this discussion as a conservative measure because it is described on the TPWD website as federally-listed.

The 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 4-7 feet long with males reaching weights up to 400 pounds. Females are typically smaller 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.

Ocelot

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

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 and weighs 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 very territorial, usually meeting only to mate. In Texas, breeding occurs in the spring. Females have a gestation period of 72-80 days and produce litters of 1-3 kittens a year.

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

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

Red Wolf

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

The red wolf is a smaller cousin of the gray wolf. As the name implies the red wolf has a coat that is brown to reddish in color. The red wolf weighs 45-80 pounds, stands approximately 26 inches tall at the shoulder and measures 4 feet in length (USFWS, 2007). Red wolves feed 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.

West Indian Manatee

The West Indian manatee is not listed by FWS for Brazoria County. Although FWS has authority over the status of this species, it is included in this discussion as a conservative measure because it is described on the TPWD website as federally-listed.

The 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 slowing 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 significantly reduces the attractiveness of the Texas coast to manatees.

Smooth Pimpleback

The smooth pimpleback is not listed by FWS for Brazoria County. Although FWS has authority over the status of this species, it is included in this discussion as a conservative measure because

it is described on the TPWD website as a candidate species. Assuming the TPWD website is accurate, candidate species do not currently carry regulatory protection; however, because they might be listed in the future they are included in this analysis as a conservative measure.

Smooth pimplebacks are small freshwater bivalves. The external coloration of smooth pimplebacks range 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 FWS for Brazoria County. Although FWS has authority over the status of this species, it is included in this discussion as a conservative measure because it is described on the TPWD website as a candidate species. Assuming the TPWD website is accurate, candidate species do not currently carry regulatory protection; however, because they might be listed in the future they are 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 sea turtle is a small to medium-sized marine turtle having an elongated oval shell with overlapping scutes on the carapace, a relatively small head with a distinctive hawk-like beak, and flippers with two claws. General coloration is brown with numerous splashes of yellow, orange, or reddish-brown on the carapace. The plastron is yellowish with black spots on the intergular and postanal scutes. Juveniles are black or very dark brown with light brown or yellow coloration on the edge of the shell, limbs, and raised ridges of the carapace. 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.

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

Green Sea Turtle

The green sea turtle grows to a maximum size of about 4 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. Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on sea grasses and marine algae.

Green Sea Turtles feed in shallow water areas with abundant sea grasses or algae. The turtles migrate from nesting areas to feeding grounds, which are sometimes several thousand miles away. Most turtles migrate along the coasts, but some populations are known to migrate across the ocean from nesting area to feeding grounds.

Kemp's Ridley Sea Turtle

Kemp's Ridley sea turtles feed in shallow water areas with abundant sea grasses or algae. The turtles migrate from nesting areas to feeding grounds, which are sometimes several thousand miles away. Most turtles migrate along the coasts, but some populations are known to migrate across the ocean from nesting area to feeding grounds. The major nesting beaches are always found in places where the seawater temperature is greater than 25 C. As a species that migrates long distances, these turtles face special problems associated with differing attitudes toward conservation in different countries.

Kemp's Ridley sea turtles are found in the coastal waters and bays of the Gulf of Mexico and Atlantic Ocean. They prefer open ocean and gulf waters with the females only coming ashore to lay eggs in beach sand. Young Kemp's Ridley sea turtles float on large mats of sargassum.

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 nesting turtles 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 is the largest of all sea turtles, with weights of 1,300 pounds (590 kg) and a carapace length of up to 8 feet (2.4 m). This turtle is unique because of the smooth leathery skin covering its carapace. Research on captive turtles 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, these turtles 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.

Leatherback sea turtles are rare visitors to Texas coastal beaches.

Loggerhead Sea Turtles

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. 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 conducted a habitat evaluation of the Project to determine if suitable habitat was present to support federally-listed threatened, endangered, or candidate species. The survey consisted of pedestrian habitat evaluation inside the existing INEOS fenceline and the adjoining property to the south and east. Evaluations of properties to the west and north were done from INEOS' property line and from aerial photography because there is no pedestrian access to them. No areas of Critical Habitat, as designated by FWS, are present within the Action Area, or the surrounding properties.

The Project Area is inside an existing facility. The Project Area is graveled with little or no vegetation present. To the north and northwest of the INEOS fenceline is an existing Ascend facility. To the northeast is open land and row crop agriculture land. To the east and south is cattle pasture. Chocolate Bayou forms the western and southwestern boundary of the Project area. To the west of Chocolate Bayou, land use is a mix of rice and cattle production. To the southwest of the INEOS fenceline, 1.6 miles from the construction zone, is the northeastern corner of the Brazoria National Wildlife Refuge (BNWR). The dominant habitats observed outside of the Action Area are described below.

Emergent Wetland- Areas along the fringe of Chocolate Bayou are comprised of brackish emergent wetlands. These areas are dominated by salt tolerant species such as wiregrass (*Spartina patens)* and gulf cordgrass (*Spartina spartinae).*

Cattle Pasture- Bermuda grass (*Cynodon dactylon*) is the dominant species within the areas used for cattle pasture. Many of these areas appear to have been in rice production at some point in the past (i.e.; evidence of irrigation canals, terraces, etc.).

Open Water- open water habitat is found on the western edge of the INEOS fenceline in Chocolate Bayou.

Drainage Canals- A drainage canal is located along INEOS' northern fenceline boundary. This canal is the source of water used in the facility.

Emergent wetlands were composed of brackish tolerant plant species such as *Spartina patens* and *Spartina spartinae* at the herbaceous level. Shrubs such as eastern baccharis (*Baccharis halimifolia*) and iva (*Iva frutescens*) were present on slightly elevated areas. Generally speaking, emergent wetlands can provide habitat for certain migratory birds and have the potential to

support hunting for eagles and other raptors. Much of the emergent wetlands that exist outside of the Action Area have been altered by grazing and fire suppression. No emergent wetlands are found within the Action Area.

Cattle pastures are common surrounding the Action Area. The habitat value of cattle pastures is generally considered to be lower than native prairies, although certain migratory birds may utilize these areas for feeding and eagles and other raptors may hunt along edges and brushy areas in these fields.

Chocolate Bayou flows south, southeast of the Project approximately seven miles before emptying into West Galveston Bay. In the vicinity of the INEOS fenceline, Chocolate Bayou is tidally influenced and supports certain aquatic species that are adapted to brackish environments.

A small drainage canal along the northern fenceline is mostly an open water habitat with trees and brush lining the banks. This drainage canal does not provide habitat for any listed species.

Section 7
Air Quality Results

7.1 Defining the Action Area

As noted in Table 5 below, modeling demonstrates that all concentrations of pollutants are below the EPA Significant Impact Levels (SILs) at ground level at all points throughout the facility. However, as a conservative measure, INEOS has defined the Action Area as encompassing all of the area inside INEOS' property boundary. Accordingly, this BA evaluates the likelihood of effects to species resulting from air deposition within INEOS' property boundary ("fence line").

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	EPA/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	46.9[a]	9.4%	**No**
CO	1-Hour	2,000	65.1[a]	3.3%	**No**
NO_2	Annual	1	0.16[a,b]	16%	**No**
NO_2	1-Hour	7.54	3.14[a,b]	41.6%	**No**
$PM_{2.5}$	Annual	0.3	0.06[c]	20.0%	**No**
$PM_{2.5}$	24-hour	1.2	0.47[c]	39.2%	**No**
PM_{10}	Annual	1	0.11[d]	11.0%	**No**
PM_{10}	24-hour	5	0.94[d]	18.8%	**No**
SO_2	Annual	1	0.005[a]	0.5%	**No**
SO_2	24-hour	5	0.05[a]	1.0%	**No**
SO_2	3-hour	25	0.1[a]	0.4%	**No**
SO_2	1-hour	7.8	0.11[a]	1.4%	**No**

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

Criteria Air Pollutant	Averaging Period	EPA/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?
SO_2	30-minute	20.42[e]	0.11[a]	0.5%	**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 EPA-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.

[e]The Texas 30-minute property-line SO_2 standard is 1,021 µg/m³. Therefore, the significant impact level for 30-minute SO_2 is 2% of 1,021 µg/m³, or 20.42 µg/m³.

Section 8
Effects of the Proposed Action

8.1 Air Quality Impacts

Modeling demonstrates that all concentrations of pollutants are below their applicable SILs at ground level at all points throughout the facility. However, as a conservative measure, INEOS has defined the Action Area as encompassing all of the area inside INEOS' property boundary. No habitat exists within the Action Area for any species listed as threatened or endangered under the ESA that occurs in Brazoria County (or for any candidate for listing under the ESA that occurs in Brazoria County). Accordingly, air emissions from the project will have no effect on any such species.

Chocolate Bayou, located entirely outside of the Action Area (which, as noted above, was set conservatively as the plant boundary, even though modeling demonstrates that all concentrations of pollutants are below the SIL at ground level at all points throughout the facility) provides no habitat for any species listed as threatened or endangered under the ESA that occurs in Brazoria County (or for any candidate for listing under the ESA that occurs in Brazoria County). However, if, hypothetically speaking, such a species were present in Chocolate Bayou in the vicinity of the facility, air emissions from the Project would have no impact on the species because the emissions would be far below the SIL before reaching Chocolate Bayou, to the extent such emissions even leave the Action Area in any detectable amount.

8.2 Water Quality Impacts

8.2.1 Wastewater Impacts

Wastewater from the Project will be discharged to the existing, permitted on-site wastewater treatment facility. The increase in wastewater influent resulting from the Project is expected to be approximately 20,000 gallons per day (increase of 0.5%), which the existing wastewater treatment facility has the capacity to accept and treat. Table 6 shows facility water quality parameters with corresponding permit limits.

Table 6. 2011 Pollutant Concentrations with Permit Limits in Parenthesis from the INEOS Chocolate Bayou Facility.

Date	Max Temperature (◦F)	BOD	BOD	COD	COD	pH	pH	TSS
	(95◦F)	Mean lb/day (843 lbs/day)	Max lb/day (2123 lbs/day)	Mean lb/day (6676 lbs/day)	Max lb/day (13352 lbs/day)	Min (6.00)	Max (9.00)	lb/day Max (4497 lb/day)
1/11	76.50	97.99	116.70	1718.47	2114.56	7.75	8.47	709.52
2/11	80.29	101.31	193.11	1857.09	2450.46	7.75	8.67	1245.96
3/11	83.08	102.00	150.93	1771.24	2505.59	7.52	8.80	917.40
4/11	85.27	86.68	110.97	1621.18	1886.06	7.81	8.56	1026.91
5/11	90.96	99.12	231.59	1404.22	1822.40	7.52	8.66	762.19
6/11	93.75	106.21	160.40	2057.92	3646.26	7.11	8.41	1690.11
7/11	94.63	145.69	302.78	1936.08	2627.72	7.46	8.65	1736.90
8/11	95.18	81.30	122.45	1521.68	2028.58	7.73	8.51	1052.76
9/11	92.04	84.26	152.15	1588.98	2141.58	7.72	8.46	949.88
10/11	87.67	84.99	106.67	1941.54	2346.28	7.28	8.58	701.73
11/11	83.36	96.98	173.84	2200.08	3354.47	7.85	8.91	2678.34
12/11	80.19	97.56	144.11	1769.90	2760.50	7.16	8.39	1183.25

Table 7 shows permit discharge parameters for TPDES priority pollutants.

Table 7. Permit Discharge Parameters for TPDES Priority Pollutants

Parameter	2011 Result	Discharge Limit
	mg/l	mg/l
Benzene	0.00025	0.082
Ethylbenzene	0.00025	0.065
Phenol	0.00077	0.016
Toluene	0.00026	0.048

The treated process wastewater effluent to Chocolate Bayou will not change as a result of the Project. The only wastewater stream from the new furnace that will be in contact with the process (dilution steam) will first pass through a steam stripper where the hydrocarbon will be recovered back to the process. After hydrocarbons are removed by the stripper, the stream will be processed in the facility's wastewater treatment facility. Any potential pollutants included in the one-half of one percent increase in wastewater influent associated with the Project will be processed in the facility's wastewater treatment facility.

Importantly, because the existing wastewater treatment facility has the capacity to handle the increase in influent associated with the Project, pollutant concentrations in wastewater effluent will not change once the Project is in operation. In addition, because current wastewater effluent flow rates and temperature fluctuate well within permitted limits on a daily basis based on variation in discharges from blowdown associated with cooling towers and boilers, and fluctuations in levels in process wastewater tanks, wastewater flow velocity attributable to the very small increase in wastewater effluent associated with the Project will not cause any change in overall flow and temperature impacts to the receiving water.

As a result, current impacts to Chocolate Bayou based on all monitored parameters, including flow, turbidity, temperature, BOD, COD, pH, TSS and all priority pollutant concentrations will not change after the Project is in operation.

Accordingly, although Chocolate Bayou provides no habitat for any species listed as threatened or endangered under the ESA that occurs in Brazoria County (or for any candidate for listing under the ESA that occurs in Brazoria County), if, hypothetically speaking, such a species was

present in Chocolate Bayou in the vicinity of the facility, wastewater discharge associated with the Project would have no effect on the species.

8.2.2 Storm Water Impacts

8.2.2.1 Storm Water Discharges Associated with Project Construction

Currently, storm water flows from the graveled 60 foot by 100 foot Project Area drain to the facility's existing segregated storm water system. This area represents a very small fraction of the areas within the facility that drain to the storm water system. Prior to undertaking Project construction activities, INEOS will apply for coverage under the Texas General Permit for Storm Water Discharges Associated with Construction Activity. INEOS' construction contractor will use appropriate best management practices to manage storm water runoff related to construction. Storm water associated with Project construction within the Project Area will continue to drain to the facility's existing segregated storm water system prior to being discharged.

Over the course of construction, the Project Area will have impervious cover added, slightly increasing the flow from the now graveled area, which will ever so slightly increase the overall flow into the facility's existing segregated storm water system. This miniscule potential increase will drain to the facility's storm water retention ponds which, like the facility's wastewater treatment facility, have the capacity to handle any increased flow associated with Project construction. In addition to settling solids out before discharge, the storm water system operates to bring the water temperature to ambient levels. Finally, because Chocolate Bayou is a naturally turbulent waterway, storm water discharges from the facility actually have a lower turbidity level than the receiving water.

Accordingly, although Chocolate Bayou provides no habitat for any species listed as threatened or endangered under the ESA that occurs in Brazoria County (or for any candidate for listing under the ESA that occurs in Brazoria County), if, hypothetically speaking, such a species was present in Chocolate Bayou in the vicinity of the facility, storm water discharge associated with Project construction would have no effect on the species.

8.2.2.2 Storm Water Discharges Associated with Project Operation

After Project construction is complete, storm water will drain to the process sewer, not the segregated storm water sewer. The increase in wastewater associated with the Project discussed above accounts for this slight increase associated with Project Area storm water post-construction.

Accordingly, for all of the reasons discussed in Section 8.2.1, although Chocolate Bayou provides no habitat for any species listed as threatened or endangered under the ESA that occurs in Brazoria County (or for any candidate for listing under the ESA that occurs in Brazoria County), if, hypothetically speaking, such a species was present in Chocolate Bayou in the vicinity of the facility, storm water discharge associated with Project operation would have no effect on the species.

8.3 Noise Impacts

The Project Area is within the developed portion of an active chemical manufacturing facility. In 2005, additional furnaces were built at the facility based on the same design as the Project. At that time, INEOS conducted noise monitoring to establish hearing protection zones for each furnace. Those readings established areas surrounding each furnace within which noise levels exceeded 85 dB, the level over which hearing protection is required during 12-hour shifts. As a result, the zones are set conservatively to the edge of the curbed area for each furnace. These areas are the same as the 60 foot by 100 foot Project Area. Accordingly, noise levels during operation of the Project will not exceed 85 dB anywhere outside of the Project Area. In addition, based on the rate at which sound waves dissipate over distance, noise levels associated with operation of the Project will be far below 85 dB by the time they reach the plant boundary, to the extent they have not completely dissipated by the time they reach that point.

Based on her many years of experience in this field, which includes establishing hearing protection zones for regular operation and during facility construction projects, including major unit turnarounds and the construction of the new units, the facility Safety Engineer, Melinda Tange, has confirmed that noise levels during Project construction will be comparable to noise levels from maintenance activities that currently take place at the plant. These 85 dB zones are set conservatively as the curbed area of the unit undergoing maintenance. Accordingly, noise levels during Project construction will not exceed 85 dB anywhere outside of the Project Area. In addition, based on the rate at which sound waves dissipate over distance, noise levels associated with operation of the Project will be far below 85 dB by the time they reach the plant boundary, to the extent they have not completely dissipated by the time they reach that point.

As a result, because there is no habitat within the plant boundary for any species listed as threatened or endangered under the ESA that occurs in Brazoria County (or any candidate for listing under the ESA that occurs in Brazoria County), noise levels associated with construction and operation of the Project will have no effect on any such species.

8.4 Infrastructure-Related Impacts

Construction of the Project involves the addition of a furnace to an existing chemical plant. The Project Area is surrounded by significant existing industrial infrastructure. Accordingly new infrastructure will not be necessary to support the Project. As a result, infrastructure impacts associated with construction and operation of the Project will have no effect on any species listed as threatened or endangered under the ESA that occurs in Brazoria County (or any candidate for listing under the ESA that occurs in Brazoria County).

8.5 Human Activity Impacts

Construction and operation of the Project will not require additional human activity compared to typical operation and maintenance activities that occur at the plant on a regular basis. As a result, human activity impacts associated with construction and operation of the Project will have no effect on any species listed as threatened or endangered under the ESA that occurs in Brazoria County (or any candidate for listing under the ESA that occurs in Brazoria County).

8.6 Species Effects Analysis

8.6.1 Piping Plover

Regional Sightings

Piping plover occurrence records were requested from the Texas Natural Diversity Database (TXNDD) for the Hoskins Mound 7.5 minute quadrangle map. The TXNDD is a repository for threatened and endangered species occurrences. The TXNDD plots these occurrences on United States Geologic Survey 7.5 minute quadrangle maps. For the purpose of this BA the Hoskins Mound USGS 7.5 minute quadrangle map was used as the search area because that is the map on which the Project is located. The Hoskins Mound 7.5 minute quadrangle map encompasses an area of 65 square miles. Based on TXNDD records, there has never been a piping plover sighting within the 65 square mile search area.

Habitat in Action Area or Chocolate Bayou

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 an existing manufacturing facility, not containing bare sandy shores or beaches utilized by piping plovers. The shoreline of Chocolate Bayou is marshy and dominated by wetland grasses and bushes and

does not contain the bare sandy shores that comprise piping plover habitat. As a result, there is no habitat for piping plovers in the Action Area or in or around Chocolate Bayou.

Potential Impacts

Accordingly, based on a lack of sightings and a lack of suitable habitat in the Action Area or in or around Chocolate Bayou, piping plovers will not be impacted by Project construction or operation.

Potential Effects

The Project will have "no effect" on piping plovers.

8.6.2 Eskimo Curlew

Regional Sightings

The last Eskimo curlew to be identified in Texas occurred in 1962. The species is assumed to be extirpated from Texas. Eskimo curlew occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been an Eskimo curlew sighting within the 65 square mile search area.

Habitat in Action Area or Chocolate Bayou

Eskimo curlew habitat is comprised of bare sandy shores. The Action Area comprises an existing manufacturing facility, not containing bare sandy shores utilized by Eskimo curlews. The shoreline of Chocolate Bayou is marshy and dominated by wetland grasses and bushes 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 65 square mile search area and was therefore not assumed extirpated in Texas, there is no habitat for Eskimo curlews in the Action Area or in or around Chocolate Bayou.

Potential Impacts

Accordingly, based on a lack of sightings across the State for 50 years and a lack of suitable habitat in the Action Area or in or around Chocolate Bayou, Eskimo curlews will not be impacted by Project construction or operation.

Potential Effects

The Project will have "no effect" on Eskimo curlews.

8.6.3 Sprague's Pipet

Regional Sightings

Sprague's pipet occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been an Sprague's pipet sighting within the 65 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 an existing manufacturing facility, not containing native prairie. The shoreline of Chocolate Bayou is marshy and dominated by wetland grasses and bushes and does not contain the native prairies that comprise Sprague's pipet habitat. As a result, even if the Sprauge's pipet had been sighted in the 65 square mile search area, there is no habitat for Sprague's pipet in the Action Area or in or around Chocolate Bayou.

Potential Impacts

Accordingly, based on a lack of sightings and a lack of suitable habitat in the Action Area or in or around Chocolate Bayou, Sprauge's pipets will not be impacted by Project construction or operation.

Potential Effects

The Project will have "no effect" on Sprague's pipets.

8.6.4 Whooping Crane

Regional Sightings

Whooping Crane occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been a whooping crane sighting within the 65 square mile search area.

The only wild, self-sustaining population of whooping cranes (and the only population that winters in Texas) migrate 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 in Texas. The population's migration route to its wintering grounds in the Fall 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. The group returns along the same route to its nesting grounds in the Spring.

Although the FWS lists the whooping crane as occurring in Brazoria County, the County lies on the extreme eastern edge of the population's migration route, and as a result, historical sightings of whooping cranes in Brazoria County are quite rare. For example, the Christmas Bird Count, an annual survey conducted by the Audobon Society that began in 1958, has never recorded a whooping crane in the survey area that includes Brazoria County.[1]

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 west.

Habitat in Action Area or Chocolate Bayou

Whooping crane habitat is generally comprised of gently sloping coastal prairie interspersed with shales and ponds. The Action Area comprises an existing manufacturing facility, not containing coastal prairie. Although the area in and around Chocolate Bayou could be considered coastal prairie, the bays and inlets that comprise the whooping cranes's wintering grounds in and around the Aransas NWR are shallow and have relatively low turbidity, making it much easier for the whooping cranes to feed on blue crabs, their primary food source. The bays and inlets in Brazoria County, especially Chocolate Bayou, are considerably deeper and more turbid, resulting in significantly diminished access to blue crab. As a result, even if the whooping crane had been sighted in the 65 square mile search area, or during the annual bird counts discussed above, there is no habitat for whooping cranes in the Action Area or in or around Chocolate Bayou.

Potential Impacts

[1] http://audubon2.org/cbchist/table.html.

Accordingly, based on a lack of sightings and a lack of suitable habitat in the Action Area or in or around Chocolate Bayou, the whooping crane will not be impacted by Project construction or operation.

Potential Effects

The Project will have "no effect" on whooping cranes.

8.6.5 Sharpnose Shiner

Regional Sightings

Sharpnose shiner occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been a sharpnose shiner sighting within the 65 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 substrate. The Action Area comprises an existing manufacturing facility, not containing any such habitat. Chocolate Bayou, a brackish drainage dominated by muddy substrate, is not part of the freshwater Brazos River drainage. As a result, even if the sharpnose shiner had been sighted in the 65 square mile search area, there is no habitat for sharpnose shiners in the Action Area or Chocolate Bayou.

Potential Impacts

Although Chocolate Bayou does not provide suitable habitat for the sharpnose shiner, if, speaking hypothetically, a sharpnose shiner was present in Chocolate Bayou, because wastewater and storm water discharges associated with the Project will have no impact on Chocolate Bayou, and because air emissions and noise levels associated with the Project have no impact outside of the Action Area, sharpnose shiners will not be impacted by the Project.

Accordingly, based on a lack of sightings, a lack of suitable habitat, and lack of any Project impacts on Chocolate Bayou, sharpnose shiners will not be impacted by Project construction or operation.

Potential Effects

The Project will have "no effect" on sharpnose shiners.

8.6.6 Smalltooth Sawfish

Regional Sightings

Smalltooth sawfish occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been a smalltooth sawfish sighting within the 65 square mile search area. Historically smalltooth sawfish were found throughout the Gulf of Mexico. Today, however, the only known population in the U.S. is near the peninsula of Florida (NMFS, 2012). As a result, smalltooth sawfish are assumed extirpated along the Texas Coast.

Habitat in Action Area or Chocolate Bayou

Sawfish species inhabit shallow coastal waters of tropical seas and estuaries. They are usually found in shallow waters very close to shore over muddy and sandy bottoms. They are often found in sheltered bays, on shallow banks, and in estuaries or river mouths. The Action Area comprises an existing manufacturing facility, not containing any such habitat. However, if the species were not extirpated along the Texas Coast, Chocolate Bayou could support smalltooth sawfish.

Potential Impacts

Although Chocolate Bayou could provide suitable habitat for the smalltooth sawfish, the species is extirpated along the Texas Coast, with the only population in the U.S. near the Florida peninsula. If, speaking hypothetically, a smalltooth sawfish was present in Chocolate Bayou, because wastewater and storm water discharges associated with the Project will have no impact on Chocolate Bayou, and because air emissions and noise levels associated with the Project have no impact outside of the Action Area, smalltooth sawfish will not be impacted by the Project.

Accordingly, based on a lack of sightings, the species extirpation from the Texas Coast, and a lack of any Project impacts on Chocolate Bayou, smalltooth sawfish will not be impacted by Project construction or operation.

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 the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, a single jaguarundi sighting within the 65 square mile search area was recorded in the Brazoria National Wildlife Refuge in 1987. However, this sighting is questionable due to a lack of any suitable habitat (discussed below) anywhere in Brazoria County (or anywhere in Texas other than the southwestern portion of the State), the fact that the jaguarundi is often confused with the much more abundant bobcat, and the lack of any coordinate data associated with the sighting.

Habitat in Action Area or Chocolate Bayou

Jaguarundi habitat is comprised of dense, thorny thickets common to southwestern Texas where cacti, mesquite, cat claw, granjeno, and other spine-studded vegetation is common. The Action Area comprises an existing manufacturing facility, not containing any such habitat. The shoreline of Chocolate Bayou is marshy and dominated by wetland grasses and bushes and does not contain the thorny thickets and arid plant communities that comprise jaguarundi habitat.

Potential Impacts

Although the Action Area or the area in or around Chocolate Bayou does not provide suitable habitat for the jaguarundi, if, speaking hypothetically, a jaguarundi was present in or around Chocolate Bayou, because wastewater and storm water discharges associated with the Project will have no impact on Chocolate Bayou, and because air emissions and noise levels associated with the Project have no impact outside of the Action Area, the jaguarundi will not be impacted by the Project.

Accordingly, based on a lack of any suitable habitat, the questionable nature of the only recorded sighting of the jaguarundi in Brazoria County, and a lack of any Project impacts on Chocolate Bayou, the jaguarundi will not be impacted by Project construction or operation.

Potential Effects

The Project will have "no effect" on jaguarundis.

8.6.8 Louisiana Black Bear

Regional Sightings

Louisiana black bear occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been a Louisiana black bear sighting within the 65 square mile search area.

Habitat in Action Area or Chocolate Bayou

The Louisiana black bear was historically found throughout Mississippi, Louisiana and eastern Texas. Their habitat consists of large tracts of bottomland hardwood forests with little human activity. The Action Area comprises an existing manufacturing facility, not containing any such habitat. The shoreline of Chocolate Bayou is marshy and dominated by wetland grasses and bushes and does not contain the bottomland hardwood forests that comprise Louisiana black bear habitat.

Potential Impacts

Accordingly, based on a lack of sightings and a lack of suitable habitat in the Action Area or in or around Chocolate Bayou, Louisiana black bears will not be impacted by Project construction or operation.

Potential Effects

The Project will have "no effect" on Louisiana black bears.

8.6.9 Ocelot

Regional Sightings

Ocelot occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been an Ocelot sighting within the 65 square mile search area.

Habitat in Action Area or Chocolate Bayou

The ocelot is a small feline that is endemic to south Texas through South America. 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 available habitat for ocelots to extreme south Texas. The Action Area comprises an existing manufacturing facility, not containing any such habitat. The shoreline of Chocolate Bayou is marshy and dominated by wetland grasses and bushes and does not contain the thick brush environment that comprises ocelot habitat. There are no known populations of ocelots in Brazoria County.

Potential Impacts

Accordingly, based on a lack of sightings and a lack of suitable habitat in the Action Area or in or around Chocolate Bayou, 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 was historically found throughout much of Texas. The last known wild red wolf was killed in 1980 and the species is currently considered extirpated from the State. Red wolf occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been a red wolf sighting within the 65 square mile search area.

Habitat in Action Area or Chocolate Bayou

Historically, the red wolf was wide-ranging throughout North America, preferring a range of habitats including forest areas, swamps, coastal prairies and wetlands. The Action Area comprises an existing manufacturing facility, not containing any such habitat. However, if the species were not extirpated from Texas, the area around Chocolate Bayou could support red wolves.

Potential Impacts

Although Chocolate Bayou could provide suitable habitat for the red wolf, the species is extirpated from Texas. If, speaking hypothetically, a red wolf was present in the area around Chocolate Bayou, because wastewater and storm water discharges associated with the Project will have no impact on Chocolate Bayou, and because air emissions and noise levels associated with the Project have no impact outside of the Action Area, red wolves would not be impacted by the Project.

Accordingly, based on a lack of sightings, the species' extirpation from Texas, and a lack of any Project impacts on the area around Chocolate Bayou, red wolves will not be impacted by Project construction or operation.

Potential Effects

The Project will have "no effect" on red wolves.

8.6.11 West Indian Manatee

Regional Sightings

West Indian manatee occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been a West Indian manatee sighting within the 65 square mile search area.

Habitat in Action Area or Chocolate Bayou

The West Indian manatee is a large herbivorous marine mammal. The majority of manatees are found in Florida waters; they are rarely present in Texas. Manatees are typically found in shallow clear waters with an abundance of rooted sea grasses. The Action Area comprises an existing manufacturing facility, not containing any such habitat. Because of its high turbidity, Chocolate Bayou has a very limited, if any, "littoral zone", that is, the zone in which sun light penetrates. This lack of sun light prevents rooted aquatic vascular plants, including sea grasses and algae, from becoming established, resulting in a lack of suitable habitat for manatees.

Potential Impacts

Although the Action Area and Chocolate Bayou do not provide suitable habitat for the West Indian manatee, if, speaking hypothetically, a manatee was present in Chocolate Bayou, because wastewater and storm water discharges associated with the Project will have no impact on Chocolate Bayou, and because air emissions and noise levels associated with the Project have no impact outside of the Action Area, the West Indian manatee will not be impacted by the Project.

Accordingly, based on a lack of sightings, a lack of suitable habitat in the Action Area or in Chocolate Bayou, and a lack of any Project impacts on Chocolate Bayou, the West Indian manatee will not be impacted by Project construction or operation.

Potential Effects

The Project will have "no effect" on West Indian manatees.

8.6.12 Smooth Pimpleback

Regional Sightings

Smooth pimpleback occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been a smooth pimpleback sighting within the 65 square mile search area.

Habitat in Action Area or Chocolate Bayou

Smooth pimplebacks are small freshwater bivalves that are native to the middle reaches of the Brazos and Colorado Rivers in Central Texas. They prefer small to moderate size streams and rivers as well as moderate sized reservoirs and have been found on mud, sand, and gravel in water as shallow as 3 to 4 cm. While smooth pimplebacks can survive in low-flow areas, they appear intolerant of dramatic water level fluctuations. The Action Area comprises an existing manufacturing facility, not containing any such habitat. The brackish to saline waters of Chocolate Bayou do not provide the freshwater habitat necessary for smooth pimplebacks.

Potential Impacts

Accordingly, based on a lack of sightings and a 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

The Project will have "no effect" on smooth pimplebacks.

8.6.13 Texas Fawnsfoot

Regional Sightings

Texas fawnsfoot occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been a Texas fawnsfoot sighting within the 65 square mile search area.

Habitat in Action Area or Chocolate Bayou

The Texas fawnsfoot is a freshwater bivalve found only in the Colorado and Brazos Rivers of Central Texas. 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 Action Area comprises an existing manufacturing facility, not containing any such habitat. The brackish to saline waters of Chocolate Bayou do not provide the freshwater habitat necessary for the Texas fawnsfoot.

Potential Impacts

Accordingly, based on a lack of sightings and a lack of suitable habitat in the Action Area or in Chocolate Bayou, the Texas fawnsfoot will not be impacted by Project construction or operation.

Potential Effects

The Project will have "no effect" on Texas fawnsfoots.

8.6.14 Atlantic Hawksbill Sea Turtle

Regional Sightings

Atlantic hawksbill sea turtle occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been an Atlantic hawksbill sea turtle sighting within the 65 square mile search area.

Habitat in Action Area or Chocolate Bayou

The Atlantic hawksbill sea turtle is a small to medium-sized marine turtle. Hawksbill turtles live in clear offshore waters of mainland and island shelves. They are more common where coral reef formations are present. Hawksbill turtles nest on sandy beaches, often in the proximity of coral reefs. Their main food source consists of sponges most often associated with the coral reef community. Hawksbill sea turtles are the most tropical of all sea turtles. They are found primarily in warmer waters and are only an occasional visitor to the Texas coast.

The Action Area comprises an existing manufacturing facility, not containing any such habitat. Due to a lack of the species' primary food source—sponges—as well as an environment that is not suitable for the formation of coral reefs due to a lack of sufficient sunlight, Chocolate Bayou does not provide suitable habitat for the Atlantic hawksbill sea turtle. Although corals feed by filtering plankton from the water, their bodies also contain symbiotic algae that provide the corals with additional nutrients (as well as their vibrant colors). Without the algae, corals will not survive. As plants, the algae need sufficient sunlight to photosynthesize, and as a result, coral reefs need to be in what is known as the "littoral zone", that is, the area where sunlight can penetrate. Because of its high turbidity, Chocolate Bayou has a very limited, if any, littoral zone. This lack of sunlight prevents the formation of coral reefs.

Potential Impacts

Although the Action Area and Chocolate Bayou do not provide suitable habitat for the Atlantic hawksbill sea turtle, if, speaking hypothetically, a turtle was present in Chocolate Bayou,

because wastewater and storm water discharges associated with the Project will have no impact on Chocolate Bayou, and because air emissions and noise levels associated with the Project have no impact outside of the Action Area, the Atlantic hawksbill sea turtle will not be impacted by the Project.

Accordingly, based on a lack of sightings, a lack of suitable habitat in the Action Area or in Chocolate Bayou, and a lack of any Project impacts on Chocolate Bayou, the Atlantic hawksbill sea turtle will not be impacted by Project construction or operation.

Potential Effects

The Project will have "no effect" on Atlantic hawksbill sea turtles.

8.6.15 Green Sea Turtle

Regional Sightings

Green sea turtle occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, two sightings of green sea turtles have been recorded within the 65 square mile search area, both in 2007. Both sightings took place in Chocolate Bay, 3.5 and 6.5 miles from the Action Area.

Importantly, neither sighting took place in Chocolate Bayou. Also, both sightings recorded a carapace (shell) length of around 10". Adult green sea turtles typically have a carapace length of between 31-44". This means that these two sightings were of juveniles. Juveniles tend to wonder around considerably more than adults in search of feeding and nesting areas. Because there have only been two recorded sightings within the 65 square mile search area, it seems quite likely that these sightings were of juveniles 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

Green sea turtles feed in shallow water areas with abundant sea grasses or algae. The turtles migrate from nesting areas to feeding grounds, which are sometimes several thousand miles away. Most turtles migrate along the coasts, but some populations are known to migrate across the ocean from nesting area to feeding grounds. Green sea turtle nest on sandy beaches. The Action Area comprises an existing manufacturing facility, not containing any such habitat. As noted above, because of its high turbidity, Chocolate Bayou has a very limited, if any, "littoral zone", that is, the zone in which sun light penetrates. This lack of sun light prevents rooted aquatic vascular plants, including sea grasses and algae, from becoming established. In

addition, the shoreline of Chocolate Bayou is marshy and dominated by wetland grasses and bushes and does not contain the sandy shores that comprise nesting habitat for green sea turtles.

Potential Impacts

Although the Action Area and Chocolate Bayou do not provide suitable nesting or feeding habitat for green sea turtles, if, speaking hypothetically, a turtle was present in Chocolate Bayou, because wastewater and storm water discharges associated with the Project will have no impact on Chocolate Bayou, and because air emissions and noise levels associated with the Project have no impact outside of the Action Area, the green sea turtle will not be impacted by the Project.

Accordingly, based on a lack of sightings in the Action Area or Chocolate Bayou, a lack of suitable nesting or feeding habitat in the Action Area or in Chocolate Bayou, and a 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 green sea turtles.

8.6.16 Kemp's Ridley Sea Turtle

Regional Sightings

Kemp's Ridley sea turtle occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been a Kemp's Ridley sea turtle sighting within the 65 square mile search area.

Habitat in Action Area or Chocolate Bayou

Kemp's Ridley sea turtles feed in shallow water areas with abundant sea grasses or algae. The turtles migrate from nesting areas to feeding grounds, which are sometimes several thousand miles away. Most turtles migrate along the coasts, but some populations are known to migrate across the ocean from nesting area to feeding grounds. The major nesting beaches are always found in places where the seawater temperature is greater than 25 C.

The Action Area comprises an existing manufacturing facility, not containing any such habitat. As noted above, because of its high turbidity, Chocolate Bayou has a very limited, if any, "littoral zone", that is, the zone in which sun light penetrates. This lack of sun light prevents

rooted aquatic vascular plants, including sea grasses and algae, from becoming established. In addition, the shoreline of Chocolate Bayou is marshy and dominated by wetland grasses and bushes and does not contain the sandy shores that comprise nesting habitat for Kemp's Ridley sea turtles.

Potential Impacts

Although the Action Area and Chocolate Bayou do not provide suitable nesting or feeding habitat for Kemp's Ridley sea turtles, if, speaking hypothetically, a turtle was present in Chocolate Bayou, because wastewater and storm water discharges associated with the Project will have no impact on Chocolate Bayou, and because air emissions and noise levels associated with the Project have no impact outside of the Action Area, the Kemp's Ridley sea turtle will not be impacted by the Project.

Accordingly, based on a lack of sightings, a lack of suitable nesting or feeding habitat in the Action Area or in Chocolate Bayou, and a 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 Kemp's Ridley sea turtles.

8.6.17 Leatherback Sea Turtle

Regional Sightings

Leatherback sea turtle occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been a Leatherback sea turtle sighting within the 65 square mile search area.

Habitat in Action Area or Chocolate Bayou

The leatherback sea turtle is a highly pelagic species that moves into coastal waters only during the reproductive season. Leatherbacks inhabit primarily the upper reaches of the open ocean, but they also frequently descend into deep waters from 650 to 1650 feet (200-500 m) in depth. Leatherback sea turtles are rare visitors to Texas coastal beaches.

The Action Area comprises an existing manufacturing facility, not containing any such habitat. The shoreline of Chocolate Bayou is marshy and dominated by wetland grasses and bushes and does not contain the sandy shores that comprise nesting habitat for Leatherback sea turtles.

Potential Impacts

Although the Action Area and Chocolate Bayou do not provide suitable nesting or feeding habitat for leatherback sea turtles, if, speaking hypothetically, a turtle was present in Chocolate Bayou, because wastewater and storm water discharges associated with the Project will have no impact on Chocolate Bayou, and because air emissions and noise levels associated with the Project have no impact outside of the Action Area, the leatherback sea turtle will not be impacted by the Project.

Accordingly, based on a lack of sightings, a lack of suitable nesting habitat in the Action Area or along the shores of Chocolate Bayou, and a 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 leatherback sea turtles.

8.6.18 Loggerhead Sea Turtles

Regional Sightings

Loggerhead sea turtle occurrence records were requested from the TXNDD for the Hoskins Mound 7.5 minute quadrangle map. Based on TXNDD records, there has never been a loggerhead sea turtle sighting within the 65 square mile search area.

Habitat in Action Area or Chocolate Bayou

Loggerheads were named for their relatively large heads, which support powerful jaws and enable them to feed on hard-shelled prey, such as whelks. They are found in the Gulf of Mexico, but are only occasional visitors to the Texas coast. Only minor and solitary nesting has been recorded along the coasts of the Gulf of Mexico.

The Action Area comprises an existing manufacturing facility, not containing any such habitat. Because whelks are found in high salinity areas with sea grasses or around passes, Chocolate Bayou's brackish environment with little to no sea grass would not provide suitable feeding habitat for loggerhead sea turtles. In addition, the shoreline of Chocolate Bayou is marshy and dominated by wetland grasses and bushes and does not contain the sandy shores that comprise nesting habitat for loggerhead sea turtles.

Potential Impacts

Although the Action Area and Chocolate Bayou do not provide suitable nesting or feeding habitat for loggerhead sea turtles, if, speaking hypothetically, a turtle was present in Chocolate Bayou, because wastewater and storm water discharges associated with the Project will have no impact on Chocolate Bayou, and because air emissions and noise levels associated with the Project have no impact outside of the Action Area, the loggerhead sea turtle will not be impacted by the Project.

Accordingly, based on a lack of sightings, a lack of suitable nesting or feeding habitat in the Action Area or in Chocolate Bayou, and a 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 loggerhead sea turtles.

Section 9
Conclusions

This section provides a summation of findings and recommended determination of effect (direct, indirect, and cumulative) on federally-protected species that has the potential to occur in Brazoria County, Texas.

9.1 Determination of Effect

For all of the reasons set forth above, this BA makes the following determination for species listed as threatened or endangered under ESA (and candidates for listing) that occur in Brazoria County, Texas.

Table 8
Determination of Effect on Listed Species

Common Name	Determination of Effect
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
Leatherback Sea Turtle	No Effect

Table 8
Determination of Effect on Listed Species

Common Name	Determination of Effect
Loggerhead Sea Turtle	No Effect

9.2 Interdependent and Interrelated Actions

The Project is limited to the construction and operation of an additional furnace inside the existing Chocolate Bayou facility. There are no interdependent or interrelated actions associated with this Project.

9.3 Cumulative Effects

The land use surrounding the Project is a mix of agriculture, cattle grazing, and industrial. There is the potential for future development of the surrounding area to have a cumulative impact on protected species. At this time INEOS is not aware of any plans for development on lands that surround the Project. No additional projects within the Action Area that could have an impact on protected species are planned at this time.

9.4 Conservation Measures

INEOS will utilize BACT to reduce emissions of air pollutants and, therefore, reduce the impacts to the environment.

Section 10
References

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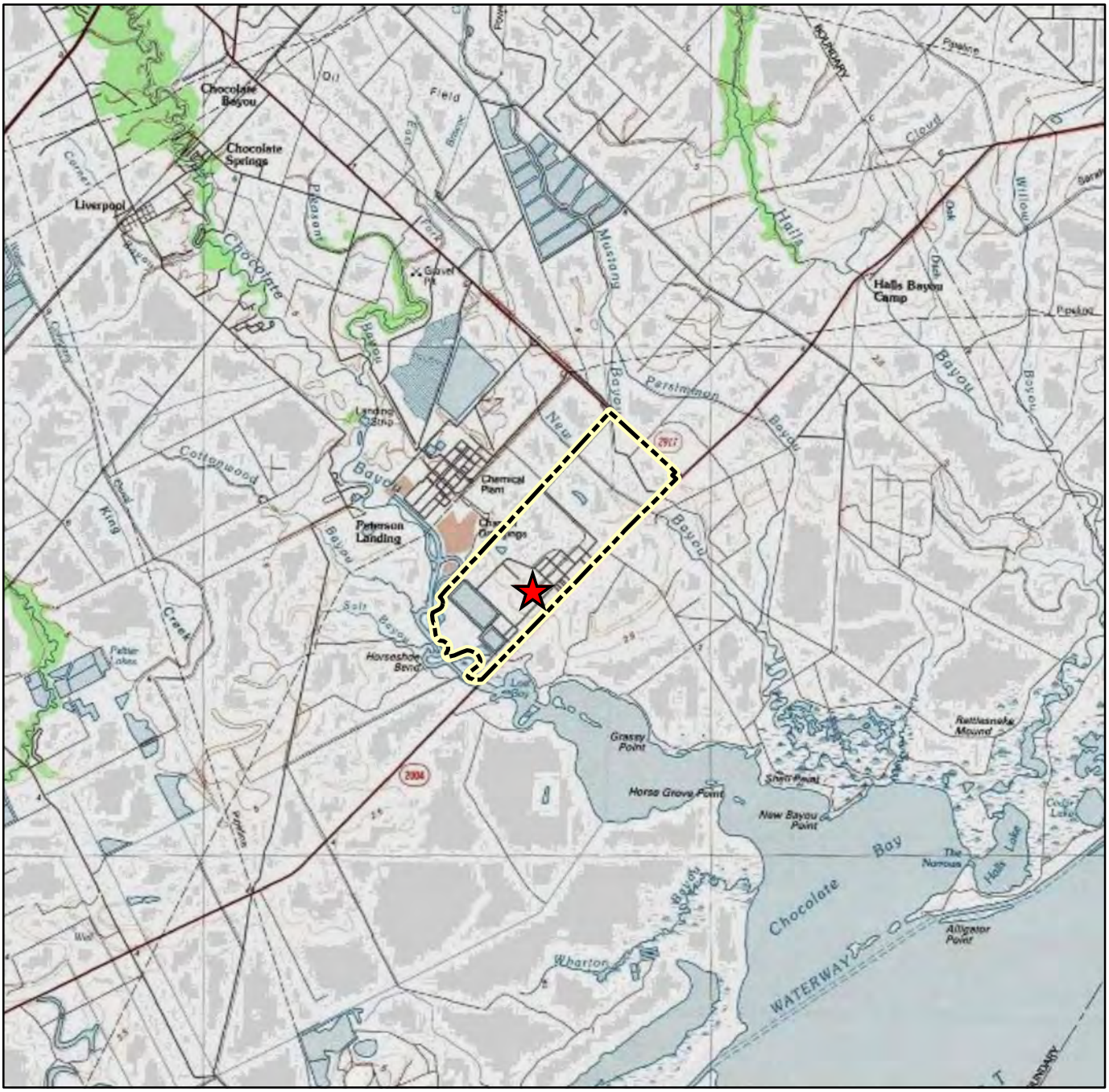
Section 11
List of Preparers

- Mike Robbins, Ecologist
- Mike Budin, Project Manager

Appendix A
Figures

TRC - GIS



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

PROJECT LOCATION

INEOS PROPERTY LINE

N

0 10,000 20,000 FEET

TRC
10011 Meadowglen Lane
Houston, TX 77042
Phone: 713.244.1000

INEOS USA LLC
CHOCOLATE BAYOU PLANT

PROJECT LOCATION
BIOLOGICAL ASSESSMENT
ALVIN, BRAZORIA COUNTY, TEXAS

DRAWN BY:	WBERRY
APPROVED BY:	MROBBINS
PROJECT NO:	192202.0000.0000
FILE NO.	192202.000.01.mxd
DATE:	APRIL 2012

FIGURE 1

TRC - GIS

BASE MAP:ESRI ONLINE DATA
BING HYBRID (2011)

CONSTRUCTION AREA
60' X 100'

N

0 300 600
FEET

TRC

10011 Meadowglen Lane
Houston, TX 77042
Phone: 713.244.1000

INEOS USA LLC
CHOCOLATE BAYOU PLANT

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

DRAWN BY:	WBERRY
APPROVED BY:	MROBBINS
PROJECT NO:	192202.0000.0000
FILE NO.	192202.000.02.mxd
DATE:	APRIL 2012

FIGURE 2

TRC - GIS

BASE MAP:ESRI ONLINE DATA
BING HYBRID (2011)

CENTROID OF
CONSTRUCTION AREA
60'T X 100' (N.T.S.)

N

0 1 2 Miles

TRC

10011 Meadowglen Lane
Houston, TX 77042
Phone: 713.244.1000

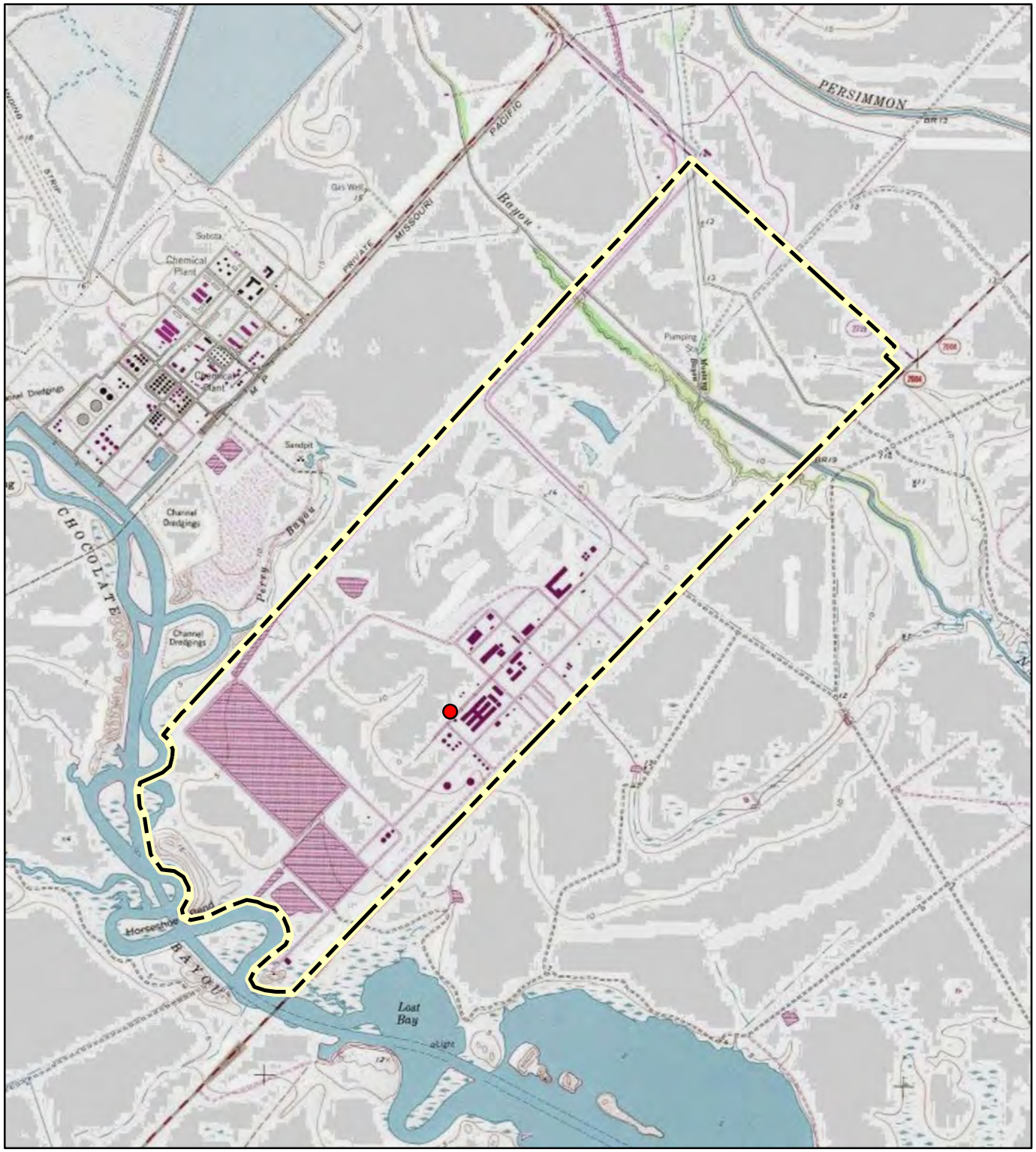
INEOS USA LLC
CHOCOLATE BAYOU PLANT

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

DRAWN BY:	WBERRY
APPROVED BY:	MROBBINS
PROJECT NO:	192202.0000.0000
FILE NO.	192202.000.03.mxd
DATE:	APRIL 2012

FIGURE 3

TRC - GIS



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

CENTROID OF CONSTRUCTION AREA 60' X 100' (N.T.S.)

INEOS PROPERTY LINE

N

1 " = 3,000 '
1:36,000

0 3,000 6,000
FEET

TRC

10011 Meadowglen Lane
Houston, TX 77042
Phone: 713.244.1000

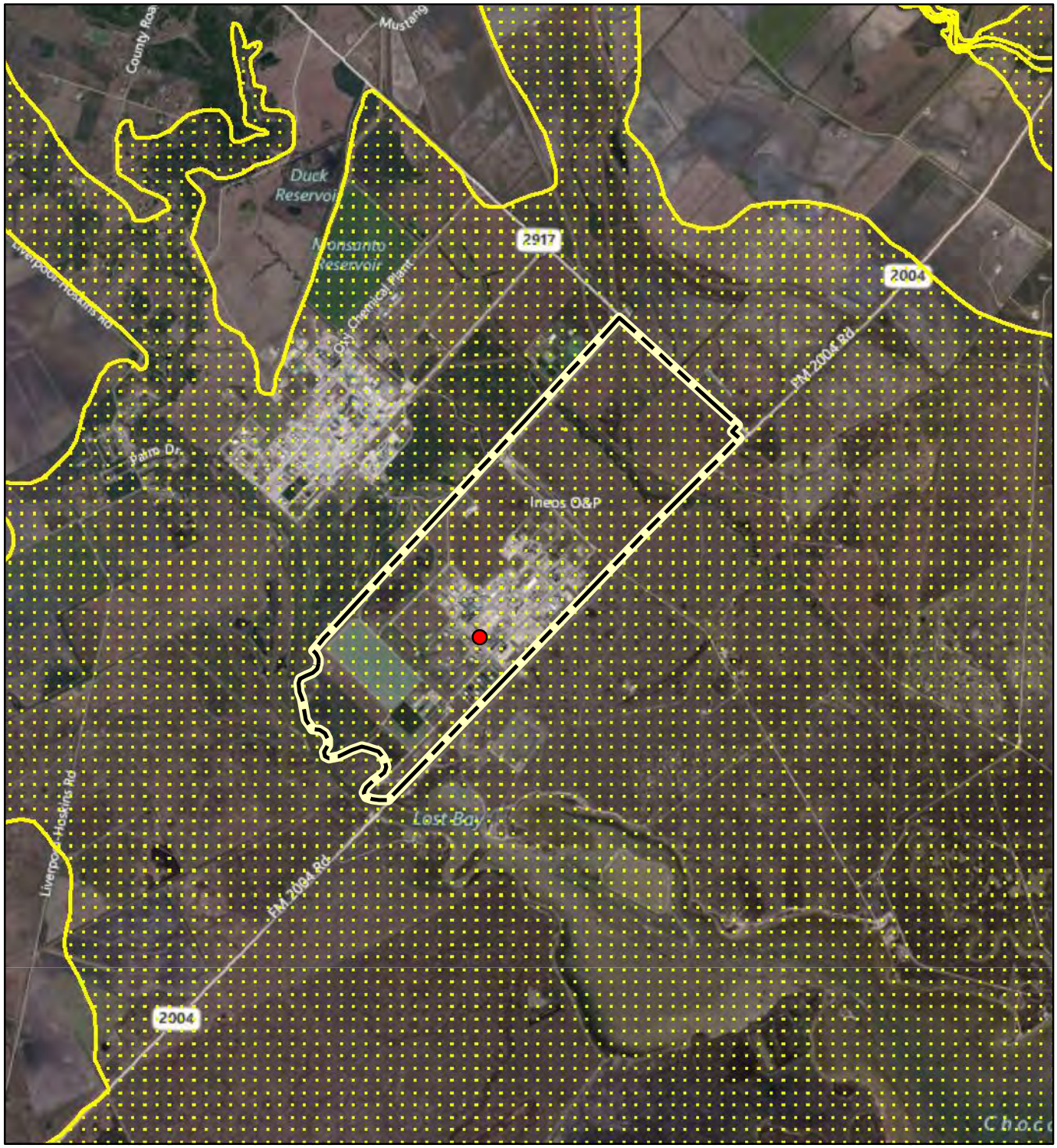
INEOS USA LLC
CHOCOLATE BAYOU PLANT

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

DRAWN BY:	WBERRY
APPROVED BY:	RHANLEY
PROJECT NO:	185864.0000.0000
FILE NO.	192202.000.04.mxd
DATE:	APRIL 2012

FIGURE 4

TRC - GIS



BASE MAP:ESRI ONLINE DATA
BING HYBRID (2011),
Q3 FLOOD DATA DERIVED FROM FEMA
FLOOD INSURANCE RATE MAPS (FIRMS)

N

1 " = 5,280 '
1:63,360

0 1 2 Miles

CENTROID OF CONSTRUCTION AREA 60' X 100' (N.T.S.)

DESIGNATED FEMA 100-YEAR FLOODPLAIN

INEOS PROPERTY LINE

TRC

10011 Meadowglen Lane
Houston, TX 77042
Phone: 713.244.1000

INEOS USA LLC
CHOCOLATE BAYOU PLANT

SURVEY AREA - 2011 AERIAL PHOTOGRAPH
FEMA FLOODPLAIN DATA - BIOLOGICAL ASSESSMENT
ALVIN, BRAZORIA COUNTY, TEXAS

DRAWN BY:	WBERRY
APPROVED BY:	RHANLEY
PROJECT NO:	185864.0000.0000
FILE NO.	192202.000.05.mxd
DATE:	APRIL 2012

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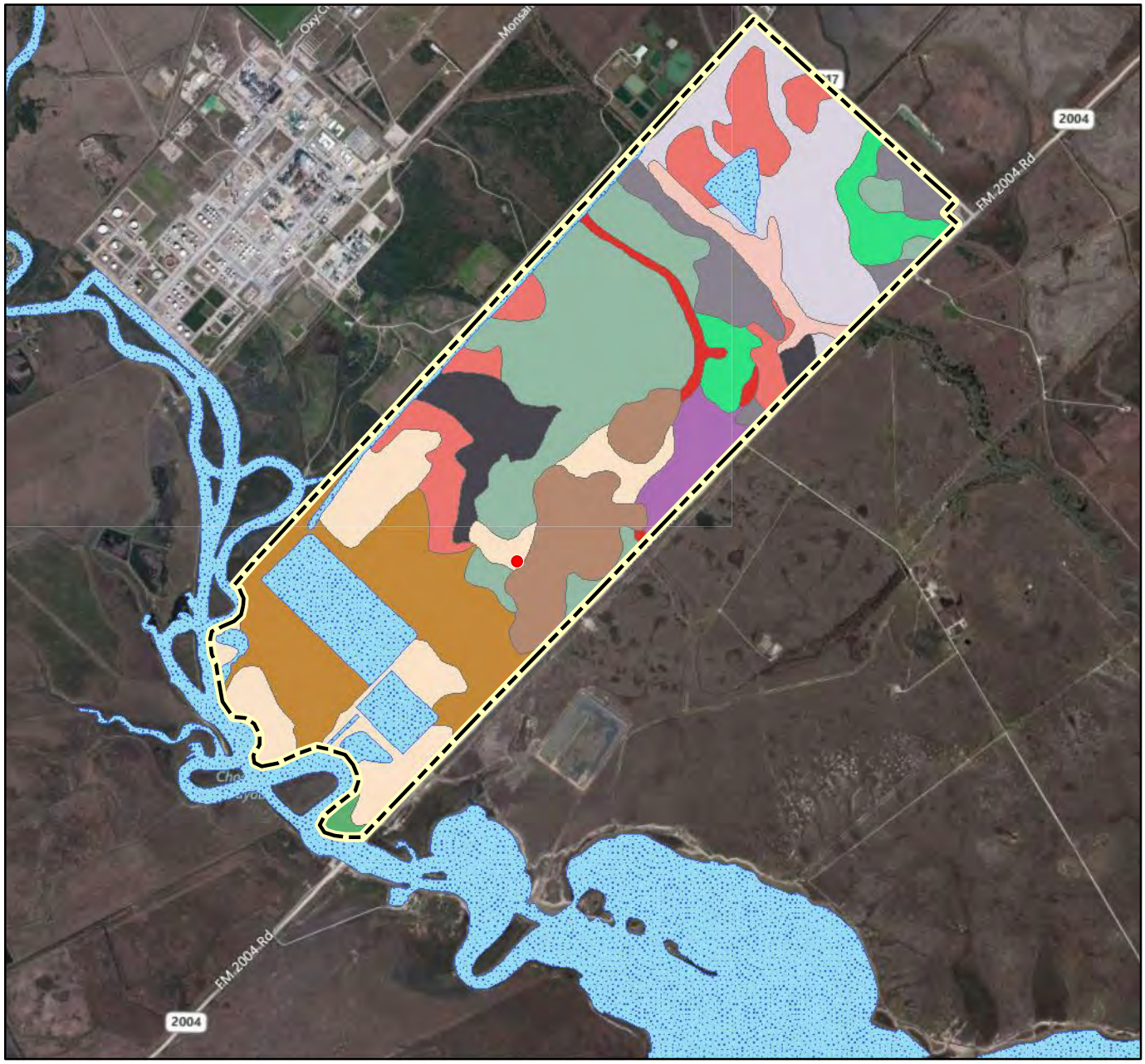
FIGURE 5

TRC - GIS



- CENTROID OF CONSTRUCTION AREA 60' X 100' (N.T.S.)
- INEOS PROPERTY LINE
- BACLIFF CLAY, 0 TO 1 PERCENT SLOPES
- BERNARD CLAY LOAM
- BERNARD-EDNA COMPLEX
- EDNA FINE SANDY LOAM, 0 TO 1 PERCENT SLOPES
- EDNA-ARIS COMPLEX
- FOLLET CLAY LOAM
- FRANCITAS CLAY
- IJAM CLAY
- IJAM-URBAN LAND COMPLEX
- LAKE CHARLES CLAY, 0 TO 1 PERCENT SLOPES
- LAKE CHARLES CLAY, 1 TO 8 PERCENT SLOPES
- LETON LOAM
- LETON-ARIS COMPLEX

N

1 " = 3,373 '
1:40,477

0 3,000 6,000
FEET

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

INEOS USA LLC
CHOCOLATE BAYOU PLANT

SOIL SURVEY MAP
BIOLOGICAL ASSESSMENT
ALVIN, BRAZORIA COUNTY, TEXAS

DRAWN BY:	WBERRY
APPROVED BY:	RHANLEY
PROJECT NO:	185864.0000.0000
FILE NO.	192202.000.06.mxd
DATE:	APRIL 2012

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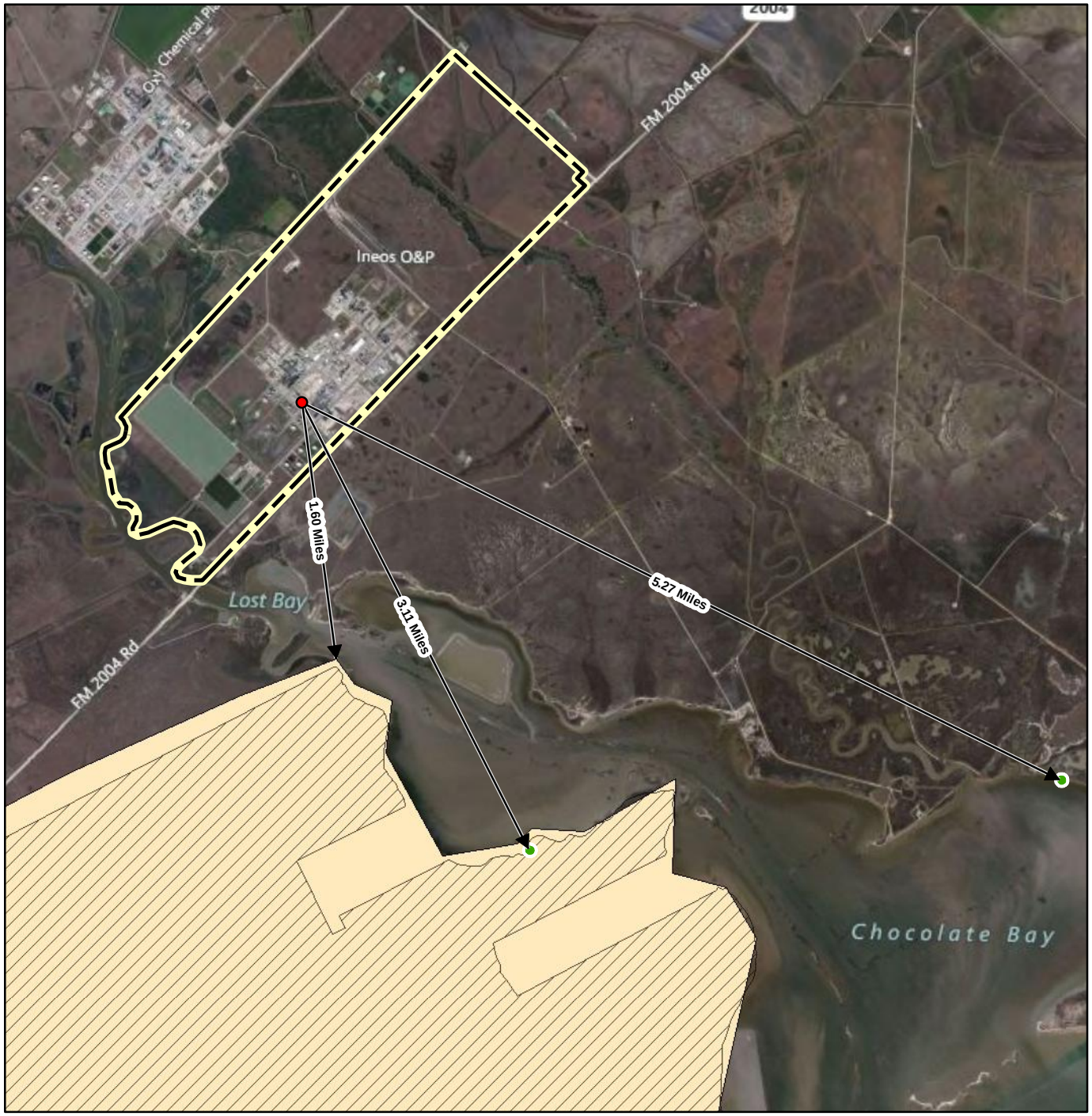
FIGURE 6

TRC - GIS



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

CENTROID OF CONSTRUCTION AREA 60' X 100' (N.T.S.)

INEOS PROPERTY LINE

BRAZORIA NATIONAL WILDLIFE REFUGE

VERTEBRATE ANIMAL

JAGUARUNDI

GREEN SEA TURTLE

N

1 " = 5,000 '
1:60,000

0 5,000 10,000 FEET

TRC

10011 Meadowglen Lane
Houston, TX 77042
Phone: 713.244.1000

INEOS USA LLC
CHOCOLATE BAYOU PLANT

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

DRAWN BY:	WBERRY
APPROVED BY:	RHANLEY
PROJECT NO:	185864.0000.0000
FILE NO.	192202.000.07.mxd
DATE:	APRIL 2012

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FIGURE 7