Essential Fish Habitat Assessment

Equistar Chemicals La Porte Complex

QE-1 Olefins Unit Expansion

La Porte, Harris County, Texas

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E.S. Executive Summary

Equistar Chemical Company (Equistar) owns and operates a chemical manufacturing complex (La Porte Complex) located in La Porte, Harris County, Texas. Equistar proposes to expand the plant and increase the production capacity with the construction of two additional cracking furnaces and associated process equipment within the existing plant footprint, immediately adjacent to nine existing cracking furnaces in the plant's QE-1 Olefins Unit. Equistar has determined that the proposed project will require a Prevention of Significant Deterioration (PSD) permit issued by the U.S. Environmental Protection Agency (USEPA) for Greenhouse Gas (GHG) emissions. In accordance with 40 CFR Part 52.21(o), the USEPA Region 6 has determined that the project is subject to compliance and the provisions of Section 7 of the Endangered Species Act (ESA).

Equistar has retained the services of URS Corporation (URS) to prepare a Biological Assessment (BA) and Essential Fish Habitat (EFH) Assessment to evaluate the potential for the proposed Equistar QE-1 Olefins Unit Expansion (Project) to affect designated EFH area and managed species adjacent to the La Porte Chemical Complex.

A review of air emissions and dispersion modeling data, expected changes in the volume and chemical composition of the wastewater effluent, wastewater effluent dilution modeling, and a review of current literature and publicly available data was conducted to determine the potential effect that the Project would have on EFH in Upper San Jacinto Bay and on the eleven listed Gulf of Mexico Fishery Management Council (GMFMC) managed species with potential for occurrence within Upper San Jacinto Bay. The proposed project will not change the structure of Upper San Jacinto Bay; changes to runoff, emissions deposition, and wastewater discharge are expected to be negligible and discountable. Further, there is no preferred habitat for any of the eleven species within the Action Area. Based on the aforementioned information, no adverse effects on EFH in Upper San Jacinto Bay, nor on the eleven listed GMFMC managed species with potential for occurrence within the Upper San Jacinto Bay, are anticipated from the Project.

1.0 Introduction

Equistar Chemical Company (Equistar) owns and operates a chemical manufacturing complex (La Porte Complex) located in La Porte, Harris County, Texas (Figure 1). Equistar proposes to expand the plant and increase the production capacity with the construction of two additional cracking furnaces and associated process equipment within the existing plant footprint, immediately adjacent to nine existing cracking furnaces in the plant's QE-1 Olefins Unit (Figure 2). Equistar has determined that the proposed project (Project) will require a Prevention of Significant Deterioration (PSD) permit issued by the U.S. Environmental Protection Agency (USEPA) for Greenhouse Gas (GHG) emissions. In accordance with 40 CFR Part 52.21(o), the USEPA Region 6 has determined that the Project is subject to compliance and the provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), as amended.

The MSFCMA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires Federal agencies to consult with the National Marine Fisheries Service (NMFS) on activities that may adversely affect Essential Fish Habitat (EFH). As defined by 16 USC 1802(10), EFH constitutes those aquatic and associated land areas, specifically enumerated as the water way substrate, water column, and water properties required for any life cycle stage for aquatic organisms.

Equistar has retained the services of URS Corporation (URS) to prepare a Biological Assessment (BA) and EFH Assessment to evaluate the potential for the Project to affect designated EFH area adjacent to the La Porte Chemical Complex. URS' *Biological Assessment for the Equistar Chemicals La Porte Complex QE-1 Olefins Unit Expansion* dated September 2012, evaluated the Project 's potential to effect federally-protected threatened and endangered (T&E) species and/or their potential habitat (URS 2012).

2.0 Project Description

2.1 Project Location

The Project is located at the Equistar La Porte Complex, approximately 2.3 miles west-northwest 300° of the intersection of Texas State Highways 225 and 146N in La Porte, Texas (Figure 1). The site is located on the La Porte United States Geological Survey (USGS) Quad, at 29.708° north latitude and 95.061° west longitude. The La Porte Complex is approximately 639 acres and is broken up into two operating areas and each area operates under a unique Texas Commission on Environmental Quality (TCEQ) Regulated Entity Number (RN) and Customer Number (CN):

- Equistar Facility: Olefins Unit and Polymers Units operated by Equistar Chemicals, LP (RN: 100210319, CN: 600124705), and

Acetyls Facility: Glacial Acetic Acid and Vinyl Acetate Monomer Units operated by LyondellBasell Acetyls, LLC (RN: 100224450, CN: 603674862).The National Land Cover Database (NLCD) classifies the Project site as primarily Developed High Intensity, Developed Medium Intensity, Developed Low Intensity, and Developed Open Space. Small areas of undeveloped land in the northwest and southwest portions of the Project area are classified as mixed forest and pasture/hay (Multi-Resolution Land Characteristics Consortium 2012). The majority of the La Porte Complex is concrete, caliche, or asphalt. Construction is proposed in industrial process areas and other developed areas of the complex. The La Porte Complex includes approximately 3 acres of the Upper San Jacinto Bay, primarily comprised of the complex's marine berth. The Upper San Jacinto Bay is a tidally-influenced side bay located on the west side of the Houston Ship Channel and San Jacinto River. The Houston Ship Channel supports heavy industrial use including consistent boat and barge traffic, connecting into Galveston Bay and the Gulf of Mexico.

2.2 Project Purpose

The purpose of the Project is to expand the existing Equistar QE-1 Olefins Unit by adding two cracking furnaces immediately adjacent to the nine existing cracking furnaces currently in operation at the La Porte Complex (Figure 2). The following additions to the QE-1 Olefins Unit are proposed:

- Two new ethylene cracking furnaces (EPNs: QE1010B and QE1011B);
- Two new selective catalytic reduction (SCR) systems, one for each of the new cracking furnaces;
- A new decoking drum (EPN: QE1416FB);
- New fugitive components in both VOC and ammonia service (added to EPN: QEFUG);
- A new group of analyzers and their vents (EPN: QEANALYZ4);
- Two additional cells added to the cooling tower (EPN: QE7801U);
- Additional maintenance, startup, and shutdown (MSS) emissions associated with the periodic clean-out of the new and modified process equipment; and
- Ammonia storage tanks and a new ammonia loading scrubber, (EPN: QENH3SC).

2.3 Construction Information

New construction of the proposed ethylene cracking furnaces (Furnace 10 and 11), associated infrastructure, and auxiliary equipment will take place within the boundaries of the La Porte Complex in an area approximately 170 feet by 250 feet, which is currently a caliche parking lot. This area is labeled as the Furnace Area (furnace site) on Figure 2.

Although the Project will require the erection of new process equipment and modification to existing process units, physical ground disturbance will be limited to the construction of the proposed furnace site. Equistar has also identified several areas of the La Porte Complex that will be used temporarily during construction of the Project, such as: a furnace contractor laydown and fabrication area, new equipment laydown, vendor trailers, and a fabrication area. These areas are also labeled on Figure 2.

The projected construction schedule is:

- Furnace Erection 3/1/13 to 5/7/14
- Compressor Rebuild 3/1/14 to 6/30/14
- Equipment Replacements 3/1/14 to 6/30/14
- Cooling Tower Cell Erection 3/1/13 to 9/30/13

2.4 Operations

Ethylene Cracking Process

The two ethylene cracking furnaces (Furnace 10 and Furnace 11) will be added onto the existing hydrocarbon cracking train consisting of nine furnaces, also referred to as heaters. The role of the cracking system is to convert less valuable saturated hydrocarbons into the highly desirable basic building blocks of the petrochemical industry (ethylene, propylene, and butenes, and butadiene). The conversion takes place in the presence of dilution steam by rapidly raising the hydrocarbon/dilution steam temperature to cracking temperatures. The extreme temperature acts to destabilize the structure of the hydrocarbon molecule and initiate the rearrangement of the hydrocarbon molecular bonds.

Decoking of the new furnaces will be done through new equipment installed as part of this expansion project. Coke forms inside process tubing and must be removed due to the restriction it creates and its insulating properties. Decoking emissions result from the steam/air decoking process. This causes both erosion of the coke and combustion of the coke. Emissions include carbon dioxide (CO_2), carbon monoxide (CO), and particulate matter (PM).

Water Use

Raw water is supplied by the Coastal Industrial Water Authority (CIWA) to the Equistar La Porte Complex, including the QE-1 ethylene manufacturing unit. CIWA takes water from the Trinity River. Equistar estimates an approximately 1.0 million gallons per day (MGD) increase in fresh water intake (from 4.0 MGD to 5.0 MGD) to make up for losses and the increase in blowdowns associated with the new equipment.

2.5 Action Area

The Action Area of potential effect has been defined as “all areas to be affected directly or indirectly by the federal action and not merely the immediate area involve in the action” according to federal regulation (50 CFR 402.2). For the basis of this EFH Assessment, the project’s Action Area was defined by the following parameters: 1) areas where ground disturbing activities would occur within the La Porte Complex; 2) areas where criteria air pollutants exceed significant impact levels (SIL); and 3) the wastewater effluent drainage channel and dilution area within the receiving water body, a portion of the Upper San Jacinto Bay immediately adjacent the La Porte Complex boundary (Figure3).

Although the Project will require the erection of new process equipment and modification to existing process units, physical ground disturbance will be limited to the construction of the proposed furnace site. Equistar has also identified several areas of the La Porte Complex that will be used temporarily during construction of the proposed project, such as: a furnace contractor laydown and fabrication area, new equipment laydown, vendor trailers, and a fabrication area. Based on the previous conversion and continual use of these areas for industrial use, these additional areas are not included in the project‘s Action Area.

The analysis of protected species likely to be affected by the Project focused on impacts within the Project site’s Action Area, which is approximately 66 acres within property boundary and 3 acres of the

Upper San Jacinto Bay adjacent to the complex's marine loading dock. The Action Area within the La Porte Chemical Complex boundary includes land surfaces and the outgoing unnamed tidal ditch extending from Outfall #004. Land use and plant community types within the Action Area include process areas (fill or concrete), marshland, maintained grasses, mixed woodland, riverine, and open water. A significant portion of these habitats have historically been constructed, manipulated, or otherwise impacted by industrial activities.

3.0 Essential Fish Habitat

MSFCMA (16 United States Code [U.S.C.] 1801-1882) provided added measures to describe, identify, and minimize adverse effects on EFH (50 CFR Part 600). The Gulf of Mexico Fishery Management Council (GMFMC) retains the responsibility for management of EFH species in Texas, Louisiana, Mississippi, and Florida. By definition, EFH includes those waters and substrate necessary for fish and shellfish spawning, breeding, feeding, and growth through maturity. "Waters" include aquatic areas and associated physical, chemical, and biological properties currently or historically utilized by the fisheries. "Substrate" includes any sediment, hard bottom, structures underlying the waters, and associated biological communities (GMFMC 1998). As defined by 16 USC 1802(10), EFH constitutes those aquatic and associated land areas, specifically enumerated as the water way substrate, water column, and water properties required for any life cycle stage for aquatic organisms.

3.1 EFH within the Project Action Area

According to the NMFS EFH Mapper, EFH has been designated for species throughout the San Jacinto River, Upper San Jacinto Bay, and Galveston Bay, and is inclusive of the small portion of the Upper San Jacinto Bay within the Project Action Area. The EFH mandate applies to all species managed under the GMFMC Fishery Management Plans, including various types of reef fishes, shrimp, and coastal migratory pelagic species that can occur in EFH in the Upper San Jacinto Bay. Table 1 provides a list of EFH designated species identified by the GMFMC in Upper San Jacinto Bay (NOAA-NMFS 2012). Designated EFH for these species was identified by the GMFCA (GMFCA 2004). Details regarding specific habitat requirements for each of these species are provided in Section 3.2. The EFH within the Project Action Area includes primarily open water habitat with small areas of possible herbaceous wetland.

Table 1 - Species with Essential Fish Habitat in the Upper San Jacinto Bay

Category	Common Name	Species Name	Life Stage
Gulf of Mexico Shrimp	Brown shrimp	*Penaeus aztecus*	Post Larval Juvenile
	White shrimp	*Penaeus setiferus*	Post Larval Juvenile
Gulf of Mexico Red drum	Red drum	*Sciaenops ocellatus*	Larval Post Larval Juvenile Adults

Category	Common Name	Species Name	Life Stage
Gulf of Mexico Reef fishes	Gray snapper	*Lutjanus griseus*	Juvenile
	Dog snapper	*Lutjanus jocu*	Juvenile
	Lane snapper	*Lutjanus synagris*	Juvenile
Migratory Species	Bull shark	*Sphyrna leucas*	Neonate Juvenile
	Scalloped hammerhead	*Sphyrna lewini*	Neonate
	Bonnethead shark	*Sphyrna tiburo*	Neonate Juvenile
	Blacktip shark	*Carcharhinus limbatus*	Neonate Juvenile
	Atlantic sharpnose shark	*Rhizoprionodon terraenovae*	Neonate Adult

3.2 Species Descriptions

Brown Shrimp *(Penaeus aztecus)*

Brown shrimp are a common, commercially fished species found within the Gulf of Mexico. Adult tails are characterized by red, dark green, and on occasion light blue pigmentation and rounded uropods. The upper midline of the head and the lower region of the abdomen are broadly grooved. Eggs are demersal and approximately 0.27 mm in diameter. Post larvae are approximately 13 mm in length and maximum adult length is approximately 195 mm for males, 236 mm for females.

Brown shrimp are opportunistic omnivores that feed on algal species and small invertebrates. Brown shrimp utilize both estuarine and marine habitats during various life stages, but are especially dependent on near-shore estuaries and littoral zones. Brown shrimp populations thrive when associated with vegetated habitats, and as a result areas with extensive wetland systems will yield larger harvestable populations than areas with less wetland area. In addition to vegetated habitats, brown shrimp post larvae and juveniles can be found in areas with silty sand and non-vegetated mud bottoms. Post larvae and juveniles have been observed in estuaries ranging from 0 to 70 parts per thousand (ppt) in salinity. Sub-adults can be found across a wide range of habitat from estuaries to the continental shelf (Haas et al. 2004, SMS 2012).Adult brown shrimp spawn offshore during flood tides in the spring and summer, with peak spawning in October and November. Hatching occurs within 24 hours. Post larvae typically migrate during late winter and early spring to estuaries and remain there until spawning. Brown shrimp range from Massachusetts to the Yucatan. This species is considered abundant throughout its range and typically have a high catch rate regulation. Brown shrimp are considered rare in the HSC and Upper San Jacinto Bay (Seiler et al. 1991).

White shrimp *(Penaeus setiferus)*

White shrimp are typically bluish white with black specks. The uropods are black near the base with bright yellow and green margins. White shrimp have longer antennae and rostra than brown or pink shrimp. Larvae are approximately 0.3 mm long, post-larvae are approximately 7 mm long, and maximum adult length is approximately 118 mm in males, 140 mm in females.

White shrimp are omnivorous, with a diet that includes zooplankton and phytoplankton (SMS 2012). White shrimp utilize both estuarine and marine environments during their life and have been collected at depths up to 80 m in the Gulf of Mexico. They are most dependent, however, on estuaries and the inner littoral zone and prefer shallow, brackish wetlands. Post-larval and juvenile white shrimp inhabit primarily areas with mud or peat bottoms and relatively heavy amounts of decaying organic matter or vegetative cover; juveniles are also frequently found in tidal rivers and tributaries. Adult white shrimp prefer soft mud or silt bottoms, and their range extends offshore (GMFMC 1998).

Offshore spawning occurs from March to September within the Gulf of Mexico. Eggs hatch within 10-12 hours. Upon hatching, white shrimp will go through several larval stages before entering the post-larval stage and migrating to estuarine nursery grounds in late May and June, approximately 2 weeks after spawning (SMS 2012).

White shrimp are considered highly abundant throughout their range. Reports have indicated that adult white shrimp are rare to common in Galveston Bay, while juvenile white shrimp abundant (CCMA 2011). White shrimp have moderate habitat usage of the Upper San Jacinto Bay and HSC (GMFMC 2004).

Red Drum *(Sciaenops ocellatus)*

Red drums are large fish that can be identified by a single black spot on the upper part of the tail base and an overall coloration ranging from nearly black to silver. The Texas record weight for red drum is 59.5 pounds (TPWD 2012). Red drum diet changes throughout their life cycle: Larvae primarily feed on detritus while juveniles and adults are predatory. Juvenile diet consists of small crabs, shrimp, and marine worms, while adults consume larger crabs, shrimp, and small fish. Red drums are preyed upon by birds, larger fish, and turtles and are also important recreational fishing species.

Red drum habitat is broad and includes both marine and estuarine areas along the coast. They are known to be found in areas with submerged vegetation and soft mud along jetties, and among pier pilings over a variety of substrates including mud, sand, and oyster reef (GMFMC 1998). Juveniles are typically limited to near-shore areas including bays, marshes, and intertidal zones and are preferential to shallow areas with grassy or muddy bottoms. Adults migrate and can be found further from shore in the Gulf of Mexico and are known to forage in shallow bay bottoms and oyster reefs (GMFMC 2004).

Red drums reach sexual maturity within 3-4 years. In the Gulf of Mexico, spawning occurs from August to October near shorelines. Eggs incubate for 24 hours before hatching. Newly hatched larvae are transported to shallow, near-shore areas by the tide.

Red drum range includes the Atlantic Ocean and near-shore waters from Massachusetts to Mexico. Although adult and juvenile red drums are common in Galveston Bay throughout the year they have a relatively low usage pattern for the Upper San Jacinto Bay and are virtually absent from the HSC (GMFMC 2004, Seiler et al. 1991).

Gray snapper (*Lutjanus griseus*)

The gray snapper, also commonly known as the mangrove snapper, has two conspicuous canine teeth in the front of the upper jaw and dark or reddish borders outlining the dorsal fins. Young gray snappers typically have a black horizontal bar that extends from the snout through the eye. The soft dorsal fin is rounded and the caudal fin is marginate. Gray snappers can grow up to 35 inches in length and 40 pounds. Gray snappers are predatory fish with diets consisting of crustaceans and small fish. Adults are found both near-shore and offshore at depths between 90 and 600 feet over hard-bottomed substrates including rocks, ledges, wrecks, and coral reefs. Juveniles utilize estuaries with fluctuating salinity near tidal creeks, mangroves, and grass beds and are also known to be associated with physical structures such as docks, pilings, and jetties (GMFMC 2010).Gray snappers spawn offshore between June and August. Depending on size, a single female can produce up to 5.9 million eggs (SMS 2012).Gray snappers range in the Atlantic Ocean extends from Massachusetts to Brazil. A robust, concentrated population can be found along the coast of Florida (FMNH 2010).

Dog snapper *(Lutjanus jocu)*

Dog snappers are brown fish with lighter coloration along the sides. A single pair of canine teeth is notably enlarged and is visible even when the mouth is closed. Adults typically develop a pale triangle and a light blue interrupted line below the eye and can reach a weight of 30 pounds. Adult dog snappers feed on fish, mollusks, and crustaceans and inhabit offshore rocky areas and reefs at depths of 16 to 100 feet. Juveniles inhabit estuaries and are known to occur in near-shore portions of freshwater rivers (FMNH 2010). Dog snappers spawn in early March, primarily in waters off Jamaica and the northeastern Caribbean (FMNH 2010). Eggs and larvae are then dispersed by ocean currents towards estuaries and other near-shore areas where post-larvae will develop into juveniles. Juveniles migrate toward coral reefs or rocky bottom habitats where they will remain as adults. Dog snappers range from Massachusetts to Brazil.

Lane snapper *(Lutjanus synagris)*

Lane snappers have a rounded anal fin which distinguishes it from other related species. As adults, lane snappers can reach 60 cm in length. Coloration ranges from silver to reddish and lane snappers typically have a green dorsal surface with dark vertical bars. A series of 7 – 10 yellow horizontal stripes extend along the sides with diagonal yellow line above the lateral line. A softened black spot is present above the lateral line. Lane snappers are euryphagic carnivores and are preyed upon by humans, sharks, and other large fish. They typically inhabit waters that range in temperature from 16.1 – 28.9 C. Adult lane snappers are found offshore in water with salinities of approximately 35 ppt. Adults can be found over all substrate types, but may have a preference for sandy or rocky bottoms (Vergara 1978). Juveniles inhabit vegetated estuaries with a fluctuating tidal cycle.

Lane snappers spawn offshore from March to September. A single female can lay up to 990,000 eggs which take 23 hours to hatch. The eggs are pelagic and are approximately 0.03 inches in diameter.

Lane snappers are found in the Atlantic Ocean from North Carolina to Brazil. Robust populations of lane snappers are found by Antilles, Panama, and on the northern coast of South America. Reef fish have relatively low habitat usage in the Upper San Jacinto Bay and HSC (GMFMC 2004).

Scalloped hammerhead (*Sphyrna lewini*)

Scalloped hammerhead sharks have a distinguishing indentation on the front margin of their broad heads and have two more indentations that flank the main central indentation on the front margin. The anal fin is deeply notched on its posterior margin. The coloration is generally a bronze tone with a pale underside. Juveniles have dark pectoral, lower caudal, and second dorsal fin tips; adults only retain the dark coloration on the pectoral fin. Males can reach approximately 6 feet and 64 pounds, and females can reach approximately 8 feet and 180 pounds. This species can live for over 30 years.

Scalloped hammerheads are a coastal pelagic semi-oceanic species that forms large schools. They are predatory with a diet consisting of fish and invertebrates. Scalloped hammerheads are viviparous with a gestational period of 11 months producing a litter of 12-38 pups. Neonates inhabit estuaries and utilize them as nursery grounds. Scalloped hammerheads are considered circum-global and are typically found in warm coastal waters or near tropical seas (FMNH 2010). The Atlantic Ocean range is from New Jersey to Brazil, including the Gulf of Mexico.

Bonnethead shark (*Sphyrna tiburo*)

Bonnethead sharks are distinguished by a shovel / bonnet-shaped head that is relatively flat. They are gray in color, lighter ventrally, with occasional dark spots along the sides of the body. Other distinguishing characteristics include a first dorsal fin that begins posterior to the base of the pectoral fins, and the absence of an air bladder (FMNH 2010). Maximum adult length is approximately 4 feet.

Bonnethead sharks form schools and inhabit continental shelves, shallow bays, and estuaries where they feed upon small fish and invertebrates. They are typically found in water depths of 32 feet to 262 feet. Bonnethead sharks are thought to spawn from spring to early summer. The species viviparous and gestates for approximately 5 months, giving birth in shallow waters in late summer to early fall. Bonnethead sharks are restricted to warm waters and the Northern hemisphere. They can be found in the Gulf of Mexico from spring through autumn, but are considered relatively rare from the Gulf of Mexico to Brazil (FMNH 2010).

Blacktip shark (*Carcharhinus limbatus*)

Blacktip sharks are distinguished by moderately long, pointed snouts, dark tips on their anal fins, and a distinctive white band extends across the flank. Coloration is typically dark gray/blue dorsally and laterally and with white ventrally. Pelvic dins are unmarked and there is no interdorsal ridge. Maximum adult size is approximately 5 feet in length and 40 pounds.

Blacktip sharks prey upon fish and crustaceans and can be found in near-shore and offshore habitats. Sightings have occurred in near-shore bays, mangrove swamps, and estuaries, as well as in deep offshore waters. This species is viviparous and with a gestational period of 11 months. Females utilize estuaries during the late spring to early summer as birthing grounds. Young blacktip sharks inhabit these nursery estuaries for the first few years of their lives. Blacktip sharks are found in tropical and subtropical waters. The Atlantic range extends from Nova Scotia to Brazil. Blacktip sharks are abundant in the Gulf of Mexico and Caribbean (FMNH 2010).

Bull shark (*Carcharhinus leucas*)

Bull sharks are predatory fish that consume fish, invertebrates, mammals, reptiles, and birds. They lack an interdorsal ridge, but have robust, blunt snouts and large, angular pectoral fins. Gray coloration dorsally fades to lighter pigmentation ventrally. Younger bull sharks have black tips that fade as they age. Maximum adult size is approximately 12 feet in length and 500 pounds (FMNH 2010).

Bull sharks inhabit shallow coastal waters that are typically less than 100 feet deep. Spawning and birthing occur year-round, and viviparous females give birth to litters consisting of 1-13 pups. Neonates and juveniles inhabit coastal lagoons, river mouths, and low-salinity estuaries. Bull sharks are found in tropical to subtropical coastal waters worldwide and occasionally can be seen in some freshwater lakes (FMNH 2010).

Atlantic sharpnose shark (*Rhizoprionodon terraenovae*)

Atlantic sharpnose sharks have a distinguishing long snout and a first dorsal fin that is located over the pectoral rear fins. They are gray dorsally and adults typically have white spots along the sides. Young sharpnose sharks have distinguishing black edges on the dorsal and caudal fins.

Atlantic sharpnose sharks prey on fish and invertebrates and inhabit tropical offshore waters, estuaries, and harbors. They are capable of tolerating low salinity levels, but cannot inhabit freshwaters. Sharpnose sharks form schools that are sexually segregated during migration seasons. Spawning occurs during the spring with viviparous females gestating for approximately 11 months and giving birth to litters of 4-7 pups (FMNH 2010). Atlantic sharpnose sharks range from New Brunswick to Brazil including the Gulf of Mexico.

3.3 Habitat Areas of Particular Concern

Habitat Areas of Particular Concern (HAPC) are geographic sites that fall within the distribution of EFH for federally protected species. HAPCs are areas of special importance that may require additional protection from adverse fishing effects. Specific to fishery actions including recreational and commercial, HAPCs are areas within EFH that are rare and are either ecologically important, sensitive to disturbance, or may be stressed. According to the NMFS EFH Mapper, there are no EFH HAPCs identified within, or adjacent to, the Action Area (NOAA-NMFS 2012).

4.0 Air Quality Assessment

Equistar conducted dispersion modeling of the proposed emissions of air pollutants from the proposed expansion project in accordance with USEPA Prevention of Significant Deterioration (PSD) permit requirements. The objective of the modeling was to demonstrate that the total concentration, including an appropriate background, would not exceed the applicable NAAQS and PSD Increment. The project is subject to PSD review for nitrogen oxide (NO_x), CO, and PM/PM_{10}/$PM_{2.5}$. The model parameters specified for the modeled location, such as meteorological data, rural versus urban dispersion coefficients, and receptor grid are discussed below. Modeling was performed using the regulatory default options, which include stack heights adjusted for stack-tip downwash, buoyancy-induced dispersion, and final plume rise. Air emissions resulting from the Project are discussed in detail in the URS' *Biological Assessment* dated September 2012 for the proposed project (URS 2012).

Table 2 shows the maximum predicted concentrations due to the expansion project for each pollutant and averaging period. It should be noted these are not total ambient concentrations. These are predicted increases in ground level concentrations due to new emissions from the proposed project.

Table 2 – Maximum Predicted Air Emission Concentrations

Pollutant	Averaging Period	Highest Modeled Concentration (µg/m^3)	Modeling Significance Level (µg/m^3)	Significant
CO	1-hour	503.93	2,000	NO
	8-hour	276.56	500	NO
PM_{10}	24-hour	1.158	5	NO
$PM_{2.5}$	24-hour	1.158	1.2	NO
	Annual	0.190	0.3	NO
NO_2	1-hour	6.963	7.5	NO
	Annual	0.132	1	NO

Based on the modeling, there were no concentration values that exceeded the SIL outside the La Porte Complex. A significant impact level (SIL) is a concentration that represents a *de minimis*, or insignificant, threshold applied to PSD permit applicants. The SIL is a measurable limit above which a source may cause or contribute to a violation of a PSD Increment for a criteria pollutant.

Additional modeling was conducted to determine if any criteria pollutant might exceed SILs within the boundaries of the La Porte Complex. Particulate matter is predicted to exceed SILs within the property boundary, near the cooling towers (Figure 4). Therefore, it is reasonable to assume that impacts to EFH and designated, managed species outside of the area determined to exceed SILs for PM are unlikely.

4.1 Nitrogen

The potential impacts of airborne nitrogen dioxide on aquatic ecosystems including acidification and eutrophication were considered. The effects of acidification on water quality, whether introduced by direct acid deposition or leaching from adjacent terrestrial ecosystems, include increased acidity, reduced acid neutralization capacity, hypoxia, and mobilization of aluminum. Given the low concentration of airborne pollutant over large volumes of surface waters, it is reasonable to assume the emission resulting from the expansion project will not affect surface water pH from airborne nitrogen. Therefore, the increase in nitrogen is considered insignificant.

4.2 Particulate Matter

The potential impacts to EFH from the increase in PM were considered. Nitrates and sulfates are the PM constituents of greatest and most widespread environmental significance. Other components of PM, such as dust, trace metals, and organics can at high levels affect plants and other organisms. The low concentration of PM over a relatively large volume of water would not be expected to cause changes in pH or eutrophication that would adversely impact to protected species using these habitats.

5.0 Water Quality Assessment

Equistar is authorized to treat and discharge wastes from the La Porte Complex under Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0004013000. The La Porte Complex is currently subject to effluent limitations, monitoring requirements, and other conditions described in the permit. The La Porte Complex process wastewaters undergo primary and secondary treatment and disinfection prior to discharge from Outfall #004. The proposed expansion project would increase the treated effluent flow for Outfall #004 from 0.5 to 0.6 MGD and increase the cooling tower blowdown from 0.3 to 0.4 MGD. Water quality at the outfall is currently maintained within all permit limits. The proposed increase in water discharge will be subject to the current permit limitations. The discharge will remain within the permitted limitations of 1.811 MGD average daily discharge. The project will not require any modifications to the existing TPDES permit.

According to the TPDES permit the existing wastewater Outfall #004 discharges to an unnamed ditch, thence to an unnamed tidal ditch which empties into Upper San Jacinto Bay Segment No. 2427. Segment No. 2427 of the Upper San Jacinto Bay is currently listed on the State's inventory of impaired and threatened waters, Texas 2006 Clean Water Act Section 303 (d) list for elevated levels of dioxin, polychlorinated biphenyls (PCBs), and pesticides in fish tissue. The discharge from the La Porte Complex does not contain more than 0.6 ug/L of PCBs and does not contain dioxin or pesticides. The proposed project will not elevate dioxin, PCB, or pesticide concentrations in the impaired segment.

The unnamed ditch from Outfall #004 is expected to have no significant aquatic life use, and the unnamed tidal ditch to Upper San Jacinto Bay is expected to be utilized by aquatic life. The Upper San Jacinto Bay is expected to be utilized by aquatic life and contact recreation.

Based on a maximum permitted discharge, an assessment of the aquatic life impacts that would be associated with wastewater from the facility was performed using the TCEQ TexTox Menu 9 model. This model is used to calculate effluent discharge limitations to maintain the surface water quality standards based upon the most recent in stream criteria established in 30 Texas Administrative Code (TAC) 302.6 (c) and (d). Numerical water quality criteria were established by the TCEQ for specific contaminants where adequate toxicity information was available and have the potential to adversely impact the water in the state. Applicable criteria were developed in accordance with current USEPA guidelines for calculating site-specific water quality criteria. The current permitted water quality discharge limitations were created from the results of a series of effluent sampling as required for the most recent permit amendment. Mixing zone and toxicological assumptions are built into the model. Potential toxic effects on aquatic life, resulting from the wastewater discharge, were established by the TCEQ for specific toxic compounds where adequate toxicity information is available and that have the potential for exerting adverse impacts on water in the state. The appropriate criteria for aquatic life protection were derived in accordance with current USEPA guidelines for developing site-specific water quality criteria. The average monthly sampling of biological oxygen demand (BOD), pH, total suspended solids (TSS), total organic carbon (TOC), and oil and grease are shown in Table 3. The current discharge is within and is anticipated to stay within the authorized levels set forth by a TPDES permit (Table 3 and 4). The effluent quality from the proposed project is expected to be approximately the same as the current discharge for the following reasons: the nature of the process is not changing, only the amount of products, especially the lighter gases, that are produced, and the current wastewater treatment facility is under loaded. The wastewater is synthetically augmented to maintain the appropriate biomass for effective secondary treatment. With the expanded wastewater, the amount of augmentation will be reduced to give similar treatment.

Table 3- Equistar-La Porte Complex Parameter Concentrations with Permit Limits in Parenthesis

Parameter	BOD	pH	TSS	TOC	Oil & Grease
(lbs/day)	(848)	(6.0-9.0)	(1878)	(831)	(106)
12/01/11-12/31/11	38	7.1-8.0	54	161	13
01/01/12-01/31/12	162	6.7-7.9	284	322	15
02/01/12-02/29/12	50	7.0-8.1	224	261	18
03/01/12-03/31/12	40	7.1-8.0	95	159	11
04/01/12-04/30/12	35	7.0-8.0	70	172	11
05/01/12-05/31/12	35	7.2-8.3	159	153	69

Table 4-Permitted Concentrations vs. Sampled Concentrations from 2012 vs. Anticipated Concentrations

Pollutant	Permit Limits (ug/L)	2012 Sample Results (ug/L)	Anticipated Sample Results (ug/L)
Acenaphthene	48.10	0.78	0.78
Acenaphthylene	48.10	0.95	0.95
Acrylonitrile	43.74	9.29	9.29
Anthracene	48.10	0.77	0.77
Benzene	110.90	2.07	2.07
Benzo(a)anthracene	3.24	0.58	0.58
3,4-Benzofluoranthene	49.76	0.63	0.63
Benzo(k)fluoranthene	48.10	0.33	0.33
Benzo(a)pyrene	3.24	0.52	0.52
Bis(2-ethylhexyl)phthalate	227.56	1.03	1.03
Carbon tetrachloride	30.97	2.76	2.76
Chlorobenzene	22.83	1.45	1.45
Chloroethane	218.56	2.50	2.50
Chloroform	37.65	2.74	2.74
2-Chlorophenol	79.93	0.97	0.97
Chrysene	32.36	0.66	0.66
Di-n-butyl phthalate	46.52	1.03	1.03
1,2-Dichlorobenzene	132.93	1.25	1.25
1,3-Dichlorobenzene	35.86	1.09	1.09
1,4-Dichlorobenzene	22.83	1.04	1.04
1,1-Dichloroethane	48.10	2.00	2.00
1,2-Dichloroethane	172.04	2.38	2.38
1,1-Dichloroethylene	23.36	2.17	2.17
1,2-trans-Dichloroethylene	44.00	3.48	3.48
2,4-Dichlorophenol	91.31	1.01	1.01
1,2-Dichloropropane	187.52	1.82	1.82
1,3-Dichloropropylene	35.86	1.13	1.13
Diethyl phtalate	165.56	1.13	1.13
2,4-Dimethylphenol	29.31	1.33	1.33

Dimethyl phthalate	38.31	0.77	0.77
4,6-Dinitro-o-cresol	225.90	1.03	1.03
2,4-Dinitrophenol	100.31	0.89	0.89
2,4-Dinitrotoluene	232.39	1.07	1.07
2,6-Dinitrotoluene	522.74	1.20	1.20
Ethylbenzene	88.07	1.73	1.73
Fluoranthene	55.45	1.05	1.05
Fluorene	48.10	0.91	0.91
Hexachlorobenzene	0.07	0.90	0.90
Hexachlorobutadiene	14.36	1.15	1.15
Hexachloroethane	44.00	1.29	1.29
Methyl chloride	154.90	1.60	1.60
Methylene chloride	72.52	2.23	2.23
Naphthalene	48.10	0.85	0.85
Nitrobenzene	55.45	1.37	1.37
2-Nitrophenol	56.24	1.22	1.22
4-Nitrophenol	101.11	0.99	0.99
Phenanthrene	12.97	0.79	0.79
Phenol	21.17	0.70	0.70
Pyrene	54.59	0.90	0.90
Tetrachloroethylene	45.66	1.68	1.68
1,2,4-Trichlorobenzene	114.14	1.05	1.05
1,1,1-Trichloroethane	44.00	2.57	2.57
1,1,2-Trichloroethane	44.00	1.34	1.34
Trichloroethylene	44.00	2.12	2.12
Toluene	65.24	1.31	1.31
Vinyl chloride	200.49	2.48	2.48

The potential effects on downstream EFH from the potential increase in flow, chemical concentrations, and other effects of waste water discharge were considered. The TPDES permit requires routine analysis of the effluent discharge through whole effluent toxicity (WET) testing methods as mandated by the regulation 40 CFR 122.33(d)(1)(i). Studies have shown that alternative test organisms used in WET testing are dependable, biological indicators of potential toxic effects and represent listed vertebrate species toxicologically (Mayer et al. 2008; Dwyer et al. 2005; Sappington et al. 2001). The effluent quality from the proposed expansion project is expected to be similar to the current discharge. Based on available analytical data screened against calculated water quality-based effluent limitations for the protection of aquatic life, none of the reported data exceeded 70% of the calculated daily average water quality-based limitations for the protection of aquatic life. Therefore, the expected projected discharge, which will continue to be below the permitted parameter limitations, is believed to be insignificant. Adverse toxicological impacts to aquatic life, including those species in designated EFH downstream, are not likely to be adversely affected by the proposed expansion project.

5.1.1 Mass Loading

The estimated increase in treated effluent discharge from Outfall #004 will result in minor increases in pollutant mass loading to the receiving water resulting in additional elements discharged into the surrounding environment. However, the relative toxicity is expected to be discountable, and the existing permit will not result in a deficiency of the Texas Surface Water Quality Standards.

5.1.2 Water Temperature

Temperature is independent of both concentration and mass loading parameters. The water temperature of Outfall #004 effluent is affected by raw water temperature, ambient air temperature, and physical limitations of the cooling tower. Due to its consistency with maintaining relatively close to ambient temperature (~74°F), a temperature limit was not issued in the TPDES permit. Respectively, the summer months will result in the highest average discharge temperatures. Although the Project will increase the treated effluent discharge volume from Outfall 004, the increase in effluent temperature is expected to be discountable and will not be an impairment of Texas water quality standards.

5.1.3 Dilution Modeling and Determination of Action Area in the Aquatic Environment

Dilution modeling was conducted to demonstrate compliance with TCEQ and EPA standards for aquatic life. The analysis was used to estimate the concentration of pollutants discharged into the aquatic environment and predict the area of the plume in Upper San Jacinto Bay. The dilution modeling was used to determine what portions of the aquatic environment to include within the Action Area. The plume area includes the area in the bay to a point of 1% effluent; at this point the project is determined to have no significant impact on federally threatened and endangered species. As described in Section 1.4, the Action Area includes the unnamed tidal ditch, which is located within the La Porte Complex property boundaries, and the portion of the San Jacinto Bay located immediately adjacent of the La Porte Complex boundaries, which is shown on Figure 3 as the dilution area.

Dilution modeling was based on the width, depth, and flow rate in the unnamed tidal ditch, and the current speed and depth of the Upper San Jacinto Bay. Width, depth, and flow rate within the unnamed tidal ditch were provided by Equistar, based on site observations and the average discharge from the

January 2011 to July 2012 Discharge Monitoring Reports for the La Porte Complex. The current speed in Upper San Jacinto Bay was obtained from model results from the National Oceanographic and Atmospheric Administrations (NOAA) Galveston Bay Operational Forecast System (GBOFS) hydrodynamic model of Galveston Bay. Depth of the Upper San Jacinto Bay in the vicinity of the mouth of the discharge channel was assumed to be 6.8 feet in the model based on average near-shore depths in the area.

Methods and Data

This section discusses water quality analysis methods and input data.

Data Used in the Analysis

Inputs required for the dilution analysis include the width, depth, and flow rate in the unnamed tidal ditch, and the current speed and depth of the San Jacinto Bay. Width, depth, and flow rate within the unnamed tidal ditch were provided by Equistar, based on site observations and the average discharge from the January 2011 to July 2012 Discharge Monitoring Reports for the La Porte Complex. The current speed in Upper San Jacinto Bay was obtained from model results from the National Oceanographic and Atmospheric Administrations (NOAA) GBOFS hydrodynamic model of Galveston Bay. Depth of the San Jacinto Bay in the vicinity of the mouth of the discharge channel was assumed to be 6.8 feet in the model based on average near-shore depths in the area. Table 5 lists the data used in the model.

Table 5 - Effluent and San Jacinto Bay Hydraulics Data used in the Dilution Analysis

Width of Discharge Channel (ft)	25
Depth of Discharge Channel (ft)	2
Discharge Flow Rate (MGD)	0.812
Current Speed in Upper San Jacinto Bay near Discharge (ft/s)	0.58
Depth in Upper San Jacinto Bay near Discharge (ft)	6.8

No water quality data for parameters of interest in the Equistar discharge were available for San Jacinto Bay in the vicinity of the discharge point. However, sediment quality and suspended sediment data were available in the vicinity of the discharge. Sediment quality data were obtained from TCEQ Surface Water Monitoring Information System database (http://www8.tceq.state.tx.us/SwqmisWeb/public/index.faces [November 28, 2012] for stations 16499, 17924 and 17923. The USGS database (http://waterdata.usgs.gov/nwis/rt) was also searched for monitoring data on the appropriate PAH, volatile, and semi-volatile chemicals that characterize the effluent and no results were found. The water quality concentrations were estimated from the sediment quality data using Equation 1 below:

$$Cwt = Tss^{*} Csed \qquad (1)$$

Cwt is the total concentration (dissolved plus absorbed) in the water column (ug/L), Tss is the suspended sediment concentration (mg/L) and Csed is the concentration on the sediment (ug/mg). The use of Equation 1 assumes that the majority of the concentration in the water column is due to the re-suspension of the bed sediments rather than discharges into the river. The concentrations on the sediment are provided in Table 8.

The concentration of suspended solids (TSS) is also necessary to estimate the water quality from sediment concentrations. Data on TSS were obtained from the same TCEQ database as sediment quality data. Table 6 provides the data used in the analysis. The 90th percentile value of 43.6 mg/L was used as a conservative but representative value.

Table 6 - TSS data used in the Dilution Analysis (mg/L)

Station ID	start date	end date	No. of Samples	Max value	Mean Value	Median value	90th Percentile	standard deviation
16499	10/13/1999	8/13/2008	12	63	21	19	24	14.2
17923	7/29/2002	4/20/2010	83	66	18	17	30	11.3
17924	7/29/2002	4/20/2010	83	112	34	28	65	22.2
Total			178	112	25.7	22.4	43.6	17.4

The soil organic carbon-water partitioning coefficient (Koc) was used to identify pollutants that may be absorbed more strongly to sediment rather than in the dissolved phase. Koc is the ratio of the mass of a chemical that is absorbed in the soil per unit mass of organic carbon in the soil at equilibrium. It is the "distribution coefficient" (Kd) normalized to total organic carbon content (kd is the ratio of concentration of a chemical that is absorbed to the sediment to the concentration dissolved at equilibrium). Higher Koc values correspond to chemicals that more strongly absorb to sediments and lower Koc values correspond to chemicals more likely to occur in the dissolved phase. To determine the ratio of absorbed to dissolved concentration from Koc the fraction organic carbon on the sediment particles is needed. These data were obtained from the TCEQ database and are shown in Table 7.

Table 7 - Total Organic Carbon, (TOC), Sediment Dry Weight, (g/g)

Station ID	Date	Value
16499	8/22/2002	0.0139
16499	10/24/2002	0.0133
16499	3/19/2004	0.0121
16499	11/9/2004	0.0115
	Average	0.0127

Table 8 - Sediment and Water Quality Data used in the Dilution Analysis

Fraction organic carbon	0.013
Suspended Solids Concentration (mg/L)	43.600

Pollutant	Permitted Daily Max (ug/L)	2012 Sampling Results (ug/L)	Bottom Sediment Concentration (ug/kg)	Total Concentration in the Water Column (mg/L)	Koc (L/Kg)	kd (L/kg)	Fraction Dissolved
Acenaphthene	45.37	0.78	170	7.41	4,898	62.2	0.997
Acenaphthylene	45.37	0.95	170	7.41	N/A	N/A	N/A
Acrylonitrile	41.25	9.29	50	2.18	0.85	0.011	1
Anthracene	45.37	0.77	170	7.41	23,493	298.4	0.987
Benzene	104.6	2.07	5	0.22	62	0.787	1
Benzo(a)anthracene	3.06	0.58	N/A	N/A	N/A	N/A	N/A
3,4-Benzofluoranthene	46.93	0.63	N/A	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	45.37	0.33	170	7.41	1,230,269	15,624	0.59
Benzo(a)pyrene	3.06	0.52	170	7.41	62	0.787	1
Bis (2-ethylhexyl) phthalate	214.6	1.03	N/A	N/A	N/A	N/A	N/A
Carbon Tetrachloride	29.21	2.76	5	0.22	152	1.93	1
Chlorobenzene	21.53	1.45	5	0.22	224	2.845	1
Chloroethane	206.15	2.5	5	0.22	33.113	0.421	1
Chloroform	35.51	2.74	5	0.22	53	0.673	1
2-Chlorophenol	75.39	0.97	170	7.41	129.936	1.65	1
Chrysene	30.52	0.66	170	7.41	398,107	5,056	0.82
Di-n-butyl Phthalate	43.88	1.03	N/A	N/A	N/A	N/A	N/A
1,2-Dichlorobenzene	125.39	1.25	N/A	N/A	N/A	N/A	N/A
1,3-Dichlorobenzene	33.83	1.09	170	7.41	295.121	3.748	1
1,4-Dichlorobenzene	21.53	1.04	170	7.41	616.595	7.831	1
1,1-Dichloroethane	45.37	2	5	0.22	53	0.673	1

1,2-Dichloroethane	162.27	2.38	5	0.22	38	0.483	1
1.1-Dichloroethylene	22.03	2.17	5	0.22	616.595	7.831	1
1,2-trans-Dichloroethylene	41.5	3.48	N/A	N/A	N/A	N/A	N/A
2,4-Dichlorophenol	86.13	1.01	170	7.41	1202.3	15.269	1
1,2-Dichloropropane	176.88	1.82	5	0.22	47	0.597	1
1,3-Dichloropropylene	33.83	1.13	N/A	N/A	N/A	N/A	N/A
Diethyl Phthalate	156.16	1.13	170	7.41	446.684	5.673	1
2,4-Dimethylphenol	27.65	1.33	170	7.41	208.93	2.653	1
Dimethyl Phthalate	36.14	0.77	170	7.41	N/A	N/A	N/A
4,6-Dinitro-o-cresol	213.08	1.03	N/A	N/A	N/A	N/A	N/A
2,4-Dinitrophenol	94.62	0.89	830	36.19	32.666	0.415	1
2,4-Dinitrotoluene	219.19	1.07	170	7.41	95.499	1.213	1
2,6-Dinitrotoluene	493.06	1.2	170	7.41	69.183	0.879	1
Ethylbenzene	83.07	1.73	5	0.22	204	2.591	1
Fluoranthene	52.3	1.05	170	7.41	49,096	624	0.97
Fluorene	45.37	0.91	170	7.41	7,707	98	1
Hexachlorobenzene	0.07	0.9	170	7.41	80,000	1,016	0.96
Hexachlorobutadiene	13.54	1.15	170	7.41	4,677	59	1
Hexachloroethane	41.5	1.29	170	7.41	1778.279	22.584	1
Methyl Chloride	146.11	1.6	N/A	N/A	N/A	N/A	N/A
Methylene Chloride	68.4	2.23	10	0.44	10	0.127	1
Naphthalene	45.37	0.85	170	7.41	1191	15.13	1
Nitrobenzene	52.3	1.37	170	7.41	119	1.511	1
2-Nitrophenol	53.05	1.22	170	7.41	114.815	1.458	1
4-Nitrophenol	95.37	0.99	830	36.19	151.356	1.922	1
Phenanthrene	12.23	0.79	170	7.41	#N/A	#N/A	#N/A
Phenol	19.97	0.7	170	7.41	28.84	0.366	1
Pyrene	51.49	0.9	170	7.41	67,992	863.5	0.96
Tetrachloroethylene	43.06	1.68	5	0.22	265	3.366	1
1,2,4-Trichlorobenzene	107.66	1.05	170	7.41	1659	21.069	1

1,1,1-Trichloroethane	41.5	2.57	5	0.22	135	1.715	1
1,1,2-Trichloroethane	41.5	1.34	5	0.22	135	1.715	1
Trichloroethylene	41.5	2.12	5	0.22	94	1.194	1
Toluene	61.54	1.31	5	0.22	140	1.778	1
Vinyl Chloride	206.15	2.48	10	0.44	18.621	0.236	1

Note: Cells marked the N/A indicate values that are unknown.

Analysis Methods

Two major stages of mixing can be identified for a waste discharge into a water body, the near-field and the far-field. In the near-field the discharge geometry and flow governs mixing, i.e. the initial momentum and buoyancy of the discharge determine the rate of dilution. In the far-field the effects of the initial momentum has dissipated, and the ambient turbulence and currents determine further mixing. In the far-field, mixing can occur during a buoyant spreading phase and a passive diffusion phase. In the buoyant spreading phase the buoyancy tends to damp mixing so mixing is generally small, the plume spreads laterally and thins out vertically. During the passive diffusion phase the plume diffuse in the horizontal and vertical directions. The plume enlarges thus becoming more dilute.

There are several length scales that can be calculated that relate to the size of plume to the bending of the jet and the amount of dilution expected in the near-field. However, due to the small momentum of the discharge at the La Porte Complex, all length scales indicate a minor near-field influence with minimal dilution. This is due to the small velocity of the discharge, estimated to be about 0.058 feet/s using the data in Table 5. Because the effluent discharge flow rate was minor compared to the volume and flow rates within San Jacinto Bay, the near-field was ignored and only dilution due to passive diffusion was calculated for the far-field.

The dilution due to passive diffusion can be calculated as (Jones, Nash and Jirka, 1996):

$$S = \frac{2b_v b_h}{L_m L_Q} \qquad (2)$$

Where b_v and b_h are the width and thickness of the plume. L_m is a length scale related to the distance from shore where the plume becomes bent over and L_Q is the distance over which the geomtry of the discharge is imporant. When the plume fully occupies the water depth b_v is replaced by the water depth.

The depth and width of the plume were calucated using the following equations:

$$b_v = \left(\frac{\pi E_z x}{u_a} + b_{vi}^2 \right)^{1/2} \qquad (3)$$

$$b_h = \left(\frac{\pi E_y x}{u_a} + b_{hi}^2 \right)^{1/2} \qquad (4)$$

Where u_a is the current speed and b_{vi} and b_{hi} are the intial thickness and width, respectively. This model was used because it is not proprietary software and is accessible to everyone.

Using the above relationships the calculated dilution is shown in Table 9. The velocity (0.58 feet/second) was chosen because it is the typical velocity for summer conditions, and the current data indicates little difference between summer and winter relative to dilution. The initial width of the plume was assumed to be about 3 feet (1 meter). The percent effluent drops to less than 10% of the plume about 20 feet downstream of the discharge and when the plume is about 10 feet wide. The plume is less than 5% effluent less than 50 feet form the discharge when the plume is less than 15 feet wide. The plume is expected to occupy the entire water depth (about 6 feet deep) within about 150 feet of the discharge.

Table 9 - La Porte Complex Dilution of Discharge to San Jacinto Bay

Distance from Discharge point along Shore (ft)	Width of Plume measured from shoreline (ft)	Bulk Dilution	% Effluent
3.3	7.1	3.8	27%
6.6	7.8	5.3	19%
9.8	8.4	6.8	15%
13.1	9.0	8.2	12%
16.4	9.6	9.6	10%
19.7	10.1	11.0	9.1%
23.0	10.6	12.4	8.1%
26.2	11.0	13.8	7.2%
29.5	11.5	15.2	6.6%
32.8	11.9	16.6	6.0%
36.1	12.4	18.0	5.6%
39.4	12.8	19.3	5.2%
45.9	13.6	22.1	4.5%
52.5	14.3	24.8	4.0%
59.0	15.0	27.6	3.6%
65.6	15.7	30.3	3.3%
72.2	16.3	33.1	3.0%
78.7	16.9	35.8	2.8%
85.3	17.5	38.6	2.6%
91.8	18.1	41.3	2.4%
98.4	18.7	44.1	2.3%
105.0	19.2	46.8	2.1%
111.5	19.7	49.6	2.0%
118.1	20.2	52.3	1.9%
131.2	21.2	57.8	1.7%
147.6	22.4	64.6	1.5%
164.0	23.5	71.5	1.4%
180.4	24.6	77.1	1.3%
196.8	25.6	80.3	1.2%
229.6	27.6	86.4	1.2%
262.4	29.4	92.0	1.1%
295.2	31.1	97.4	1.0%

328.0	32.7	102.4	1.0%
393.6	35.7	111.9	0.9%
459.2	38.5	120.5	0.8%
524.8	41.0	128.7	0.8%
590.4	43.5	136.3	0.7%
656.0	45.8	143.5	0.7%
820.0	51.1	160.1	0.6%
984.0	55.9	175.2	0.6%
1312.0	64.4	202.0	0.5%

The estimated concentration data in San Jacinto Bay and the measured concentrations in the effluent were used to estimate the average concentration in the plume. Table 10 shows the predicted concentrations in the plume for 10%, 5%, and 1% effluent.

Table 10 - Predicted Concentration in the Discharge Plume For 10%, 5%, and 1% Dilution Values

Pollutant	2012 Sampling Results for Effluent (ug/L)	Bottom Sediment (ug/kg)	Total Concentration in San Jacinto Bay (ug/L)	10% effluent	5% effluent	1% effluent
Acenaphthene	0.78	170	0.007412	0.085	0.046	0.015
Acenaphthylene	0.95	170	0.007412	0.102	0.055	0.017
Acrylonitrile	9.29	50	0.00218	0.931	0.467	0.095
Anthracene	0.77	170	0.007412	0.084	0.046	0.015
Benzene	2.07	5	0.000218	0.207	0.104	0.021
Benzo(a)anthracene	0.58	N/A	N/A	N/A	N/A	N/A
3,4-Benzofluoranthene	0.63	N/A	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	0.33	170	0.007412	0.04	0.024	0.011
Benzo(a)pyrene	0.52	170	0.007412	0.059	0.033	0.013
Bis (2-ethylhexyl) phthalate	1.03	N/A	N/A	N/A	N/A	N/A
Carbon Tetrachloride	2.76	5	0.000218	0.276	0.138	0.028
Chlorobenzene	1.45	5	0.000218	0.145	0.073	0.015
Chloroethane	2.5	5	0.000218	0.25	0.125	0.025
Chloroform	2.74	5	0.000218	0.274	0.137	0.028
2-Chlorophenol	0.97	170	0.007412	0.104	0.056	0.017
Chrysene	0.66	170	0.007412	0.073	0.04	0.014
Di-n-butyl Phthalate	1.03	N/A	N/A	N/A	N/A	N/A
1,2-Dichlorobenzene	1.25	N/A	N/A	N/A	N/A	N/A
1,3-Dichlorobenzene	1.09	170	0.007412	0.116	0.062	0.018
1,4-Dichlorobenzene	1.04	170	0.007412	0.111	0.059	0.018
1,1-Dichloroethane	2	5	0.000218	0.2	0.1	0.02

1,2-Dichloroethane	2.38	5	0.000218	0.238	0.119	0.024
1,1-Dichloroethylene	2.17	5	0.000218	0.217	0.109	0.022
1,2-trans-Dichloroethylene	3.48	N/A	N/A	N/A	N/A	N/A
2,4-Dichlorophenol	1.01	170	0.007412	0.108	0.058	0.017
1,2-Dichloropropane	1.82	5	0.000218	0.182	0.091	0.018
1,3-Dichloropropylene	1.13	N/A	N/A	N/A	N/A	N/A
Diethyl Phthalate	1.13	170	0.007412	0.12	0.064	0.019
2,4-Dimethylphenol	1.33	170	0.007412	0.14	0.074	0.021
Dimethyl Phthalate	0.77	170	0.007412	0.084	0.046	0.015
4,6-Dinitro-o-cresol	1.03	N/A	N/A	N/A	N/A	N/A
2,4-Dinitrophenol	0.89	830	0.036188	0.122	0.079	0.045
2,4-Dinitrotoluene	1.07	170	0.007412	0.114	0.061	0.018
2,6-Dinitrotoluene	1.2	170	0.007412	0.127	0.067	0.019
Ethylbenzene	1.73	5	0.000218	0.173	0.087	0.018
Fluoranthene	1.05	170	0.007412	0.112	0.06	0.018
Fluorene	0.91	170	0.007412	0.098	0.053	0.016
Hexachlorobenzene	0.9	170	0.007412	0.097	0.052	0.016
Hexachlorobutadiene	1.15	170	0.007412	0.122	0.065	0.019
Hexachloroethane	1.29	170	0.007412	0.136	0.072	0.02
Methyl Chloride	1.6	N/A	N/A	N/A	N/A	N/A
Methylene Chloride	2.23	10	0.000436	0.223	0.112	0.023
Naphthalene	0.85	170	0.007412	0.092	0.05	0.016
Nitrobenzene	1.37	170	0.007412	0.144	0.076	0.021
2-Nitrophenol	1.22	170	0.007412	0.129	0.068	0.02
4-Nitrophenol	0.99	830	0.036188	0.132	0.084	0.046
Phenanthrene	0.79	170	0.007412	0.086	0.047	0.015
Phenol	0.7	170	0.007412	0.077	0.042	0.014
Pyrene	0.9	170	0.007412	0.097	0.052	0.016
Tetrachloroethylene	1.68	5	0.000218	0.168	0.084	0.017
1,2,4-Trichlorobenzene	1.05	170	0.007412	0.112	0.06	0.018
1,1,1-Trichloroethane	2.57	5	0.000218	0.257	0.129	0.026
1,1,2-Trichloroethane	1.34	5	0.000218	0.134	0.067	0.014
Trichloroethylene	2.12	5	0.000218	0.212	0.106	0.021
Toluene	1.31	5	0.000218	0.131	0.066	0.013
Vinyl Chloride	2.48	10	0.000436	0.248	0.124	0.025

Note: Cells marked the N/A indicate values that are unknown.

The dilution modeling used, and presented in Table 8, is a conservative model because it assumed that there was no mixing of effluent with surface water in the unnamed tidal ditch, and it also assumed that the depth of the San Jacinto Bay near the mouth of the discharge channel was only 6.8 feet deep. In reality, the effluent would be diluted within the discharge channel prior to entering the San Jacinto Bay, and the depth of the San Jacinto Bay near the mouth of the discharge channel increases to greater than

6.8 feet quickly due to the docking facilities. The result of this conservative modeling approach is that the modeling should overestimate the areal extent of the plume in the San Jacinto Bay.

Conclusions

As shown on Table 8, and discussed above, within approximately 300 feet of mouth of the unnamed tidal ditch, the plume only contains 1 % effluent, and the width of the plume has only expanded to 31 feet. Outside of this plume area, there is little mixing of the effluent with surrounding surface water. Due to the deflection of the plume along the shoreline, the entire Action Area for the San Jacinto Bay is confined to the portion of the Bay that is immediately adjacent to the La Porte Complex boundaries.

Water quality data for these particular pollutants were not found in the TCEQ and USGS database. We obtained sediment data from the TCEQ as a general approach to identify ambient concentrations in the receiving water body, Upper San Jacinto Bay. Bottom sediment concentrations are an overestimate of the concentrations within the bay. However, this was the only publicly available data found. The effluent concentrations were sampled before the flow reaches the waste water treatment facility and, as shown in Table 8, are lower than the ambient concentration level. The possibility exists that the effluent discharge could be cleaner than the receiving water body. After treatment, these values will decrease significantly. The data represented is a conservative approach in understanding the characteristics of the effluent in a general comparison to the ambient conditions of the Upper San Jacinto Bay.

5.1.4 Toxicity Assessment

Wastewater that is generated on site and discharged is subject to effluent limitations set in TPDES Permit No. WQ0004013000. Multiple outfalls are utilized by the La Porte Complex; however, the Project will primarily affect Outfall #004 which is located west of the cooling towers and drains north. Outfall #004 is approximately 600 feet from the northern end of Ethylene Road. The wastewater from Outfall #004 discharges to an unnamed, non-tidal drainage channel (unnamed ditch). This channel then becomes tidal (unnamed tidal ditch) prior to discharging to Upper San Jacinto Bay in Segment No. 2427 of the Bays and Estuaries. Only the unnamed tidal ditch and Upper San Jacinto Bay are assumed to contain aquatic life. Segment No. 2427 is currently listed on the State's inventory of impaired and threatened waters, Texas 2006 Clean Water Act Section 303 (d) list for elevated levels of dioxin, PCBs, and pesticides in fish tissue. . The discharge from the La Porte Complex does not contain more than 0.6 ug/L of PCBs and does not contain dioxin or pesticides. The project is not expected to elevate dioxin and PCB concentrations in the impaired segment. Increased levels of permitted chemical concentrations are expected to be discharged from the affected effluent; however these levels will remain within the TPDES limitations. As a result, the Project is not anticipated to require an amendment to the existing TPDES Permit.

The federal guidelines 40 CFR part 414 will regulate the process wastewaters and discharge point sources that use end-of-pipe biological treatment. 40 CFR part 313 will regulate the discharge of domestic wastewater. Discharge limitations within the current TPDES permit will remain the same. The La Porte Complex has conducted whole effluent toxicity testing over the past 5 years. The TCEQ has defined unique dilution factors to assess the unnamed ditch, the unnamed tidal ditch, and the Upper San Jacinto Bay based on applicable discharge volumes, critical low flow, and harmonic mean stream flows. Based on preliminary data for an amended TPDES permit, freshwater criterion will be used for assessing the effluent discharge from the end-of-the-pipe for freshwater features and a marine criterion will be used for assessing tidal features. The Aquatic Life Surface Water Risk-Based Exposure Limits (SWRBELs) and National Pollutant Criteria Database were used to compare maximum discharge limitations as criteria for aquatic life. Applicable criteria were developed in accordance with current USEPA guidelines for calculating site-specific water quality criteria. The Aquatic Organism Bioaccumulation Criteria was used to compare discharge limitations as a criterion for human health consumption of marine fish tissue. The TCEQ used data from the original TPDES permit application to determine current discharge limitations. Effluent dilutions, aquatic organism bioaccumulation, dissolved oxygen, toxicity of aquatic life, toxicity of human health in consumption of marine organisms were modeled using TCEQ guidelines and procedures. TCEQ will require WET tests biomonitoring and "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organism, Third Edition" (USEPA-821-R-02-014) in order to assess or control potential toxicity. Studies have shown that alternative test organisms used in WET testing are dependable, biological indicators of potential toxic effects and represent listed vertebrate species toxicologically (Mayer et al. 2008; Dwyer et al. 2005; Sappington et al. 2001). The biomonitoring analyses are done using a synthetic receiving stream because the Houston Ship Channel/Upper San Jacinto Bay water affects the organisms more than the facility's effluent. Seventeen chronic WET tests have been analyzed for Outfall #004 in the past 5 years. There has been only one example of significant lethality to Mysid shrimp (*Mysidopsis bahia),* which demonstrates the potential for effluent discharges to impact common invertebrate prey species. However, the documentation does not clearly define which dilution factor was used in the test, and the following test showed no significant lethality.

5.2 Potential Effects to EFH Managed Species

This section presents the results of the analysis of potential impacts to EFH designated species and their potential habitats with the Action Area. This analysis is based on the proposed air emissions and dispersion modeling data, proposed changes in the flow rate and chemical composition of the wastewater effluent at Outfall #004, effluent dilution modeling, and literature review. The following impact sources are included in the analysis:

- **Direct actions on Upper San Jacinto Bay structure:** The proposed expansion project will not alter the structure of Upper San Jacinto Bay, and no disturbance to the current substrate is anticipated.
- **Control of run-off during construction and operation:** The furnace site, or area of direct construction disturbance, is located approximately 360 meters west of the Upper San Jacinto Bay. The Action Area has been defined to include the drainage channel and approximately 6 acres of the Upper San Jacinto Bay. Current best management practices (BMPs) will be used to prevent additional runoff including sediments or chemicals resulting from construction and operation.

- **Deposition of emissions from operation of the Project:** Atmospheric deposition of airborne constituents is expected to be negligible and have no effect on water quality or aquatic habitats in areas where ground-level SIL concentrations for regulated constituents are not exceeded. The only surface water that is contained within the area of SIL exceedance for NO2 and PM is a very small segment of the unnamed tidal ditch to which Outfall #004 ultimately discharges. The SIL exceedance area does not include EFH within the Upper San Jacinto Bay and no changes to water quality or EFH should result from deposition. Detailed information about the air emissions analyses can be found in the *Biological Assessment.*
- **Discharge of wastewater:** Operation of the proposed olefin unit will increase the discharge volume of cooling tower blowdown and treated wastewater effluent from the La Porte facility. The discharge from the facility (Outfall #004) is not expected to change and will remain within the current TCEQ permitted limitations. A new permit will not be required. Any changes in water quality that result from the Project are expected to be discountable. This is discussed in Section 5.0.

Because the Project will not change the structure of Upper San Jacinto Bay, project site runoff will be minimized to negligible levels using BMPs, deposition of emissions over the Upper San Jacinto Bay are expected to be negligible, and effects from the increase in volume of wastewater are expected to be discountable, the proposed project is not expected to significantly affect EFH.

The assessment of potential impacts is limited to protected species within the Action Area. Eleven species were identified by the GMFMC for the Upper San Jacinto Bay Each of the species is evaluated based on the presence of preferred habitat, potential of occurrence, and potential affects to the species resulting from the proposed project.

Brown Shrimp (Penaeus aztecus

Brown shrimp are likely to occur within Upper San Jacinto Bay, although there is no preferred habitat within the Action Area. Any occurrence of brown shrimp in the Action Area would be incidental or transient. Because the Project will not change the structure of the Upper San Jacinto Bay, and effects of runoff, emissions deposition, and wastewater discharge are expected to be negligible and discountable, ***no adverse effects*** on brown shrimp are anticipated as a result of the Project.

White shrimp (Penaeus setiferus)

White shrimp are likely to occur within Upper San Jacinto Bay, although there is no preferred habitat within the Action Area. Any occurrence of white shrimp in the Action Area would be incidental or transient. Because the Project will not change the structure of Upper San Jacinto Bay, and effects of runoff, emissions deposition, and wastewater discharge are expected to be negligible and discountable, ***no adverse effects*** on white shrimp are anticipated as a result of the Project.

Red Drum (Sciaenops ocellatus)

Red drums are unlikely to occur within Upper San Jacinto Bay and there is no preferred habitat within the Action Area. Any occurrence of red drum in the Action Area would be incidental or transient. Because the Project will not change the structure of Upper San Jacinto Bay, and effects of runoff, emissions deposition, and wastewater discharge are expected to be negligible and discountable, ***no adverse effects*** on red drum are anticipated as a result of the proposed project.

Gray snapper (Lutjanus griseus)

Gray snapper may occur within Upper San Jacinto Bay, although there is no preferred habitat within the Action Area due to its industrial nature. Any occurrence of gray snapper in the Action Area would be incidental or transient. Because the Project will not change the structure of Upper San Jacinto Bay, and effects of runoff, emissions deposition, and wastewater discharge are expected to be negligible and discountable, ***no adverse effects*** on gray snapper are anticipated as a result of the Project.

Dog snapper (Lutjanus jocu)

Dog snapper may occur within Upper San Jacinto Bay, although there is no preferred habitat within the Action Area due to its industrial nature. Any occurrence of dog snapper in the Action Area would be incidental or transient. Because the Project will not change the structure of Upper San Jacinto Bay, and effects of runoff, emissions deposition, and wastewater discharge are expected to be negligible and discountable, ***no adverse effects*** on dog snapper are anticipated as a result of the Project.

Lane snapper (Lutjanus synagris)

Lane snapper may occur within Upper San Jacinto Bay, although there is no preferred habitat within the Action Area due to its industrial nature. Any occurrence of lane snapper in the Action Area would be incidental or transient. Because the Project will not change the structure of Upper San Jacinto Bay, and effects of runoff, emissions deposition, and wastewater discharge are expected to be negligible and discountable, ***no adverse effects*** on lane snapper are anticipated as a result of the Project.

Scalloped hammerhead (Sphyrna lewini)

Scalloped hammerheads may occur within Upper San Jacinto Bay, although there is no preferred habitat within the Action Area due to its industrial nature. Any occurrence of scalloped hammerheads in the Action Area would be incidental or transient. Because the Project will not change the structure of Upper San Jacinto Bay, and effects of runoff, emissions deposition, and wastewater discharge are expected to be negligible and discountable, ***no adverse effects*** on scalloped hammerheads are anticipated as a result of the Project.

Bonnethead shark (Sphyrna tiburo)

Bonnethead sharks are unlikely to occur within Upper San Jacinto Bay, and there is no preferred habitat within the Action Area. Any occurrence of bonnethead sharks in the Action Area would be incidental or transient. Because the Project will not change the structure of San Jacinto Bay, and effects of runoff, emissions deposition, and wastewater discharge are expected to be negligible and discountable, ***no adverse effects*** on bonnethead sharks are anticipated as a result of the Project.

Blacktip shark (Carcharhinus limbatus)

Blacktip sharks may occur within Upper San Jacinto Bay, although there is no preferred habitat within the Action Area. Any occurrence of blacktip sharks in the Action Area would be incidental or transient. Because the Project will not change the structure of Upper San Jacinto Bay, and effects of runoff, emissions deposition, and wastewater discharge are expected to be negligible and discountable, ***no adverse effects*** on blacktip sharks are anticipated as a result of the Project.

Bull shark (Carcharhinus leucas)

Bull sharks may occur within Upper San Jacinto Bay, although there is no preferred habitat within the Action Area. Any occurrence of bull sharks in the Action Area would be incidental or transient. Because the Project will not change the structure of Upper San Jacinto Bay, and effects of runoff, emissions deposition, and wastewater discharge are expected to be negligible and discountable, ***no adverse effects*** on bull sharks are anticipated as a result of the Project.

Atlantic sharpnose shark (Rhizoprionodon terraenovae)

Atlantic sharpnose sharks are unlikely to occur within Upper San Jacinto Bay, and there is no preferred habitat within the Action Area. Any occurrence of Atlantic sharpnose sharks in the Action Area would be incidental or transient. Because the Project will not change the structure of Upper San Jacinto Bay, and effects of runoff, emissions deposition, and wastewater discharge are expected to be negligible and discountable, ***no adverse effects*** on Atlantic sharpnose sharks are anticipated as a result of the Project.

6.0 Mitigation Measures

6.1.1 Air Emissions

Equistar plans to utilize the Best Available Control Technology (BACT) to control emissions and thus minimize impacts to the surrounding environment to the maximum extent practicable. The proposed emissions of each pollutant subject to PSD review are consistent with both the TCEQ BACT guidance and the most stringent limit in the RACT/BACT/LAER Clearinghouse (RBLC); and, are considered to be the top level of control available for the new and modified facilities.

6.1.2 Water Quality

Wastewater discharges will be subject to TPDES permit limitations, which have been designed to be protective of aquatic and marine species. All wastewater will be treated before being discharged into the SJB Segment No. 2427. A current Stormwater Pollution Protection Plan (SWPPP) will be employed for further precaution.

All wastewater associated with construction and operation of the expansion project will be treated onsite. The project is not expected to produce a substantial wastewater impact. Stormwater runoff from within the cracking facility is directed through a series of onsite ditches and weirs.

7.0 Conclusions

A review of air emissions and dispersion modeling data, expected changes in the volume and chemical composition of the wastewater effluent, wastewater effluent dilution modeling, and a review of current literature and publicly available data was conducted to determine the potential effect that the Project would have on EFH in Upper San Jacinto Bay and on the eleven listed GMFMC managed species with potential for occurrence within Upper San Jacinto Bay. The Project will not change the structure of Upper San Jacinto Bay, and changes to runoff, emissions deposition, and wastewater discharge are expected to be negligible and discountable. Further, there is no preferred habitat for any of the eleven species within the Action Area. Based on the aforementioned information, ***no adverse effects*** on EFH in Upper San Jacinto Bay, nor on the eleven listed GMFMC managed species with potential for occurrence within Upper San Jacinto Bay, are anticipated from the Project.

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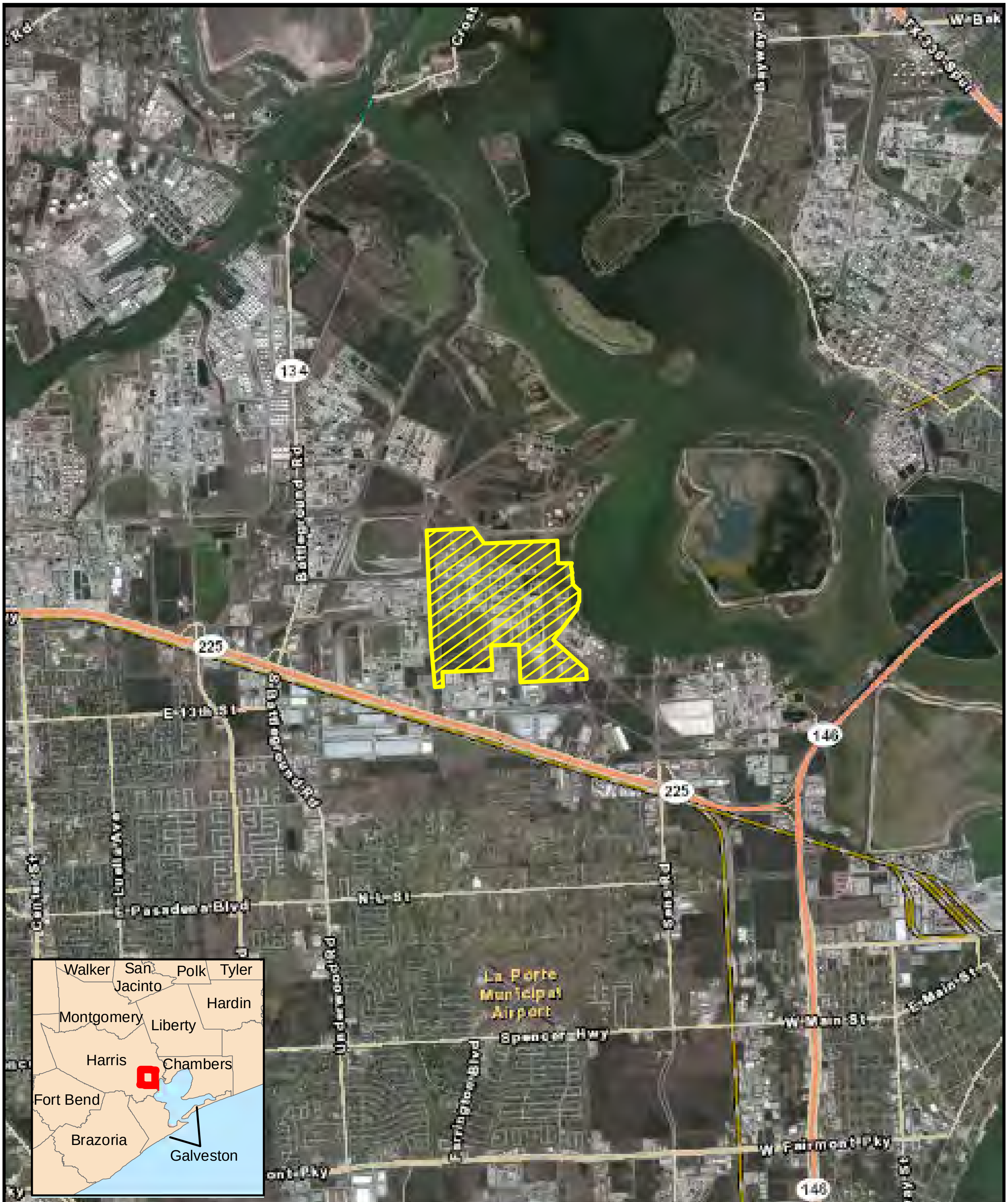
Figures



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Legend

Property Boundary

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Title:	**Vicinity Map**
Project:	**Essential Fish Habitat QE-1 Unit Expansion Equistar – La Porte Complex**
Client:	**Equistar Chemicals, L.P.**

Drawn by:	Date:	Project No.:	
AM	9/13/2012	25014882	Figure 1

URS

Title: Site Plan Map

Project: Essential Fish Habitat QE-1 Unit Expansion
Equistar – La Porte Complex

Client: Equistar Chemicals, L.P.

Drawn by:	Date:	Project No.:	
AM	9/13/2012	25014882	Figure 2

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Outfall 004
Property Boundary
Action Area
Effluent Dilution Area
Furnace Site
SIL Exceedance Area
Drainage Ditch

N

0 500 1,000 Feet

Title:	**Action Area Map**
Project:	**Essential Fish Habitat QE-1 Unit Expansion Equistar – La Porte Complex**
Client:	**Equistar Chemicals, L.P.**

Drawn by:	Date:	Project No.:	
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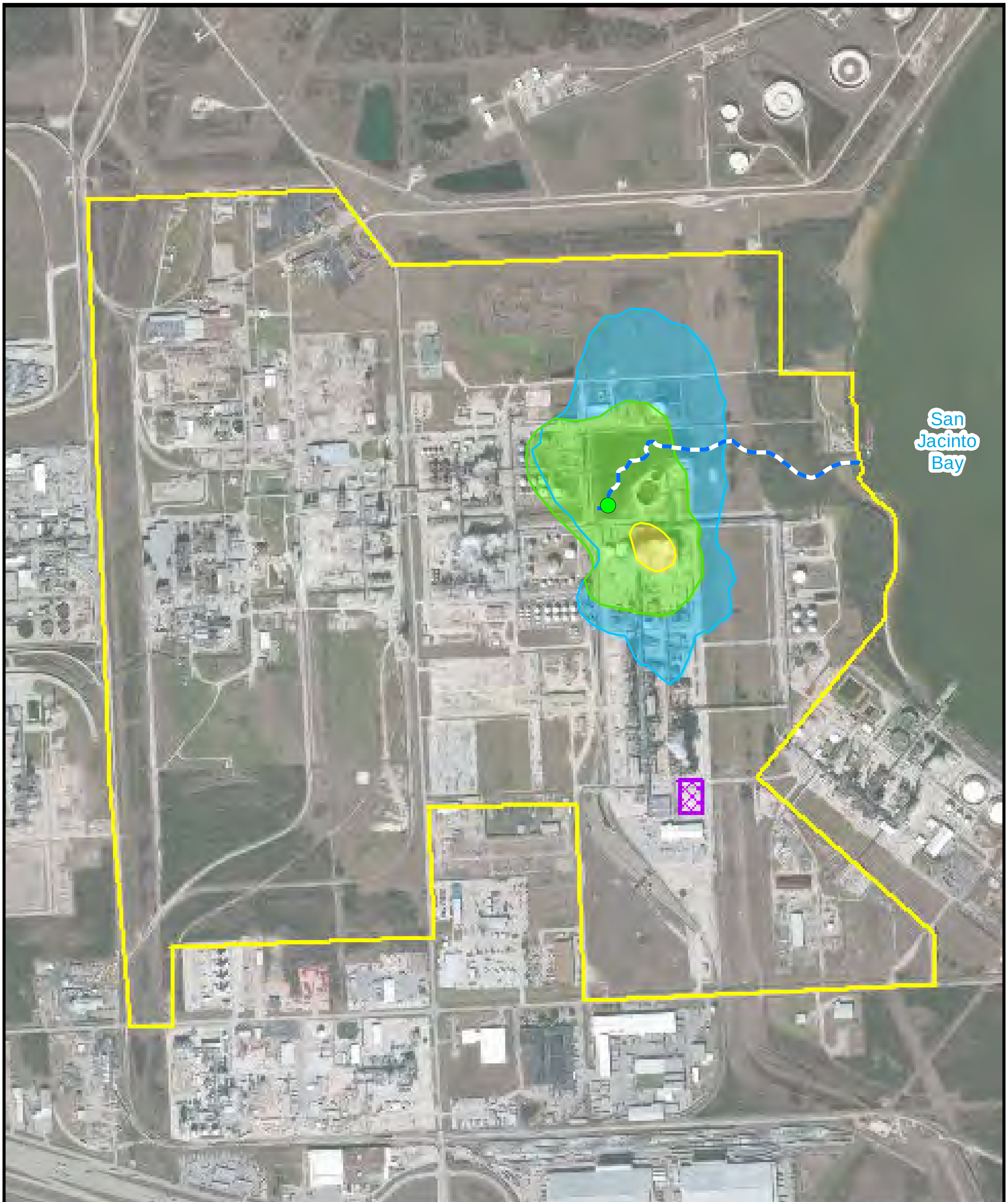

URS

- Outfall 004
- Ditch
- PM10 Annual SIL
- PM2.5 24-HR SIL
- PM2.5 Annual SIL
- Property Boundary
- Furnace Site

N

0 500 1,000 Feet

Title:	**Significant Impact Levels Exceedance Map**
Project:	**Essential Fish Habitat QE-1 Unit Expansion Equistar – La Porte Complex**
Client:	**Equistar Chemicals, L.P.**

Drawn by:	Date:	Project No.:	
AM	**9/13/2012**	**25014882**	**Figure 4**

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