Ecological Risk Assessment for Area of Concern 4 (AOC-4)

Remedial Investigation/Feasibility Study

Falcon Refinery Superfund Site
Ingleside, San Patricio County, Texas
EPA Identification No. TXD086278058

Remedial Action Contract 2 Full Service
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Prepared for

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LIST OF ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
AST	Above ground storage tank
BRAPF	Baseline Risk Assessment and Problem Formulation
COPEC	Chemicals of potential concern
CSM	Conceptual site model
EA	EA Engineering, Science, and Technology, Inc.
EPA	U.S. Environmental Protection Agency
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
FM	Farm-to-market
FS	Feasibility Study
ND	Non-detect
NORCO	National Oil Recovery Corporation
PAH	Polynuclear aromatic hydrocarbon
RI	Remedial Investigation
Site	Falcon Refinery Superfund Site
SLERA	Screening-Level Ecological Risk Assessment
SQL	Sample Quantitation Level
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCEQ	Texas Commission on Environmental Quality
UCLM	Upper Confidence Level of the Mean
VOC	Volatile Organic Compound

1. INTRODUCTION

EA Engineering, Science, and Technology, Inc. (EA) has been authorized by the U.S. Environmental Protection Agency (EPA), under Remedial Action Contract Number EP-W-06-004, Task Order 0088-RICO-06MC, to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the Falcon Refinery Superfund Site (Site). EPA's scope of work includes the preparation of a Screening Level Ecological Risk Assessment (SLERA) for the Site. EPA has requested that EA prepare a SLERA for the barge dock area (Area of Concern [AOC] 4) and the Intracoastal Waterway (AOC-5) separate from the remaining Site. This document provides the results of the SLERA for AOC-4.

1.1 SITE BACKGROUND AND DESCRIPTION

The Site is located 1.7 miles southeast of State Highway 361 on Farm-to-Market (FM) 2725 at the north and south corners of the intersection of FM 2725 and Bishop Road near the City of Ingleside in San Patricio County, Texas (Figure 1). The Site occupies approximately 104 acres and consists of a refinery that operated intermittently and has not produced hydrocarbon products in several years. The refinery is currently inactive, except for a crude oil storage operation being conducted by Superior Crude Gathering, Inc. When in operation the refinery had a capacity of 40,000 barrels per day and the primary products consisted of naphtha, jet fuel, kerosene, diesel, and fuel oil. The refinery also historically transferred and stored vinyl acetate, a substance not excluded under the petroleum exclusion.

The Site is divided into the North Site, South Site and current barge dock facility. There are pipelines that connect the North and South Sites with the current and former barge dock facilities. The North Site consisted of nine above ground storage tanks (ASTs), three truck loading racks, associated piping, and a transfer pump. The South Site consisted of the main operations of the refinery. This area had a control room, heaters, crude towers, coalesers, boilers, fire water tank, exchangers, cooling towers, desalters, exchangers, compressors, a lab, 24 ASTs, separator, clarifiers, and aeration pond (TRC 2013). The barge dock facility is located on Redfish Bay and was used to load and unload crude oil and refined hydrocarbons via pipelines that connect the dock to the North and South Sites.

The Site was proposed to the National Priorities List on 5 September 2002. The Potentially Responsible Party for the Site, National Oil Recovery Corporation (NORCO), entered into an "Administrative Order on Consent" with the EPA on 9 June 2004, to perform and finance the removal action and RI/FS for the Site.

In 2012, NORCO sold the former Falcon Refinery to Lazarus Texas Refining I, LLC (Lazarus), which operates the former refinery as a crude oil bulk storage and transfer facility. Lazarus is attempting to obtain a notice of no further action for the barge dock facility to obtain a "bridge loan" until additional funding can be obtained (TRC 2013). Lazarus plans to further develop the Site through remedial actions and upgrades.

The Site has been divided into AOCs based upon former use and location (Figure 2). AOC 1 consists of the Former Operational Units and includes the entire North Site and a drum disposal area and metal waste disposal area of the South Site. AOC 2 includes areas of the refinery that were not used for operations or storage and have no record of releases. AOC 3 encompasses the wetlands immediately adjacent to the Site that are bordered by Bay Avenue, Bishop Road, and a dam on the upstream side; wetlands located between Bishop Road, Sunray Road, Bay Avenue, and residences along Thayer Avenue; and the wetlands between Sunray Road, residences along FM 2725, Gulf Marine Fabricators, Offshore Specialty Fabricators, and the outlet of the wetlands into Redfish Bay. Within AOC 3, there are one active and several abandoned pipelines that lead from the refinery to the barge dock facilities. During June 2006, the abandoned pipelines were cut, the contents of the pipelines were removed, and plates were welded on the pipelines. AOC 4 includes the barge docking facility. AOC 4 is approximately 0.5 acres and is located on Redfish Bay. The fenced facility, which is connected to the refinery by pipelines, is used to load and unload barges. Currently only crude oil passes through the docking facility. Historically, refined products were also loaded and unloaded. AOC 5 encompasses the sediments and surface water within the Intracoastal Waterway adjacent to the barge dock facility. AOC 6 includes the neighborhood along Thayer Road, across from the refinery. AOC 7 includes the neighborhood along Bishop Road, across from the North Site.

1.2 SITE INVESTIGATIONS

Phase I sampling was conducted at the Site in 2007 by the PRPs. EA conducted Phase II investigation activities in accordance with the Field Sampling Plan (EA 2012a) and Quality Assurance Project Plan (EA 2012b) under this task order in 2013.

1.3 AOC-4 BACKGROUND AND DESCRIPTION

AOC-4 is the current barge docking facility which occupies approximately 0.5 acres adjacent to the Intracoastal Waterway. The fenced facility is connected to the refinery by pipelines and is used to load and unload barges. It was reported that only crude oil passed through the docking facility. However, refined products historically were loaded and unloaded at this docking facility. There have been no reported releases associated with this AOC. However, analytical results indicate that a release or releases have occurred.

2. ECOLOGICAL RISK ASSESSMENT

This section presents the SLERA conducted by EA for AOC 4 at the Site. The purpose of this assessment is to characterize and quantify potential environmental impacts from residual chemicals in soil at AOC 4 from Site activities. The assessment was conducted in accordance with EPA guidance for the RI/FS process; specifically the ERA was conducted in accordance with the process for ecological risk assessments (ERAs) outlined in the document *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA 1997), other relevant EPA guidance, as well as the Texas Commission on Environmental Quality (TCEQ) guidance *Conducting Ecological Risk Assessments at Remediation Sites in Texas* (TCEQ 2014) and *Texas Surface Water Quality Standards* (TCEQ 2010).

The process for ERA outlined in EPA guidance includes eight steps (EPA 1997, 1998), and this document presents the first three steps of the ERA process (Figure 3). Steps 1 and 2 represent the SLERA. The SLERA uses highly precautionary assumptions regarding exposure and toxicity to develop a Conceptual Site Model (CSM) and identify Chemicals of Potential Ecological Concern (COPECs). The CSM defines complete and significant exposure pathways and identifies assessment and measurement endpoints. The screening level evaluation typically relies on chemical analytical data.

Step 3 of the SLERA process is the Baseline Risk Assessment and Problem Formulation (BRAPF). The BRAPF draws from the risk evaluation performed in the SLERA to identify COPECs, exposure pathways, assessment endpoints, and risk questions requiring further consideration. The BRAPF often includes refinement of the screening level risk calculations through use of more realistic or more relevant exposure and toxicity data. The goal of the BRAPF is to provide a clear definition of the ecological risk problems for the Site. This problem formulation forms the basis for either further assessment or, in cases where sufficient data are available, risk management if necessary.

In the case of the Falcon Refinery Superfund Site, a SLERA and BRAPF refinement of risk calculations were performed for AOC-4. Section 2.1 presents the CSM and assessment endpoints. Section 2.2 discusses the data used in the SLERA and presents measurement endpoints for the screening level risk evaluation. Section 2.3 presents the SLERA results and conclusions. Section 2.4 presents the refined risk assessment and methodology and discusses the data and measurement endpoints used.

Uncertainties associated with the risk assessment are presented in Section 2.5, and results of the risk characterization are considered together in developing the conclusions for the Site which are presented in Section 2.9.

Summary of Data Used in the SLERA

Initial field sampling was conducted in 2007 as a result of an EPA approved RI/FS Field Sampling Plan and Quality Insurance Plan for the former refinery, adjacent properties, and background sampling locations (TRC 2013). Analytical data obtained during the sampling was evaluated for ecological exposures, and results indicated that further sampling was necessary to adequately assess certain portions of the Site. Field activities conducted in 2013 as part of the Phase II Field Sampling Plan had objectives relating to this SLERA which included providing data to identify and delineate the extent of COPECs in environmental media, identify potential and complete exposure pathways, and provide data for completion of human health and ERAs as well as the feasibility study. Table 1 presents the samples collected in 2007 and 2013 that were used in this risk assessment.

A total of seven surface soil samples were collected from AOC-4 in 2007 and 2013 combined. Sample locations are presented in Figure 4. For the purposes of the ERA, surface soil is defined at the biotic zone, from 0 to 6 inches below ground surface.

The soil was analyzed for target analyte list (TAL) metals, polynuclear aromatic hydrocarbons (PAHs), semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs).

Data Reduction and Summary Statistics

This section describes the approach that was followed to evaluate the available analytical data in each medium of concern (e.g., surface soil, sediment, and surface water). The following list summarizes the approach:

- Analytical results with a “R” qualifier (indicating that the data were rejected during the validation process) were not used in the SLERA and BRAPF.

- Analytical results with a “U” or “UJ” qualifier indicate that the analyte was not detected at the sample quantitation level (SQL). These data were considered non-detects (NDs) and were retained in the data set. In the calculation of the 95 percent upper confidence limits of the mean (UCLMs), each ND was assigned a numerical value of one-half its SQL.

- Analytical results with a “J” qualifier indicate that the reported values were estimated because the analyte was detected at a concentration below the SQL or for other reasons. These data were considered detections and were retained in the data set at the measured concentration.

- Analytical results with “D”, “K”, or “L” qualifiers were considered detections and were retained in the data set at the measured concentration.

- Inorganic analytes with “B” or “BJ” qualifiers were retained in the data set at the measured concentration.

- Analytical results for organic analytes with a "B" qualifier (blank-related data) were treated as NDs.

In accordance with EPA (1989) guidance, the following steps were first used to summarize the chemical analytical data for the SLERA:

- Sample data were compared to blank (laboratory, equipment rinse, and field) concentration data. If the chemical concentration detected in a site-related sample was less than 10 times (for common laboratory chemicals) or 5 times (for all other compounds) the concentration detected in the corresponding blank sample, the sample was excluded from the SLERA in accordance with EPA guidance (EPA 1989). The identification and validation of sampling or laboratory artifacts were performed prior to data summarization.

- The maximum concentration of a pair of duplicate or split samples (taken from the same location on the same date) if both parent and duplicate were detected, the maximum nondetect concentration if both parent and duplicate were nondetects, and the detected value if either parent or duplicate were detected, and the other nondetected were used to represent the concentration for that location.

- Frequency of detection was calculated as the number of samples in which the chemical was detected over the total number of samples analyzed.

There are a number of uncertainties associated with the chemical analytical data associated with sample coverage and study design. Uncertainties associated with the data used in the SLERA are discussed in Section 2.5.

2.1 ECOLOGICAL CONCEPTUAL SITE MODEL

As part of the CSM, potential sources of chemicals and exposure pathways are characterized for the Site (Figure 5). The model illustrates the pathways through which receptors may be exposed to sources of COPECs. Sources and exposure pathways are discussed further below.

Ecological Setting

The Falcon Refinery Superfund Site consists of a refinery that had the capacity of 40,000 barrels per day with the primary products consisting of naphtha, jet fuel, kerosene, diesel, and fuel oil. The refinery operated intermittently and is currently inactive. The Site encompasses approximately 104 acres in San Patricio County, Texas with portions of the Site (AOC-4 and AOC-5) located along Redfish Bay in the Intracoastal Waterway. The property includes piping that leads from the Site to dock facilities at Redfish Bay, where crude oil and hydrocarbons were historically and are currently being transferred between barges and storage tanks to adjacent properties. The current barge dock facility is fenced and contains several small structures to load and unload crude oil. There have been no known spills or releases, and there are no visible indications of environmental impacts at the barge dock facility.

The barge dock facility (AOC-4) consists of approximately 0.5 acres. The barge dock facility is fenced, predominately paved, and contains several small structures with no wooded, shrub, or open field habitat. Due to the small size and the unsuitable habitat for terrestrial wildlife, it was determined that AOC-4 meets the EPA Region 6 Ecological Exclusion Screening (Appendix A). Sites that meet these criteria require no further ecological evaluation at a property where a response action is being pursued. Since there are incomplete or insignificant ecological exposure pathways at AOC-4, the Site was precluded from the need for a formal ERA. However, an initial screening was still performed at the Site to identify potential COPECs even though no further analysis was conducted.

Threatened and Endangered Species

An important consideration in forming an ecological conceptual model is the presence of endangered, threatened, and rare species on the Site. As part of this assessment, the U.S. Fish and Wildlife Service (USFWS 2014) and the Texas Parks and Wildlife Division (2014) program databases were searched for species that may utilize AOC-4 and the adjacent wetlands and waterways. Seven endangered and five federally and/or state listed threatened species may exist within the project area:

Endangered

- Whooping crane (*Grus americana*)
- West Indian manatee (*Trichechus manatus*)
- Hawksbill sea turtle (*Eretmochelys imbricata*)
- Kemp's Ridley sea turtle (*Lepidochelys kempii*)
- Leatherback sea turtle (*Dermochelys coriacea*)
- Eskimo curlew (*Numenius borealis*)
- Smalltooth sawfish (*Pristis pectinata*)

Threatened

- Piping plover (*Charadrius melodus*)
- Sooty tern (*Sterna fuscata*)
- Reddish egret (*Egretta rufescens*)
- Wood stork (*Myctena americana*)
- White-face ibis (*Plegadis chihi*).

A more extensive analysis and biological survey would be needed to determine whether or not additional state listed species utilize the Site. It is also possible that bald eagles (*Haliaeetus leucocephalus*) could be associated with the intercoastal habitats. Bald eagles were recently delisted from the federal and state threatened and endangered species lists, and the species is now protected under the Bald and Golden Eagle Protection Act.

Identification of Potential Receptors

AOC-4 has been excluded for further ecological analysis due to lack of significant wildlife habitat and exposure pathways.

Potential Source Areas

Based on the Site history, TAL metals, PAHs, SVOCs, and VOCs were analyzed in the soils at AOC-4. The primary source areas are the current and former barge docking facility.

Fate, Transport, and Media of Concern

A number of fate and transport pathways are expected to influence the transfer of elevated concentrations of COPECs between environmental media in the Site. While only evaluating an initial screening, chemicals in surface soil at AOC-4 may have been transferred vertically to subsurface soil by leaching beyond the zone of exposure for ecological receptors, or horizontally to soil further from the source. Given the tendency for some of the COPECs at the Site (metals and PAHs) to bind to soil, horizontal transport is expected to be limited.

It is important to note that transport pathways are dependent upon factors that influence the forms of chemicals in environmental media and their bioavailability. This is especially important for metals. Metals are present in nature in a wide range of chemical forms. Soluble forms of some metals are highly mobile in soil, sediment, and water, facilitating higher transport rates and making them more bioavailable, meaning that they are taken up more easily by plants and animals. Many of the mineral forms of metals found in naturally occurring rocks and soils are relatively insoluble and are not readily taken up by wildlife. Changes in the chemistry of soil, sediment, or water may make metals more or less soluble, and thus determine their ultimate mobility and bioavailability.

Based on the above discussion of potential habitats, sources, and fate and transport, surface soil was considered the primary media of concern (Figure 5).

Identification of Exposure Pathways

Since AOC-4 meets the EPA Region 6 Ecological Exclusionary Criteria due to its small size and insufficient wildlife habitat, all exposure pathways are considered insignificant (Figure 5).

Selection of Representative Receptors

Since AOC-4 meets the EPA Region 6 Ecological Exclusionary Criteria due to its small size and insufficient wildlife habitat, representative receptors were not selected for the Site.

2.2 STEPS 1 & 2: SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT

The first two steps of the 8-step ERA process (Figure 3) constitute the SLERA. The SLERA includes screening-level problem formulation, ecological effects evaluation, exposure estimate,

and risk calculation. This section presents the SLERA for the Falcon Refinery Superfund Site and is organized into the following subsections:

- Screening-level problem formulation
- Summary of the SLERA results.

Screening Level Problem Formulation

The screening-level problem formulation includes development of a CSM and assessment and measurement endpoints. Table 2 provides the assessment and measurement endpoints for AOC-4, but additional evaluation is excluded since it meets the EPA Region 6 Ecological Exclusionary Criteria.

Measurement and Assessment Endpoints

EPA guidance stresses the importance of ecologically significant endpoints. As discussed by EPA, "Assessment endpoints are explicit expressions of the actual environmental value that is to be protected, operationally defined by an ecological entity and its attributes" (EPA 1998). Failure to select appropriate assessment and measurement endpoints can result in the inability to answer the risk questions central to an ERA. Several criteria are applicable for endpoint selection (Suter 1993; EPA 1998):

1. ***Unambiguous Definition***—Assessment endpoints should indicate a subject and a characteristic of the subject (e.g., fish reproduction).

2. ***Accessibility to Prediction and Measurement***—Assessment endpoints should be reliably predictable from measurements.

3. ***Susceptibility to the Hazardous Agent/Stressor***—Susceptibility of an organism (plant or animal) results from the combination of potential for exposure and the sensitivity to the concentrations of contaminants or other stressors of concern.

4. ***Biological Relevance***—Biological relevance of impacts to an individual organism is determined by the importance of the impact to higher levels of biological organization (e.g., populations or communities).

5. ***Social Relevance and Policy Goals***—Assessment endpoints should be of value to decision-makers and the public. The assessment endpoints should represent effects that would warrant consideration of site remediation or alteration of project plans. Assessment endpoint selection should also include endpoints that may be mandated legally (e.g., protected species).

The ecological assessment endpoints applicable to this site are discussed below:

- Protection of organisms exposed directly or indirectly to surface soil to ensure that COPECs in surface soil do not have unacceptable adverse effects on organism survival, growth, and reproduction, which may result in adverse effects to the community structure (e.g., diversity or biomass).

These assessment endpoints are general and are refined and revised for sample types warranting evaluation in the refined assessment conducted in Step 3.

The measurement endpoints are measurable ecological characteristics that are related to the assessment endpoints (EPA 1998). Because it is difficult to "measure" assessment endpoints, measurement endpoints were chosen that permit inference regarding the assessment endpoints described above. Measurement endpoints selected for this risk assessment are the following:

1. ***Media Chemistry for Surface Soil***—The measurement of maximum COPEC concentrations in surface soil provides the means, when compared to conservative (based on chronic or no effects levels), ecotoxicological-based screening concentrations, for drawing inferences regarding the assessment endpoint for surface soil.

Identification of Chemicals of Potential Ecological Concern

COPECs are selected by comparison of maximum concentrations found in surface soil to EPA Region 3 and Region 4 ecological risk screening values, which coincide with TCEQ Screening Levels (TCEQ 2014). Maximum concentrations in soil were compared to the lowest value obtained from the EPA Eco-SSLs, or EPA Region 4 screening values for soil which are found at the following links:

- Surface Soil: the lowest value obtained from the Eco-SSLs of available receptors, accessed at http://www.epa.gov/ecotox/ecossl, or the Region IV Ecological Screening Values, accessed at http://www.epa.gov/region4/superfund/programs/riskassess/ecolbul.html

The criteria are presented in Table 3. Potential ecological risks associated with aluminum and iron in surface soils are identified based on pH. Aluminum and iron in surface soil can be identified as COPECs only at sites where the soil pH is less than 5.0 (EPA 2003). pH values for soils were not available for AOC-4, however soil pH is typically higher than 5.0; and considering the minimal habitat at this AOC, neither metal was identified as a COPEC in surface soil samples during the initial screening.

Surface soil was screened and risks evaluated independently for AOC-4.

2.3 SLERA RESULTS

Maximum exposure estimates were compared to media-specific screening levels and are shown in Table 4. The results of this risk calculation are used to identify COPECs. The SLERA risk

calculation is performed by comparing the maximum exposure concentration to the screening level. When the screening level is greater than the maximum concentration, the potential for adverse effects is considered unlikely. Because of the conservative nature of the SLERA, chemicals with maximum concentrations less than the screening level can be removed from further examination. If the maximum concentration is equal to or greater than the screening leve1, or if a media-specific screening criterion is not available, the chemical is retained as a COPEC and examined further. Inclusion of these chemicals as COPECs does not necessarily indicate that they pose risks; it indicates that the chemicals cannot be definitively eliminated from further consideration. Essential nutrients, although detected in surface soil, sediment, and surface water, are not included in the list of COPECs. Essential nutrients include calcium, magnesium, sodium, and potassium.

The following chemicals exceed the surface soil screening value and were identified as COPECs. Exposure Point Concentrations (EPCs) are shown in Table 4**:**

- Antimony
- Barium
- Cadmium
- Chromium
- Copper
- Lead
- Manganese
- Mercury
- Nickel
- Selenium
- Vanadium
- Zinc
- Total LMW PAHs
- Total HMW PAHs.

The following SVOCs and VOCs were retained as COPECs due to lack of soil screening values. Risks from these detected chemicals cannot be determined and are typically discussed in the uncertainty evaluation of the ERA:

- Acetophenone
- Benzaldehyde
- Bis(2-ethylhexyl)phthalate
- Carbazole
- 2-Butanone
- Isopropylbenzene
- Trichloroflouromethane
- Xylenes (m & p)
- Xylenes (o).

SLERA Conclusions

Although numerous COPECs were identified in the surface soil at AOC-4, the Site meets the EPA Region 6 Ecological Exclusion Screening (Attachment A) and consequently no further evaluation of AOC-4 is necessary. AOC-4 provides minimal habitat of low value; consequently population level risks for ecological receptors are not expected.

2.4 ECOLOGICAL RISK ASSESSMENT REFINEMENT

The third step in the 8-step ERA process is required only for compounds for which the SLERA (Steps 1 and 2) indicates a need for further ecological risk evaluation. Consistent with ERA guidance (EPA 1997), highly conservative assumptions were used in the SLERA to provide an upper bound estimate of risk to ecological resources. Such an approach meets with the objectives of the SLERA, which are to screen out all chemicals that do not have the potential to adversely affect ecological resources and to maintain chemicals that have potential to cause risks. These conservative assumptions are expected to over-estimate actual levels of risk to most ecological receptors. Consequently, some chemicals that pose negligible risk may be retained as COPEC at the outset of Step 3. The objective of the BRAPF is to determine the scope and goals of the baseline ERA by considering the results of the SLERA with additional site-specific information and alternate, more realistic assumptions in the estimates of risk. The results of this evaluation build upon the risk results presented in the SLERA and are intended to help in making scientific management decisions about the need for further investigation.

Since AOC-4 meets the EPA Region 6 Ecological Exclusion Screening, ERA refinement was not required.

2.5 UNCERTAINTY EVALUATION

This ERA for AOC-4 at the Falcon Refinery Superfund Site may incorporate a number of uncertainties associated with the estimates of ecological risk. However, since AOC-4 meets the EPA Region 6 Ecological Exclusion Screening, a detailed uncertainty evaluation was not conducted for this ERA.

3. CONCLUSIONS

A conceptual model was developed for AOC-4 based on review of site conditions and available data. This model identified that the Site may provide a terrestrial habitat. However, AOC-4 meets the EPA Region 6 Exclusionary Criteria for evaluation. Therefore the COPECs at AOC-4 do not present an unacceptable risk to ecological receptors.

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FIGURES

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N

0 5,000 10,000

Feet

Image Source:
ESRI ArcGIS Online USA Topo Maps layer, 1:100,000 scale, Copyright:© 2011 National Geographic Society, i-cubed

Falcon Refinery Superfund Site
Ingleside, San Patricio County,Texas

Figure 1
Location Map
Ecological Risk Assessment for AOC-4

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N

0 250 500

Feet

Legend:

Area of Concern Boundary

Active NORCO Pipeline

Above ground

Underground

Abandonded NORCO Pipeline

Above ground

Underground

Outside Operations

Gulf South Pipeline

Boss Pipeline

Gathering Line 2'

Plains Marketing Pipeline

Source: AOC and pipeline locations from TRC, dated, March 10, 2011

Image Source: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009

Falcon Refinery Superfund Site
Ingleside, San Patricio County,Texas

Figure 2
Site Map
Ecological Risk Assessment for AOC-4

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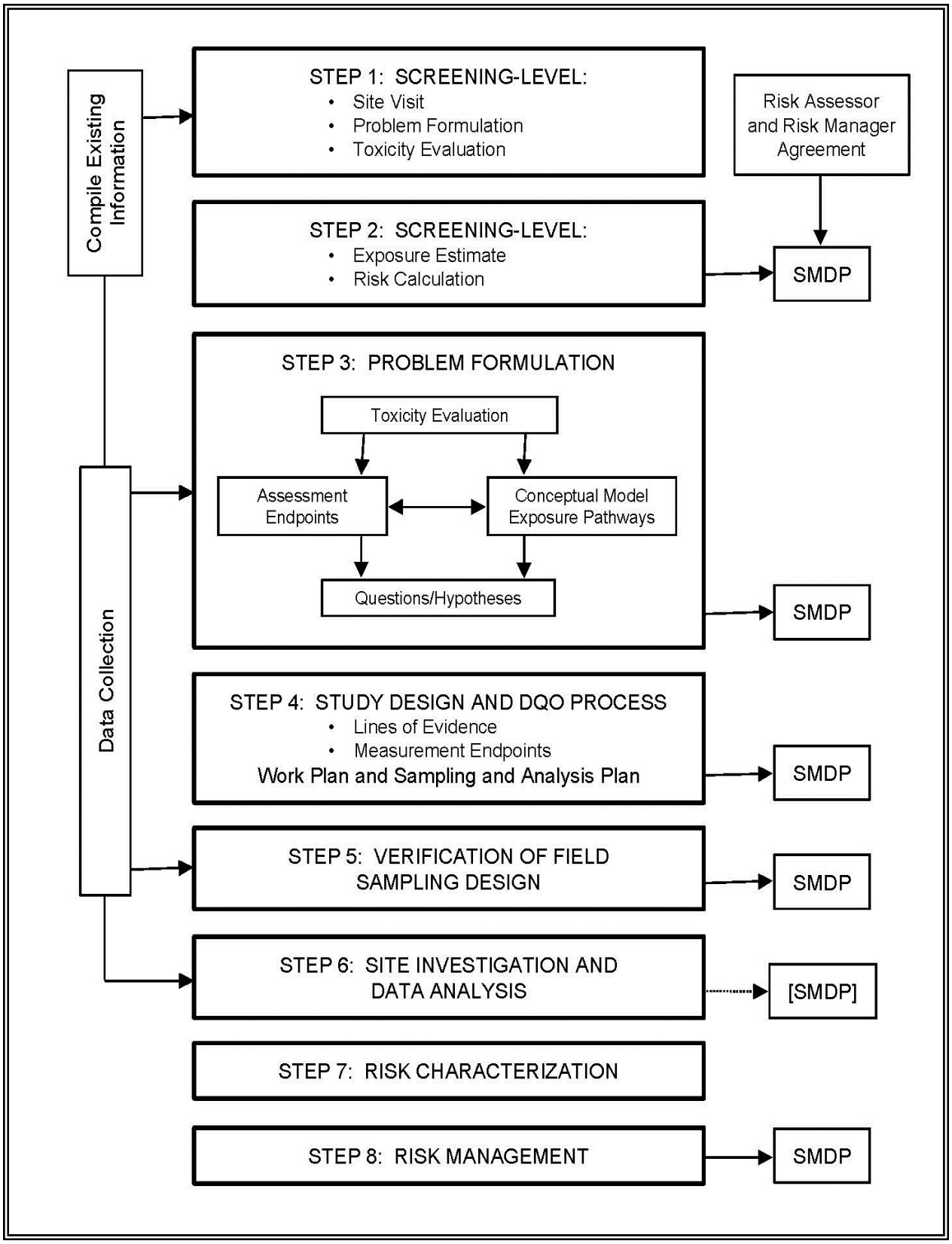

Figure 3 Eight-step Ecological Risk Assessment Process for Superfund (from EPA 1997).

N

0 50 100

Feet

Legend:

- Monitoring Well Location (2013)
- Soil Sample Location (2013)
- Soil Sample Location (2007)
- Area of Concern 4 Boundary

Source: AOC and pipeline locations from TRC, dated, March 10, 2011

Image Source: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009

Falcon Refinery Superfund Site
Ingleside, San Patricio County,Texas

Figure 4
AOC-4 Sample Locations
Ecological Risk Assessment for AOC-4

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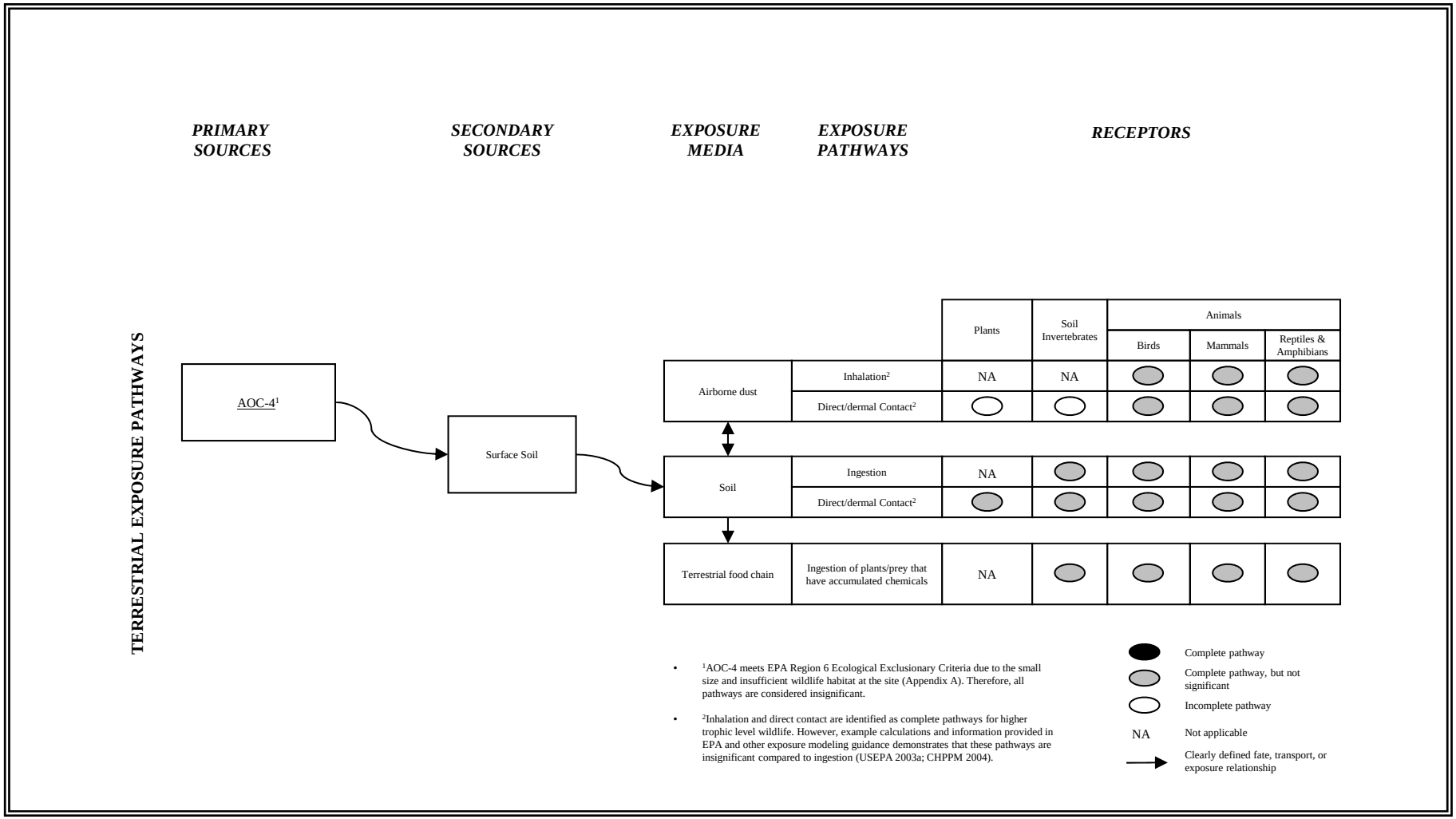

Figure 5. Ecological Conceptual Site Model for Falcon Refinery Superfund Site

TABLES

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Table 1
Samples Used in the Ecological Risk Assessment

Area	Media	Sample Date	Sample ID
AOC-4	Surface Soil	10-Dec-07	FR-133A[1]
		17-Sep-13	MW-17
		10-Sep-13	MW-17-0.0-0.5
		10-Sep-13	SO4-01-0.0-0.5
		10-Sep-13	SO4-02-0.0-0.5
		10-Sep-13	SO4-03-0.0-0.5
		10-Sep-13	SO4-05-0.0-0.5

NOTE:
AOC: Area of Concern
1. Composite soil sample.

Table 2
Measurement Endpoints for Ecological Risk Assessment

Assessment Endpoint	Measurement Endpoint	On Site-Measurements/Exposure Point Concentrations (EPC)	Evaluation Method	Risk Indicators
Protection of surface soil invertebrates exposed to COPECs in surface soil from adverse survival, growth and reproductive effects	Initial screening (site AOC-4 excluded from additional evaluation)	• surface soil concentrations measured at site in past and more recent sampling	• Direct comparison to the Eco-SSL or Region IV ecological screening values to define COPECs	• Chemicals defined as COPECs indicate the potential for risk

NOTE:
AOC: Area of Concern
COPEC: Chemical of Potential Ecological Concern
Eco-SSL: Ecological Soil Screening Levels

Table 3

Ecological Screening Benchmarks

Chemical	Soil Criteria (mg/kg)	Soil Criteria Source
Metals		
Aluminum	5.00E+01	Region IV
Antimony	2.70E-01	Mammalian Eco-SSL
Arsenic	1.80E+01	Plant Eco-SSL
Barium	3.30E+02	Soil Invertebrate Eco-SSL
Beryllium	2.10E+01	Mammalian Eco-SSL
Cadmium	3.60E-01	Mammalian Eco-SSL
Calcium	NA	--
Chromium	2.60E+01	Avian Eco-SSL for Cr III
Cobalt	1.30E+01	Plant Eco-SSL
Copper	2.80E+01	Avian Eco-SSL
Iron	2.00E+02	Region IV
Lead	1.10E+01	Avian Eco-SSL
Magnesium	NA	--
Manganese	2.20E+02	Plant Eco-SSL
Mercury	1.00E-01	Region IV
Nickel	3.80E+01	Plant Eco-SSL
Potassium	NA	--
Selenium	5.20E-01	Plant Eco-SSL
Silver	4.20E+00	Avian Eco-SSL
Sodium	NA	--
Thallium	1.00E+00	Region IV
Vanadium	7.80E+00	Avian Eco-SSL
Zinc	4.60E+01	Avian Eco-SSL
PAHs		
2-Methylnaphthalene	NA	--
Acenaphthene	NA	--
Acenaphthylene	NA	--
Anthracene	NA	--
Benzo(a)Anthracene	NA	--
Benzo(a)Pyrene	NA	--
Benzo(b)Fluoranthene	NA	--
Benzo(g,h,i)Perylene	NA	--
Benzo(k)Fluoranthene	NA	--
Chrysene	NA	--
Dibenzo(a,h)Anthracene	NA	--
Fluoranthene	NA	--
Fluorene	NA	--
Indeno(1,2,3-Cd)Pyrene	NA	--
Naphthalene	NA	--
Phenanthrene	NA	--
Pyrene	NA	--
Total LMW PAHs	2.90E+01	Soil Invertebrate Eco-SSL
Total HMW PAHs	1.10E+00	Mammalian Eco-SSL
Total PAHs	NA	--
SVOCs		
1,1'-Biphenyl	6.00E+01	Region IV
2-Methylphenol	NA	--
4-Methylphenol	NA	--
Acetophenone	NA	--
Benzaldehyde	NA	--
Benzoic Acid	NA	--
Butyl benzyl phthalate	NA	--

Table 3

Ecological Screening Benchmarks

Chemical	Soil Criteria (mg/kg)	Soil Criteria Source
Bis(2-ethylhexyl)phthalate	NA	--
Caprolactum	NA	--
Carbazole	NA	--
Diethyl phthalate	1.00E+02	Region IV
Dimethyl phthalate	2.00E+02	Region IV
Di-N-Butyl phthalate	2.00E+02	Region IV
Di-N-octyl Phthalate	NA	--
Isophorone	NA	--
Phenol	5.00E-02	Region IV
VOCs		
1,1,2,2-Tetrachloroethane	NA	--
1,2,4-Trimethlybenzene	NA	--
1,3,5-Trimethylbenzene	NA	--
2-Butanone	NA	--
4-Methyl-2-pentanone	NA	--
Acetone	NA	--
Benzene	5.00E-02	
Benzaldehyde	1.00E-02	Region IV
Carbon disulfide	NA	--
Chloroform	1.00E-03	Region IV
Chloromethane	NA	--
Ethylbenzene	5.00E-02	Region IV
Isopropylbenzene	NA	--
Methylene chloride	NA	--
n-Propylbenzene	NA	--
Styrene	1.00E-01	Region IV
Tetrachloroethene	1.00E-02	Region IV
Toluene	5.00E-02	Region IV
Trichloroethene	NA	--
Trichloroflouromethane	NA	--
Xylenes (m & p)	NA	--
Xylenes (o)	NA	--
Xylenes (Total)	5.00E-02	Region IV

Sources
For surface soil criteria:
The lowest Eco-SSLs of available receptors, accessed at
http://www.epa.gov/ecotox/ecossl/, or
Region IV Ecological Screening Values, accessed at
http://www.epa.gov/region4/superfund/programs/riskassess/ecolbul.html or
Region III Ecological Screening Values, assessed at
http://www.epa.gov/reg3hscd/risk/eco/btag/sbv/marsed/screenbench.htm,
were used if Eco-SSLs were not available.

Notes:

NA: Screening Value not available

mg/kg: milligram per kilogram

Eco-SSL: Ecological Soil Screening Levels

LMW PAH: Low molecular weight polynuclear aromatic hydrocarbon

HMW PAH: High molecular weight polynuclear aromatic hydrocarbon

Table 4
Maximum Soil Detection Comparison to Screening Levels
for AOC-4

Analyte	Surface Soil				Selection of Chemical of Potential Ecological Concern
	Frequency	Maximum (mg/kg)	Location of Maximum	Screening Criteria (mg/kg)	Terrestrial Habitats
Metals					
Aluminum	7/7	1.70E+04	SO4-01-0.0-0.5	pH < 5.5	NO
Antimony	**1/7**	**4.75E-01**	**FR-133A**	**2.70E-01**	**YES**
Arsenic	7/7	5.70E+00	SO4-01-0.0-0.5	1.00E+01	NO
Barium	**7/7**	**8.09E+02**	**SO4-01-0.0-0.5**	**1.65E+02**	**YES**
Beryllium	1/7	1.80E-01	FR-133A	1.00E+01	NO
Cadmium	**2/7**	**9.00E-01**	**SO4-01-0.0-0.5**	**3.60E-01**	**YES**
Calcium	6/6	2.64E+05	SO4-03-0.0-0.5	2.12E+05	NO, Esn. Nut.
Chromium	**7/7**	**1.76E+01**	**SO4-04-0.0-0.5**	**4.00E-01**	**YES**
Cobalt	7/7	3.80E+00	SO4-01-0.0-0.5	1.30E+01	NO
Copper	**7/7**	**3.98E+01**	**SO4-04-0.0-0.5**	**2.80E+01**	**YES**
Iron	7/7	1.30E+04	SO4-01-0.0-0.5	pH < 5.5	NO
Lead	**7/7**	**4.84E+02**	**FR-133A**	**1.10E+01**	**YES**
Magnesium	6/6	6.01E+03	SO4-01-0.0-0.5	4.55E+03	NO, Esn. Nut.
Manganese	**7/7**	**2.59E+02**	**SO4-01-0.0-0.5**	**1.65E+02**	**YES**
Mercury	**7/7**	**1.50E+00**	**SO4-01-0.0-0.5**	**5.00E-04**	**YES**
Nickel	**7/7**	**1.85E+01**	**SO4-01-0.0-0.5**	**3.00E+00**	**YES**
Potassium	6/6	4.00E+03	SO4-01-0.0-0.5	3.66E+03	NO, Esn. Nut.
Selenium	**1/7**	**4.28E+02**	**FR-133A**	**2.00E-01**	**YES**
Sodium	5/6	4.23E+03	MW-17-0.0-0.5	2.89E+03	NO, Esn. Nut.
Vanadium	**7/7**	**2.13E+01**	**SO4-01-0.0-0.5**	**2.00E+00**	**YES**
Zinc	**7/7**	**5.60E+02**	**SO4-01-0.0-0.5**	**8.50E+00**	**YES**
PAHs					
Acenaphthene	3/6	3.20E-02	SO4-04-0.0-0.5	NA	Use Total LMW
Acenaphthylene	4/6	6.10E-02	SO4-04-0.0-0.5	NA	Use Total LMW
Anthracene	5/6	6.50E-02	SO4-04-0.0-0.5	NA	Use Total LMW
Benzo(a)Anthracene	7/7	5.90E-01	MW-17-0.0-0.5	NA	Use Total HMW
Benzo(a)Pyrene	7/7	5.09E-01	MW-17-0.0-0.5	NA	Use Total HMW
Benzo(b)Fluoranthene	7/7	8.20E-01	MW-17-0.0-0.5	NA	Use Total HMW
Benzo(g,h,i)Perylene	7/7	2.19E-01	FR-133A	NA	Use Total HMW
Benzo(k)Fluoranthene	7/7	2.70E-01	SO4-04-0.0-0.5	NA	Use Total HMW
Chrysene	7/7	6.00E-01	MW-17-0.0-0.5	NA	Use Total HMW
Dibenzo(a,h)Anthracene	5/6	7.60E-02	MW-17-0.0-0.5	NA	Use Total HMW
Fluoranthene	7/7	1.40E+00	MW-17-0.0-0.5	NA	Use Total LMW
Fluorene	2/6	1.50E-02	MW-17-0.0-0.5	NA	Use Total LMW
Indeno(1,2,3-Cd)Pyrene	7/7	3.50E-01	SO4-04-0.0-0.5 MW-17-0.0-0.5	NA	Use Total HMW
Phenanthrene	7/7	1.66E+02	FR-133A	NA	Use Total LMW
Pyrene	7/7	1.10E+00	MW-17-0.0-0.5	NA	Use Total HMW
Total LMW PAHs	**7/7**	**1.66E+02**	**FR-133A**	**2.90E+01**	**YES**
Total HMW PAHs	**7/7**	**5.87E+00**	**MW-17-0.0-0.5**	**1.10E+00**	**YES**
SVOCs					
Acetophenone	**1/6**	**6.20E-02**	**SO4-05-0.0-0.5**	**NA**	**YES**
Benzaldehyde	**1/6**	**6.60E-02**	**SO4-05-0.0-0.5**	**NA**	**YES**
Bis(2-ethylhexyl)phthalate	**3/7**	**2.20E-01**	**SO4-04-0.0-0.5**	**NA**	**YES**
Carbazole	**1/6**	**1.90E-02**	**SO4-05-0.0-0.5**	**NA**	**YES**
Dimethyl phthalate	2/6	1.50E-01	SO4-04-0.0-0.5	2.00E+02	NO
Phenol	1/6	3.30E-02	SO4-05-0.0-0.5	5.00E-02	NO
VOCs					
2-Butanone	**1/6**	**1.40E-02**	**SO4-01-0.0-0.5**	**NA**	**YES**
Ethylbenzene	1/6	3.70E-03	SO4-01-0.0-0.5	5.00E-02	NO
Isopropylbenzene	**2/7**	**2.30E-03**	**FR-133A**	**NA**	**YES**
Tetrachloroethene	1/6	1.20E-03	SO4-01-0.0-0.5	1.00E-02	NO
Trichloroflouromethane	**4/6**	**5.00E-04**	**SO4-01-0.0-0.5**	**NA**	**YES**
Xylenes (m & p)	**2/6**	**3.50E-02**	**SO4-01-0.0-0.5**	**NA**	**YES**
Xylenes (o)	**1/6**	**1.20E-02**	**SO4-01-0.0-0.5**	**NA**	**YES**

NOTES:
NA: not available
mg/kg: milligram per kilogram
LMW PAH: Low molecular weight polynuclear aromatic hydrocarbon
HMW PAH: High molecular weight polynuclear aromatic hydrocarbon
Esn. Nut.: Essential nutrient

APPENDIX A

EPA Region 6 Ecological Exclusionary Criteria for AOC-4

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APPENDIX A
ECOLOGICAL EXCLUSION CRITERIA WORKSHEET

The Exclusion Criteria Worksheet is intended to aid facilities and regulators in determining whether or not further ecological evaluation is necessary at an affected property where a response action is being pursued utilizing the CAS. Exclusion criteria refer to those conditions at an affected property which preclude the need for a formal ecological risk assessment (ERA) because there are incomplete or insignificant ecological exposure pathways due to the nature of the affected property setting and/or the condition of the affected property media. The person completing the worksheet should be familiar with the affected property but need not be a professional scientist in order to respond, although some questions will likely require contacting a wildlife management agency (U.S. Fish and Wildlife Service, etc.). The worksheet is designed for general applicability to all affected property; however, there may be unusual circumstances which require professional judgment in order to determine the need for further ecological evaluation (e.g., cave-dwelling receptors). In these cases, it is strongly encouraged to contact your state regulatory agency for additional guidance before proceeding.

The worksheet consists of three major parts. Part 1, identification of the affected property and background information, Part 2, the actual exclusion criteria and supportive information, and Part 3, a qualitative summary statement and certification of the information submitted. Answers to the worksheet should reflect existing conditions and should not consider future remedial actions at the affected property. Completion of the worksheet should lead to a logical conclusion as to whether further ecological evaluation is warranted. Definitions of terms used in the worksheet are provided and users are encouraged to review these definitions before completing the worksheet.

The Exclusion Worksheet has been adapted from and follows the Texas Natural Resources Conservation Commission (TNRCC) Texas Risk Reduction Program (TRRP) Tier 1 Checklist. TNRCC has developed some additional information regarding the use of their Tier 1 Checklist which should also be consulted in completing the CAS Ecological Exclusion Criteria Worksheet. This information can be found in Chapter 2 of TNRCCs Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas, Draft Final, August 2000; http://www.tnrcc.state.tx.us/permitting/remed/techsupp/erag8_00.pdf

Part 1. Affected Property Identification and Background Information

1) Provide a description of the specific area of the response action and the nature of the release. Include estimated acreage of the affected property and the facility property, and a description of the type of facility and/or operation associated with the affected property. Also describe the location of the affected property with respect to the facility property boundaries and public roadways.

The site is currently a barge docking facility, which is approximately 0.5 acres and is located on Redfish Bay. The fenced facility, which is connected to the refinery by pipelines, is used to load and unload barges. Currently, only crude oil passes through the docking facility. No public roadways connect to the site and most of the site is paved or contains building facilities.

Attach available USGS topographic maps and/or aerial or other affected property photographs to this form to depict the affected property and surrounding area. (*Please see Attachment A*)

_____ Topo map __X__ Aerial photo _____ Other

2) Identify the environmental media known or suspected to contain chemicals of concern (COCs) at the present time. Check all that apply:

Known/Suspected COC Location	Based on sampling data?	
__X__ Soil < 5 ft below ground surface	__X__ Yes	_____ No
_____ Soil > 5 ft below ground surface	_____ Yes	_____ No
_____ Groundwater	_____ Yes	_____ No
_____ Surface Water/Sediments	_____ Yes	_____ No

Explain (previously collected information may be referenced):

Soil and groundwater samples were collected from the site in 2007 and 2013 (TRC 2013, this report). As there had been no reported releases or evidence of spills at the site, COC screening was limited to metals, VOCs, and SVOCs in 2007 and PAHs were added to the Phase II sampling in 2013.

3) Provide the information below for the nearest surface water body which has become or has the potential to become impacted from migrating COCs via surface water runoff, air deposition, groundwater seepage, etc.

Exclude: wastewater treatment facilities and stormwater conveyances/impoundments authorized by permit.

Also exclude: conveyances, decorative ponds, and those portions of the process facilities which are:

a. Not in contact with surface waters of the State or other surface waters which are ultimately in contact with surface waters of the State; and

b. Not consistently or routinely utilized as valuable habitat for natural communities including birds, mammals, reptiles, etc.

The nearest surface water body is adjacent to the affected property. The surface water body is named Redfish Bay (AOC-5).

The surface water body is best described as a:

__X__ Saltwater or brackish swamp/marsh/wetland

____

Is the water body listed as a State classified segment?

__X__Yes Segment #__2483_____Use classification: Aquatic Life Use, Contact Recreation Use, General Use, Fish Consumption Use, Oyster Waters Use

_____No

As necessary, provide further description of surface waters in the vicinity of the affected property:

AOC-5 in Redfish Bay and the intercoastal waterway is being investigated separately in the Screening Level Ecological Risk Assessment and Human Health Risk Assessment.

Part 2. Exclusion Criteria and Supportive Information

Subpart A. Surface Water/Sediment Exposure

1) Regarding the affected property where a response action is being pursued, have COCs migrated and resulted in a release or imminent threat of release to either surface waters or to their associated sediments via surface water runoff, air deposition, groundwater seepage, etc.

Exclude: wastewater treatment facilities and stormwater conveyances/impoundments authorized by permit.

Also exclude: conveyances, decorative ponds, and those portions of the process facilities which are:

a. Not in contact with surface waters of the State or other surface waters which are ultimately in contact with surface waters of the State; and

b. Not consistently or routinely utilized as valuable habitat for natural communities including birds, mammals, reptiles, etc.

_____Yes __X__No

Explain:

The site (AOC-4) is considered industrial with no suitable habitat that would support wildlife communities. The aquatic region (AOC-5) is being considered separately.

If the answer is Yes to Subpart A above, the affected property does not meet the exclusion criteria. (However, complete the remainder of Part 2, to determine if there is a complete and/or significant soil exposure pathway, then complete Part 3, Qualitative Summary and Certification).

If the answer is No to Subpart A above, go to Subpart B.

Subpart B. Affected Property Setting

In answering Yes to the following question, it is understood that the affected property is not attractive to wildlife or livestock, including threatened or endangered species (i.e., the affected property does not serve as valuable habitat, foraging area, or refuge for ecological communities). May require consultation with management agencies.

1). Is the affected property wholly contained within contiguous land characterized by: pavement, buildings, landscaped area, functioning cap, roadways, equipment storage area, manufacturing or process area, or other surface cover or structure, or otherwise disturbed ground?

__X__Yes _____No

Explain:

The 0.5 acre site is primarily covered by pavement, buildings, roadways, and process areas. There is no natural or undisturbed habitat within the site boundaries.

If the answer is Yes to Subpart B above, the affected property meets the exclusion criteria, assuming the answer to Subpart A was No. (Skip Subparts C and D and complete Part 3, Qualitative Summary and Certification).

If the answer is No to Subpart B above, go to Subpart C.

Subpart C. Soil Exposure

1) Are COCs which are in the soil if the affected property solely below the first 5 feet beneath ground surface or does the affected property have a physical barrier present to prevent exposure to receptors to COCs in the surface soil?

_____Yes _____No

Explain: _____

If the answer is Yes to Subpart C above, the affected property meets the exclusion criteria, assuming the answer to Subpart A was No. (Skip Subpart D and complete Part 3, Qualitative Summary and Certification).

If the answer is No to Subpart C above, go to Subpart D.

Subpart D. DeMinimus Land Area

In answering Yes to the question below, it is understood that all of the follow conditions apply:

- The affected property is not known to serve as habitat, foraging area, or refuge to threatened/endangered or otherwise protected species. (Will likely require consultation with wildlife management agencies).
- Similar but unimpacted habitat exists within a half-mile radius.
- The affected property is not known to be located within one-quarter mile of sensitive environmental areas (e.g., rookeries, wildlife management areas, preserves). (Will likely require consultation with wildlife management agencies).
- There is no reason to suspect that the COCs associated with the affected property will migrate such that the affected property will become larger than one acre.

- Using human health protective concentration levels as a basis to determine the extent of the COCs, does the affected property consist of one acre or less and does it meet all the conditions described above?

  _____Yes _____No

  Explain how the conditions are/are not met: _____
  _____
  _____

If the answer is Yes to Subpart D, then no further ecological evaluation is needed at the affected property, assuming the answer to Subpart A was No. (Complete Part 3, Qualitative Summary and Certification).

If the answer is No to Subpart D, Proceed to an Ecological Risk Evaluation.

Part 3. Qualitative Summary and Certification (Complete in all cases)

Attach a brief statement (1 page or less) summarizing the information you have provided in this form. This summary should include sufficient information to verify that the affected property meets or does not meet

the exclusion criteria. The facility should make the initial decision regarding the need to conduct further ecological evaluation based on the results of this worksheet. However, the State will make a final determination on the need for further ecological assessment.

Please see Attachment B.

Note : the facility has the continuing obligation to re-enter the ERA process if changing circumstances result in the affected property not meeting the exclusion criteria requirements presented in this worksheet.

Completed by: Amber Garr
Environmental Scientist
March 17, 2014

I believe that the information submitted is true, accurate, and complete, to the best of my knowledge.

Dan Hinckley (Typed Name of Person)

Lead Ecological Risk Assessor (Title of Person)

Daniel A. Hinckley (Signature of Person)

27 March 2014 (Date Signed)

Definitions (applicable to Exclusion Worksheet)

Affected property - The entire area (i.e., on-site and off-site; including all environmental media) which contains releases of chemicals of concern at concentrations equal to or greater than the assessment level applicable for the land use (i.e., residential or commercial/industrial) and groundwater classification.

Assessment level - a critical protective concentration level for a chemical of concern used for affected property assessments where the human health protective concentration level is established by State regulation or guidance .

Bedrock - the solid rock (i.e., consolidated, coherent, and relatively hard naturally formed material that cannot normally be excavated by manual methods alone) that underlies gravel, soil, or other surficial material.

Chemicals of concern - any chemical that has the potential to adversely affect ecological or human receptors due to its concentration, distribution, and mode of toxicity.

Community - an assembledge of plant and animal populations occupying the same habitat in which the various species interact via spatial and trophic relationships (e.g., a desert community or a pond community).

Complete exposure pathway - an exposure pathway where a human or ecological receptor is exposed to a chemical of concern via an exposure route (e.g., incidental soil ingestion, inhalation of volatiles and particulates, consumption of prey, etc).

De Minimus - the description of an area of affected property comprised of one acre or less where the ecological risk is considered to be insignificant because the small extent of contamination, the absence of protected species, the availability of similar unimpacted habitat nearby, and the lack of adjacent sensitive environmental areas.

Ecological protective concentration level - the concentration of a chemical of concern at the point of exposure within an exposure medium (e.g., soil, sediment, groundwater, or surface water) which is determined to be protective for ecological receptors. These concentration levels are intended to be protective for more mobile or wide-ranging ecological receptors and, where appropriate benthic invertebrate communities within waters of the State. These concentration levels are not intended to be directly protective of receptors with limited mobility or ranges (e.g., plants, soil invertebrates, and small rodents), particularly those residing within active areas of a facility, unless these receptors are threatened/endangered species or unless impacts to these receptors result in disruption of the ecosystem or other unacceptable consequences fo the more mobile or wide-ranging receptors (e.g., impacts to an off-site grassland habitat eliminate rodents which causes a desirable owl population to leave the area).

Ecological risk assessment - a process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors; however, as used in this context, only chemical stressors (i.e., COCs) are evaluated.

Environmental medium - a material found in the natural environment such as soil, (including non-waste fill materials), groundwater, air, surface water, and sediments, or a mixture of such materials with liquids,

sludges, gasses or solids, including hazardous waste which is inseparable by simple mechanical removal processes, and is made up of primarily of natural environmental material.

Exclusion criteria - those conditions at an affected property which preclude the need to establish a protective concentration level for an ecological exposure pathway because the exposure pathway between the chemical of concern and the ecological receptors is not complete or is insignificant.

Exposure medium - the environmental medium or biological tissue in which or by which exposure to chemicals of concern by human or ecological receptors occurs.

Facility - the installation associated with the affected property where the release of chemicals of concern have occurred.

Functioning cap - a low permeability layer or other approved cover meeting its design specifications to minimize water infiltration and chemical of concern migration, and prevent ecological or human receptor exposure to chemical of concern, where design requirements are routinely maintained.

Landscaped area - an area of ornamental, or introduced, or commercially installed, or manicured vegetation, which is routinely maintained.

Off-site property - all environmental media which is outside the legal boundaries of the on-site property.

On-site property - all environmental media within the legal boundaries of a property that has become subject to corrective action, either through voluntary action, permit or order.

Physical barrier - any structure or system, natural or manmade, that prevents exposure or prevents physical migration of chemicals of concern to points of exposure.

Point of exposure - the location within an environmental medium where a receptor will be assumed to have a reasonable potential to come into contact with chemicals of concern. The point of exposure may be a discrete point, plane, or an area within or beyond some location.

Protective concentration level - the concentration of a chemical of concern which can remain within the source medium and not result in levels which exceed the applicable human health risk based exposure limit considering cumulative risk and hazard index for both carcinogenic and non-carcinogenic effects respectively, or ecological protective concentration level at the point of exposure for that exposure pathway.

Release - any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment, with the exception of:

- a release that results in an exposure to a person solely within a workplace, concerning a claim that the person may assert against the persons employer;
- an emission from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, pipeline pumping station engine;
- a release of source, by product, or special nuclear material a nuclear incident, as those terms identified by the Atomic Energy Act of 1954, as amended (42 USC 2201 et. seq.); if the release area is subject to requirements concerning financial protection established by

the Nuclear Regulatory Commission under Section 170 of that Act;

- for the purpose of the environmental response law Section 104, as amended, or other response action, release of source, by-product, or special nuclear material from a processing site designated under Section 102(a)(1) for Section 302(a) of the Uranium Mill Tailings Radiation Control Act of 1978 (42 USC Section 7912 and Section 7942) as amended; and
- the normal application of fertilizer.

Sediment - non-suspended particulate material lying below surface waters such as bays, the ocean, rivers, streams, lakes, ponds, or other similar surface water body (including intermittent streams). Dredged sediments which have been removed from surface water bodies and placed on land shall be considered soils.

Sensitive environmental areas - areas that provide unique and often protected habitat for wildlife species. These areas are typically used during critical life stages such as breeding, hatching, rearing of young, and overwintering. Examples include; critical habitat for threatened and endangered species, wilderness areas, parks and wildlife refuges.

Source medium - an environmental medium containing chemicals of concern which must be removed, decontaminated and/or controlled in order to protect human health and the environment. The source medium may be the exposure medium for some exposure pathways.

Stressor - any physical, chemical, or biological entity that can induce an adverse response; however, as used in this context, only chemical entities apply.

Subsurface soil - for human health exposure pathways, the portion of the soil zone between the base of the surface soil and the top of the groundwater-bearing unit(s). For ecological exposure pathways, the portion of the soil zone between 0.5 feet and 5 feet in depth.

Surface cover - a layer of artificially placed utility material (e.g., shell, gravel).

Surface soil - for human health exposure pathways, the soil zone extending from ground surface to 15 feet in depth for residential land use and from ground surface to 5 feet in depth for commercial/industrial land use; or to the top of the uppermost groundwater-bearing unit or bedrock, whichever is less in depth. For ecological exposure pathways, the soil zone extending from ground surface to 0.5 feet in depth.

Surface water - any water meeting the definition of surface water as defined by the authorized State.

ECOLOGICAL ASSESSMENT CHECKLIST

The evaluation associated with the checklist is intended to be a screening-level survey of the developed and undeveloped/ecological portions of the site. The checklist is patterned after ERAGS Appendix A - Checklist for Ecological Assessment/Sampling, June 1997 and consists of five major sections: 1 - Site Description, 2 - Terrestrial Habitat Checklist, 3 - Aquatic Habitat Checklist (non-flowing systems), 4 - Aquatic Habitat Checklist (flowing systems), and 5 - Wetlands Habitat Checklist. Answers to the checklist should reflect existing conditions and should not consider future remedial actions at the site.

In general, the checklist is designed for applicability to all sites, however, there may be unusual circumstances which require professional judgment in order to determine the need for further ecological evaluation. Sources and general information available for the identification of ecological receptors and habitats may include: the U.S. Fish and Wildlife Service (http://www.fws.gov), State Game and Fish Conservation Services, United States Geological Service (USGS), National Wetland Inventory Maps (http://nwi.fws.gov) National Audubon Society, National Biological Survey, national and local wildlife clubs, National and State Heritage Programs, State and National Parks System, and tribal organizations.

Section 1. Site Description

1. Site Name: Falcon Refinery Superfund Site Location: Redfish Bay

   County/Parish: San Patricio County City: Ingleside State: TX Type of Facility: Barge Docking Facility

2. Latitude: 27.85822° N Longitude: -97.16860° W

3. What is the approximate area of the site? 0.5 acres

4. Is this the first site visit? Yes _____ No X. If no, attach trip report of previous site visit(s), if available. Date(s) of previous site visit(s): NA – no site visit has taken place

5. Please attach to the checklist USGS topographic map(s) of the site, if available.

6. Are aerial or other site photographs available? Yes X No_____. If yes, please attach any available photo(s) to the site map at the conclusion of this section.

7. The land use on the site is:

   _____% Urban
   _____% Rural
   _____% Residential
   100 % Industrial light X heavy
   _____% Agriculture
   (Crops:_____)
   _____% Recreational

   The area surrounding the site is:

   _____% Urban
   50 % Rural
   _____% Residential
   50 % Industrial X light heavy
   _____% Agriculture
   (Crops:_____)
   _____% Recreational

8. Has any movement of soil taken place at the site? Yes ___

If yes, please identify the most likely cause of this disturbance:

_____Agricultural Use
_____Natural Events
_X_____Heavy Equipment
_____Erosion
_____Mining
_____Other

Please describe: *Site has been used to offloads barges and has been reworked to authorize the offloading.*

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State Monuments, wetlands, prairie potholes? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

No

10. What type of facility is located at the site?

__X__Chemical_____Manufacturing _____Mixing _____Waste Disposal
_____Other (specify) _____

11. What are the suspected contaminants of concern at the site? If known, what are their maximum concentration levels? S

Suspected contaminants include metals, PAHs, SVOCs, and VOCs

12. Check any potential routes of off-site migration of contaminants observed at the site:

_____Swales _____Depressions _____Drainage ditches
_X___Runoff _____Windblown particulate _____Vehicular traffic
_____Other (specify) _____

13. If known, what is the approximate depth to the water table? *Not known.*

14. Is the direction of surface runoff apparent from site observations? Yes ___ No___X. If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

_____Surface water _____Groundwater _____Sewer _____Collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? Yes X__No____.

Intercoastal waterway (AOC-5) Redfish Bay adjacent to site is being evaluated independently.

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section 3: Aquatic Habitat Checklist - non-flowing systems and /or Section 4: Aquatic Habitat Checklist - flowing systems.

Yes ___X_(approximate distance: *Adjacent (evaluated separately as AOC-5)*____) No____.

17. Is there evidence of flooding? Yes _____ No X____. *Wetlands and flood plains are not always*

obvious; do not answer "no" without confirming information. If yes, complete Section 5: Wetland Habitat Checklist. _____

_____

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying the fauna. (Use a blank sheet if additional space is needed for text).

NA _____

_____

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? Yes _____ No No. *If yes, you are required to verify this information with the U.S. Fish and Wildlife Service.* If species identities are known, please list them in the text. _____

_____

20. Record weather conditions at the time this checklist was prepared:
Date: *Not applicable*

_____Temperature (^{0}C /^{0}F) _____ Normal daily high temperature
_____Wind (direction/speed) _____ Precipitation (rain,snow)
_____Cloud cover

Section 1A. Summary of Observations and Site Setting

Completed by _____ Affiliation _____
Additional Preparers _____
Site Manager _____
Date _____

Section 2. Terrestrial Habitat Checklist

Section 2A. Wooded

1. Are there any wooded areas on the site? Yes_____No__X__. If no, go to Section IIB: Shrub/Scrub.

2. What percentage of the area of the site is wooded? (_____%_____acres). Indicate the wooded area on the site map which is attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site. _____
_____

3. What is the dominant type of vegetation in the wooded area?
(Circle one: Evergreen/Deciduous/Mixed) Provide a photograph if available.
Dominant plant, if known: _____

4. What is the predominant size of the trees at the site? Use diameter at breast height.
_____ 0-6 inches _____6-12 inches _____> 12 inches

5. Specify type of understory present, if known. Provide a photograph, if available. _____
_____
_____

Section 2B. Shrub/scrub

1. Is shrub/scrub vegetation present at the site? Yes_____No__X__. If no, go to Section IIC: Open Field.

2. What percentage of the site is covered by shrub/scrub vegetation? (_____%_____acres). Indicate the acres of shrub/scrub on the site map. Please identify what information was used to determine this area.
_____
_____

3. What is the dominant type of shrub/scrub vegetation, if known? Provide a photograph if available.
_____

4. What is the approximate average height of the shrub/scrub vegetation?
_____0-2 feet _____2-5 feet _____> 5 feet

5. Based on site observations, how dense is the shrub/scrub vegetation?
_____Dense _____patchy _____Sparse

Section 2C. Open Field

1. Are there open (bare, barren) field areas present at the site? Yes_____No_____X_____. If yes, please indicate the type below:
_____Prairie/plains _____Savannah _____Old field _____Other (specify) _____
_____

2. What percentage of the site is open field? (_____ % _____ acres). Indicate the open field areas on the site map.

3. What is/are the dominant plant plants? Provide a photograph if available. _____
_____

4. What is the approximate average height of the dominant plant? _____

5. Describe the vegetation cover: _____ Dense _____ Sparse _____ Patchy

Section 2D. Miscellaneous

1. Are other types of terrestrial habitats present at the site, other than woods, shrub/scrub, and open field? Yes_____No__X___. If yes, identify and describe below. _____
_____
_____
_____
_____

2. Describe the terrestrial miscellaneous habitat(s) and identify these areas on the site map.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc? _____
_____

4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site. _____
_____
_____
_____

Section 3. Aquatic Habitat Checklist – Non-flowing Systems

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section 5, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?
_____Natural (pond or lake)
_____Artificially created (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?
_____

3. If a waterbody is present, what are its known uses (e.g., recreation, navigation, etc.)?
_____

4. What is the approximate size of the waterbody(ies)? _____ acre(s).

5. Is any aquatic vegetation present? Yes _____ No _____. If yes, please identify the type of vegetation present, if known.
_____Emergent _____Submergent _____Floating

6. If known, what is the depth of the water? _____

7. What is the general composition of the substrate? Check all that apply.
_____Bedrock _____Sand _____Muck (fine/black)
_____Boulder (>10 in.) _____Silt (fine) _____Debris
_____Cobble (2.5-10 in.) _____Marl (shells) _____Detritus
_____Gravel (0.1-2.5 in.) _____Clay (slick) _____Concrete
_____Other (specify) _____

8. What is the source of water in the waterbody?
_____River/Stream/Creek _____Groundwater _____Other (specify) _____
_____Industrial discharge _____Surface runoff

9. Is there a discharge from the site to the waterbody? Yes_____No_____. If yes, please describe this discharge and its path. _____
_____

10. Is there a discharge from the waterbody? Yes _____ No _____. If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.
_____River/Stream/Creek _____onsite offsite _____ Distance _____
_____Groundwater _____onsite offsite _____
_____Wetland _____onsite offsite _____ Distance _____
_____Impoundment _____onsite offsite _____

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

_____ Area
_____ Depth (average)
_____ pH
_____ Dissolved oxygen
_____ Salinity
_____ Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth_____)
_____ Other (specify)

12. Describe observed color and area of coloration. _____
_____

13. Mark the open-water, non-flowing system on the site map attached to this checklist.

14. What observations, if any were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds mammals, etc.? _____
_____
_____

Section 4. Aquatic Habitat Checklist – Flowing Systems

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section 5, wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is (are) present at the site?

_____River	_____Stream	_____Creek
_____Dry wash	_____Arroyo	_____Brook
_____Artificially created (ditch, etc,)	_____Intermittent stream	_____Channeling
	X____Other (specify) Bay	

2. If known, what is the name of the waterbody? *Redfish Bay in the intercoastal waterway. However, the adjacent aquatic habitat is being evaluated separately as AOC-5*

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)? Yes_____No_____. If yes, please describe indicators that were observed. _____
_____
_____

4. What is the general composition of the substrate? Check all that apply.

_____Bedrock _____Sand _____Muck (fine/black)

_____Boulder (>10 in.) _____Silt (fine) _____Debris
_____Cobble (2.5-10 in.) _____Marl (shells) _____Detritus
_____Gravel (0.1-2.5 in.) _____Clay (slick) _____Concrete
_____Other (specify) _____

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)? _____
_____
_____

6. Is the system influenced by tides? Yes _____ No _____. What information was used to make this determination? _____
_____

7. Is the flow intermittent? Yes _____ No _____. If yes, please note the information that was used in making this determination. _____
_____

8. Is there a discharge from the site to the waterbody? Yes _____ No _____. If yes, please describe the discharge and its path. _____
_____

9. Is there a discharge from the waterbody? Yes _____ No _____. If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge in onsite or off site.
_____
_____

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected, provide the measurement and the units of measure in the appropriate space below:

_____ Width (feet)
_____ Depth (feet)
_____ Velocity (specify units)
_____ Temperature (depth of the water at which the temperature was taken)
_____ pH
_____ Dissolved oxygen
_____ Salinity
_____ Turbidity (clear, slightly turbid, turbid, opaque)
(Secchi disk depth_____)
_____ Other (specify) _____

11. Described observed color and area of coloration. _____
_____
_____

12. Is any aquatic vegetation present? Yes _____ No _____. If yes, please identify the type of vegetation present, if known.
_____Emergent _____Submergent _____Floating

13. Mark the flowing water system on the attached site map.

14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.? _____
_____
_____

Section 5. Wetland Habitat Checklist

1. Based on observations and/or available information, are designated or know wetlands definitely present at the site? Yes_____No_____.
Please note the sources of observations and information used (e.g., USGS Topographic maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.
_____
_____
_____

2. Based on the location of the site (e.g., along a waterbody, in a floodplain) and site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? Yes_____No _____. If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

_____Submergement _____Emergent
_____Shrub/scrub _____Wooded
_____Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available. _____
_____
_____
_____

5. Is standing water present. Yes ____ No ____. If yes, is this water: Fresh _____ Brackish _____ What is the approximate area of the water (sq. ft.)? _____
Please complete questions 4, 11, 12 in Checklist 3 - Aquatic Habitat -- Non-Flowing Systems.

6. Is there evidence of flooding at the site? What observations were noted?
_____Buttressing _____Water marks _____Mud cracks
_____Debris line _____Other (describe below)
_____

7. If known, what is the source of water in the wetland?

_____Stream/River/Creek/Lake/Pond _____Groundwater _____ Flooding _____Surface runoff

8. Is there a discharge from the site to a known or suspected wetland? Yes _____ No _____. If yes, please describe. _____
_____

9. Is there a discharge from the wetland? Yes _____ No _____. If yes, to what waterbody is the discharge released?
_____Surface stream/River _____Groundwater _____Lake/pond _____Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.
Color (blue/gray, brown, black, mottled) _____
Water content (dry, wet, saturated/unsaturated) _____

11. Mark the observed wetland area(s) on the attached site map.

Attachment A

Attachment A

Attachment B

Two areas of concern were evaluated for this Screening Level Ecological Risk Assessment, however, we are requesting exclusion for one site (AOC-4) as per the guidelines in the USEPA Region 6 Ecological Exclusion Screening criteria. AOC-4 is approximately 0.5 acres and contains the current barge docking facility. The site is fenced, predominately paved, and contains several small structures with no wooded, shrub, or open field habitat. Due to the site's small size and the unsuitable habitat for terrestrial wildlife, we believe it meets the exclusionary criteria.

The adjacent aquatic habitat (AOC-5) is located within Redfish Bay in the intercoastal waterway and is being evaluated separately.