PROPOSED PLAN

GULFCO MARINE MAINTENANCE SUPERFUND SITE
FREEPORT, BRAZORIA COUNTY, TEXAS

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 6
June 2011

INTRODUCTION

This **Proposed Plan** identifies the United States Environmental Protection Agency's (EPA) preliminary recommendation and Preferred Alternative of how best to address the contamination discovered at the Gulfco Marine Maintenance Superfund Site (hereinafter, "the Gulfco Site" or "the Site"). This Proposed Plan also presents the alternatives that were evaluated and explains the reasons the EPA is recommending the Preferred Alternative. Words in **"boldface"** type in the Proposed Plan are defined in the "Glossary of Terms."

The purposes of this Proposed Plan are:

- To present the rationale for the EPA's preliminary recommendation of implementation of Alternative 2 (Ground Water Controls and Monitoring) for the Site,
- To solicit public review and comment on the preliminary recommendation and the information contained in the Administrative Record,
- To provide the history and background information about the Site, and
- To provide details and information on how the public can be involved in the remedy selection process and where the public can find more information about the Site.

The Site is located in Freeport, Texas, at 906 Marlin Avenue, which is also referred to as County Road 756 (see Figure 1 – Site Location Map).

Preliminary Recommendation

The EPA's preliminary recommendation for the Site is the implementation of Alternative 2 (Ground Water Controls and Monitoring). Under this preliminary recommendation, institutional control technologies are used to address the Remedial Action Objectives (RAO) for the affected ground water. This alternative includes: 1) review and evaluation of current restrictive covenants prohibiting ground water use on Lots 55 through 57 of the Site and requiring protection against indoor vapor intrusion for building construction on these lots; 2) modification of the existing institutional controls to identify the type and location of hazardous substances; 3) annual ground water monitoring, and as a part of the Five-Year Reviews, to confirm stability of the affected ground water plume and demonstrate the occurrence of natural biodegradation and other processes, as well as an evaluation of additional measures to address the RAOs; and 4) implementation of an Operation and Maintenance Plan to provide ground water monitoring and inspection/repair of the cap covering the former impoundments. Natural biodegradation is one of the processes that will aid in the stability of the ground water plumes, but it is not a component of the Preferred Alternative described in this Proposed Plan. Monitored Natural Attenuation is not a remedy component, and restoration of the ground water is not a RAO.

9543660

The EPA is also recommending this action because the previous **Removal Action** eliminated the existing and potential risks to human health and the environment, except for the vapor intrusion pathway. Additionally, the **Ecological Risk Assessments** concluded that current or potential future Site conditions pose no unacceptable risks to ecological receptors.

The EPA's rationale for this preliminary recommendation is explained further in the following sections of this Proposed Plan.

Public Meeting and Comment Period

A public meeting is scheduled for July 14, 2011, at 7 pm at the Velasco Community House located at 110 Skinner Street in Freeport, Texas. The EPA will hold this public meeting to explain the Proposed Plan and the EPA's preliminary recommendation of implementation of Alternative 2 (Ground Water Controls and Monitoring) for the Site. Oral and written comments will be accepted at the meeting. The 30-day public comment period will begin on July 3, 2011, and ends on August 2, 2011. The Site's information repositories, containing the **Administrative Record** of the documents used to develop this Proposed Plan, are located at:

Freeport Branch Library
410 Brazosport Boulevard
Freeport, Texas 77541

U.S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

The documents comprising the Administrative Record include, among others, the **Remedial Investigation** (RI), **Feasibility Study** (FS), **Human Health Risk Assessment**, Screening Level Ecological Risk Assessment, and Baseline Ecological Risk Assessment Reports. The Proposed Plan highlights key information from the RI and FS Reports. Attachment 1 (Comment Sheet) can be used to provide the EPA with written comments during the public meeting and/or comment period.

The EPA, with concurrence from the TCEQ, may modify the EPA's preliminary recommendation presented in this Proposed Plan or select a Remedial Action based on new information or the public's comments. Therefore, the public is encouraged to review the documents found in the Administrative Record to gain a more comprehensive understanding of the Site, participate in the scheduled public meeting, and to review and comment on the EPA's preliminary recommendation presented in this Proposed Plan. The public's input on all of the alternatives for the Site and on the rationale for the Preferred Alternative is important in the EPA's remedy selection process.

The EPA, in consultation with the TCEQ, will issue a **Record of Decision** for the Site, which identifies the Selected Remedy, after reviewing and evaluating all comments submitted during the Proposed Plan public meeting and the 30-day public comment period. The EPA will respond to all significant comments in a **Responsiveness Summary** which will be included in the Record of Decision for the Site.

STATUTORY AND REGULATORY AUTHORITY

The EPA, the lead agency, is issuing this Proposed Plan and preliminary recommendation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or **Superfund**), as amended, and to fulfill the requirements under CERCLA §117(a) and under §300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The TCEQ, as the support agency, provided management assistance to the EPA. The "Final Rule," adding the Site to the **National Priorities List**, was published in the Federal Register on May 30, 2003.

SITE BACKGROUND

Site Location

The Site (See Figure 1 – Site Location Map), which is located within the city limits of Freeport, Brazoria County, Texas, consists of approximately 40 acres along the north bank of the Intracoastal Waterway between Oyster Creek and the Texas Highway 332 bridge, located approximately one mile to the east and west of the Site, respectively. The Site includes approximately 1,200 linear feet (ft.) of shoreline on the Gulf Intracoastal Waterway. The

population of Brazoria County is approximately 242,000, with approximately 12,700 residents in Freeport according to the 2000 U.S. Census.

Marlin Avenue, which runs approximately east to west, divides the Site into two primary areas (See Figure 2 – Site Map). The property to the north of Marlin Avenue, or the North Area, consists of undeveloped land and the closed surface impoundments, while the property south of Marlin Avenue, or the South Area, was developed for industrial uses with multiple structures, a dry dock, sand blasting areas, a former aboveground storage tank (AST) tank farm, and two barge slips connected to the Intracoastal Waterway. The North Area is zoned as "M-2, Heavy Manufacturing." The South Area is zoned as "W-3, Waterfront Heavy" by the City of Freeport. This designation provides for commercial and industrial land use, primarily port, harbor, or marine-related activities. Institutional controls in the form of restrictive covenants prohibiting any land use other than commercial or industrial and prohibiting ground water use have been filed for all parcels within both the North and South Areas. Additional restrictions requiring any building design to preclude indoor vapor intrusion and requiring EPA and TCEQ notification prior to any building construction have been filed for Lots 55, 56 and 57 of the North Area.

Adjacent property to the north, west, and east of the North Area is unused and undeveloped. Adjacent property to the east of the South Area is currently used for industrial purposes. The property to the west of the South Area is currently vacant and previously served as a commercial marina. The Intracoastal Waterway bounds the Site to the south. Residential areas are located south of Marlin Avenue, approximately 300.0 ft west of the Site, and 1,000 ft east of the Site.

The South Area includes approximately 20 acres of upland that was created from dredged material from the Intracoastal Waterway. Some of the North Area is upland created from dredge spoil, but most of this area is considered wetlands by the United States Fish and Wildlife Service. The Intracoastal Waterway design width and depth in the vicinity of the Site, based on United States Army Corps of Engineers mean low tide datum, is 125.0 ft wide and 12.0 ft deep.

History of the Site

The Site underwent several ownerships and operated as a barge cleaning and repair facility from 1971 to about 1998. Barges brought to the facility were cleaned of waste oils, caustics, and organic chemicals. Three surface impoundments in the North Area were used for storage of these materials and waste wash waters generated during barge cleaning activities until 1981. The impoundments were closed in 1982. The shallow ground water, consisting of salt water unfit for human consumption, occurring below the former impoundments was investigated and found to contain various organic chemicals.

Pre-barge cleaning operations were associated with dredge spoiling activities in the area to the south of the Site. Dredge spoils from the Intracoastal Waterway can be seen in historical photographs of the southern part of the Site. Deed records for specific lots on the Site conveyed an easement to United States for the work of "constructing, improving, and maintaining an Intracoastal Waterway", and for "the deposit of dredged material."

Additionally, off-shore oil platform fabrication work was performed in the northeast part of the South Area during the early 1960s. Raw materials and supplies were brought onto the Site, the platform fabrication work (*i.e.*, welding, metals cutting, etc.) was performed, and the finished products and any unused materials and supplies were removed from the Site.

Contaminated Media and Cause

The EPA believes that the contamination, in the ground water underlying the Site, was caused by the historical barge cleaning and wash water disposal operations, and possibly the off-shore oil platform fabrication work operations. The uppermost ground water-bearing unit, or Zone A, underlying the North Area contains **volatile organic compounds** (VOCs), particularly chlorinated solvents, their degradation products, and benzene at concentrations exceeding their "extent evaluation criteria or values." The extent evaluation criteria are screening levels that were used to determine the extent of contamination. If soil or ground water concentrations, at the

perimeter of the area being investigated, exceeded the extent evaluation criteria or values, additional samples were taken over an expanded area. These screening levels were compiled from a number of sources such as the EPA's Region 6 Media-Specific Screening Levels, TCEQ's Protective Concentration Levels, surface water quality standards, and Maximum Contaminant Levels. The actual screening value used in determining whether to perform additional sampling was the lowest, or more conservative, of these values.

Semi-volatile organic compounds (SVOCs) and metals were also detected in Zone A at concentrations exceeding these values. "**Dense nonaqueous phase liquids** (DNAPL)**,**" consisting of organic carcinogenic compounds that could affect human health if ingested or inhaled, were also detected in the water-bearing zone. The thirteen potential source areas and the nature and extent of contamination of all media within these areas were investigated during the RI and are discussed in more detail in the following sections of this Proposed Plan.

PREVIOUS ENFORCEMENT ACTIVITIES

The EPA has conducted enforcement activities to compel the **potentially responsible parties** (PRPs) to investigate the Site's contamination.

The EPA issued a Unilateral Administrative Order (UAO), effective July 29, 2005, to the PRPs to perform a RI to define the nature and extent of contamination at the Site and to prepare a Feasibility Study to identify and screen remedial action alternatives. The RI, FS, in addition to, the Human Health and Ecological Risk Assessment Reports have been completed and support the EPA's preliminary recommendation described in this Proposed Plan.

The EPA issued an Administrative Settlement Agreement and Order on Consent for Removal Action (Settlement Agreement) on October 26, 2010, addressing the former AST Tank Farm located in the South Area. The Settlement Agreement required the removal of the ASTs that contained hazardous substances from the barge cleaning operations. The removal work began in November 2010 and was completed by March 2011.

PREVIOUS INVESTIGATIONS

Federal and state entities have conducted several studies of the Site to investigate the Site's contamination.

The Texas Water Commission (TWC), a predecessor of the TCEQ, certified closure of the surface impoundments, located at the North Area, on August 24, 1982. Impoundment closure activities involved removal of liquids and most of the impoundment sludges prior to closure. The impoundments were capped with three ft of clay and a hard-wearing surface (*i.e.*, shell).

A Public Health Assessment (PHA) was prepared for the Site in 2004 by the Texas Department of Health (TDH) for the Agency for Toxic Substances and Disease Registry (ATSDR). The PHA concluded that contaminants in soil, sediment, and ground water pose no apparent public health hazards, but the overall public health hazard could not be determined due to a lack of data for all pathways.

A Health Assessment (HA) was prepared for the Site in February 13, 2008, by the TDH for the ATSDR. The HA concluded that, "Based upon our analysis of the November and December 2006 data, we do not expect to see health effects associated with exposure to contaminants in fish and crab collected from the Intracoastal Waterway near the Gulfco Marine Maintenance Superfund Site. Therefore, consumption of fish and crab from the Intracoastal Waterway poses no apparent public health hazard."

Potentially Responsible Parties' Involvement

The PRPs have been involved with the investigation and cleanup of the Site. The PRPs performed the RI/FS for the Site through a 2005 UAO, and a 2010 Removal Action under a Settlement Agreement with the EPA which addressed the former AST Tank Farm located at the South Area.

COMMUNITY INVOLVEMENT

The EPA has been actively engaged in dialogue and collaboration with the affected community and has strived to advocate and strengthen early and

meaningful community involvement during the EPA's removal and remedial activities at the Site. The following community participation activities performed during the remedy selection process meet the public participation requirements in CERCLA and the NCP.

Community Involvement Plan

The **Community Involvement Plan** (CIP) for the Site was prepared in November 2004. The CIP is central to Superfund community involvement. It specifies the outreach activities that the EPA will undertake to address community concerns and expectations. The CIP includes background information on the community, community issues and concerns, community involvement activities and timing (including a communication strategy), an official contact list, and local media contacts.

Technical Assistance Grant

The availability of a Technical Assistance Grant (TAG) was published on September 26, 2002, and May 15, 2003. No final applications were received. The purpose of a TAG is for a local community group to secure the services of a Technical Advisor to assist them in understanding the information that is developed about the Site during the Superfund process. The TAG provides funding for activities that help a community participate in decision making at Superfund sites.

Community Meetings

The EPA and TCEQ have conducted community meetings during the course of the Superfund activities at the Site and have provided public notices of these meetings in order to encourage the community's participation. Community meetings were held in August 2003 and October 2005.

A public meeting is scheduled for July 14, 2011, at 7 pm at the Velasco Community House located at 110 Skinner Street in Freeport, Texas. The EPA will hold this public meeting to explain the Proposed Plan and the EPA's preliminary recommendation of implementation of Alternative 2 (Ground Water Controls and Monitoring) for the Site. Oral and written comments will be accepted at the meeting. The 30-day public comment period will begin on July 3, 2011, and ends on August 2, 2011. The EPA encourages the public to participate in the scheduled public meeting and to review and comment on the EPA's preliminary recommendation presented in this Proposed Plan.

Fact Sheets

Fact sheets have been and will continue to be prepared as necessary to provide the public current information about the Site. The EPA has posted a current fact sheet, which provides additional information about the Site, on the internet at:

http://www.epa.gov/region6/6sf/pdffiles/0602027.pdf

The EPA and TCEQ will continue to provide information regarding the cleanup of the Site to the public through public meetings, the Administrative Record file for the Site, and local newspaper announcements.

SCOPE AND ROLE OF OPERABLE UNITS

"**Operable Unit**" (OU) means a discrete action that comprises an incremental step toward comprehensively addressing problems at a site. The cleanup of a site can be divided into a number of OUs, depending on the complexity of the problems associated with a site. OUs may address geographical portions of a site, site-specific problems, or initial phases of an action. OUs may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site. OUs will not impede implementation of subsequent actions, including a final action at a site. The EPA has organized the Site into one OU, consisting of the North and South Area, and the action described in this Proposed Plan addresses all of the contaminated media at the Site.

SITE CHARACTERISTICS AND REMEDIAL INVESTIGATION ACTIVITIES

Sampling Strategy

Site investigation activities were performed using a phased approach for each environmental medium investigated. The first investigative phase for each medium involved the collection of

environmental samples from that medium at locations specified in the RI Work Plan (WP), or, in some cases, at initial locations jointly determined by the EPA and Gulfco Restoration Group representatives. Following validation, data from an initial investigation phase were compared to Preliminary Screening Values (PSVs) specified in the WP and background levels, as appropriate for that specific medium and chemical of interest (COI), for the purpose of assessing whether the lateral and, for most media, vertical extent of the COI(s) in the environmental medium being evaluated had been identified. In cases where perimeter samples contained one or more COIs exceeding both their respective PSVs and background levels, where applicable, additional investigative phases were proposed in accordance with WP provisions.

Former Surface Impoundments

The former surface impoundments, located at the North Area, consisted of three earthen lagoons used for the storage of wash waters generated from barge cleaning operations. Covering an area of approximately 2.5 acres combined, the impoundments were reportedly three ft deep with a natural clay liner. The impoundments were closed in 1982 with closure activities reported to include: (1) removal of liquids and most of the contained sludges, (2) solidification of approximately 100 cubic yards of residual sludge that was difficult to excavate, (3) and capping with three ft of clay and a hard-wearing surface (*i.e.*, shell). The impoundments' cap extends approximately 1.5 to 2.5 ft above the surrounding grade. The cap crown slope is about 2% with slopes of 5 to 1 (horizontal to vertical) or less at the cap edge.

Soil borings were drilled through the impoundments' cap and soil samples were tested to evaluate the construction materials and thickness of the cap. The surface impoundment cap thicknesses at the boring locations ranged from 2.5 to greater than 3.5 ft. The geotechnical properties of the cap material are consistent with those recommended for industrial landfill cover systems in TCEQ's Technical Guideline No. 3, and the vertical hydraulic conductivities were all less than the TCEQ's guideline value of 1.0×10^{-7} centimeters per second.

A detailed field inspection of the cap was performed on August 3, 2006. The cap appeared to be in generally good condition with no significant desiccation cracks or erosion features observed on the cap surface or slopes. The cap surface consisted of a partially vegetated crushed oyster shell surface overlying the clay layer. Some sporadic indications of animal penetrations (*e.g.*, crab burrows) of the cap's surface were observed. Occasional debris (*e.g.*, scrap wood and telephone poles) was present on the surface and several large bushes, approximately three ft in height, were observed mostly near the cap edges. Drilling rig and other heavy equipment (*i.e.*, support truck) traffic across the western end of the cap in conjunction with Site investigation activities has resulted in surface rutting of the cap in this area. A follow-up cap inspection was performed on September 17, 2008, to assess potential damage to the cap as a result of Hurricane Ike. No visible damage from the hurricane storm surge or associated effects was observed.

The cap investigation and inspection findings indicate the need for cap repair activities, specifically the restoration of a three-ft thick clay layer throughout the cap, and repair of rutted areas to meet the requirements of the TWC-approved closure plan.

NATURE AND EXTENT OF CONTAMINATION

The nature and extent of COIs in Site environmental media were investigated during the RI through the collection of Site and background Intracoastal Waterway sediment and surface water samples, fish tissue samples, South and North Area soil samples, background and off-site soil samples, former surface impoundment cap soil borings, wetland sediment and surface water samples, ground water samples, and pond sediment and surface water samples. For the Site's ground water investigation, monitoring wells and temporary and permanent piezometers were installed throughout the Site during the RI.

Intracoastal Waterway Sediments

Intracoastal Waterway sediments were investigated through the collection and analysis of samples from a background area and samples adjacent to the Site. All samples were collected from

the 0 to 0.5 ft depth interval below the ground's surface (bgs). Additional Intracoastal Waterway sediment samples were collected as part of the Baseline Ecological Risk Assessment.

Certain polynuclear aromatic hydrocarbons (PAHs), including some carcinogenic PAHs, and 4,4'-dichlorodiphenyltrichloroethane (DDT) were the only COIs detected in Site Intracoastal Waterway sediment samples at concentrations exceeding extent evaluation comparison values. These exceedances were limited to sample locations within or on the perimeter of the barge slip areas. Based on these data, the lateral extent of contamination in Intracoastal Waterway sediments, as defined by COI concentrations above extent evaluation comparison values, was identified as limited to small localized areas within two of the Site's barge slips. A vertical extent evaluation does not apply to this medium.

Intracoastal Waterway Surface Water

Intracoastal Waterway surface water was investigated through the collection and analysis of samples from a background area and samples adjacent to the Site. Intracoastal Waterway samples were composites consisting of three sub-samples (*i.e.*, one sub-sample from approximately one ft below the water surface, a second sub-sample from the mid-depth of the water column, and a third sub-sample from approximately one ft above the base of the water column).

No COIs were detected at concentrations above their respective extent evaluation comparison values in Site Intracoastal Waterway surface water samples, thus background surface water values were not calculated for this comparison.

North Area Soils

North Area RI Phase 1 soil samples were collected for chemical analysis from the 0 to 0.5 and 1.0 to 2.0 ft bgs depth intervals from upland locations. Based on the Phase 1 soil data from the 1.0 to 2.0 ft bgs depth interval samples at these locations, a Phase 2 soil sample was collected from the 4.0 to 5.0 ft bgs depth interval at one location. In addition to this Phase 2 sample, shallow soil borings were advanced at locations where scrap metal was observed at the surface of the ground. Soil samples were collected for laboratory analysis from the 0 to 0.5 and 1.5 to 2.0 ft bgs depth intervals from these borings. Additional Phase 2 borings were advanced in the vicinity of the Phase 1 soil boring, where subsurface debris (*e.g.*, a section of rope) was observed in the auger cuttings from the boring for an adjacent monitoring well, in order to evaluate the presence and/or composition of debris in this area. Soil samples for laboratory analyses were collected from multiple depth intervals from these borings, generally corresponding to the 1.0 ft bgs depth interval immediately above observed debris, immediately below the debris, and within the approximate center of the observed debris layer. Debris was observed at one boring from approximately 3.0 to 6.0 ft bgs. Given the depth of the debris relative to the saturated zone (*i.e.*, saturated conditions were observed at a depth of approximately 4.0 to 5.0 ft bgs), it was decided to not attempt to collect a sample below the debris at this location from the 3.0 to 4.0 ft bgs depth interval sample at this location.

Site investigation activities also included an evaluation of the construction materials and thickness of the clay caps constructed on the former surface impoundments during closure of the impoundments in 1982. This evaluation involved drilling and sampling of borings through the caps, geotechnical testing of representative cap material (*i.e.*, clay) samples, and performance of a field inspection of the caps, including observation of desiccation cracks, erosion features, and overall surface condition.

The only COIs detected in at least one North Area soil sample at concentrations exceeding their respective extent evaluation comparison values were arsenic, iron, lead, 1,2,3-trichloropropane (1,2,3-TCP), trichloroethene (TCE), benzo(a)pyrene (BaP), dibenz(a,h)anthracene, and polychlorinated biphenyls (PCBs). The lateral extent of contamination in North Area soils, as defined by COI concentrations above their respective extent evaluation comparison values, was limited to small localized areas within the North Area where upland soils are present (*i.e.*, within the area surrounded by wetlands). The vertical extent of COIs at concentrations above extent evaluation comparison values in North Area soils extends to the saturated zone at some locations. Within the extent of North Area soil contamination, a small localized area of buried debris (*i.e.*, rope, wood fragments,

plastic, packing material, etc.) was encountered at depths of 3.0 ft bgs or more in the subsurface south of the former surface impoundments.

South Area Soils

RI activities in the South Area consisted of two separate soil programs with differing scopes and objectives. The first South Area soil sampling program involved the collection of soil samples from multiple depth intervals for evaluating the lateral and vertical extent of COIs in Site soils. This program is referred to as the "South Area soil investigation." The second soil program, which was limited to the collection of surface soil samples, from the 0 to 1.0 inch bgs depth interval, from the western part of the South Area and off-site properties immediately west of the South Area had the focused objective of evaluating the potential for migration of metals associated with Site's sandblasting operations to produce elevated concentrations of COIs in soils in the residential areas to the west of the Site. This program is referred to as the "residential surface soil investigation."

The South Area Phase 1 soil investigation samples were collected for chemical analysis from the 0 to 0.5 and 1.0 to 2.0 ft bgs depth intervals from several locations in the South Area. Based on data from these initial Phase 1 samples, Phase 2 soil samples were collected from the 4.0 to 5.0 ft bgs depth interval from several of these locations from the South Area and from various depth intervals at locations on the adjacent former commercial marina parcel to the west.

Soil samples were collected as part of a residential surface soil investigation program to evaluate the potential for migration of metals associated with Site's sandblasting operations to produce elevated concentrations of those metals in soils in residential areas to the west. This investigation included the collection of surface soil samples for chemical analysis from the 0 to 1.0 inch bgs depth interval at specified locations on several Site lots.

COIs detected in South Area soils at concentrations exceeding extent evaluation comparison values included certain metals, polychlorinated biphenyls (PCBs), and PAHs, including some carcinogenic PAHs. The lateral extent of contamination in South Area soils, as defined by COI concentrations above their respective extent evaluation comparison values, was identified as limited to the South Area and potentially a small localized area immediately west and adjacent to the Site on an off-site lot. The vertical extent of COI concentrations above comparison values in South Area soils was defined by samples from depths less than 4.0 ft bgs, except for a sample collected from a depth of 4.5 ft bgs during a removal action performed at the tank farm in the South Area.

Lead concentrations, from the residential surface soil investigation program, were compared to the lowest of the lead PSVs that are associated with direct contact exposure pathways (*i.e.*, those pathways involving potential soil contact by residential receptors). The lead PSVs for these pathways are the EPA Region 6 human health media-specific screening level for soil of 400 **milligram per kilogram** (mg/kg), and the TCEQ $^{Tot}Soil_{Comb}$ Protective Concentration Level (PCL) of 500 mg/kg, which includes inhalation, ingestion and dermal contact pathways. Thus, a lead concentration of 400 mg/kg was used as the comparison value for assessing whether further surface soil investigation beyond Lots 19 and 20 was necessary. The sole Lot 19/20 surface soil sample with a lead concentration greater than 400 mg/kg is believed to be indicative of a local source associated with the former marina rather than a source at the Site. Other soil samples exhibited lead concentrations below the 400 mg/kg comparison value, thus precluding the need for further residential soil investigation sampling.

Wetland Sediments

RI wetland sediment samples, from the North Area of the Site, were initially collected for chemical analysis from the 0 to 0.5 ft bgs depth interval at several Phase 1 locations. At several of these locations, where saturated conditions were not encountered at depths less than 2.0 ft bgs, samples were also collected from the 1.0 to 2.0 ft bgs depth interval. In addition, Phase 2 wetland sediment samples were collected from on- and off-site locations selected based on field observations, particularly with regard to potential drainage areas. Based on the Phase 1 and 2 sample data, additional samples were collected.

COIs detected in at least one wetland sediment sample at concentrations exceeding their respective extent evaluation comparison values included certain metals, pesticides and PAHs, including some carcinogenic PAHs. The lateral extent of contamination in wetland sediments, as defined by COIs concentrations above extent evaluation comparison values, was limited to specific areas within the Site's boundaries and small localized areas immediately north and east of the Site. The vertical extent of COIs at concentrations above extent evaluation comparison values in wetland sediments was limited to the upper one foot of unsaturated sediment.

Wetland Surface Water

Based on field reconnaissance and subsequent discussions with the EPA during 2006, the number of proposed surface water sample locations, from the North Area of the Site, was subsequently revised to due to the general lack of ponded surface water in the area. Sampling at these locations was performed on December 6, 2006. Surface water was not present at two sample locations at that time and it was determined that only a limited number of wetland surface water locations would be sampled.

Acrolein, copper, mercury, and manganese were the only COIs detected in at least one wetland surface water sample at concentrations exceeding their respective extent evaluation comparison values. The lateral extent of contamination in wetland surface water, as defined by COI concentrations above extent evaluation comparison values, was limited to localized areas within and immediately north of the Site. A vertical extent evaluation does not apply to this medium.

Ponds Sediment

RI ponds sediment samples were collected from locations within the "Fresh Water Pond" on Lot 55 in the North Area and from the smaller pond to the southeast (hereinafter, "the Small Pond"). At all locations, sediment samples were collected from the 0 to 0.5 ft bgs depth interval.

Zinc and 4,4'-DDT were the only COIs detected in at least one pond sediment sample at concentrations exceeding their respective extent evaluation comparison values. These exceedances were all limited to the Small Pond at the Site, which effectively defined the extent of contamination in pond sediments. A vertical extent evaluation does not apply to this medium.

Ponds Surface Water

RI ponds surface water samples were collected from locations within the "Fresh Water Pond" and "Small Pond." Water in the "Fresh Water Pond," which was approximately 4.0 to 4.5 ft deep at several sample locations, is relatively brackish. Water in the much shallower "Small Pond," at a depth of approximately 0.2 ft when sampled in July 2006 and nearly dry in June 2008, is less brackish.

Arsenic, manganese, silver, and thallium were the only COIs detected in at least one pond surface water sample at concentrations exceeding their respective extent evaluation comparison values. The lateral extent of pond surface water contamination, as identified by these exceedances of the extent evaluation comparison values, is defined by the boundaries of the two ponds. A vertical extent evaluation does not apply to this medium.

Ground Water

Ground water RI Investigation activities included evaluations of the possible presence of **Non-Aqueous Phase Liquid** (NAPL), including both **Light Non-Aqueous Phase Liquid** (LNAPL) and DNAPL, in Site monitoring wells. The three uppermost water-bearing units at the Site, which are designated from shallowest to deepest as Zone A, Zone B, and Zone C, respectively, were evaluated as part of the Site ground water investigation.

Zone A is the uppermost water-bearing unit at the Site. It is generally first encountered at a depth of 5.0 to 15.0 ft bgs, with an average depth of approximately 10.0 ft bgs. Zone A ranges in thickness from approximately 2.0 to 10.0 ft, with an average thickness of approximately 8.0 ft.

Zone B is first encountered at a depth of 15.0 to 33.0 ft bgs. The average depth to the top of Zone B was approximately 19.0 ft bgs. Zone B is separated from Zone A by a medium- to high-plasticity clay

that ranged in thickness from approximately 2.0 to 7.0 ft. Where present, Zone B sands ranged in thickness from as little as 1.0 ft to as much as approximately 20.0 ft, with an average thickness of approximately 11.0 ft.

Zone C consisted of a thin, less than 0.5 ft thick, shell layer at a depth of approximately 73.0 ft bgs within a high plasticity clay unit. Approximately 25.0 or more ft of clay to silty clay separate Zone C from Zone B, where Zone B is present.

Although semi-volatile organic compounds (SVOCs) and metals were detected in Zone A ground water samples at concentrations exceeding extent evaluation comparison values, volatile organic compounds (VOCs), particularly chlorinated solvents and their degradation products, were the predominant COIs detected in Zone A ground water samples. The following compounds were detected in Zone A ground water above their respective extent evaluation comparison values:

- Trichloroethane (1,1,1-TCA);
- 1,1-dichloroethene (1,1-DCE);
- 1,2,3-trichloropropane (1,2,3-TCP);
- 1,2-dichloroethane (1,2-DCA);
- Benzene;
- Cis-1,2-dichloroethene (Cis-1,2-DCE);
- Methylene chloride;
- Tetrachloroethene (PCE);
- Trichloroethene (TCE); and
- Vinyl chloride (VC)

The highest COI concentrations in Zone A ground water were generally observed in wells where visible NAPL was observed in soil cores from the base of Zone A. Concentrations of several COIs, most notably 1,1,1-trichloroethane (1,1,1-TCA), tetrachloroethene (PCE), and TCE exceeded 1% of the compound's solubility limit, which is often used as an indicator for the possible presence of NAPL. Thus, the ground water data from these wells are consistent with the observation of visible NAPL within the soil matrix. The extent of VOCs exceeding extent evaluation comparison values and DNAPL was generally limited to a localized area within the North Area, roughly over the southern half of the former surface impoundments area, and a similarly sized area immediately to the south of the former surface impoundments.

The lateral extents of the primary COIs in Zone A ground water are generally limited to an area of approximately 200.0 ft or less, and in many cases much less, from the boundary of the former surface impoundments. Dividing this distance by the potential migration period estimates of 27 to 38 years would correspond to contaminant migration rates ranging from approximately 5.0 to 7.0 ft/year. These rates are consistent with estimated Zone A average linear ground water velocities of up to 5.0 ft/year. However, considering that these migration rates correspond to the furthest extent of potentially observed migration and that NAPL, a potential source of dissolved COIs, was observed in soil cores for monitoring wells located approximately 120.0 to 160.0 ft south of the impoundments, the limited extent of COIs observed in Zone A ground water is consistent with both the low estimated ground water velocity and further reductions in contaminant migration due to biodegradation. The observed dissolved COI plume stability, low ground water velocity, and demonstrated contaminant degradation also predict limited potential for future migration.

Several SVOCs (primarily anthracene, naphthalene, phenanthrene, and pyrene) and pesticides (primarily endosulfan II, endosulfan sulfate, 4,4'-DDE, Dieldrin, gamma-BHC, and heptachlor epoxide) were occasionally detected in Zone A ground water samples at concentrations exceeding extent evaluation comparison values. These exceedances were either: (1) not confirmed by a second sample collected at that location (*e.g.*, the endosulfan sulfate and heptachlor epoxide exceedances in one sample from a well were not confirmed in a subsequent sample collected from this well ten months later, (2) not confirmed by a sample from a monitoring well subsequently installed adjacent to a temporary piezometer location, or (3) bounded by samples from downgradient monitoring wells that did not show exceedances of that specific COI.

Chromium, nickel, and silver concentrations exceeded extent evaluation comparison values in a number of Zone A ground water samples. In all cases, these concentrations exceeded TCEQ ecological benchmark values for surface water ecological surface water criteria, but were far below TCEQ Class 3 ground water protective concentration

levels (PCLs). As such, these exceedances are solely attributable to the conservative assumption of direct and undiluted discharge of Site ground water to surface water. Furthermore, the ecological benchmark values are intended to apply to dissolved concentrations in surface water rather than the total concentrations represented by the ground water data. Considering the presence of a significant amount of fine-grained material, such as silt or clay, in the Zone A matrix, it is highly unlikely that the chromium, silver, and nickel concentrations detected in ground water samples reflect actual dissolved concentrations in ground water that could be theoretically discharged to surface water. Even if the observed total chromium, nickel, and silver concentrations did reflect dissolved concentrations discharging to surface water, the resultant mass flux would be extremely low and would be readily diluted at the point of discharge. Thus, these ecological benchmarks for dissolved metals concentrations in surface water are not considered applicable to total metals concentrations in ground water samples. As a result, the chromium, nickel and silver ground water exceedances relative to ecological surface water criteria data were not used to define the lateral extent of contamination in Zone A.

The lateral extent of contamination in Zone B was limited to VOCs detected in samples from a single well located southeast of the former surface impoundments. Concentrations of several COIs in one well; most notably 1,1,1-TCA, PCE, and TCE; exceeded 1% of the compound solubility limit. These concentrations are consistent with the observation of visible NAPL within the soil matrix at the base of Zone B GWBU in the soil core from the boring at this location. The vertical extent of contamination in ground water is limited to Zones A and B.

The extent of contamination in Zone C was evaluated through the collection and analysis of samples from one ground water monitoring well and five piezometers. As for Zone B, the extent evaluation comparison values listed for Zone C did not consider ecological PSVs. The only concentrations exceeding extent evaluation comparison values were 1,2,3-TCP; PCE; and TCE in the initial sample collected from one monitoring well, and 1,2,3-TCP in a second sample collected from this same well. No exceedances were noted in two subsequent samples collected from this well, nor were any exceedances indicated in samples from any of the five piezometers. Based on the absence of any exceedances in the Zone C piezometers, and the lack of confirmed exceedances in the single well, it is concluded that the vertical extent of contamination in Site ground water has been defined as limited to Zones A and B.

Fish Tissue

Fish tissue samples of red drum, spotted sea trout, southern flounder, and blue crab were collected from the Site, Intracoastal Waterway, and background area for laboratory analysis. Only six red drum samples were collected from the Site over the sampling period due to difficulty in collecting legal size fish.

Samples of red drum, spotted sea trout, southern flounder, and blue crab were analyzed for COIs selected based on Intracoastal Waterway sediment data. Hazard indices calculated based on the fish tissue data were several orders of magnitude below one, indicating that the fish ingestion pathway does not present an unacceptable noncarcinogenic health risk. Cancer risk estimates based on these data were 2.0×10^{-6}, or less, and thus within or below the EPA's target risk range, indicating that adverse carcinogenic health effects are unlikely. Based on that evaluation, it was concluded that exposure to site-related COIs via the fish ingestion pathway does not pose a health threat to recreational anglers fishing at the Site, or their families.

CURRENT AND POTENTIAL FUTURE LAND USES

The land use for the North Area and South Area is currently classified by the City of Freeport Zoning Code.

The land use for the North Area is currently zoned as "M-2, Heavy Manufacturing." This classification allows for manufacturing and industrial activities. The North Area consists of undeveloped land, a former parking area, and the closed surface impoundments.

The South Area is currently unused but it is anticipated that the South Area will be used for

commercial/industrial purposes in the future. The South Area is zoned as "W-3, Waterfront Heavy." This classification provides for port, harbor, or marine-related activities including the storage, transport, and handling and manufacturing of goods, materials, and cargoes related to marine activities. The South Area was developed for industrial uses with improvements including multiple structures, a dry dock, two barge slips, a sand blasting area, and a former AST Tank Farm.

Restrictive covenants limiting types of land uses, construction, and ground water use have been filed for various parcels of the Site. Restrictive covenants prohibiting any land use other than commercial or industrial and prohibiting ground water use have been filed for all parcels within both the North and South Areas. Additional restrictions requiring any building design to preclude indoor vapor intrusion have been filed for Lots 55, 56, and 57 in the North Area. A further restriction requiring EPA and TCEQ notification prior to any building construction has also been filed for Lots 55, 56, and 57.

CURRENT AND POTENTIAL FUTURE GROUND WATER USES

Ground water in Zones A and B is characterized by total dissolved solids (TDS) concentrations of approximately 30,000 mg/L or more. These TDS concentrations are approximately triple the 10,000 mg/L level used by the EPA to define water as non-potable and by TCEQ to identify Class 3 ground water (*i.e.*, ground water not considered useable as drinking water). Due to naturally high salinity, Zones A and B, as well as underlying ground water-bearing zones within the upper approximately 200.0 ft of the subsurface, have not been used as a water supply source. It is not expected that these water-bearing zones will be used as a potable source of drinking water in the near future.

HUMAN HEALTH RISK ASSESSMENT AND SUMMARY OF SITE RISKS

A **Baseline Human Health Risk Assessment** (BHHRA) is an integral part of the RI process. A BHHRA estimates the current and possible future risks if no action were taken to clean up a site, or baseline risk. The EPA's Superfund risk assessors determine how threatening a hazardous waste site is to human health and the environment. They seek to determine a safe level for each potentially dangerous contaminant present (*i.e.*, a level at which ill health effects are unlikely and the probability of cancer is very small). Living near a Superfund site doesn't automatically place a person at risk, that depends on the chemicals present and the ways people are exposed to them.

The BHHRA used data collected during the RI and industrial/commercial land use assumptions to evaluate the completeness and potential significance of potential human health exposure pathways identified in Conceptual Site Models (CSMs) for the South and North Areas of the Site.

To estimate the baseline risk at a Superfund site, the EPA identifies the following four-step process:

- Step 1 – Identify Chemicals of Concern,
- Step 2 – Estimate Exposure,
- Step 3 – Assess Potential Health Effects, and
- Step 4 – Characterize Site Risk.

In Step 1, the risk assessor compiles all of the chemical data for a site to identify what chemicals were detected in each medium (*i.e.*, soil and ground water). Chemicals that are detected frequently at high concentrations, or are considered highly toxic, are considered "chemicals of concern" (COC) and are evaluated in the risk assessment. In Step 2, the risk assessor considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, the risk assessor calculates a "reasonable maximum exposure" (RME) scenario, which portrays the highest level of human exposure that could reasonably be expected to occur. In Step 3, the risk assessor compiles toxicity information on each chemical, including numeric values for assessing cancer and non-cancer adverse health effects.

The EPA identifies two types of risk: cancer risk and non-cancer risk. The likelihood of any kind of cancer resulting from a Superfund site is generally

expressed as an upper bound probability; for example, a "1 in 10,000 chance" of an individual developing cancer. In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For non-cancer health effects, the risk assessor calculates a "hazard index" (HI). The key concept here is that a "threshold level," measured usually as a hazard index of less than 1, exists below which non-cancer health effects are no longer predicted. In Step 4, the risk assessor uses the exposure information from Step 2 and toxicity information from Step 3 to calculate potential cancer and non-cancer health risks. The results are compared to the EPA's acceptable levels of risk to determine whether site risks are great enough to potentially cause health problems for populations at or near the Superfund site.

Chemicals of Concern

COCs are chemicals that pose a carcinogenic risk to human health greater than 1 in 1,000,000 (*i.e.*, 1.0×10^{-6}), have a non-carcinogenic hazard index (HI) greater than 1.0, or are found in Site ground water at concentrations that exceed maximum contaminant levels (MCLs). The following list of COCs were chosen as risk drivers due to their highest potential cancer risk and/or toxicity potential to any or all of the effected potential receptors (*i.e.*, off-site residential, future industrial/commercial worker, future on-site construction worker, youth trespasser, and contact recreational user). The following constituents are considered to be ground water COCs at the Site:

- Benzene,
- 1,1,1-Trichloroethane,
- 1,2-Dichloroethane,
- 1,2,3-Trichloropropane,
- cis-1,2-Dichloroethene,
- Tetrachloroethylene,
- Trichloroethene,
- Methylene Chloride, and
- Vinyl Chloride.

Benzene, also known as benzol, is a colorless liquid with a sweet odor. Benzene evaporates into air very quickly and dissolves slightly in water. Benzene is highly flammable. Benzene is found in air, water, and soil and comes from both industrial and natural sources. Brief exposure (5-10 minutes) to very high levels of benzene in air can result in death. Lower levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. In most cases, people will stop feeling these effects when they are no longer exposed and begin to breathe fresh air. Long-term exposure to benzene can cause cancer of the blood-forming organs. This condition is called leukemia.

1,1,1-Trichloroethane is a synthetic chemical that does not occur naturally in the environment. It had many industrial and household uses, including use as a solvent to dissolve other substances, such as glues and paints; to remove oil or grease from manufactured metal parts; and as an ingredient of household products such as spot cleaners, glues, and aerosol sprays. Breathing high levels of this substance for a short time can cause dizziness, lightheadedness, and possibly loss of coordination. Breathing higher levels can cause unconsciousness.

1,1-Dichloroethene is an industrial chemical that is not found naturally in the environment. It is a colorless liquid with a mild, sweet smell. It is used to make flame retardant coatings for steel pipes and used in adhesive applications. Exposure to this COC occurs mainly in the workplace. Breathing high levels of this COC can affect the liver, kidney, and central nervous system.

1,2-Dichloroethane, also called ethylene dichloride, is a manufactured chemical that is not found naturally in the environment. It is a clear liquid and has a pleasant smell and sweet taste. The most common use of this substance is in the production of vinyl chloride which is used to make a variety of plastic and vinyl products including polyvinyl chloride pipes, furniture and automobile upholstery, wall coverings, housewares, and

automobile parts. It is also used as a solvent and is added to leaded gasoline to remove lead.

1,2,3-Trichloropropane is a colorless, heavy liquid with a sweet but strong odor. It is mainly used to make other chemicals. Some of it is also used as an industrial solvent, paint and varnish remover, and cleaning and degreasing agent. Exposure to high levels of this COC for a short time causes eye and throat irritation.

1,2-Dichloroethene, is a highly flammable, colorless liquid with a sharp harsh odor. It is used to produce solvents and in chemical mixtures. Breathing high levels of this COC can make you feel nauseous, drowsy, and tired.

Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products. Results of animal studies, conducted with amounts much higher than those that most people are exposed to, show that this substance can cause liver and kidney damage and liver and kidney cancers even though the relevance to people is unclear. This substance may reasonably be anticipated to be a human carcinogen.

Trichloroethene is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers. Drinking or breathing high levels of this substance may cause nervous system effects, liver and lung damage, abnormal heartbeat, coma, and possibly death.

Vinyl chloride is a colorless gas. It burns easily and it is not stable at high temperatures. It has a mild, sweet odor and is a manufactured substance that does not occur naturally. It can be formed when other substances such as trichloroethane, trichloroethylene, and tetrachloroethylene are broken down. Vinyl chloride is used to make polyvinyl chloride (PVC). PVC is used to make a variety of plastic products, including pipes, wire, cable coatings, and packaging materials.

COCs at the site pose a carcinogenic risk to human health greater than 1 in 1,000,000 (*i.e.*, 1.0×10^{-6}), have a non-carcinogenic HI greater than 1, or are found in Site ground water at concentrations that exceed MCLs.

Potential Exposure Pathways

Based on current and reasonably anticipated future land use, potentially exposed populations include future commercial/industrial workers and future construction workers at the Site. Soil is the primary media of concern for these receptors. A future indoor air exposure pathway was evaluated for the commercial/industrial worker since VOCs were detected in Zone A ground water.

Exposure Pathways Affecting Each Population Group

Current and future land use-based exposure pathways were identified and evaluated in the exposure assessment for the BHHRA for the Site. The following receptors were evaluated for the on-site and off-site areas of the North Area of the Site:

- Off-site Resident: Inhalation of ambient air.

- Future On-site Industrial/Commercial Worker: Inhalation of ambient/indoor air, skin contact with and accidental ingestion of water, skin contact with and/or ingestion of sediments, direct skin contact with and ingestion of soil.

- Future On-site Construction Worker: Inhalation of ambient air, inhalation of vapors close to source while excavation, skin contact with and accidental ingestion of water, skin contact with and/or ingestion of sediments, direct skin contact with and ingestion of soil.

- Potential Current Youth Trespasser: Inhalation of ambient air, skin contact with and accidental ingestion of water, inhalation of vapors close to source, direct skin contact and/or ingestion of sediment, and direct skin contact as well as ingestion of soil.

- Contact Recreational User: A contact recreation scenario was assessed for surface water and sediment in the wetlands and ponds of the North Area to represent a hypothetical receptor who occasionally contacts these media while wading, birding, or participating in other recreational activities.

The following receptors were evaluated for the on- and off-site areas of the South Area of the Site:

- Offsite Resident: Inhalation of ambient air, ingestion of fish, skin contact with and accidental ingestion of water, inhalation of vapors from ground water, skin contact with and/or ingestion of sediments.

- Future On-site Industrial/Commercial Worker: Inhalation of ambient/indoor air, direct skin contact with and ingestion of soil.

- Future On-site Construction Worker: Inhalation of ambient/indoor air, direct skin contact with and ingestion of soil.

- Potential Current Youth Trespasser: **I**nhalation of ambient air and direct skin contact as well as ingestion of soil was evaluated for youth trespasser.

- Contact Recreational User: A contact recreation scenario was assessed for surface water and sediment in the wetlands and ponds of the South Area to represent a hypothetical receptor who occasionally contacts these media while wading, birding, or participating in other recreational activities.

Summary of Human Health Risk Characterization

Risk estimates were calculated for current and future on- and off-site land use scenarios for hypothetical human receptors. Cancer risks were estimated as the probability of an individual developing cancer over a lifetime as a result of exposure to the Site's carcinogenic contaminants. The potential for non-carcinogenic hazards due to potential exposures to chemicals was evaluated by calculating an HI for the COCs at the Site. The BHHRA shows the detailed calculation of risk. The risk assessment organized the types of risk at the Site according to various exposure scenarios. Each exposure scenario specifies the type of human receptor (*e.g.*, child resident, adult industrial worker), the exposure pathway (*e.g.*, inhalation, ingestion) and the COC. If a contaminant or exposure scenario is found to produce a risk which will require a remedial action, based on either the carcinogenic risk or the HI, that contaminant or exposure scenario is said to "drive the risk" or "drive" the need for action. A remediation goal is set for site-related contaminants that drive the risk at a site. The following exposure scenarios are driving the need for action at the Site and all risks are expressed as an RME.

Five different exposure scenarios were quantitatively evaluated for the different potentially contaminated media identified at the Site. Exposure scenarios were developed to describe current and potential future land use by various human receptors and included a future industrial worker, future construction worker, current youth trespasser, current contact recreation receptor, and off-site resident. Exposure and risks were calculated for both central tendency and RME scenarios.

The BHHRA showed that there was no unacceptable cancer risk or non-cancer HIs for any of the current or future exposure scenarios, except for future exposure to an indoor industrial worker if a building is constructed over impacted ground water in the North Area. Potential cancer risks in the North Area using maximum shallow Zone A ground water concentrations as well as vapor intrusion computer programs were predicted to be 2.0×10^{-2} which is 204 times greater than 1.0×10^{-4}. In other words, for every 10,000 people that could be exposed, 204 extra cancer cases may occur as a result of exposure to Site contaminants. The HI was estimated to be 18.0 so that non-cancer health effects are possible. It should be noted that this scenario was evaluated despite the current restrictive covenant on Lots 55, 56, and 57 that require future building design to preclude vapor intrusion, which would effectively make this pathway incomplete. Therefore, current risks at the Site are

not unacceptable given the low levels of potential exposure. Estimated risks from Zone A ground water at the South Area were below the EPA's goals; and therefore, adverse risks associated with the vapor intrusion pathway are unlikely in this area.

Uncertainty Analysis for Human Health Risk Assessment

The objective of the uncertainty analysis is to provide decision makers with a summary of those factors that significantly influence the risk results, evaluate their range of variability, and assess the contribution of these factors to the potential under- or over-estimation of overall BHHRA results. Sources of uncertainty include: 1) data analysis, 2) exposure analysis, 3) toxicity assessment, and 4) risk characterization. Efforts were made in the BHHRA to purposefully err on the side of conservatism in the absence of Site-specific information. It is believed that the overall impact of the uncertainty and conservative nature of the evaluation results in an overly protective assessment. Therefore, for scenarios with risks and HIs within or below the Superfund risk range goal, of 1.0×10^{-4} and 1.0×10^{-6}, and target HI of less than 1.0, it can be said with confidence that these environmental media and areas do not present an unacceptable risk.

Conclusions of the Human Health Risk Assessment

The primary objective of this BHHRA was to evaluate the possible risks associated with PCOCs in environmental media on human receptors at the Site. Five different exposure scenarios were quantitatively evaluated for the thirteen different potentially contaminated media identified at the Site. Exposure scenarios were developed to describe current and potential future land use by various human receptors and included a future industrial worker, future construction worker, current youth trespasser, current contact recreation receptor, and current off-site residential receptor. Exposure and risks were calculated for both central tendency and reasonable maximum exposure (RME) scenarios.

Based on the risk estimates and hazard indices, there were not unacceptable cancer risk or non-cancer HIs for any of the current or future exposure scenarios except for future exposure to an indoor industrial worker if a building is constructed over impacted ground water in the North Area. Potential cancer risks in the North Area using maximum shallow Zone A ground water concentrations and the vapor intrusion model were predicted to be greater than 1.0×10^{-4} while the HIs were estimated to be greater than 1.0. It should be noted that this scenario was evaluated despite the current restrictive covenant on Lots 55, 56, and 57 that require future building design to preclude vapor intrusion, which would effectively make this pathway incomplete. Estimated risks from Zone A ground water at the South Area were below the EPA's goals and, therefore, adverse risks associated with the vapor intrusion pathway are unlikely in this area.

Based on the Site risks evaluated in the BHHRA, the remedy selected needs to prevent future exposure from risk driver COCs to identified populations that may be affected. To minimize contaminant exposure, plume migration needs to be contained and vapor intrusion needs to be mitigated. Also, institutional controls need to be placed so future land uses do not include a potential residential scenario and to prevent use or disturbance of ground water. This would be inconsistent with the risk assessment evaluation and would be deemed not protective of human health.

The EPA believes that the preliminary recommendation identified in this Proposed Plan, and the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

ECOLOGICAL RISK ASSESSMENTS AND SUMMARY OF SITE RISKS

An **Ecological Risk Assessment** (ERA) is also an integral part of the RI process. A ERA is defined as a process that evaluates the likelihood that adverse ecological effects are occurring or may occur as a result of exposure to one or more stressors.

Screening Level Ecological Risk Assessment

The Final SLERA used data collected during the RI to evaluate the completeness and potential significance of potential ecological exposure pathways identified in CSMs for terrestrial and aquatic ecosystems at the Site. The SLERA

concluded that it was necessary to proceed to a site-specific BERA because of exceedances of protective ecological benchmarks for direct contact toxicity to invertebrates in the sediment in the wetlands and Intracoastal Waterway, soil in the North Area, and surface water in the wetlands at the Site. No literature-based food chain hazard quotients (HQs) exceeded unity of 1.0 in the SLERA and, as such, adverse risks to higher trophic level receptors were considered unlikely and were not evaluated further in the BERA.

Baseline Ecological Risk Assessment

Ecological risk assessment activities were performed in accordance with EPA's 8 step guidance for ecological risk assessment. For the first phase of the ecological risk assessment (called a Screening Ecological Risk Assessment, SLERA), ecological risks were ruled out for ecological biota which consume food items potentially containing site-related contaminants of potential ecological concern (COPECs). However, there was need for conducting a phase two of the ecological risk assessment process, the BERA, in order to further evaluate the potential for direct toxicity risks to ecological biota. This was done by performing laboratory toxicity tests (using EPA-accepted laboratory test protocols) on laboratory biota representative of biota living at the Site. These toxicity tests were run using Site-specific soil, sediment, and surface water media samples to capture any adverse ecological toxicity effects on survival and growth of the test biota due to Site-related COPECs.

The Site areas included North area soil, wetland sediment, Intracoastal Waterway sediment, and wetland surface water. Samples were also collected from analogous reference area media for comparison. Sample locations were chosen for Site samples based on a concentration gradient of COPECs that were identified in the SLERA. The approach for the assessment was to compare toxicity test results from Site and reference area sample locations that had similar environmental conditions, except for the potential of adverse influence from releases of Site-related COPECs.

It was determined that there were no statistically significant differences in toxicity for Site-specific sediment, soil, or surface water samples compared with reference samples. Because of the lack of evidence of Site-related toxicity, there was no need to develop ecological-based remediation goals.

Uncertainty Analysis for Ecological Risk Assessments

Uncertainties are associated with each step in the BERA process, including problem formulation, ecological effects evaluation, exposure estimation, and risk characterization. The interpretation of the BERA results are aided by a recognition and understanding of the source and nature of the known set of uncertainties that can influence the risk characterization results. The uncertainties associated with this BERA included those associated with: 1) Problem Formulation (i.e., COPEC selection and reference sample locations), 2) Exposure Analysis and Ecological Effects Evaluation, and 3) Risk Characterization.

REMEDIAL ACTION OBJECTIVES

The Remedial Action Objectives (RAOs) for the Site were identified based on concerns related to future human health exposure associated with North Area ground water. The RAOs for contaminated ground water are: 1) to confirm, on an ongoing basis, the stability of the VOC and SVOC plumes in Zones A and B, both in terms of lateral extent, and the absence of impacts above screening levels to underlying GWBUs; 2) to maintain, as necessary, protection against potential exposures to VOCs at levels posing an unacceptable risk via the ground water to indoor air pathway; 3) to prevent land use other than commercial/industrial; and 4) to prevent ground water use. The EPA's preliminary recommendation identified in this Proposed Plan will meet these RAOs.

RAOs consist of medium-specific goals for protecting human health and the environment. As such, RAOs are developed for those exposure pathways identified as posing an unacceptable risk to either: (1) human receptors as described in the BHHRA, and/or (2) ecological receptors based on data developed in the BERA. Based on data presented in the Final BERA Report, no RAOs were developed based on ecological endpoints given the lack of potential risk to these receptors. As such, RAOs for the Site were identified to address concerns

related to future human health exposure associated with North Area ground water.

The Final RI and BHHRA Reports note that ground water in affected water-bearing units at the Site (*i.e.*, Zones A and B) and the next underlying water-bearing unit (*i.e.*, Zone C) is not useable as a drinking water source due to naturally high total dissolved solids (TDS) concentrations. Consequently, the only potentially unacceptable human health risks associated with COIs detected in Site ground water are for the pathway involving volatilization of VOCs from North Area ground water to a hypothetical indoor air receptor. This conclusion is based on the continued stability of the current COI plume, both in terms of lateral extent in Zones A and B and the absence of COIs in deeper water-bearing units. Restrictive covenants currently in place for Lots 55 through 57, which encompass the area of the VOC plume, require EPA and TCEQ notification and approval prior to construction of any buildings on these parcels. The restrictive covenants also advise that response actions, such as protection against indoor vapor intrusion, may be necessary prior to building construction.

SUMMARY OF REMEDIAL ALTERNATIVES

General response actions were identified to address the RAOs for the Site. Remedial technologies potentially applicable to these general response actions were screened and technologies were then assembled into remedial alternatives. Based on this process several remedial alternatives were developed.

Alternative 1 – No Action

Under Alternative 1 (No Action), no remedial action or institutional controls, beyond those currently in place, are implemented. This alternative serves as a baseline against which other alternatives are evaluated.

Alternative 2 – Ground Water Controls and Monitoring

Under Alternative 2 (Ground Water Controls and Monitoring), institutional control (IC) technologies are used to address the RAOs for the affected ground water. This alternative includes: 1) review and evaluation of current restrictive covenants prohibiting ground water use on Lots 55 through 57 of the Site and requiring protection against indoor vapor intrusion for building construction on these lots; 2) modification of the existing institutional controls to identify the type and location of hazardous substances; 3) annual ground water monitoring, and as a part of the Five-Year Reviews, to confirm stability of the VOC and SVOC ground water plumes and demonstrate the occurrence of natural biodegradation and other processes, as well as an evaluation of additional measures to address the RAOs; and 4) implementation of an Operation and Maintenance Plan to provide ground water monitoring and inspection/repair of the cap covering the former impoundments. Natural biodegradation is one of the processes that will aid in the stability of the ground water plumes, but it is not a component of the Preferred Alternative described in this Proposed Plan. Monitored Natural Attenuation is not a remedy component, and restoration of the ground water is not a RAO.

Alternative 3 – Ground Water Containment

Under Alternative 3 (Ground Water Containment), containment technologies are used to address the RAOs for the affected ground water. It includes the following: 1) review/evaluation of current restrictive covenants prohibiting ground water use on Lots 55 through 57 of the Site and requiring protection against indoor vapor intrusion for building construction on these lots, 2) installation/operation of a series of vertical ground water extraction wells to provide hydraulic control of affected ground water, 3) treatment of collected ground water using low profile aeration with off-gas treatment by catalytic oxidation, 4) discharge of treated ground water to the City of Freeport publicly-owned treatment works (POTW) or to the Intracoastal Waterway through a TPDES-permitted outfall if discharge to the POTW is not feasible, 5) annual ground water monitoring to verify the effectiveness of ground water hydraulic control, and 6) implementation of an Operation and Maintenance Plan to provide inspection/repair of the cap covering the former impoundments.

EVALUTION OF ALTERNATIVES

The NCP requires that the alternatives be evaluated against nine evaluation criteria. The EPA uses the nine NCP criteria to evaluate remedial alternatives for the cleanup of a release. The following sections of the Proposed Plan summarize the relative performance of the alternatives by highlighting the key differences among the alternatives in relation to the eight criteria. These eight criteria are categorized into three groups: threshold, balancing, and modifying. The threshold criteria must be met in order for an alternative to be eligible for selection. The threshold criteria are: 1) overall protection of human health and the environment, and 2) compliance with applicable or relevant and appropriate requirements (ARARs). The balancing criteria are used to weight major tradeoffs among alternatives. The five balancing criteria are: 3) long-term effectiveness and permanence, 4) reduction of toxicity, mobility or volume through treatment, 5) short-term effectiveness, 6) implementability, and 7) cost. The two modifying criteria are: 8) community acceptance, and 9) state acceptance. The EPA will evaluate the "community acceptance" criterion after the thirty-day public comment period.

Based on the initial screening of technologies and evaluation of alternatives, three remedial alternatives were taken through the FS. Following is a comparative analysis of the remedial alternatives that explains the rationale for the selection of Alternative 2 (Ground Water Controls and Monitoring) as the preliminary recommendation for the Site.

Overall Protection of Human Health and the Environment

Alternative 1 provides no additional protection of human health and the environment beyond the current restrictive covenants on Lots 55, 56, and 57 that require future building design to preclude indoor vapor intrusion. Thus Alternative 1 fails to adequately address the RAOs of verifying the continued stability of the affected ground water plume, and maintaining protection against potential exposures to VOCs at levels posing an unacceptable risk via the ground water to indoor air pathway. In contrast, Alternatives 2 and 3 both adequately address the RAOs and provide overall protection of human health and the environment. Alternative 2 provides this protection through an ongoing ground water monitoring program to verify that the affected ground water plume remains stable and does not expand beyond the areas for which restrictive covenants provide protection against potential exposures via the ground water to indoor air vapor intrusion pathway. Alternative 3 includes this ground water monitoring program, and also uses a ground water extraction and treatment program to provide hydraulic control as a measure of protection. In summary, Alternatives 2 and 3 meet this threshold criterion, but Alternative 1 does not.

Alternative 2 provides overall protection of human health and the environment. It addresses the RAO of confirming the stability of the affected ground water plume through ground water monitoring. It addresses the RAO of maintaining protection against potential exposures to VOCs at levels posing an unacceptable risk via the ground water to indoor air pathway by using the monitoring component to identify if any plume expansion is occurring and then provides for modification of the restrictive covenants as necessary to provide protection against potential exposures via the ground water to indoor air vapor intrusion pathway.

Compliance with Applicable or Relevant and Appropriate Requirements

Chemical-specific ARARs are health- or risk-based numerical values or methodologies that specify the acceptable amount or concentration of a chemical that may be found in, or discharged to, the environment. Location-specific ARARs are restrictions placed on the types of activities that can be conducted or on the concentration of hazardous substances that can be present solely because of the location where they will be conducted. Action-specific ARARS are technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes.

Chemical-specific ARARs that could be applicable to the Site are Resource Conservation and Recovery Act (RCRA) waste classification requirements, specifically the RCRA hazardous waste criteria specified in 40 CFR 261 Subpart C. These ARARs apply to wastes that are generated as

part of Site remedial actions. These requirements, along with Texas waste classification rules provided in 30 TAC 335 Subchapter R, would be used to determine the classification (*i.e.*, hazardous or non-hazardous Class 1, 2, or 3) for any wastes managed at an off-site treatment, storage or disposal facility. Texas Risk Reduction Program (TRRP) Protective Concentration Levels (PCLs) specified in 30 TAC Chapter 350 serve as chemical-specific criteria for the investigation/remediation of the Site. These PCLs, along with other EPA-specific chemical-specific criteria, were used to define the extent of contamination at the Site. The TRRP PCLs were not used in place of the Site-specific BHHRA and BERA to establish Site-specific risk levels and RAOs for those areas of the Site that pose risk to human health or the environment.

Location-specific ARARs that could be applicable to the Site consist of requirements applicable to wetlands, critical habitat for endangered or threatened Species, coastal zones, and floodplains. Much of the North Area is considered wetlands. A primary potential ARAR related to wetlands is Section 404(b)(1) of the Clean Water Act (CWA), promulgated as regulation in 40 CFR 230.10, which generally prohibits discharge of dredged or fill material to wetlands. Remedial actions that impact rare, threatened, and endangered species may be subject to applicable Federal and State regulations that include 40 CFR §6.302(h) (EPA Procedures for Implementing Endangered Species Protection Requirements Under the Endangered Species Act, 40 CFR §230.30 (Potential Impacts on Biological Characteristics of the Aquatic Ecosystem), 50 CFR Part 402 (Interagency Cooperation – Endangered Species Act of 1973, as Amended), and 31 TAC §501.23(a) (Texas Coastal Coordination Council Policies for Development in Critical). For coastal zones, the Coastal Zone Management Act of 1972 (16 USC Section 1451 et. seq.) requires the development and implementation of programs to manage the land and water resources of the coastal zone, including ecological, cultural, historic, and aesthetic values. Remedial actions that impact the coastal zone are subject to 15 CFR Part 923 (Coastal Zone Management Program Regulations). For floodplains, remedial alternatives involving on-site treatment, storage or disposal facilities for RCRA hazardous waste at the site are subject to the 40 CFR 264.18(b) requirements that they be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood.

Action-specific ARARs that could be applicable to the Site consist of RCRA unit-specific standards, air emissions, and effluent discharge. If hydraulic control of affected ground water is provided by a ground water extraction and treatment system, the treatment system may be treating a hazardous waste (*i.e.*, the contaminated ground water may be characteristically hazardous due to concentrations of certain contaminants such as TCE). Thus, the unit-specific RCRA design and operating standards for units that treat hazardous waste must be considered. In addition, several air emission standards must be considered. Under RCRA, there are several exemptions from the unit-specific management standards for units that treat hazardous waste (40 CFR 264.1[g]). One of these units is a wastewater treatment unit. A wastewater treatment unit is defined in 40 CFR 260.10 as, "a device which is part of a wastewater treatment facility that is subject to regulation under either Section 402 or 307(b) of the Clean Water Act, receives and treats or stores an influent wastewater that is a hazardous waste, and meets the definition of a tank or tank system. If the ground water treatment system uses an air stripper to remove VOCs from the ground water, air emissions will be generated by the treatment system that may be subject to several Federal and State air quality regulations. These regulations include, New Source Performance Standards (40 CFR Part 60), National Emission Standards for Hazardous Air Pollutants (40 CFR Parts 61 and 63), RCRA Air Emissions Requirements (40 CFR Part 264, Control of Air Pollution from Volatile Organic Compounds (30 TAC Chapter 115); and Permits by Rule (Waste Processes and Remediation [30 TAC Chapter 106, Subchapter X]). If the effluent from a ground water extraction and treatment system is discharged to the City of Freeport POTW, the City's industrial discharge rates and ordinances would apply to this discharge. As such an industrial wastewater discharge permit is required by the City since discharge limits and monitoring/reporting would be subject to City standards described in Chapter 51 of the City of Freeport Code of Ordinances.

Through the current restrictive covenants, all three alternatives comply with the chemical-specific ARARs associated with Site-specific risk levels

developed in the BHHRA. Since Alternative 1 requires no other action, there are no applicable location-specific or action-specific ARARs for which compliance is needed. The location-specific ARARs associated with wetland and coastal zone habitats at the Site are a consideration for Alternative 2, but would not be expected to pose any significant compliance concerns or implications for this alternative. The location-specific ARARs would be a more significant consideration for Alternative 3, which would involve much more extensive construction within these areas and thus have a potential for their disruption and/or need for mitigation or restoration. Alternative 3 is the only alternative for which action-specific ARARS could potentially apply. The ground water treatment and discharge components of this alternative would need to be designed to comply with these action-specific ARARS. Thus all three alternatives meet this threshold criterion, but Alternative 3 has a higher potential to present potential compliance concerns or implications than Alternatives 1 and 2.

Through the current restrictive covenants, Alternative 2 complies with the chemical-specific ARARs associated with Site-specific risk levels developed in the BHHRA. The annual ground water sampling to be performed as part of this alternative would have minimal effects on the wetland and coastal zone habitats in which the monitoring wells are constructed, and thus the alternative complies with the location-specific ARARs associated with those areas. Action-specific ARARs do not apply to Alternative 2.

Long-Term Effectiveness and Permanence

Alternative 1 provides the lowest long-term effectiveness and permanence because it is not effective in the long-term in meeting the RAOs or maintaining protection of human health and the environment. Alternatives 2 and 3 are effective in meeting the RAOs over the long-term and provide a generally similar level of long-term effectiveness and permanence. Both would be expected to be reliable, and both have a relatively low risk associated with their potential failure. Alternatives 2 and 3 both include long-term monitoring and management components, although those long-term components are much more complex for Alternative 3. Alternative 2 would not be expected to pose any appreciable potential habitat impacts, while habitat impacts from Alternative 3 would be expected to be more significant. Taken as a whole, this analysis suggests that Alternative 2 provides the highest long-term effectiveness and permanence, Alternative 3 provides a slightly lower long-term effectiveness and permanence, and Alternative 1 does not provide long-term effectiveness and permanence.

Alternative 2 is effective at protecting human health and the environment over the long-term. It contains a long-term ground water monitoring component which will include maintenance of the monitoring well network. The resultant risks, if any, that might occur should the monitoring program fail to detect any plume expansion would be expected to be minor, given the limited extent of contaminant migration observed during the 27 to 38 years since operation and closure of the former surface impoundments, the low ground water velocity at the Site, and the observed natural biodegradation of the ground water COIs. Similarly, should the affected ground water plume migrate beyond Lots 55, 56 and 57, the resultant potential risks associated with the indoor vapor intrusion pathway in areas outside of these parcels would be expected to be low due to: 1) the fact that the clayey vadose soils that overly the affected ground water are generally not conducive to COI vapor migration, and 2) the low likelihood that any structures would actually be built in these areas given the regulatory complications associated with construction within the wetland area in which the affected ground water plume is located. Thus, Alternative 2 would be expected to be reliable in meeting the RAOs over the long-term. Potential habitat impacts from the annual ground water monitoring events would be expected to be minimal.

Reduction of Toxicity, Mobility, and Volume through Treatment

Under all three alternatives, natural biodegradation of COIs in Site ground water likely provides some reductions in toxicity, mobility, and volume of affected ground water through this intrinsic in-situ treatment. An evaluation of those reductions will be provided by the ground water monitoring component of Alternatives 2 and 3. No significant added reductions in toxicity, mobility, and volume of the affected ground water plume are provided by any of the three alternatives. Treatment

of the extracted ground water and off-gas from the treatment system as part of Alternative 3 would reduce the toxicity of the extracted ground water itself, but in terms of the affected ground water plume, all three alternatives are considered equivalent with regard to this balancing criterion.

The natural biodegradation of COIs in Site ground water likely provides some reductions in toxicity, mobility, and volume of affected ground water through this intrinsic in-situ treatment. An evaluation of those reductions will be provided by the ground water monitoring component of the Alternative 2. No added reductions in toxicity, mobility, and volume through treatment are provided by Alternative 2.

Short-Term Effectiveness

Alternative 1 provides the lowest short-term effectiveness because it is not effective in the short-term in meeting RAOs or maintaining protection of human health and the environment. Alternatives 2 and 3 are both effective at meeting the RAOs and providing protection of human health and the environment in the short-term. Alternative 2 does not present any associated risks to the community or on-site workers or any appreciable environmental impacts as part of its implementation. Alternative 3 would present safety risks to on-site workers similar to those inherent in any construction project, and would present slight safety risks to the local community due to the temporary increase in traffic to the Site during the construction period. Alternative 3 would probably result in some local habitat impacts in the extraction well and treatment compound areas during the construction period. Thus Alternative 2 provides the highest short-term effectiveness, Alternative 3 provides a slightly lower short-term effectiveness, and Alternative 1 is not considered effective in the short-term.

Alternative 2 is effective at meeting the RAOs and providing protection of human health and the environment in the short-term. Since the primary field activities consists of monitoring and maintaining existing monitoring wells, it does not present any appreciable associated risks to the community or on-site workers nor does it result in any environmental impacts as part of its implementation.

Implementability

Alternative 1 is the most easily implemented since it requires no action. Alternatives 2 and 3 are both readily implemented as both utilize widely accepted and proven technologies. Alternative 2 is considered more implementable than Alternative 3 because Alternative 3 involves the technologically more complex components of treatment system construction and operation, including catalytic oxidation of air stripper off gas treatment, and the administratively more complex component of effluent discharge to a POTW or through a TPDES permit.

Alternative 2 is easily implemented since the alternative provides for monitoring of existing monitoring wells and does not require the installation of any new wells. Ground water monitoring programs and institutional controls are commonly used and accepted remedial technologies that do not pose any significant technical or administrative feasibility concerns.

Cost

The projected cost associated with Alternative 1 is $0, for the purposes of this evaluation, since it involves no new actions. The projected present worth cost of Alternative 2 is $260,000. The projected present worth cost of Alternative 3 is $5,500,000.

Alternative 2 is cost-effective because the remedy's costs are proportional to its overall effectiveness. Capital costs for this alternative include review and evaluation of institutional controls and plugging and abandonment of existing monitoring wells not included in the long-term ground water monitoring program. O&M costs primarily consist of sample collection and analysis, monitoring data evaluation, and well repair and maintenance, as needed. The present worth of these costs, assuming a 30 year period and 5% discount factor including contingencies, is $260,000 for capital and $15,600 for O&M, respectively.

State Acceptance

The State of Texas (TCEQ) supports the EPA's preliminary recommendation of the implementation of Alternative 2 (Ground Water Controls and Monitoring) for the Site. This support is documented in a letter to the EPA dated May ?, 2011.

PREFERRED ALTERNATIVE

Based on the evaluation of alternatives, Alternative 2 (Ground Water Controls and Monitoring) is recommended as the Preferred Alternative for the Site. This alternative includes: 1) review and evaluation of current restrictive covenants prohibiting ground water use on Lots 55 through 57 of the Site and requiring protection against indoor vapor intrusion for building construction on these lots; 2) modification of the existing institutional controls to identify the type and location of hazardous substances; 3) annual ground water monitoring, and as a part of the Five-Year Reviews, to confirm stability of the affected ground water plume and demonstrate the occurrence of natural biodegradation and other processes, as well as an evaluation of additional measures to address the RAOs; and 4) implementation of an Operation and Maintenance Plan to provide ground water monitoring and inspection/repair of the cap covering the former impoundments. Natural biodegradation is one of the processes that will aid in the stability of the ground water plumes, but it is not a component of the Preferred Alternative described in this Proposed Plan. Monitored Natural Attenuation is not a remedy component, and restoration of the ground water is not a RAO.

In conjunction with the restrictive covenant review/evaluation component of Alternative 2, it is anticipated that one or more modifications to the current institutional controls may be required. These modifications may include the addition of supplemental information regarding the affected ground water plume, such as a metes and bounds description of the affected area and a list of the contaminants present.

For the monitoring component of this alternative, the stability of the affected ground water plume will be confirmed by an evaluation of the temporal trends of the primary ground water COIs which include 1,1,1-TCA; 1,1-DCE; 1,2,3-TCP; 1,2-DCA); benzene; cis-1,2-DCE; methylene chloride; PCE; TCE; and VC; above their respective extent evaluation criteria and their 1% compound solubility limit within the monitoring well network. Data from the monitoring well network will be used to demonstrate the occurrence of natural attenuation of the ground water plumes. The EPA's guidance document titled, "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance" (March 2009, USEPA Office of Resource Conservation and Recovery, EPA 530-R-09-007) will be used in this evaluation.

For the purposes of this evaluation, Zone A perimeter monitoring wells will include wells OMW21, NG3MW19, ND4MW03, NB4MW18, NC2MW28, and OMW20. Zone B perimeter monitoring wells will include OMW27B, NG3MW25B, NE4MW31B, and ND4MW24B. Should such trend analyses indicate a statistically significant increase (SSI), additional sampling will be performed at the indicated location within thirty (30) days of determination of the SSI to confirm the trend. Should a confirmed SSI be indicated, then an evaluation of apparent plume expansion will be performed by the installation of one or more additional monitoring wells outward from the affected well, or wells, as necessary to bound the plume to the appropriate extent evaluation comparison values. Although not used for the temporal trend analysis and contingent evaluation of plume stability, sampling and analysis of monitoring wells NE1MW04, NF2MW06, ND3MW29, NE4MW30B, and NE4MW32C will also be performed.

The EPA is recommending this Preferred Alternative because it will address the RAOs for the ground water and is cost-effective because the remedy's costs are proportional to its overall effectiveness. The EPA is also recommending this Preferred Alternative because the previous Removal Action eliminated the existing and potential risks to human health and the environment, except for the vapor intrusion pathway. Additionally, the Ecological Risk Assessments concluded that current or potential future Site conditions pose no unacceptable risks to ecological receptors.

Also, Alternative 1 fails to meet the threshold criterion of overall protection of human health and the environment and thus is eliminated from further consideration. Alternatives 2 and 3 are considered roughly equivalent with regard to the criteria of: 1) overall protection of human health and the environment, 2) compliance with ARARs, and 3) reduction of toxicity, mobility, and volume through treatment. Alternative 2 is considered slightly superior to Alternative 3 with regard to the criteria of: 1) long-term effectiveness and permanence, 2) short-term effectiveness, and 3) implementability. Additionally, the projected present worth cost of Alternative 3 is more than 20 times greater than the projected present worth cost of Alternative 2, the Preferred Alternative. Thus, based on its overall superior ranking and significantly lower cost than Alternative 3, Alternative 2 is recommended as the Preferred Alternative for the Site.

FIVE-YEAR REVIEWS

Five-Year Reviews (FYR) are generally required on a site-wide basis, by statute or program policy, when site-related hazardous substances remain at a site that do not allow for unlimited use and unrestricted exposure. Unlimited use and unrestricted exposure means that there are no restrictions placed on the potential use of the land or natural resource. The FYR is: 1) A regular EPA checkup on a Superfund site that has been cleaned up, with waste left behind, to make sure that the site is safe; 2) A way to make sure the cleanup continues to protect people and the environment; and 3) A chance for the public to inform the EPA about site conditions and any concerns they may have about the site.

Policy FYRs will be required for the Site since contaminants were found in the ground water that prevent unlimited use and unrestricted exposure. The EPA will notify the public of these scheduled reviews through the publication of public notices, and may schedule community meetings as appropriate.

STATE AGENCY SUPPORT

The State of Texas (TCEQ) supports the EPA's preliminary recommendation of the implementation of Alternative 2 (Ground Water Controls and Monitoring) for the Site since the previous Removal Action eliminated the existing and potential risks to human health and the environment, except for the vapor intrusion pathway. The TCEQ also supports the EPA's Preferred Alternative because it will address the RAOs for the ground water and NAPL, is cost-effective, and the remedy's costs are proportional to its overall effectiveness. Additionally, the Human Health Risk and Ecological Risk Assessments concluded that current or potential future Site conditions pose no unacceptable risks to human health or to the environment, respectively.

COMMUNITY ACCEPTANCE

The NCP requires that the alternatives for the Site be evaluated against nine evaluation criteria, including the modifying criteria of "community acceptance." The community's acceptance of the EPA's preliminary recommendation of the implementation of Alternative 2 (Ground Water Controls and Monitoring) for the Site will be evaluated after the public comment period ends on August 2, 2011, and will be described in the Record of Decision and Responsiveness Summary. The Record of Decision is expected to be issued in a short time frame after the close of the public comment period. The EPA's preliminary recommendation can change in response to public comment or new information.

COMMUNITY PARTICIPATION

The EPA and the TCEQ will continue to provide information regarding the cleanup of the Site to the public through community meetings, the Administrative Record file for the Site, and local newspaper announcements. The EPA and the TCEQ encourage the public to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted at the Site by reviewing the Administrative Record file.

A public meeting is scheduled for July 14, 2011, at 7 pm at the Velasco Community House located at 110 Skinner Street in Freeport, Texas. The EPA will hold this public meeting to explain the Proposed Plan and the EPA's preliminary recommendation of implementation of Alternative 2 (Ground Water Controls and Monitoring) for the Site. Oral and written comments will be accepted at the meeting. The 30-day public comment period will begin on July

3, 2011, and ends on August 2, 2011. The Site's information repositories, containing the **Administrative Record** of the documents used to develop this Proposed Plan are located at:

Freeport Branch Library
410 Brazosport Boulevard
Freeport, Texas 77541

U.S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

The EPA has established these local Site Repositories to provide the public a location near the community to review and copy background and current information about the Site. Attachment 1 (Comment Sheet) can be used to provide the EPA with comments during the Proposed Plan meeting or public comment period.

SUMMARY

Based on the information available at this time, the EPA and TCEQ believe that the preliminary recommendation of the implementation of Alternative 2 (Ground Water Controls and Monitoring) at the Site is appropriate because it will address the RAOs for the ground water and is cost-effective because the remedy's costs are proportional to its overall effectiveness. The EPA is also recommending this Preferred Alternative because the previous Removal Action eliminated the existing and potential risks to human health and the environment, except for the vapor intrusion pathway. Additionally, the Ecological Risk Assessments concluded that current or potential future Site conditions pose no unacceptable risks to ecological receptors.

The Remedial Action Objectives (RAOs) for the Site that the Preferred Alternative will meet are based on concerns related to future human health exposure associated with North Area ground water. The RAOs for contaminated ground water are: 1) to verify, on an ongoing basis, the continued stability of the VOC plume in Zones A and B, both in terms of lateral extent, and the absence of impacts above screening levels to underlying water-bearing units; 2) to maintain, as necessary, protection against potential exposures to VOCs at levels posing an unacceptable risk via the ground water to indoor air pathway; 3) to prevent land use other than commercial/industrial; and 4) to prevent ground water use.

The State of Texas (TCEQ) supports the EPA's preliminary recommendation of the implementation of Alternative 2 (Ground Water Controls and Monitoring) for the Site. The EPA, in consultation with TCEQ, may modify the EPA's preliminary recommendation presented in this Proposed Plan or select a Remedial Action based on new information or public comments.

Based on information currently available, the EPA believes that the Preferred Alternative presented in this Proposed Plan meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment, 2) comply with ARARs, and 3) be cost-effective.

CONTACTS FOR MORE INFORMATION

Please contact the EPA's representatives for any questions you may have concerning the EPA's preliminary recommendation of the implementation of Alternative 2 (Ground Water Controls and Monitoring) for the Gulfco Site, the meeting to discuss the Proposed Plan, or any other information concerning the Site. The EPA's representatives are:

Gary Miller, P.E.
(Remedial Project Manager)
Telephone: 214-665-8318*
E-Mail Address:
miller.garyg@epa.gov

Donn Walters
(Public Liaison)
Telephone: 214-665-6483*
E-Mail Address:
walters.donn@epa.gov

*EPA's Superfund Toll-Free #:
1-800-533-3508

GLOSSARY OF TERMS

Administrative Record (AR) – All documents which the EPA considers or relies upon in selecting the response action at a Superfund site, culminating in the Record of Decision for a Remedial Action or an Action Memorandum for a Removal Action.

Baseline Human Health Risk Assessment (BHHRA) – A process to estimate the nature and probability of adverse health effects in humans who may be exposed to chemicals in contaminated environmental media, now or in the future. This risk assessment estimates the current and possible future risks if no action were taken to clean up a site. The EPA's Superfund risk assessors determine how threatening a hazardous waste site is to human health and the environment. They seek to determine a safe level for each potentially dangerous contaminant present (*e.g.*, a level at which ill health effects are unlikely and the probability of cancer is very small). Living near a Superfund site doesn't automatically place a person at risk, that depends on the chemicals present and the ways people are exposed to them. A human health risk assessment addresses questions such as:

- What types of health problems may be caused by environmental stressors such as chemicals?
- What is the chance that people will experience health problems when exposed to different levels of environmental stressors?
- Is there a level below which some chemicals don't pose a human health risk?
- What environmental stressors are people exposed to and at what levels and for how long?
- Are some people more likely to be susceptible to environmental stressors because of factors such as age, etc.?
- Are some people more likely to be exposed to environmental stressors because of factors such as where they play, etc.?

Community Involvement Plan (CIP) – The CIP is central to Superfund community involvement. It specifies the outreach activities that the EPA will undertake to address community concerns and expectations. The CIP may include: a site description, community background information, community issues and concerns, community involvement activities and timing (including the communication strategy), a copy of interview questions, an official contact list, the location for public meetings, the location of the information repository, and local media contacts.

Dense Non-Aqueous Phase Liquids (DNAPL) – Non-aqueous phase liquids such as chlorinated hydrocarbon solvents or petroleum fractions with a specific gravity greater than 1.0 that sink through the water column until they reach a confining layer.

Ecological Risk Assessment (ERA) – A process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more chemical, physical, or biological stressors.

Extent Evaluation Criteria or Values – Screening levels that were used to determine the extent of contamination. If soil or ground water concentrations, at the perimeter of the area being investigated, exceeded the extent evaluation criteria or values, additional samples were taken over an expanded area. These screening levels were compiled from a number of sources such as the EPA's Region 6 Media-Specific Screening Levels, TCEQ's Protective Concentration Levels, surface water quality standards, and Maximum Contaminant Levels. The actual screening value used in determining whether to perform additional sampling was the lowest, or more conservative, of these values.

Feasibility Study (FS) – The mechanism for the development, screening, and detailed evaluation of alternative remedial actions.

Ground Water – Water found beneath the surface of the ground that fills pores between soil, sand, and gravel particles to the point of saturation. Ground water can be used as a water supply when it occurs in sufficient quantity and quality.

Light Non-Aqueous Phase Liquids (LNAPL) – A non-aqueous phase liquid with a specific gravity less than 1.0. Because the specific gravity of water is 1.0, most LNAPLs float on top of the water table. Most common petroleum hydrocarbon fuels and lubricating oils are LNAPLs.

Milligram/Kilogram (mg/kg) – Units of measure used to express the concentrations of metals (*e.g.*, lead) or organics in soil or sediments. For example, one mg/kg of lead in soil would be equivalent to one cent in $10,000.

National Priorities List (NPL) – The EPA's list, compiled pursuant to statutory authority, of uncontrolled hazardous substance releases in the United States that are priorities for long-term evaluation and response. The NPL is based primarily on the score a site receives from the Hazard Ranking System. The EPA updates the NPL at least once a year.

Non-Aqueous Phase Liquids (NAPL) – Contaminants that remain undiluted as the original bulk liquid in the subsurface (*e.g*. spilled oil).

Operable Unit (OU) – A discrete action that comprises an incremental step toward comprehensively addressing problems at a site. The cleanup of a site can be divided into a number of OUs, depending on the complexity of the problems associated with a site. OUs may address geographical portions of a site, site-specific problems, or initial phases of an action. OUs may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site.

Potentially Responsible Parties (PRPs) – Individuals or companies (such as owners, operators, transporters, or generators of hazardous waste) that are potentially responsible for, or contributing to, the contamination problems at a Superfund site. Whenever possible, the EPA requires PRPs, through administrative and legal actions, to clean up hazardous waste sites they have contaminated.

Proposed Plan – A decision document that presents the EPA's rationale for the preliminary selection of a remedial action. The Proposed Plan solicits public review and comment on the proposed action and the information contained in the Administrative Record for a site. It also provides the history and background information about a Site and describes where more information can be found.

Record of Decision (ROD) – The final Remedial Action plan for a site. The purpose of the ROD is to document the remedy selected, provide a rationale for the selected remedy, and establish performance standards or goals for the site or the operable unit under consideration. The ROD provides a plan for site design and remediation, and documents the extent of human health or environmental risks posed by the site or operable unit. It also serves as legal certification that the remedy was selected in accordance with the requirements of the Superfund statute and regulations. The ROD is one of the most important documents in the remedy selection process because it documents all activities prior to the selection of a remedy and provides a conceptual plan for activities subsequent to the ROD.

Remedial Investigation (RI) – The step in the Superfund cleanup process that is conducted to gather sufficient information to support the selection of a site remedy that will reduce or eliminate the risks associated with contamination at the site. The RI involves site characterization which is the collection of data and information necessary to characterize the nature and extent of contamination at the site. The RI also determines whether the contamination presents a significant risk to human health or the environment.

Removal Action – An action based on the type of situation, the urgency and threat of the release or potential release, and the subsequent time frame in which the action must be initiated.

Responsiveness Summary – A summary of oral and/or written public comments received by the EPA during a public comment period on key EPA documents, such as a Proposed Plan, and the EPA's response to those comments. A responsiveness summary is included in the Record of Decision for a site.

Semi-volatile Organic Compound (SVOC) – Organic compounds that volatilize slowly at standard temperature (20 degrees Centigrade and 1 atmosphere of pressure).

Superfund – The program operated under the legislative authority of the "Comprehensive Environmental Response, Compensation, and Liability Act" that funds and carries out EPA solid waste emergency and long-term removal and remedial activities. These activities include establishing the National Priorities List, investigating sites for inclusion on the list, determining their priority, and conducting and/or supervising cleanup and other remedial actions.

Uncertainty – Is the lack of knowledge about specific variables, parameters, models, or other factors and is a component of risk resulting from imperfect knowledge of the degree of hazard or of its spatial and temporal distribution. For example, we can be very certain that different people drink different amounts of water, but we may be uncertain about how much variability there is in water intakes among the population. Another example includes limited data regarding the concentration of a contaminant in an environmental medium.

Volatile Organic Compound (VOC) – Any organic compound that participates in atmospheric photochemical reactions except those designated by EPA as having negligible photochemical reactivity.

ATTACHMENT 1
COMMENT SHEET

Your comments on the Proposed Plan for the Gulfco Marine Maintenance Superfund Site (hereinafter "Gulfco" or "the Site") are important to the EPA and the TCEQ and will help us evaluate the EPA's preliminary recommendation of the implementation of Alternative 2 (Ground Water Controls and Monitoring) for the Site. You may use the space below to write your comments. Use additional sheets if necessary. Please mail your comments to the EPA's Remedial Project Manager:

Gary Miller, P.E.
U.S. Environmental Protection Agency
Superfund Division (6SF-RA)
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Your comments must be postmarked on or before August 2, 2011, the end of the 30-day public comment period. You may also provide oral or written comments during the public meeting scheduled for July 14, 2011, at 7 pm at the Velasco Community House located at 110 Skinner Street in Freeport, Texas. Those individuals with computer communications capabilities may submit their comments to the EPA's Remedial Project Manager via the internet at: miller.garyg@epa.gov. The EPA will respond to all significant comments in a "Responsiveness Summary" that will be included with the Record of Decision which identifies the Selected Remedy for the Site. If you have any questions about the comment period or the Gulfco Site, please contact Gary Miller at (214) 665-8318 or the EPA's toll-free number at 1-800-533-3508.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

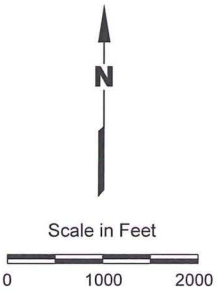
Name:_____ Mailing Address:_____

City:_____ State:_____ Zip Code:_____

Telephone #:_____ E-Mail Address: _____

FIGURES

QUADRANGLE LOCATION



Source:
Base map taken from http://www.tnris.state.tx.us Freeport, Texas 7.5 min. U.S.G.S. quadrangle, 1974.

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 1
SITE LOCATION MAP

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: APRIL, 2011	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

Gulfco Marine Maintenance Site Boundary (approximate)

Lot Boundary (approximate)

N

Approx. Scale in Feet

0 125 250

Source of photo: H-GAC, Texas aerial photograph, 2006.

GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 2

SITE MAP

PROJECT: 1352	BY: ZGK	REVISIONS
DATE: APRIL, 2011	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS