

RESPONSE ACTION CONTRACT

United States Environmental Protection Agency Region 6

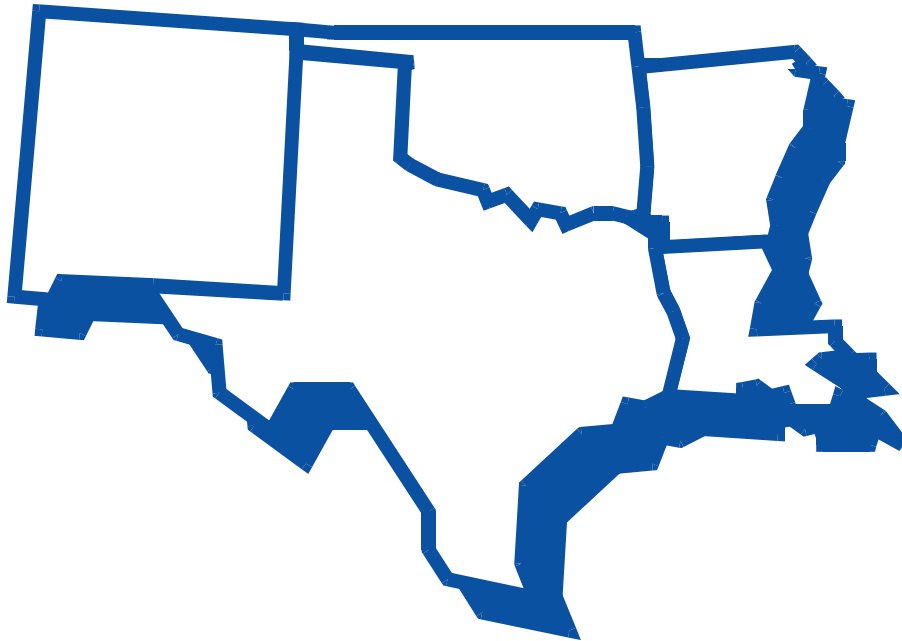
Contract No. 68-W6-0036



Version 1.0
Baseline Ecological Risk Assessment
State Marine Superfund Site

EPA Work Assignment No. 139-RICO-06BX
DCN 05-7898

July 2005



In Association With:
Science Applications International Corporation
Geo-Marine, Inc.

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Baseline Ecological Risk Assessment

The following sections present the approach, assumptions, and conclusion of the baseline ecological risk assessment (BERA) for the State Marine Superfund Site (SMS). The BERA is not a complete BERA outlining the full 8-Step process for ecological risk assessment under CERCLA. Instead, the BERA concludes after step 3 (Baseline Problem Formulation [BPF]), which consists primarily of a refinement of risk calculations in Steps 1 and 2 presented in the RI report for the site, commonly referred to as Step 3a. The approach and assumptions presented below are consistent with the EPA-approved Ecological Risk Assessment Work Plan for the site (CH2MHILL, 2005)

1. Data Used in the BERA

- **Soil** - All historical surface (0-0.5') soil data that were available to CH2M HILL electronically as of June 17, 2005, were used in the BERA. The available data consisted of soil samples collected in 1995 and 2001 from various areas, including six "hot spot" areas that were identified during the 1995 Expanded Site Inspection (ESI) (TNRCC, 1996) and 2001 Remedial Investigation (RI) (Weston, 2001) based on historical activities performed in six distinct areas. The data were grouped for the BERA based on the groupings presented in the 1995 ESI and the groupings provided in the 2001 RI Report. It should be noted that during the 1995 ESI, soil samples were grouped by areas potentially impacted by the potential sources and included areas outside the immediate source boundaries. The following soil data groupings were used in the BERA:
 - Current Aboveground Storage Tank Area
 - Former Lauren Tank Farm Area
 - Former Wastewater Impoundments
 - Maintenance Shed Area
 - Tar Burn Area
 - Wastewater Treatment Facility
 - Non-Source Area
- **Sediment** - All historical sediment data collected from the 0-6 inch interval and available to CH2M HILL electronically as of June 17, 2005 were used in the BERA. The available data consisted of sediment samples collected in 1995, 1999, and 2001. The sediment data were used to evaluate direct toxicity to lower trophic level organisms and to model whole-body biota tissue concentrations for consumption by wildlife. Data from other sources, including the Palmer Barge and Calcasieu Estuary ERAs, were used as a frame of reference.

Site data were split into three distinct groupings as presented previously in the RI Report and described below:

- Intertidal Area - 0-6 inch samples collected along the shore of the site at the approximate high water mark. Piscivorous birds and omnivorous shorebirds would be expected to forage in this area.
- Near shore area - 0-6 inch samples collected below shallow waters where shorebirds and piscivorous birds would both be expected to forage.

- Offshore area – 0-6 inch samples collected below deeper waters where piscivorous birds would forage but where the water is too deep for shorebirds.
- Ground water – Risk resulting from ground water would most likely present greatest exposure to sediment dwelling organisms and the pathway would be addressed adequately through the evaluation of sediment chemistry data. No ground water seeps were observed during the site reconnaissance visit on June 17, 2005. However, ground water data from two shallow wells were analyzed to determine if ground water is a source contributing to contamination identified in sediments in Sabine Lake adjacent to the Site. The wells are located approximately 80 to 100 feet from the shore from well screen depths around 25 feet bgs. According to the ground water profile presented in the RI Report, the ground water elevation is approximately 2 feet above mean sea level at the wells and is decreasing as it approaches Sabine Lake.

2. Refinement of Chemicals of Potential Ecological Concern

The COPECs were identified for soil and sediment by a five-part screening process that evaluates 1) frequency of detection, 2) background concentrations, 3) risk-based screening levels, 4) bioaccumulative COPECs, and 5) gradient analysis (soils only). In addition, chemicals that are considered essential nutrients (calcium, magnesium, potassium, and sodium) will not be selected as COPECs.

2.1 Part 1: Frequency of Detection Evaluation

The frequency at which each chemical was detected was evaluated. Those constituents detected at a frequency of five percent or less in soil or sediment within a particular exposure area or data grouping were eliminated from the BERA for that specific exposure area or data grouping. 4-methyl phenol was eliminated from the Non-source area of concern (AOC) and acetophenone and benzaldehyde were eliminated from the nearshore sediment, based on detections of less than 5 percent. The 5 percent of detected samples for these compounds within these exposure areas did not appear to be hot spots. Those constituents detected at a frequency greater than 5 percent were carried to Part 2 of the COPEC screening process.

2.2 Part 2: Comparison to Background

A comparison was made of site chemical concentrations to background levels. The following sources of background data were used in the comparison:

- **Soil** – site-specific background data collected in 1995 during the ESI and in 2001 during the RI;
- **Sediment** – background data collected in Sabine Lake (in an area not impacted by the site) during the 2001 RI and additional background sediment data from Sabine Lake collected in 1998 and 1999 from the Calcasieu Estuary BERA were used.

The background comparison included the following components:

- **Graphical Comparison** – Box and whisker plots were prepared for visual comparison of site and background data.

- **Central Tendency Comparison** – Comparisons were performed to determine whether an average shift of the site data population appeared to exist relative to the background data population. This involved the non-parametric Wilcoxon Rank Sum test.
- **Comparison to Background Threshold Value** - Upper tolerance limits (UTLs) and Prediction Limits were calculated to estimate the upper tail of the background population. These are presented as auxiliary statistics in this study while the conclusions from the Wilcoxon Rank Sum are used for risk decisions.
- **Final Data Evaluation** - After the preliminary conclusions were developed, the background dataset underwent a final review for inappropriate conclusions.

Those constituents concluded to exceed background concentrations were carried to Step 3 of the COPEC screening process. A summary of the background evaluation for each exposure area is provided in **Tables 1-10**. The box and whisker plots are provided as **Attachment 1**. Based on a limited data set with which to work, background statistics for organic constituents were not used to eliminate constituents from further evaluation. Several inorganic constituents in soil were eliminated from further consideration due to the results of the background comparison. Only antimony was eliminated from further consideration in sediments based upon the background comparison. While background was used to eliminate COPECs from further quantitative evaluation, there is still the potential for ecological risks to exist at the Site from the constituents that were eliminated. However, these constituents were eliminated from quantitative evaluation because the statistical background analysis has shown that the risks attributable to the site could not be distinguished from risks found in the general area and a remedy for such risks would not be feasible.

2.3 Part 3: Comparison to Screening Levels

For each analyte carried to Step 3, the maximum detected concentration in each medium within each exposure area was compared to its appropriate medium-specific ecological risk-based screening levels, identified below and depicted in **Tables 11-20**:

- **Soil** – Qualitative (Iron and aluminum) and quantitative EcoSSLs; terrestrial plant and invertebrate screening levels in the Ecological Risk Assessment Guidance document (TNRCC, 2001). In addition, screening levels from other EPA sources were used as necessary.
- **Sediment** – Screening levels and processes for derivation of benchmarks in the Ecological Risk Assessment Guidance document (TNRCC, 2001). In addition, screening levels from other EPA sources were used as necessary.

For those constituents without screening values, screening values for proxy chemicals were used when available. Constituents with no appropriate proxy toxicity values were retained for quantitative evaluation for risk to upper trophic level wildlife. Those constituents without either screening values or wildlife TRVs were evaluated qualitatively.

2.4 Part 4: Determination of Bioaccumulative COPECs

Bioaccumulative COPECs for soil and sediment were determined using the information on bioaccumulative chemicals as presented in the TCEQ *Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas* (TNRCC, 2001). All bioaccumulative constituents

were retained as COPECs and were carried into the risk analysis if they were detected at levels greater than background. Bioaccumulative nature was not noted as a rationale for retaining COPECs in **Tables 11-20** as coincidentally, all detected bioaccumulative compounds above background were also above medium-specific screening levels.

2.5 Part 5: Gradient Analysis

A gradient analysis was performed for COPECs in soils that were not believed to be site-related. Inorganic constituents and polycyclic aromatic hydrocarbons (PAHs) were determined to be site-related. Thus, pesticides remained the only COPECs for which to perform a gradient analysis. Insufficient spatial sampling coverage was available from which to perform a gradient analysis.

3. Contaminant Fate and Transport

Table 21 highlights contaminant fate and transport mechanisms. **Table 22** highlights mechanisms of ecotoxicity for all COPECs identified.

4. Ecosystems and Receptors Potentially at Risk

Based upon previous site investigations and review of threatened and endangered species lists for the area, the following feeding guilds and surrogate receptors were identified for evaluation:

- **Terrestrial** –omnivorous birds (northern bobwhite quail) and mammals (white-footed mouse), and carnivorous mammals (coyote)
- **Aquatic** –benthic invertebrates, omnivorous birds (spotted sandpiper), and carnivorous birds (belted kingfisher)

Carnivorous birds may frequent the Site and be exposed to COPECs. However, due to large home range sizes relative to the size of the Site and other site use factors, exposure from the site was considered sufficiently low such that evaluation of risk was not warranted.

Herbivorous birds and mammals may occasionally be found at the Site. This feeding guild was not evaluated because the majority of plant species found on site are not known to provide significant nutritional value. Thus, the main exposure route being evaluated, the ingestion pathway, would not be substantial for this feeding guild at this Site. The most likely scenario at the site is that any species of small bird or mammal living at the site would need to be more omnivorous in its diet to meet its nutritional requirements. Hence, omnivorous birds and mammals are much more likely to be found at the site and would have the greatest exposure potential and potential risk from site-related COPECs.

5. Conceptual Site Model

The existing draft ecological conceptual site model (CSM) presented in the RI Report was revised, as appropriate, and is available as **Figure 1**. The CSM presents potential chemical sources, release mechanisms, receptors, and exposure routes. Food web models are presented for the terrestrial and aquatic marine food webs present at the site in **Figures 2** and **3**.

6. Assessment Endpoints and Risk Questions

Assessment endpoints were developed for each feeding guild identified with complete significant exposure pathways to site-related contaminants. **Table 23** provides measurement endpoints selected for each assessment endpoint. Risk hypotheses were developed for each endpoint and conclusions were drawn at the end of the risk assessment as to whether the null hypothesis was accepted or rejected.

7. Complete Exposure Pathways

Potential exposure pathways were identified in the BERA. The CSM illustrates which pathways were significant, complete, and which were evaluated. Specific exposure pathways are presented in detail in **Figure 1**.

Exposure pathways not explicitly addressed in this BERA include 1) inhalation and dermal exposure pathways for upper trophic level organisms, 2) foliar uptake of dissolved COPCs by aquatic plants, and 3) risk to amphibians and reptiles, because these pathways currently lack enough accompanying toxicological exposure information and guidance for a complete quantitative evaluation (USEPA, 1999).

Exposure to subsurface soil was not considered. Some burrowing mammals may be exposed to surface soils. However, it was assumed that the greatest exposure of the site-specific COPECs would be in surface soils where uptake by invertebrates and the shallow rooted plants found at the site would be the greatest.

8. Exposure Assessment

The EPA's *Wildlife Exposure Factors Handbook* (EPA, 1993) was the primary source of exposure factors data. **Table 24** lists the factors used for each receptor and the source of the data provided. BSAFs and BAFs used in the RI were reevaluated along with new values and final values are presented in **Table 25**. Bioaccumulation regression models from oak ridge national laboratory (ORNL) and the ecological soil screening levels (EcoSSLs), which are available in **Table 26**, were used as appropriate. Other factors were reevaluated or refined as specified in Step 3 of the BERA process under CERCLA.

The exposure to upper trophic level organisms was assessed by quantifying the daily dose of ingested contaminated food items (that is, plant and animal) and ingested media. Exposure to receptors was estimated using chemical-specific Exposure Point Concentrations (EPCs), bioaccumulation data, and several other factors such as species-specific body weights, ingestion rates, home range data, and area use factors. Prey tissue concentrations were estimated using chemical-specific bioaccumulation factors and bioaccumulation regression models. Site-specific tissue data were not available. Instead, tissue concentrations were modeled using literature data.

Benthic invertebrates were evaluated for direct toxicity to COPECs in sediment. EPCs were compared directly to media screening levels.

Fish tissue concentrations used in modeling ingestion by piscivorous birds were modeled using biota sediment accumulation factors. It was assumed that the fish from which these BSAFs were developed were from the same trophic level as those expected in the diets of piscivorous birds feeding adjacent to the Site.

Initial EPCs were established as maximum detected concentrations. 95% UCLs were only calculated for those COPECs for which risk estimates using maximum concentrations indicated risk. For those COPECs suggesting risk based on maximum detected concentrations, 95% UCLs were calculated using the most recent version of ProUCL. The final list of COPECs and EPCs used for the risk evaluation is presented in **Tables 27 and 28** for soil and sediment, respectively. For a handful of COPECs, EPCs were further refined to mean concentrations when 95% UCLs indicated risk. Mean concentrations were considered a reasonable exposure point concentration because, assuming available food sources and cover are equal throughout the exposure area, receptors would not spend a greater percent of their foraging time at any one point versus another (i.e., the higher concentration areas).

Area use factors (AUFs) were applied to exposure estimates based on the ratio of exposure area to home range. For herbivorous mammals, each source area onsite was evaluated as a separate exposure area. All site data were combined as one exposure area for the coyote and northern bobwhite. All sediment data were combined as one exposure area for the belted kingfisher. Risk estimates for the spotted sandpiper were calculated separately for the intertidal and nearshore exposure areas because it was anticipated that the intertidal area contained significantly higher concentrations and separate calculations would help focus the location of the risks. Since the combined area was slightly less than the home range, the risk estimates were combined to determine total risk and were proportioned as 20 percent from the intertidal area and 80 percent from the nearshore area, based on acreage. A site use factor (SUF) was also applied to the risk estimates for the spotted sandpiper. The majority of the species within the omnivorous bird feeding guild are not year round residents of the area and spend less than half the year at the site. An SUF of 50 percent was multiplied by the AUF to determine a combined site use factor for the spotted sandpiper risk estimates.

9. Effects Assessment

Toxicity values used in the screening level evaluation (Steps 1 and 2) were reevaluated and refined as shown in **Tables 29 and 30**. The USEPA (1999) TRV selection hierarchy was used as guidance for identifying toxicity values used to develop TRVs and uncertainty factors were applied as directed when necessary. The EcoSSLs (USEPA, 2005), *Toxicological Benchmarks for Wildlife: 1996 Revision* (Sample et al. 1996), EPA's ECOTOX database, and EPA's draft *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (1999) were consulted as possible sources for avian and mammalian TRVs.

For those constituents (if any) with missing toxicity values, toxicity values for proxy chemicals were used if available. Constituents with no appropriate proxy toxicity values were evaluated qualitatively.

10. Risk Characterization

Hazard quotients (HQ) were calculated by dividing exposure point concentrations (EPC) by ecological risk-based screening levels for benthic invertebrates and exposure doses by toxicological reference values for wildlife. HIs were calculated for total LPAHs and HPAHs as the sum of HQs for individual PAHs. Risk characterizations for the applicable receptors in each exposure area are presented in **Tables 31-49**.

10.1 Terrestrial Omnivorous/Insectivorous Mammals:

No observed adverse effect level (NOAEL)-based HQs for the white-footed mouse in the Former Wastewater Impoundments are presented in **Table 31**. The NOAEL-based HQ exceeds unity only for zinc (1.5). No lowest observed adverse effect level (LOAEL)-based HQs exceed unity. Therefore, the risk to the omnivorous / insectivorous mammal feeding guild lies in the risk management area between the NOAEL and LOAEL. The risk was considered marginal and was not recommended for further analysis or risk management.

NOAEL-based HQs for the white-footed mouse in the Wastewater Treatment Facility are presented in **Table 32**. The NOAEL-based HQ exceeds unity only for zinc (1.9). No LOAEL-based HQs exceed unity. Therefore, the risk to the omnivorous/ insectivorous mammal feeding guild lies in the risk management area between the NOAEL and LOAEL. The risk was considered marginal and was not recommended for further analysis or risk management.

NOAEL-based HQs for the white-footed mouse in the Current Above Ground Storage Tanks are presented in **Table 33**. The NOAEL-based HQ exceeds unity only for chromium (1.3), lead (2.1), and zinc (1.7). The HI for HPAHs also exceeds unity (1.5). No LOAEL-based HQs or HIs exceed unity. Therefore, all of the risks to the omnivorous/ insectivorous mammal feeding guild lie in the risk management area between the NOAEL and LOAEL. These risks were considered marginal and were not recommended for further analysis or risk management.

NOAEL-based HQs for the white-footed mouse in the Maintenance Shed Area are presented in **Table 34**. The NOAEL-based HQ exceeds unity only for beta endosulfan (1.7), endrin aldehyde (1.5), and zinc (2.4). No LOAEL-based HQs exceed unity. However, the risk for beta-endosulfan is not bound by a LOAEL due to a lack of available toxicological data. While there is no certainty with where the LAOEL TRV would lie relative to the NOAEL TRV, an assumption that the LOAEL is as little as two times the NOAEL would yield a LOAEL HQ below unity. Of all the TRVs presented in **Tables 27** and **28**, only two LOAEL TRVs are less than two times the NOAEL TRV, so this assumption is well supported. Therefore, all the risks to the omnivorous/ insectivorous mammal feeding guild lie in the risk management area between the NOAEL and LOAEL. These risks were considered marginal and were not recommended for further analysis or risk management.

NOAEL-based HQs for the white-footed mouse in the Tar Burn Area are presented in **Table 35**. The NOAEL-based HQ exceeds unity only for zinc (1.7). No LOAEL-based HQs exceed unity. Therefore, the risk to the omnivorous/ insectivorous mammal feeding guild lies in the risk management area between the NOAEL and LOAEL. The risk was considered marginal and was not recommended for further analysis or risk management.

NOAEL-based HQs for the white-footed mouse in the Lauren Tank Farm are presented in **Table 36**. The NOAEL-based HQ exceeds unity only for alpha chlordane (1.3), cadmium (1.1), endrin aldehyde (53), and zinc (1.7). The HI for HPAHs also exceeds unity (1.7). LOAEL-based HQs also exceed unity for endrin aldehyde (5.3). No other LOAEL-based HQ or HI exceeds unity. Risk to the omnivorous/ insectivorous mammal feeding guild from endrin aldehyde is recommended for further analysis or risk management.

NOAEL-based HQs for the white-footed mouse in the Non-source Area are presented in **Table 37**. The NOAEL-based HQ exceeds unity only for cadmium (5), carbazole (1.2),

chrysene (1.1), dieldrin (114), endrin aldehyde (378), fluoranthene (3.5), heptachlor epoxide (43), p,p'-DDE (1.6), and pyrene (2.3). The HI for HPAHs also exceeds unity (10). LOAEL-based HQs also exceed unity for dieldrin (14), endrin aldehyde (38), and heptachlor epoxide (4.3). No other LOAEL-based HQ or HI exceeds unity. The risk from zinc, which appears to be attributable to a data outlier, is discussed further in the uncertainty analysis. Risks to the omnivorous/ insectivorous mammal feeding guild from dieldrin, endrin aldehyde, and heptachlor epoxide are recommended for further analysis or risk management.

Terrestrial Omnivorous/Insectivorous Birds: HQs for the northern bobwhite quail are presented in **Table 38**. NOAEL-based HQs exceed 1.0 only for chromium, copper, lead, zinc, dieldrin, heptachlor epoxide, and DDT and its metabolites DDD and DDE. All HQs were below 10. No LOAEL-based HQs exceed unity. Therefore, the risk to the omnivorous/ insectivorous bird feeding guild lies in the risk management area between the NOAEL and LOAEL. These risks were considered marginal and were not recommended for further analysis or risk management.

Terrestrial Carnivorous Mammals: HQs for the coyote are presented in **Table 39**. No NOAEL-based or LOAEL-based HQs exceed 1.0. Therefore, there is no risk to the carnivorous mammal feeding guild. No further analysis or risk management is required.

Benthic Invertebrates: Sediment concentrations from all three exposure areas in Sabine Lake were compared to primary and secondary effects levels indicative of toxicity to benthic invertebrate communities. The effects levels selected are those proposed by the TCEQ's Ecological Risk Assessment Workgroup in March 2004. For inorganic constituents, PAHs, DDTs, and PCBs the values are effects range low (ERLs) and effects range median (ERMs) values published by Long et al., 1995. For many of the VOCs, values were derived using equilibrium partitioning methodology as described in TNRCC 2001. Since few marine sediment screening values are available, these sources were given precedence and when not available, other sources such as AET values were considered for screening purposes.

Benthic invertebrates range from immobile to having small home ranges; therefore, each exposure area was evaluated independently. Constituents were identified as COCs for benthic invertebrates when the maximum magnitude of exceedance of the primary effect level is greater than 10 or if the frequency of exceedance of the secondary effect level exceeds 20 %.

The analysis of the Intertidal Area indicates marginal or lower risk exists for all COPECs except lead (**Table 40**). The maximum magnitude of exceedance of the primary effect levels is less than 10 for all COPECs. For lead, the concentrations of two samples exceed the secondary effect level. For all other COPECs, one or fewer samples exceed the secondary effect level. Risks to benthic invertebrates for all COPECs except lead are marginal, do not require further analysis, and are not recommended for risk management. The risk to benthic invertebrates for lead requires further analysis and/or risk management.

The analysis of the Nearshore Area indicates marginal or lower risk exists for all COPECs (**Table 41**). The maximum magnitude of exceedance of the primary effect levels is less than 10 for all COPECs. For all COPECs, one or fewer samples exceed the secondary effect level with a maximum frequency of exceedance of less than 5%. Risks for all COPECs are marginal, do not require further analysis, and are not recommended for risk management.

For barium in the nearshore area, the concentrations of 20 samples exceed the primary effect level and no secondary effect level is available. Though approximately 45 percent of the barium samples exceed the primary screening value, the risk is not considered significant. The maximum magnitude of exceedance is less than ten. The value exceeded is the lowest of the available toxicity test results that was available for development of the Apparent Effects Thresholds. Perhaps more importantly, screening values are not readily available for barium in sediments. Of all the studies conducted over the years to develop screening values, no other studies have included barium. Barium is not generally considered toxic. Barium in the nearshore sediments is not recommended for further analysis or risk management.

The analysis of the Offshore Area indicates marginal or lower risks exist for all COPECs (**Table 42**). The maximum magnitude of exceedance of the primary effect levels is less than 10 for all COPECs and no sample concentrations exceed secondary effect levels. Risks to benthic invertebrates for all COPECs are marginal, do not require further analysis, and are not recommended for risk management.

Omnivorous/Insectivorous Birds: HQs for the spotted sandpiper in the Intertidal Area are presented in **Table 43**. No NOAEL-based or LOAEL-based HQs exceed 1.0. HQs for the spotted sandpiper in the Nearshore Area are presented in **Table 44**. The NOAEL-based HQs for fluorene (3.2), manganese (2.6), phenanthrene (1.8), and thallium (2.1), exceed unity, as does the LPAH HI (5). No LOAEL-based HQs exceed unity. **Table 45** presents the combined total HQs for the spotted sandpiper representing omnivorous/ insectivorous shore birds foraging in both the intertidal and nearshore areas. NOAEL-based HQs fluorene (3.3), manganese (3.4), phenanthrene (1.8), and thallium (2.1), exceed unity, as does the LPAH HI (5). No LOAEL-based HQs exceed unity. Risks to omnivorous/ insectivorous shore birds are marginal, do not require further analysis, and are not recommended for risk management. No further analysis or risk management is required.

Piscivorous Birds: HQs for the belted kingfisher from the combined Intertidal, Nearshore, and Offshore Areas are presented in **Table 46**. Only the NOAEL-based HQ for zinc exceeds unity (7.5). No LOAEL-based HQs exceed unity. Therefore, the risk to the piscivorous bird feeding guild lies in the risk management area between the NOAEL and LOAEL. This risk was considered marginal and was not recommended for further analysis or risk management.

11. Uncertainty Assessment

Uncertainties are inherent in all risk assessments. The nature and magnitude of the uncertainties depend on the amount and quality of data available, the degree of knowledge concerning site conditions, and the assumptions made to perform the assessment. A qualitative evaluation of the major general uncertainties associated with this screening assessment, in no particular order of importance, is outlined below:

- No avian and mammalian life history data specific to the site were available; therefore, exposure parameters were either modeled based on allometric relationships (e.g., food ingestion rates) or were based on data from these same species in other portions of their range. Because diet composition as well as food, water, and soil ingestion rates can differ among individuals and locations, published parameter values may not accurately reflect individuals present at the site. Consequently, risk may be either overestimated or underestimated.

- No site-specific data on concentrations in prey items were available. Therefore, concentrations in these prey items were estimated using literature-derived bioaccumulation models. The suitability of these models is unknown. Consequently, concentrations of COPECs in actual prey may be either higher or lower than the data used in this screen.
- Literature-derived toxicity data based on laboratory studies were the only available toxicity data used to evaluate risk to all receptor groups. It was assumed that effects observed in laboratory species were indicative of effects that would occur in wild species. The suitability of this assumption is unknown. Consequently, the risk may be either overestimated or underestimated.
- Dietary compositions were simplified for the site receptors to estimate concentrations in food items using bioaccumulation models. It was assumed that concentrations were similar in comparable food types. The suitability of this assumption is unknown. Consequently, risk may be either overestimated or underestimated.
- Because toxicity data specific for bird and mammal species at the site were not available, it was necessary to extrapolate toxicity values from test species to site receptor species. Although scaling factors were employed (Sample and Arenal, 1999), these factors are not chemical-specific and are based on acute toxicity data. Consequently, risk may be either overestimated or underestimated.
- In this screen, risks for most chemicals were each considered independently. Because chemicals may interact in an additive, antagonistic, or synergistic manner, the evaluation of single-chemical risk may either underestimate or overestimate risk associated with chemical mixtures. The risk from PAHs and organochlorine pesticides were summed to determine the combined risk.
- Detection limits for some data were insufficient because they were greater than ecological screening values. These compounds were carried forward in the risk assessment and evaluated for effects on wildlife using one-half the detection limit as a proxy value for non-detects. This assumption could either underestimate or overestimate risk, depending on the true concentration of those constituents.
- All sediment data used in the risk assessment is a minimum of four years old. The Site is located along Sabine Lake adjacent to a canal that receives regular boat traffic. It is dredged every two to three years. The sediments in this area are also subject to tidal movements. Sediments located in such an active area are not likely to remain constant, and as such, the available data from 2001, 1999, and 1995 are neither necessarily reflective solely of site-related influence nor are they definitively representative of existing conditions.
- There is a lack of spatial coverage for pesticide data at the Site. Pesticides were detected in some of the source areas; however, there was insufficient sample coverage to determine if a site related gradients exist. Samples were not collected in many areas surrounding pesticide detections. In these areas, risk could be either under or over estimated, depending on the concentration in the surrounding area relative to the EPC that was used in the risk estimates.

- Risk was not calculated for reptiles and amphibians due to insufficient toxicological data and site-specific data. Some species of omnivorous birds have similar diets to those of omnivorous reptiles and amphibians. Hence, conclusions for the omnivorous bird feeding guild were considered representative of the reptiles and amphibians likely living on the Site.
- Risk was not calculated for terrestrial plants or invertebrates. No endangered plant or invertebrate species were identified within the area. Significant plant and insect species were noted as thriving within the Site during the last site visit on June 17, 2005. Thus, these lower trophic level organisms were not considered assessment endpoints for the Site.
- Toxicity information adequate to quantify ecological risks was not available for some detected constituents. In some cases, data for surrogate chemicals were used. The use of surrogate toxicity information to quantify toxicity for these contaminants might lead to overestimates or underestimates of risk to ecological receptors. For some constituents, there is no information available from which to develop TRVs. Consequently, these constituents could not be evaluated. There is no information available from which to develop TRVs for 13 COPECs for birds and 1 COPEC for mammals. For some COCs, there is a mammal TRV but no avian TRV or vice versa. The uncertainty of risk to one class of receptors in these cases is reduced by the lack of quantifiable risk to the other class of organisms.
- The exposure dose estimates in this screening risk assessment assume that 100 percent of the chemical concentrations to which receptors are exposed is in the bioavailable form. Most chemicals will not be 100 percent bioavailable. In the cases where bioavailability is less than 100 percent, risk is overestimated.

12. Scientific Management Decision Point (SMDP)

Table 47 presents a summary of the LOAEL-based HQs for all wildlife and effects range medium (ERM) exceedances for benthic invertebrates. **Table 48** presents a summary of the assessment and measurement endpoints and risk hypotheses posed with answers for each. Any risks remaining after completion of the uncertainty analysis are considered contaminants of concern (COCs) instead of COPECs. Based on calculated risks, Preliminary Remediation Goals (PRGs) were developed for COCs in soil and sediment (**Table 49**). PRGs are also presented in the Feasibility Study (FS) for the Site. PRGs were calculated based upon the most sensitive receptor that presented risk to a given COC within a given exposure area. PRGs represent the midway point between no-effect and lowest effect levels for wildlife or between primary and secondary effect levels for sediment dwelling organisms. **Figures 4** through **10** present areas of PRG exceedance in soil and sediment.

TABLE 47. SUMMARY OF RISKS BY EXPOSURE AREA AND RECEPTOR

Exposure Area	White-footed Mouse	Northern Bobwhite	Coyote	Benthic Invertebrates	Spotted Sandpiper	Belted Kingfisher
Former Wastewater Impoundments	No Risk	No Risk	No Risk	-	-	-

Exposure Area	White-footed Mouse	Northern Bobwhite	Coyote	Benthic Invertebrates	Spotted Sandpiper	Belted Kingfisher
Wastewater Treatment Facility	No Risk	No Risk	No Risk	-	-	-
Current Aboveground Storage Tanks	No Risk	No Risk	No Risk	-	-	-
Maintenance Shed Area	No Risk	No Risk	No Risk	-	-	-
Tar Burn Area	No Risk	No Risk	No Risk	-	-	-
Former Lauren Tank Farm	Endrin Aldehyde - 5	No Risk	No Risk	-	-	-
Non Source Area	Dieldrin – 11 Endrin Aldehyde – 37 Heptachlor Epoxide - 4	No Risk	No Risk	-	-	-
Intertidal Area	-	-	-	Lead - 4 X ERM	No Risk	No Risk
Nearshore Area	-	-	-	No Risk	No Risk	No Risk
Offshore Area	-	-	-	No Risk	No Risk	No Risk

The exact source of lead contamination in sediments is uncertain. Ground water is a potential source. **Table 50** presents the calculation of a ground water to sediment protective screening value (0.8 ug/L) based on methods described in the Texas Risk Reduction Program (TRPP) guidance – TRRP-24. The concentration of lead in ground water samples collected during the RI in 2001 (20 ug/L) is two orders of magnitude greater than the screening value. This indicates that ground water from the site could be a potential source of lead to sediments in the intertidal area that indicate toxicity to benthic organisms.

While PRGs are presented for each medium, within Step 8 of the Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments – Interim Final (EPA, 1997), the following two statements are made:

- “The risk manager must balance (1) residual risks posed by site contaminants before and after implementation of the selected remedy with (2) the potential impacts of the selected remedy on the environment independent of contaminant effects.”
- “In instances where substantial ecological impact will result from the remedy (e.g., dredging a wetland), the risk manager will need to consider ways to mitigate the impact of the remedy and compare mitigated impacts to the threats posed by the site contamination.”

Net Environmental Benefit Analysis (NEBA) provides a framework to meet this guidance. A NEBA can be conducted to support the selection of remedial alternatives for sediments adjacent to the Site. The purpose of the NEBA is to develop information for the EPA work authorization manager (WAM) and other stakeholders to enable the development of a

defensible, scientifically based cleanup approach at the Site. The overall goal is to identify potential remedial alternatives that would provide for the protection of human health and the environment while providing the greatest net ecological value. Within the NEBA, preliminary assumptions can be made regarding various input parameters and, as such, this analysis is exploratory in nature and can be revised as necessary. NEBA is recommended as a method to assist in remedial decision making at this site. A NEBA will be presented as an appendix to the FS for the site. The key stakeholders would be expected to work collaboratively to further refine the analyses in order to suit those purposes based on the best information available at that time.

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Tables

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Table 1

Comparison of Surface Soil Data from the Former Wastewater Impoundments to Background

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Chemical Group	Parameter	p-value from Wilcoxon Rank Sum (WRS) Test	Is Background Exceeded via WRS Test?	Site Detection Frequency	Bkgd Detection Frequency	Site Mean	Bkgd Mean	Site Median	Bkgd Median	Number of Exceedances of Normal UTL	Percent of Exceedances of Normal UTL	Number of Exceedances of Normal UPL	Number of Exceedances of Background Max
METAL	ALUMINUM	0.715	no	12/12	5/5	6300	7240	4990	6370	0	0	1	1
METAL	ANTIMONY	0.121	Yes	8/12	1/5	8.62	2.03	1.4	0.43				4
METAL	ARSENIC	0.642	no	12/12	5/5	5.78	8.3	6	6.4	0	0	0	0
METAL	BARIUM	0.359	no	12/12	5/5	259	243	211	225	0	0	0	1
METAL	BERYLLIUM	0.521	no	12/12	5/5	0.483	0.622	0.485	0.5	0	0	0	0
METAL	CALCIUM	0.958	no	12/12	5/5	7770	22200	7110	16100	0	0	0	0
METAL	CHROMIUM, TOTAL	0.521	no	12/12	5/5	14.6	16.9	10.9	13.8	0	0	0	0
METAL	COBALT	0.679	no	12/12	5/5	5.08	7.7	5.15	4.3	0	0	0	0
METAL	COPPER	0.051	Yes	12/12	5/5	74.2	23.1	58.3	10.7	2	17	3	6
METAL	CYANIDE	0.770	no	1/12	2/5	0.19	0.437	0.065	0.21				0
METAL	IRON	0.359	no	12/12	5/5	20400	35400	17900	12000	0	0	0	0
METAL	LEAD	0.061	Yes	12/12	5/5	120	32	83.1	22.2	5	42	7	8
METAL	MAGNESIUM	0.939	no	12/12	5/5	1350	2150	1430	2600	0	0	0	0
METAL	MANGANESE	0.878	no	12/12	5/5	274	544	275	427	0	0	0	0
METAL	MERCURY	0.232	no	6/12	1/5	0.0908	0.061	0.07	0.065				5
METAL	NICKEL	0.500	no	12/12	5/5	19.7	19.9	13.8	18.2	0	0	1	2
METAL	POTASSIUM	0.945	no	12/12	5/5	935	1430	946	1530	0	0	0	0
METAL	SELENIUM	0.843	no	1/12	1/5	0.621	1.02	0.625	0.65				0
METAL	SILVER	0.166	Yes	9/12	3/5	0.785	0.385	0.585	0.42	5	42	6	7
METAL	SODIUM	0.562	no	8/12	5/5	354	362	321	312	0	0	0	2
METAL	THALLIUM	0.500	no	4/12	1/5	1.19	1.85	0.675	0.65				0
METAL	VANADIUM	0.748	no	12/12	5/5	16.5	23	16.9	18.3	0	0	0	0
METAL	ZINC	0.028	Yes	12/12	5/5	210	66	211	56.5	6	50	7	7
SVOC	2-METHYLNAPHTHALENE	0.541	no	5/12	1/5	0.294	0.181	0.198	0.21				1
SVOC	ACENAPHTHENE	0.698	no	8/12	1/5	0.146	0.156	0.0875	0.21				5
SVOC	ACENAPHTHYLENE	0.582	no	11/12	1/5	0.689	0.215	0.195	0.22				5
SVOC	ANTHRACENE	0.378	no	11/12	1/5	0.715	0.195	0.23	0.22				6
SVOC	BENZO(a)ANTHRACENE	0.285	no	11/12	2/5	0.458	0.208	0.25	0.22				4
SVOC	BENZO(a)PYRENE	0.251	no	10/12	2/5	0.626	0.282	0.215	0.22				4
SVOC	BENZO(b)FLUORANTHENE	0.235	no	11/12	2/5	0.889	0.22	0.305	0.22				4
SVOC	BENZO(g,h,i)PERYLENE	0.583	no	8/12	1/5	1.21	0.509	0.155	0.22				3
SVOC	BENZO(k)FLUORANTHENE	0.735	no	8/12	2/5	0.168	0.191	0.085	0.22				2
SVOC	CARBAZOLE	0.661	no	10/12	1/5	0.195	0.171	0.0875	0.21				4
SVOC	CHRYSENE	0.236	no	11/12	2/5	0.905	0.275	0.365	0.22				4
SVOC	DI-n-BUTYL PHTHALATE	0.338	no	1/12	1/5	0.286	0.158	0.208	0.21				1
SVOC	DIBENZ(a,h)ANTHRACENE	0.963	no	8/12	1/5	0.123	0.239	0.085	0.22				1
SVOC	FLUORANTHENE	0.073	Yes	11/12	3/5	0.738	0.157	0.34	0.085	4	33	5	5
SVOC	FLUORENE	0.320	no	7/12	1/5	0.175	0.128	0.15	0.085				6
SVOC	INDENO(1,2,3-c,d)PYRENE	0.500	no	9/12	2/5	0.474	0.262	0.11	0.22				3
SVOC	NAPHTHALENE	0.521	no	5/12	1/5	0.244	0.175	0.198	0.21				2
SVOC	PHENANTHRENE	0.251	no	12/12	2/5	0.531	0.166	0.225	0.22				5
SVOC	PYRENE	0.131	Yes	11/12	2/5	1.44	0.311	0.365	0.22				5
SVOC	bis(2-ETHYLHEXYL) PHTHALATE	0.438	no	4/12	3/5	0.823	0.401	0.215	0.21	1	8	1	1

Table 2

Comparison of Surface Soil Data from the Wastewater Treatment Facility to Background

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Chemical Group	Parameter	p-value from Wilcoxon Rank Sum (WRS) Test	Is Background Exceeded via WRS Test?	Site Detection Frequency	Bkgd Detection Frequency	Site Mean	Bkgd Mean	Site Median	Bkgd Median	Number of Exceedances of Normal UTL	Percent of Exceedances of Normal UTL	Number of Exceedances of Normal UPL	Number of Exceedances of Background Max
METAL	ALUMINUM	0.500	no	7/7	5/5	6720	7240	6630	6370	0	0	0	0
METAL	ANTIMONY	0.086	Yes	6/7	1/5	2.24	2.03	1.7	0.43				0
METAL	ARSENIC	0.318	no	7/7	5/5	8.33	8.3	6.8	6.4	0	0	0	0
METAL	BARIUM	0.890	no	7/7	5/5	139	243	98.9	225	0	0	0	0
METAL	BERYLLIUM	0.140	Yes	7/7	5/5	0.749	0.622	0.65	0.5	0	0	0	0
METAL	CALCIUM	0.961	no	7/7	5/5	5220	22200	5630	16100	0	0	0	0
METAL	CHROMIUM, TOTAL	0.318	no	7/7	5/5	22.9	16.9	12.8	13.8	0	0	1	1
METAL	COBALT	0.264	no	7/7	5/5	7.7	7.7	5.8	4.3	0	0	0	0
METAL	COPPER	0.051	Yes	7/7	5/5	101	23.1	50.6	10.7	2	29	2	2
METAL	CYANIDE	0.809	no	1/7	2/5	0.162	0.437	0.065	0.21				0
METAL	IRON	0.175	Yes	7/7	5/5	47300	35400	17700	12000	0	0	1	1
METAL	LEAD	0.022	Yes	7/7	5/5	90.3	32	61.4	22.2	3	43	3	5
METAL	MAGNESIUM	0.682	no	7/7	5/5	1760	2150	1270	2600	0	0	0	1
METAL	MANGANESE	0.682	no	7/7	5/5	1870	544	335	427	1	14	1	1
METAL	MERCURY	0.174	Yes	5/7	1/5	0.231	0.061	0.07	0.065				3
METAL	NICKEL	0.318	no	7/7	5/5	29.7	19.9	16.2	18.2	0	0	1	1
METAL	POTASSIUM	0.735	no	7/7	5/5	1280	1430	1070	1530	0	0	1	1
METAL	SELENIUM	0.684	no	2/7	1/5	1.08	1.02	0.6	0.65				1
METAL	SILVER	0.086	Yes	5/7	3/5	0.858	0.385	0.82	0.42	4	57	5	5
METAL	SODIUM	0.110	Yes	7/7	5/5	1160	362	890	312	2	29	4	4
METAL	THALLIUM	0.683	no	2/7	1/5	2.12	1.85	0.6	0.65				1
METAL	VANADIUM	0.735	no	7/7	5/5	17.6	23	16.2	18.3	0	0	0	0
METAL	ZINC	0.009	Yes	7/7	5/5	389	66	331	56.5	4	57	6	7
SVOC	2-METHYLNAPHTHALENE	0.711	no	2/7	1/5	0.153	0.181	0.205	0.21				1
SVOC	ACENAPHTHENE	0.916	no	3/7	1/5	0.0971	0.156	0.085	0.21				1
SVOC	ACENAPHTHYLENE	0.878	no	4/7	1/5	0.148	0.215	0.085	0.22				1
SVOC	ANTHRACENE	0.736	no	6/7	1/5	0.178	0.195	0.085	0.22				2
SVOC	BENZALDEHYDE	0.048	Yes	2/7	3/5	0.125	0.0382	0.085	0.009	0	0	0	2
SVOC	BENZO(a)ANTHRACENE	0.563	no	5/7	2/5	0.219	0.208	0.11	0.22				1
SVOC	BENZO(a)PYRENE	0.595	no	5/7	2/5	0.201	0.282	0.1	0.22				0
SVOC	BENZO(b)FLUORANTHENE	0.375	no	5/7	2/5	0.324	0.22	0.15	0.22				1
SVOC	BENZO(g,h,i)PERYLENE	0.915	no	4/7	1/5	0.142	0.509	0.13	0.22				0
SVOC	BENZO(k)FLUORANTHENE	0.737	no	5/7	2/5	0.129	0.191	0.085	0.22				0
SVOC	CARBAZOLE	0.936	no	3/7	1/5	0.11	0.171	0.085	0.21				1
SVOC	CHRYSENE	0.375	no	5/7	2/5	0.333	0.275	0.17	0.22				1
SVOC	DIBENZ(a,h)ANTHRACENE	0.979	no	5/7	1/5	0.0643	0.239	0.085	0.22				0
SVOC	FLUORANTHENE	0.317	no	5/7	3/5	0.434	0.157	0.13	0.085	1	14	1	1
SVOC	FLUORENE	0.500	no	3/7	1/5	0.131	0.128	0.09	0.085				3
SVOC	INDENO(1,2,3-c,d)PYRENE	0.684	no	5/7	2/5	0.15	0.262	0.11	0.22				0
SVOC	NAPHTHALENE	0.827	no	2/7	1/5	0.139	0.175	0.12	0.21				0
SVOC	PHENANTHRENE	0.532	no	6/7	2/5	0.256	0.166	0.09	0.22				1
SVOC	PYRENE	0.468	no	5/7	2/5	0.374	0.311	0.14	0.22				1

Table 3

Comparison of Surface Soil Data from the Current Aboveground Storage Tanks to Background

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Chemical Group	Parameter	p-value from Wilcoxon Rank Sum (WRS) Test	Is Background Exceeded via WRS Test?	Site Detection Frequency	Bkgd Detection Frequency	Site Mean	Bkgd Mean	Site Median	Bkgd Median	Number of Exceedances of Normal UTL	Percent of Exceedances of Normal UTL	Number of Exceedances of Normal UPL	Number of Exceedances of Background Max
METAL	ALUMINUM	0.967	no	5/5	5/5	1780	7240	1040	6370	0	0	0	0
METAL	ANTIMONY	0.387	no	2/3	1/5	1.66	2.03	2.1	0.43				0
METAL	ARSENIC	0.912	no	5/5	5/5	3.6	8.3	1.6	6.4	0	0	0	0
METAL	BARIUM	0.500	no	5/5	5/5	194	243	233	225	0	0	0	0
METAL	BERYLLIUM	0.977	no	3/5	5/5	0.134	0.622	0.09	0.5	0	0	0	0
METAL	CALCIUM	0.967	no	4/5	5/5	3630	22200	1870	16100	0	0	0	0
METAL	CHROMIUM, TOTAL	0.880	no	5/5	5/5	28.2	16.9	3.2	13.8	1	20	1	1
METAL	COBALT	0.967	no	5/5	5/5	1.81	7.7	1.2	4.3	0	0	0	0
METAL	COPPER	0.620	no	5/5	5/5	14.8	23.1	10.3	10.7	0	0	0	0
METAL	CYANIDE	0.867	no	2/5	2/5	0.122	0.437	0.06	0.21				0
METAL	IRON	0.911	no	5/5	5/5	7830	35400	5020	12000	0	0	0	0
METAL	LEAD	0.580	no	5/5	5/5	134	32	20.4	22.2	1	20	1	2
METAL	MAGNESIUM	0.976	no	5/5	5/5	348	2150	219	2600	0	0	0	0
METAL	MANGANESE	0.967	no	5/5	5/5	140	544	75	427	0	0	0	0
METAL	MERCURY	0.623	no	2/5	1/5	0.064	0.061	0.03	0.065				2
METAL	NICKEL	0.967	no	5/5	5/5	5.88	19.9	4.7	18.2	0	0	0	0
METAL	POTASSIUM	0.983	no	5/5	5/5	396	1430	304	1530	0	0	0	0
METAL	SILVER	0.500	no	4/5	3/5	0.458	0.385	0.33	0.42	1	20	2	2
METAL	SODIUM	0.657	no	5/5	5/5	291	362	261	312	0	0	0	0
METAL	VANADIUM	0.879	no	5/5	5/5	11.5	23	4.9	18.3	0	0	0	0
METAL	ZINC	0.420	no	5/5	5/5	142	66	76.3	56.5	1	20	1	1
SVOC	2-METHYLNAPHTHALENE	0.815	no	2/5	1/5	0.147	0.181	0.195	0.21				0
SVOC	ACENAPHTHENE	0.541	no	2/5	1/5	0.215	0.156	0.2	0.21				1
SVOC	ACENAPHTHYLENE	0.968	no	4/5	1/5	0.087	0.215	0.02	0.22				0
SVOC	ANTHRACENE	0.816	no	3/5	1/5	0.392	0.195	0.2	0.22				1
SVOC	BENZALDEHYDE	0.160	Yes	3/5	3/5	0.0886	0.0382	0.03	0.009	0	0	0	2
SVOC	BENZO(a)ANTHRACENE	0.657	no	5/5	2/5	0.648	0.208	0.05	0.22				1
SVOC	BENZO(a)PYRENE	0.657	no	5/5	2/5	0.596	0.282	0.06	0.22				1
SVOC	BENZO(b)FLUORANTHENE	0.657	no	5/5	2/5	0.966	0.22	0.09	0.22				1
SVOC	BENZO(g,h,i)PERYLENE	0.815	no	3/5	1/5	0.308	0.509	0.2	0.22				0
SVOC	BENZO(k)FLUORANTHENE	0.838	no	5/5	2/5	0.388	0.191	0.04	0.22				1
SVOC	CARBAZOLE	0.581	no	2/5	1/5	0.171	0.171	0.2	0.21				1
SVOC	CHRYSENE	0.787	no	5/5	2/5	0.622	0.275	0.08	0.22				1
SVOC	DIBENZ(a,h)ANTHRACENE	0.815	no	2/5	1/5	0.193	0.239	0.2	0.22				0
SVOC	FLUORANTHENE	0.580	no	5/5	3/5	2.07	0.157	0.07	0.085	1	20	1	1
SVOC	FLUORENE	0.211	no	1/5	1/5	0.255	0.128	0.2	0.085				1
SVOC	INDENO(1,2,3-c,d)PYRENE	0.787	no	5/5	2/5	0.254	0.262	0.04	0.22				1
SVOC	NAPHTHALENE	0.861	no	2/5	1/5	0.139	0.175	0.195	0.21				0
SVOC	PHENANTHRENE	0.580	no	4/5	2/5	0.844	0.166	0.13	0.22				1
SVOC	PYRENE	0.657	no	5/5	2/5	1.76	0.311	0.13	0.22				1

Table 4

Comparison of Surface Soil Data from the Maintenance Shed Area to Background

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Chemical Group	Parameter	p-value from Wilcoxon Rank Sum (WRS) Test	Is Background Exceeded via WRS Test?	Site Detection Frequency	Bkgd Detection Frequency	Site Mean	Bkgd Mean	Site Median	Bkgd Median	Number of Exceedances of Normal UTL	Percent of Exceedances of Normal UTL	Number of Exceedances of Normal UPL	Number of Exceedances of Background Max
METAL	ALUMINUM	0.947	no	9/9	5/5	3470	7240	3370	6370	0	0	0	0
METAL	ANTIMONY	0.261	no	4/8	1/5	4.26	2.03	3.15	0.43				1
METAL	ARSENIC	0.762	no	9/9	5/5	6.23	8.3	6.1	6.4	0	0	0	1
METAL	BARIUM	0.917	no	9/9	5/5	129	243	70.9	225	0	0	0	0
METAL	BERYLLIUM	0.557	no	7/8	5/5	0.559	0.622	0.51	0.5	0	0	1	1
METAL	CALCIUM	0.781	no	9/9	5/5	34600	22200	7590	16100	2	22	2	2
METAL	CHROMIUM, TOTAL	0.699	no	9/9	5/5	12	16.9	10.4	13.8	0	0	0	0
METAL	COBALT	0.742	no	9/9	5/5	4.2	7.7	5	4.3	0	0	0	0
METAL	COPPER	0.500	no	9/9	5/5	49.1	23.1	18.9	10.7	1	11	2	2
METAL	CYANIDE	0.557	no	1/8	2/5	0.246	0.437	0.315	0.21				0
METAL	IRON	0.652	no	9/9	5/5	16700	35400	15500	12000	0	0	0	0
METAL	LEAD	0.348	no	9/9	5/5	101	32	63.5	22.2	4	44	4	5
METAL	MAGNESIUM	0.897	no	9/9	5/5	1360	2150	845	2600	0	0	0	1
METAL	MANGANESE	0.967	no	9/9	5/5	207	544	113	427	0	0	0	0
METAL	MERCURY	0.306	no	4/8	1/5	0.0856	0.061	0.065	0.065				3
METAL	NICKEL	0.781	no	9/9	5/5	13.1	19.9	10.5	18.2	0	0	0	0
METAL	POTASSIUM	0.933	no	9/9	5/5	767	1430	948	1530	0	0	0	0
METAL	SILVER	0.820	no	2/8	3/5	0.716	0.385	0.273	0.42	2	25	2	2
METAL	SODIUM	0.699	no	9/9	5/5	293	362	243	312	0	0	0	0
METAL	THALLIUM	0.744	no	3/9	1/5	27.1	1.85	0.6	0.65				1
METAL	VANADIUM	0.967	no	9/9	5/5	10.5	23	10.7	18.3	0	0	0	0
METAL	ZINC	0.103	Yes	9/9	5/5	386	66	143	56.5	3	33	5	5
SVOC	2-METHYLNAPHTHALENE	0.889	no	4/9	1/5	0.131	0.181	0.085	0.21				1
SVOC	ACENAPHTHENE	0.682	no	1/9	1/5	0.14	0.156	0.085	0.21				0
SVOC	ACENAPHTHYLENE	0.937	no	4/9	1/5	0.113	0.215	0.085	0.22				0
SVOC	ANTHRACENE	0.604	no	6/9	1/5	0.156	0.195	0.1	0.22				3
SVOC	BENZALDEHYDE	0.029	Yes	1/9	3/5	0.122	0.0382	0.085	0.009	0	0	0	1
SVOC	BENZO(a)ANTHRACENE	0.703	no	4/9	2/5	0.216	0.208	0.085	0.22				1
SVOC	BENZO(a)PYRENE	0.603	no	7/9	2/5	0.343	0.282	0.12	0.22				2
SVOC	BENZO(b)FLUORANTHENE	0.371	no	5/9	2/5	0.558	0.22	0.27	0.22				1
SVOC	BENZO(g,h,i)PERYLENE	0.934	no	7/9	1/5	0.242	0.509	0.11	0.22				0
SVOC	BENZO(k)FLUORANTHENE	0.500	no	4/9	2/5	0.393	0.191	0.085	0.22				1
SVOC	CARBAZOLE	0.928	no	5/9	1/5	0.112	0.171	0.085	0.21				2
SVOC	CHRYSENE	0.526	no	5/9	2/5	0.351	0.275	0.16	0.22				1
SVOC	DI-n-BUTYL PHTHALATE	0.703	no	2/9	1/5	0.134	0.158	0.085	0.21				1
SVOC	DIBENZ(a,h)ANTHRACENE	0.910	no	4/9	1/5	0.164	0.239	0.085	0.22				1
SVOC	FLUORANTHENE	0.102	Yes	6/9	3/5	0.763	0.157	0.24	0.085	2	22	3	3
SVOC	FLUORENE	0.390	no	1/9	1/5	0.147	0.128	0.085	0.085				1
SVOC	INDENO(1,2,3-c,d)PYRENE	0.743	no	7/9	2/5	0.194	0.262	0.09	0.22				1
SVOC	NAPHTHALENE	0.835	no	4/9	1/5	0.137	0.175	0.085	0.21				2
SVOC	PHENANTHRENE	0.500	no	6/9	2/5	0.322	0.166	0.085	0.22				2
SVOC	PYRENE	0.526	no	7/9	2/5	0.792	0.311	0.2	0.22				2
SVOC	bis(2-ETHYLHEXYL) PHTHALATE	0.877	no	2/9	3/5	0.182	0.401	0.085	0.21	0	0	0	0

Table 5

Comparison of Surface Soil Data from the Tar Burn Area to Background

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Chemical Group	Parameter	p-value from Wilcoxon Rank Sum (WRS) Test	Is Background Exceeded via WRS Test?	Site Detection Frequency	Bkgd Detection Frequency	Site Mean	Bkgd Mean	Site Median	Bkgd Median	Number of Exceedances of Normal UTL	Percent of Exceedances of Normal UTL	Number of Exceedances of Normal UPL	Number of Exceedances of Background Max
METAL	ALUMINUM	0.547	no	4/4	5/5	8250	7240	5790	6370	0	0	1	1
METAL	ANTIMONY	0.107	Yes	4/4	1/5	2.75	2.03	1.85	0.43				0
METAL	ARSENIC	0.500	no	4/4	5/5	6.45	8.3	6.8	6.4	0	0	0	0
METAL	BARIUM	0.849	no	4/4	5/5	119	243	120	225	0	0	0	0
METAL	BERYLLIUM	0.453	no	4/4	5/5	0.508	0.622	0.505	0.5	0	0	0	0
METAL	CALCIUM	0.500	no	4/4	5/5	28400	22200	21700	16100	0	0	1	1
METAL	CHROMIUM, TOTAL	0.500	no	4/4	5/5	13.9	16.9	11.5	13.8	0	0	0	0
METAL	COBALT	0.500	no	4/4	5/5	4.9	7.7	4.8	4.3	0	0	0	0
METAL	COPPER	0.107	Yes	4/4	5/5	64.7	23.1	43.2	10.7	1	25	1	1
METAL	CYANIDE	0.641	no	1/4	2/5	0.11	0.437	0.0675	0.21				0
METAL	IRON	0.406	no	4/4	5/5	13900	35400	12700	12000	0	0	0	0
METAL	LEAD	0.052	Yes	4/4	5/5	320	32	138	22.2	3	75	3	3
METAL	MAGNESIUM	0.849	no	4/4	5/5	1350	2150	1250	2600	0	0	0	0
METAL	MANGANESE	0.721	no	4/4	5/5	321	544	344	427	0	0	0	0
METAL	MERCURY	0.107	Yes	4/4	1/5	0.158	0.061	0.13	0.065				3
METAL	NICKEL	0.500	no	4/4	5/5	14.6	19.9	12.1	18.2	0	0	0	0
METAL	POTASSIUM	0.721	no	4/4	5/5	1180	1430	1100	1530	0	0	0	0
METAL	SILVER	0.024	Yes	4/4	3/5	0.873	0.385	0.845	0.42	4	100	4	4
METAL	SODIUM	0.151	Yes	4/4	5/5	476	362	468	312	0	0	0	0
METAL	THALLIUM	0.452	no	1/4	1/5	0.813	1.85	0.675	0.65				0
METAL	VANADIUM	0.721	no	4/4	5/5	15.2	23	16.2	18.3	0	0	0	0
METAL	ZINC	0.035	Yes	4/4	5/5	327	66	393	56.5	3	75	3	3
SVOC	2-METHYLNAPHTHALENE	0.594	no	2/4	1/5	0.129	0.181	0.13	0.21				0
SVOC	ACENAPHTHENE	0.241	no	1/4	1/5	0.183	0.156	0.228	0.21				0
SVOC	ACENAPHTHYLENE	0.594	no	3/4	1/5	0.21	0.215	0.17	0.22				1
SVOC	ANTHRACENE	0.500	no	4/4	1/5	0.188	0.195	0.175	0.22				1
SVOC	BENZALDEHYDE	0.051	Yes	3/4	3/5	1.66	0.0382	0.165	0.009	1	25	1	3
SVOC	BENZO(a)ANTHRACENE	0.208	no	4/4	2/5	0.43	0.208	0.37	0.22				1
SVOC	BENZO(a)PYRENE	0.208	no	4/4	2/5	0.545	0.282	0.455	0.22				1
SVOC	BENZO(b)FLUORANTHENE	0.075	Yes	4/4	2/5	0.685	0.22	0.695	0.22				3
SVOC	BENZO(g,h,i)PERYLENE	0.547	no	4/4	1/5	0.255	0.509	0.25	0.22				0
SVOC	BENZO(k)FLUORANTHENE	0.151	Yes	4/4	2/5	0.66	0.191	0.595	0.22				2
SVOC	CARBAZOLE	0.594	no	3/4	1/5	0.168	0.171	0.15	0.21				1
SVOC	CHRYSENE	0.151	Yes	4/4	2/5	0.468	0.275	0.34	0.22				1
SVOC	DI-n-BUTYL PHTHALATE	0.241	no	1/4	1/5	0.223	0.158	0.228	0.21				0
SVOC	DIBENZ(a,h)ANTHRACENE	0.873	no	4/4	1/5	0.105	0.239	0.09	0.22				0
SVOC	FLUORANTHENE	0.052	Yes	4/4	3/5	0.753	0.157	0.51	0.085	1	25	2	3
SVOC	FLUORENE	0.406	no	2/4	1/5	0.146	0.128	0.17	0.085				1
SVOC	INDENO(1,2,3-c,d)PYRENE	0.318	no	4/4	2/5	0.375	0.262	0.345	0.22				0
SVOC	NAPHTHALENE	0.594	no	2/4	1/5	0.131	0.175	0.135	0.21				0
SVOC	PHENANTHRENE	0.279	no	4/4	2/5	0.37	0.166	0.25	0.22				2
SVOC	PYRENE	0.151	Yes	4/4	2/5	0.725	0.311	0.64	0.22				1
SVOC	bis(2-ETHYLHEXYL) PHTHALATE	0.075	Yes	2/4	3/5	1.37	0.401	0.275	0.21	1	25	1	1

Table 6

Comparison of Surface Soil Data from the Former Lauren Tank Farm to Background

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Chemical Group	Parameter	p-value from Wilcoxon Rank Sum (WRS) Test	Is Background Exceeded via WRS Test?	Site Detection Frequency	Bkgd Detection Frequency	Site Mean	Bkgd Mean	Site Median	Bkgd Median	Number of Exceedances of Normal UTL	Percent of Exceedances of Normal UTL	Number of Exceedances of Normal UPL	Number of Exceedances of Background Max
METAL	ALUMINUM	0.806	no	13/13	5/5	5350	7240	4730	6370	0	0	0	0
METAL	ANTIMONY	0.721	no	2/13	1/5	0.842	2.03	0.55	0.43				0
METAL	ARSENIC	0.500	no	13/13	5/5	8.12	8.3	6.3	6.4	0	0	1	1
METAL	BARIUM	0.976	no	13/13	5/5	110	243	96.4	225	0	0	0	0
METAL	BERYLLIUM	0.500	no	10/13	5/5	0.507	0.622	0.55	0.5	0	0	0	0
METAL	CALCIUM	0.961	no	13/13	5/5	6440	22200	4500	16100	0	0	0	0
METAL	CHROMIUM, TOTAL	0.703	no	13/13	5/5	48.3	16.9	9.5	13.8	1	8	1	1
METAL	COBALT	0.423	no	13/13	5/5	6.22	7.7	5.4	4.3	0	0	0	1
METAL	COPPER	0.109	Yes	13/13	5/5	622	23.1	24.5	10.7	3	23	3	4
METAL	CYANIDE	0.705	no	1/13	2/5	0.252	0.437	0.19	0.21				0
METAL	IRON	0.423	no	13/13	5/5	24600	35400	17400	12000	0	0	0	1
METAL	LEAD	0.109	Yes	13/13	5/5	137	32	51.4	22.2	3	23	6	6
METAL	MAGNESIUM	0.961	no	13/13	5/5	1210	2150	1230	2600	0	0	0	0
METAL	MANGANESE	0.944	no	13/13	5/5	254	544	208	427	0	0	0	1
METAL	MERCURY	0.202	no	5/12	1/5	0.593	0.061	0.0675	0.065				5
METAL	NICKEL	0.651	no	13/13	5/5	42.5	19.9	10.6	18.2	1	8	1	1
METAL	POTASSIUM	0.539	no	13/13	5/5	1420	1430	1330	1530	0	0	1	1
METAL	SELENIUM	0.961	no	3/13	1/5	0.754	1.02	0.4	0.65				1
METAL	SILVER	0.349	no	7/13	3/5	0.925	0.385	0.29	0.42	1	8	4	6
METAL	SODIUM	0.314	no	12/13	5/5	694	362	858	312	3	23	7	7
METAL	THALLIUM	0.945	no	2/13	1/5	0.676	1.85	0.55	0.65				0
METAL	VANADIUM	0.780	no	13/13	5/5	15.1	23	15.2	18.3	0	0	0	0
METAL	ZINC	0.126	Yes	13/13	5/5	222	66	111	56.5	3	23	6	6
SVOC	2-METHYLNAPHTHALENE	0.936	no	8/13	1/5	0.294	0.181	0.085	0.21				2
SVOC	ACENAPHTHENE	0.520	no	2/13	1/5	0.294	0.156	0.085	0.21				1
SVOC	ACENAPHTHYLENE	0.923	no	9/13	1/5	0.204	0.215	0.085	0.22				2
SVOC	ANTHRACENE	0.955	no	9/13	1/5	0.208	0.195	0.085	0.22				2
SVOC	BENZALDEHYDE	0.040	Yes	5/13	3/5	0.241	0.0382	0.085	0.009	0	0	0	5
SVOC	BENZO(a)ANTHRACENE	0.558	no	8/13	2/5	0.609	0.208	0.085	0.22				1
SVOC	BENZO(a)PYRENE	0.500	no	10/13	2/5	0.69	0.282	0.13	0.22				1
SVOC	BENZO(b)FLUORANTHENE	0.615	no	11/13	2/5	0.708	0.22	0.11	0.22				1
SVOC	BENZO(g,h,i)PERYLENE	0.686	no	10/13	1/5	0.475	0.509	0.17	0.22				1
SVOC	BENZO(k)FLUORANTHENE	0.669	no	8/13	2/5	0.438	0.191	0.085	0.22				1
SVOC	CARBAZOLE	0.654	no	3/13	1/5	0.315	0.171	0.085	0.21				1
SVOC	CHRYSENE	0.615	no	10/13	2/5	0.692	0.275	0.11	0.22				1
SVOC	DI-n-BUTYL PHTHALATE	0.500	no	1/13	1/5	0.356	0.158	0.085	0.21				1
SVOC	DIBENZ(a,h)ANTHRACENE	0.929	no	8/13	1/5	0.308	0.239	0.085	0.22				1
SVOC	FLUORANTHENE	0.615	no	11/13	3/5	0.695	0.157	0.08	0.085	1	8	2	2
SVOC	FLUORENE	0.401	no	3/13	1/5	0.289	0.128	0.085	0.085				3
SVOC	INDENO(1,2,3-c,d)PYRENE	0.633	no	11/13	2/5	0.316	0.262	0.12	0.22				1
SVOC	NAPHTHALENE	0.936	no	8/13	1/5	0.2	0.175	0.085	0.21				2
SVOC	PHENANTHRENE	0.721	no	9/13	2/5	0.308	0.166	0.085	0.22				3
SVOC	PYRENE	0.596	no	11/13	2/5	0.758	0.311	0.085	0.22				2
SVOC	bis(2-ETHYLHEXYL) PHTHALATE	0.832	no	7/13	3/5	0.488	0.401	0.11	0.21	0	0	1	1

Table 7

Comparison of Surface Soil Data from the Non-source Area to Background

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Chemical Group	Parameter	p-value from Wilcoxon Rank Sum (WRS) Test	Is Background Exceeded via WRS Test?	Site Detection Frequency	Bkgd Detection Frequency	Site Mean	Bkgd Mean	Site Median	Bkgd Median	Number of Exceedances of Normal UTL	Percent of Exceedances of Normal UTL	Number of Exceedances of Normal UPL	Number of Exceedances of Background Max
	ALUMINUM	0.759	no	54/54	5/5	5970	7240	5440	6370	0	0	2	2
METAL	ANTIMONY	0.221	no	27/47	1/5	2.99	2.03	0.96	0.43				6
METAL	ARSENIC	0.715	no	52/54	5/5	6.61	8.3	5.95	6.4	1	2	1	1
METAL	BARIUM	0.817	no	54/54	5/5	182	243	130	225	0	0	1	2
METAL	BERYLLIUM	0.715	no	51/54	5/5	0.985	0.622	0.465	0.5	2	4	2	2
METAL	CALCIUM	0.935	no	54/54	5/5	13300	22200	4860	16100	2	4	2	5
METAL	CHROMIUM, TOTAL	0.554	no	54/54	5/5	16.7	16.9	10.2	13.8	1	2	3	4
METAL	COBALT	0.687	no	54/54	5/5	5.87	7.7	5	4.3	1	2	1	1
METAL	COPPER	0.126	Yes	54/54	5/5	192	23.1	21.8	10.7	10	19	15	16
METAL	CYANIDE	0.950	no	8/54	2/5	0.103	0.437	0.065	0.21				0
METAL	IRON	0.378	no	54/54	5/5	22600	35400	14500	12000	0	0	1	2
METAL	LEAD	0.197	Yes	54/54	5/5	224	32	38.3	22.2	18	33	21	22
METAL	MAGNESIUM	0.980	no	54/54	5/5	1260	2150	1230	2600	0	0	0	1
METAL	MANGANESE	0.963	no	54/54	5/5	265	544	228	427	0	0	0	2
METAL	MERCURY	0.647	no	17/54	1/5	0.0748	0.061	0.035	0.065				17
METAL	NICKEL	0.755	no	54/54	5/5	18	19.9	10.7	18.2	1	2	2	2
METAL	POTASSIUM	0.791	no	54/54	5/5	1170	1430	1240	1530	0	0	0	1
METAL	SELENIUM	0.974	no	4/54	1/5	0.587	1.02	0.6	0.65				1
METAL	SILVER	0.001	Yes	53/54	3/5	0.982	0.385	0.7	0.42	24	44	40	48
METAL	SODIUM	0.153	Yes	54/54	5/5	639	362	405	312	5	9	15	18
METAL	THALLIUM	0.898	no	10/54	1/5	0.856	1.85	0.6	0.65				0
METAL	VANADIUM	0.897	no	54/54	5/5	14.7	23	14.8	18.3	0	0	0	0
METAL	ZINC	0.126	Yes	54/54	5/5	1060	66	101	56.5	20	37	21	23
METAL	2-METHYLNAPHTHALENE	0.410	no	15/55	1/5	0.333	0.181	0.21	0.21				3
SVOC	ACENAPHTHENE	0.144	Yes	6/55	1/5	0.545	0.156	0.215	0.21				5
SVOC	ACENAPHTHYLENE	0.831	no	28/55	1/5	0.38	0.215	0.21	0.22				7
SVOC	ANTHRACENE	0.788	no	34/55	1/5	0.534	0.195	0.2	0.22				10
SVOC	BENZALDEHYDE	0.039	Yes	32/55	3/5	0.204	0.0382	0.07	0.009	0	0	1	23
SVOC	BENZO(a)ANTHRACENE	0.620	no	40/55	2/5	0.72	0.208	0.18	0.22				8
SVOC	BENZO(a)PYRENE	0.721	no	48/55	2/5	0.619	0.282	0.1	0.22				7
SVOC	BENZO(b)FLUORANTHENE	0.558	no	45/55	2/5	0.839	0.22	0.21	0.22				12
SVOC	BENZO(g,h,i)PERYLENE	0.532	no	24/55	1/5	0.433	0.509	0.22	0.22				2
SVOC	BENZO(k)FLUORANTHENE	0.610	no	33/55	2/5	0.49	0.191	0.205	0.22				6
SVOC	CARBAZOLE	0.500	no	18/55	1/5	0.385	0.171	0.21	0.21				6
SVOC	CHRYSENE	0.684	no	43/55	2/5	0.747	0.275	0.175	0.22				8
SVOC	DI-n-BUTYL PHTHALATE	0.113	Yes	5/55	1/5	0.402	0.158	0.22	0.21				3
SVOC	DIBENZ(a,h)ANTHRACENE	0.898	no	30/55	1/5	0.264	0.239	0.19	0.22				3
SVOC	FLUORANTHENE	0.516	no	46/55	3/5	1.46	0.157	0.12	0.085	7	13	8	8
SVOC	FLUORENE	0.106	Yes	9/55	1/5	0.494	0.128	0.215	0.085				7
SVOC	INDENO(1,2,3-c,d)PYRENE	0.708	no	42/55	2/5	0.358	0.262	0.18	0.22				4
SVOC	NAPHTHALENE	0.421	no	14/55	1/5	0.408	0.175	0.21	0.21				4
SVOC	PHENANTHRENE	0.660	no	38/55	2/5	1.25	0.166	0.16	0.22				9
SVOC	PYRENE	0.645	no	43/55	2/5	1.14	0.311	0.185	0.22				5
SVOC	bis(2-ETHYLHEXYL) PHTHALATE	0.153	Yes	20/55	3/5	0.685	0.401	0.225	0.21	2	4	6	6

Table 8

Comparison of Intertidal Surface Sediment (0-6 in., top of bank to mean lower water mark) to Background

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Chemical Group	Parameter	p-value from Wilcoxon Rank Sum (WRS) Test	Is Background Exceeded via WRS Test?	Site Detection Frequency	Bkgd Detection Frequency	Site Mean	Bkgd Mean	Site Median	Bkgd Median	Number of Exceedances of Normal UTL	Percent of Exceedances of Normal UTL	Number of Exceedances of Normal UPL	Number of Exceedances of Background Max
METAL	ALUMINUM	0.042	Yes	9/9	5/5	1710	431	1730	448	7	78	7	7
METAL	ANTIMONY	0.033	Yes	9/9	5/5	4.04	0.306	0.71	0.29	6	67	6	6
METAL	ARSENIC	0.006	Yes	9/9	5/5	7.01	0.686	6.4	0.59	9	100	9	9
METAL	BARIUM	0.006	Yes	9/9	5/5	45.9	4.52	47.1	4.4	9	100	9	9
METAL	BERYLLIUM	0.012	Yes	2/9	2/5	0.123	0.0484	0.085	0.048	.	.	.	2
METAL	CADMIUM	0.006	Yes	9/9	5/5	0.728	0.053	0.8	0.049	8	89	8	9
METAL	CALCIUM	0.006	Yes	9/9	5/5	52100	111	12900	108	8	89	9	9
METAL	CHROMIUM, TOTAL	0.006	Yes	9/9	5/5	25	1.09	17.5	1.1	9	100	9	9
METAL	COBALT	0.006	Yes	9/9	5/5	4.66	0.86	4.5	0.96	7	78	8	9
METAL	IRON	0.006	Yes	9/9	5/5	76300	1690	75000	1680	9	100	9	9
METAL	LEAD	0.006	Yes	9/9	5/5	204	1.92	67.3	2	9	100	9	9
METAL	MAGNESIUM	0.026	Yes	9/9	5/5	1150	202	954	208	7	78	7	7
METAL	MANGANESE	0.006	Yes	9/9	5/5	469	32	271	29.9	8	89	9	9
METAL	MERCURY	0.006	Yes	9/9	2/5	0.0659	0.00287	0.045	0.0019	.	.	.	9
METAL	NICKEL	0.006	Yes	9/9	5/5	22.3	0.778	14.3	0.81	9	100	9	9
METAL	POTASSIUM	0.042	Yes	9/9	5/5	423	120	272	128	7	78	7	7
METAL	SODIUM	0.006	Yes	9/9	5/5	987	403	928	414	8	89	9	9
METAL	VANADIUM	0.010	Yes	9/9	5/5	8.77	2.28	8.7	2.1	7	78	8	8
METAL	ZINC	0.006	Yes	9/9	5/5	222	4.86	198	5.1	9	100	9	9

Table 10

Comparison of Offshore Surface Sediment (0-6 in.) to Background

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Chemical Group	Parameter	p-value from Wilcoxon Rank Sum (WRS) Test	Is Background Exceeded via WRS Test?	Site Detection Frequency	Bkgd Detection Frequency	Site Mean	Bkgd Mean	Site Median	Bkgd Median	Number of Exceedances of Normal UTL	Percent of Exceedances of Normal UTL	Number of Exceedances of Normal UPL	Number of Exceedances of Background Max
METAL	ALUMINUM	0.005	Yes	11/11	5/5	5840	431	6800	448	10	91	10	10
METAL	ANTIMONY	0.764	no	1/11	5/5	0.258	0.306	0.28	0.29	0	0	0	0
METAL	ARSENIC	0.004	Yes	11/11	5/5	6.26	0.686	6.6	0.59	11	100	11	11
METAL	BARIIUM	0.004	Yes	11/11	5/5	52.4	4.52	39	4.4	11	100	11	11
METAL	BERYLLIUM	0.012	Yes	10/11	2/5	0.61	0.0484	0.63	0.048				10
METAL	CADMIUM	0.010	Yes	11/11	5/5	0.102	0.053	0.1	0.049	4	36	10	10
METAL	CALCIUM	0.004	Yes	11/11	5/5	1970	111	1640	108	10	91	11	11
METAL	CHROMIUM, TOTAL	0.004	Yes	11/11	5/5	8.05	1.09	8.8	1.1	11	100	11	11
METAL	COBALT	0.004	Yes	11/11	5/5	6.59	0.86	6.8	0.96	10	91	11	11
METAL	IRON	0.004	Yes	11/11	5/5	11200	1690	12100	1680	11	100	11	11
METAL	LEAD	0.004	Yes	11/11	5/5	9.75	1.92	9.8	2	11	100	11	11
METAL	MAGNESIUM	0.004	Yes	11/11	5/5	3040	202	3460	208	10	91	10	11
METAL	MANGANESE	0.004	Yes	11/11	5/5	385	32	388	29.9	9	82	10	11
METAL	MERCURY	0.003	Yes	1/11	2/5	0.0327	0.00287	0.035	0.0019				1
METAL	NICKEL	0.004	Yes	11/11	5/5	12.5	0.778	10.3	0.81	11	100	11	0
METAL	POTASSIUM	0.004	Yes	11/11	5/5	1830	120	2270	128	10	91	11	11
METAL	SODIUM	0.004	Yes	11/11	5/5	3160	403	3470	414	11	100	11	11
METAL	VANADIUM	0.004	Yes	11/11	5/5	14.1	2.28	15.9	2.1	10	91	10	11
METAL	ZINC	0.004	Yes	11/11	5/5	32.1	4.86	35.1	5.1	11	100	11	11

Table 11
Occurrence, distribution, and selection of chemicals of potential concern in the Former Wastewater Impoundments S_c
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Former Wastewater Impoundments
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
ALUMINUM	967	=	SM123	20600	=	SM122	ND	57.2	mg/Kg	12/12	100.00%	0	No	AI-SSL
ANTIMONY	1	LJvQ	SM127	44.7	=	SM95-SO-22	0.83	17.2	mg/Kg	8/12	66.67%	0.3	Yes	ASL
BARIUM	104	=	SM95-SO-26	534	=	SM123	ND	57.2	mg/Kg	12/12	100.00%	330	No	BKGD
CADMIUM	0.33	LQ	SM125	2.4	=	SM95-SO-22	0.16	1.4	mg/Kg	7/12	58.33%	0.4	Yes	ASL
CALCIUM	4970	=	SM124	12200	J	SM95-SO-22	ND	1430	mg/Kg	12/12	100.00%		No	NUT
CHROMIUM, TOTAL	5	JK	SM127	36.2	=	SM95-SO-22	ND	2.9	mg/Kg	12/12	100.00%	7.9	No	BKGD
COPPER	7.2	=	SM123	298	=	SM95-SO-26	ND	7.2	mg/Kg	12/12	100.00%	54	Yes	ASL
IRON	6050	=	SM123	51900	=	SM95-SO-22	ND	28.6	mg/Kg	12/12	100.00%	0	No	Fe-SSL
LEAD	12.6	=	SM123	435	=	SM95-SO-19	ND	0.86	mg/Kg	12/12	100.00%	15	Yes	ASL
MAGNESIUM	458	LQ	SM123	2010	=	SM95-SO-22	ND	1430	mg/Kg	12/12	100.00%		No	NUT
MANGANESE	105	=	SM127	478	Jv	SM95-SO-22	ND	4.3	mg/Kg	12/12	100.00%	152	No	BKGD
MERCURY	0.07	LJ*QH	SM126	0.22	=	SM95-SO-26	0.14	0.14	mg/Kg	6/12	50.00%	0.1	No	BKGD
NICKEL	2.5	LQ	SM123	59.2	=	SM95-SO-22	ND	11.4	mg/Kg	12/12	100.00%	48	No	BKGD
POTASSIUM	319	LQ	SM123	1530	=	SM95-SO-26	ND	1430	mg/Kg	12/12	100.00%		No	NUT
SELENIUM	1.3	=	SM95-SO-22	1.3	=	SM95-SO-22	1.3	1.3	mg/Kg	1/12	8.33%	1	No	BKGD
SILVER	0.29	LQ	SM123	2.6	LQ	SM122	0.57	2.9	mg/Kg	9/12	75.00%	2	Yes	ASL
SODIUM	244	J*	SM95-SO-19	768	J	SM95-SO-22	265	1430	mg/Kg	8/12	66.67%		No	NUT
THALLIUM	1.3	=	SM95-SO-19	3.8	=	SM95-SO-22	2.4	2.4	mg/Kg	4/12	33.33%	1	No	BKGD
VANADIUM	5.5	LQ	SM123	26.4	=	SM120	ND	14.3	mg/Kg	12/12	100.00%	2	No	BKGD
ZINC	40.4	=	SM123	460	=	SM95-SO-22	ND	5.7	mg/Kg	12/12	100.00%	120	Yes	ASL
ALDRIN							0.0017	0.0017	mg/kg	0/4	0.00%	0.0025	No	ND
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/4	0.00%		No	ND
ALPHA ENDOSULFAN							0.0017	0.0017	mg/kg	0/4	0.00%		No	ND
ALPHA-CHLORDANE	0.0026	=	SM95-SO-26	0.003	=	SM95-SO-21	0.0017	0.0017	mg/kg	2/4	50.00%		Yes	NSL
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/4	0.00%		No	ND
BETA ENDOSULFAN	0.0081	Jv	SM95-SO-22	0.0081	Jv	SM95-SO-22	0.0033	0.0033	mg/kg	1/4	25.00%		Yes	NSL
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/4	0.00%		No	ND
DIELDRIN							0.0033	0.0033	mg/kg	0/4	0.00%	0.000032	No	ND
ENDOSULFAN SULFATE	0.0092	Jv	SM95-SO-22	0.0092	Jv	SM95-SO-22	0.0033	0.0033	mg/kg	1/4	25.00%		Yes	NSL
ENDRIN	0.0076	=	SM95-SO-21	0.014	Jv	SM95-SO-22	0.0033	0.0033	mg/kg	2/4	50.00%		Yes	NSL
ENDRIN ALDEHYDE	0.01	Jv	SM95-SO-22	0.01	Jv	SM95-SO-22	0.0033	0.0033	mg/kg	1/4	25.00%		Yes	NSL
ENDRIN KETONE	0.0099	Jv	SM95-SO-22	0.0099	Jv	SM95-SO-22	0.0033	0.0033	mg/kg	1/4	25.00%		Yes	NSL
GAMMA BHC (LINDANE)							0.0017	0.0017	mg/kg	0/4	0.00%		No	ND
GAMMA-CHLORDANE	0.0028	=	SM95-SO-26	0.0056	=	SM95-SO-21	0.0017	0.0017	mg/kg	2/4	50.00%		Yes	NSL
HEPTACHLOR							0.0017	0.0017	mg/kg	0/4	0.00%		No	ND
HEPTACHLOR EPOXIDE	0.0051	J	SM95-SO-22	0.0051	J	SM95-SO-22	0.0017	0.0017	mg/kg	1/4	25.00%		Yes	NSL
METHOXYCHLOR							0.017	0.017	mg/kg	0/4	0.00%		No	ND
P,P'-DDD							0.0033	0.0033	mg/kg	0/4	0.00%		No	ND
P,P'-DDE							0.0033	0.0033	mg/kg	0/4	0.00%		No	ND
P,P'-DDT	0.0091	Jv	SM95-SO-22	0.0091	Jv	SM95-SO-22	0.0033	0.0033	mg/kg	1/4	25.00%		Yes	NSL
PCB-1016 (AROCHLOR 1016)							0.033	0.033	mg/kg	0/4	0.00%	40	No	ND
PCB-1221 (AROCHLOR 1221)							0.033	0.033	mg/kg	0/4	0.00%	40	No	ND
PCB-1232 (AROCHLOR 1232)							0.033	0.033	mg/kg	0/4	0.00%	40	No	ND
PCB-1242 (AROCHLOR 1242)							0.033	0.033	mg/kg	0/4	0.00%	40	No	ND
PCB-1248 (AROCHLOR 1248)							0.033	0.033	mg/kg	0/4	0.00%	10	No	ND
PCB-1254 (AROCHLOR 1254)							0.033	0.033	mg/kg	0/4	0.00%	10	No	ND
PCB-1260 (AROCHLOR 1260)							0.033	0.033	mg/kg	0/4	0.00%	10	No	ND
TOXAPHENE							0.17	0.17	mg/kg	0/4	0.00%		No	ND
1,2,4,5-TETRACHLOROBENZENE							0.17	0.17	mg/kg	0/4	0.00%		No	ND
2,2'-OXYBIS(1-CHLORO)PROPANE							2.3	2.3	mg/kg	0/12	0.00%		No	ND
2,3,4,6-TETRACHLOROPHENOL							0.17	0.17	mg/kg	0/4	0.00%	20	No	ND
2,4,5-TRICHLOROPHENOL							5.7	5.7	mg/kg	0/12	0.00%	1.3	No	ND
2,4,6-TRICHLOROPHENOL							2.3	2.3	mg/kg	0/12	0.00%	10	No	ND
2,4-DICHLOROPHENOL							2.3	2.3	mg/kg	0/12	0.00%	20	No	ND
2,4-DIMETHYLPHENOL							2.3	2.3	mg/kg	0/12	0.00%		No	ND
2,4-DINITROPHENOL							5.7	5.7	mg/kg	0/12	0.00%	20	No	ND
2,4-DINITROTOLUENE							2.3	2.3	mg/kg	0/12	0.00%	3.2	No	ND
2,6-DINITROTOLUENE							2.3	2.3	mg/kg	0/12	0.00%	0.03283	No	ND
2-CHLORONAPHTHALENE							2.3	2.3	mg/kg	0/12	0.00%	1	No	ND
2-CHLOROPHENOL							2.3	2.3	mg/kg	0/12	0.00%	20	No	ND
2-METHYLNAPHTHALENE	0.028	LJQK	SM124	0.7	=	SM95-SO-22	2.3	2.3	mg/Kg	5/12	41.67%	0.1	Yes	ASL
2-METHYLPHENOL (O-CRESOL)							2.3	2.3	mg/kg	0/12	0.00%	0.5	No	ND
2-NITROANILINE							5.7	5.7	mg/kg	0/12	0.00%		No	ND
2-NITROPHENOL							2.3	2.3	mg/kg	0/12	0.00%		No	ND
3,3'-DICHLOROBENZIDINE							2.3	2.3	mg/kg	0/12	0.00%		No	ND
3-NITROANILINE							5.7	5.7	mg/kg	0/12	0.00%		No	ND
4,6-DINITRO-2-METHYLPHENOL							5.7	5.7	mg/kg	0/12	0.00%		No	ND
4-BROMOPHENYL PHENYL ETHER							2.3	2.3	mg/kg	0/12	0.00%		No	ND
4-CHLORO-3-METHYLPHENOL							2.3	2.3	mg/kg	0/12	0.00%	7.95	No	ND
4-CHLOROANILINE							2.3	2.3	mg/kg	0/12	0.00%		No	ND
4-CHLOROPHENYL PHENYL ETHER							2.3	2.3	mg/kg	0/12	0.00%		No	ND
4-METHYLPHENOL (P-CRESOL)							2.3	2.3	mg/kg	0/12	0.00%	0.5	No	ND
4-NITROANILINE							5.7	5.7	mg/kg	0/12	0.00%		No	ND
4-NITROPHENOL							5.7	5.7	mg/kg	0/12	0.00%	7	No	ND

Table 11
Occurrence, distribution, and selection of chemicals of potential concern in the Former Wastewater Impoundments Ss
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Former Wastewater Impoundments
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
ALUMINUM	967	=	SM123	20600	=	SM122	ND	57.2	mg/Kg	12/12	100.00%	0	No	AI-SSL
ANTIMONY	1	LJvQ	SM127	44.7	=	SM95-SO-22	0.83	17.2	mg/Kg	8/12	66.67%	0.3	Yes	ASL
BARIUM	104	=	SM95-SO-26	534	=	SM123	ND	57.2	mg/Kg	12/12	100.00%	330	No	BKGD
CADMIUM	0.33	LQ	SM125	2.4	=	SM95-SO-22	0.16	1.4	mg/Kg	7/12	58.33%	0.4	Yes	ASL
CALCIUM	4970	=	SM124	12200	J	SM95-SO-22	ND	1430	mg/Kg	12/12	100.00%		No	NUT
CHROMIUM, TOTAL	5	JK	SM127	36.2	=	SM95-SO-22	ND	2.9	mg/Kg	12/12	100.00%	7.9	No	BKGD
COPPER	7.2	=	SM123	298	=	SM95-SO-26	ND	7.2	mg/Kg	12/12	100.00%	54	Yes	ASL
IRON	6050	=	SM123	51900	=	SM95-SO-22	ND	28.6	mg/Kg	12/12	100.00%	0	No	Fe-SSL
LEAD	12.6	=	SM123	435	=	SM95-SO-19	ND	0.86	mg/Kg	12/12	100.00%	15	Yes	ASL
ACENAPHTHENE	0.016	LJQK	SM127	0.39	J	SM95-SO-22	0.92	2.3	mg/Kg	8/12	66.67%	20	No	BSL
ACENAPHTHYLENE	0.027	LJQK	SM121	2.9	=	SM95-SO-22	0.17	2.3	mg/Kg	11/12	91.67%	1.7	Yes	ASL
ACETOPHENONE							2.3	2.3	mg/kg	0/12	0.00%	300	No	ND
ANTHRACENE	0.025	LJQK	SM121	2.9	=	SM95-SO-22	0.17	2.3	mg/Kg	11/12	91.67%	0.1	Yes	ASL
ATRAZINE							2.3	2.3	mg/kg	0/12	0.00%	0.00005	No	ND
BENZALDEHYDE							2.3	2.3	mg/kg	0/12	0.00%		No	ND
BENZO(A)ANTHRACENE	0.022	*	SM95-SO-26	1.3	=	SM95-SO-22	0.17	2.3	mg/kg	11/12	91.67%	1.2	Yes	ASL
BENZO(A)ANTHRACENE	0.022	*	SM95-SO-26	1.3	LJQK	SM126	0.17	2.3	mg/kg	11/12	91.67%	1.2	Yes	ASL
BENZO(A)PYRENE	0.041	LJQK	SM121	2.6	=	SM95-SO-22	0.17	2.3	mg/kg	10/12	83.33%	0.1	Yes	ASL
BENZO(B)FLUORANTHENE	0.05	=	SM95-SO-26	3.6	=	SM95-SO-22	0.17	2.3	mg/kg	11/12	91.67%	1.2	Yes	ASL
BENZO(G,H,I)PERYLENE	0.06	LJQK	SM120	8.8	*	SM95-SO-22	0.45	2.3	mg/kg	8/12	66.67%	119	No	BSL
BENZO(K)FLUORANTHENE	0.022	LJQK	SM121	0.65	LJQK	SM126	0.17	2.3	mg/kg	8/12	66.67%	25	No	BSL
BENZYL BUTYL PHTHALATE	0.16	*	SM95-SO-19	0.16	*	SM95-SO-19	2.3	2.3	mg/kg	1/12	8.33%	0.23889	Yes	DL
BIPHENYL (DIPHENYL)							2.3	2.3	mg/kg	0/12	0.00%	60	No	ND
BIS(2-CHLOROETHOXY) METHANE							2.3	2.3	mg/kg	0/12	0.00%		No	ND
BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL)							2.3	2.3	mg/kg	0/12	0.00%		No	ND
BIS(2-ETHYLHEXYL) PHTHALATE	0.086	*	SM95-SO-26	4.9	=	SM125	2.3	2.3	mg/kg	4/12	33.33%	0.92594	Yes	ASL
CAPROLACTAM							2.3	2.3	mg/kg	0/12	0.00%		No	ND
CARBAZOLE	0.021	LJQK	SM120	0.77	=	SM95-SO-22	0.45	2.3	mg/kg	10/12	83.33%		Yes	NSL
CARBAZOLE	0.021	LJQK	SM124	0.77	=	SM95-SO-22	0.45	2.3	mg/kg	10/12	83.33%		Yes	NSL
CHRYSENE	0.044	*	SM95-SO-26	3.4	*	SM95-SO-22	0.17	2.3	mg/kg	11/12	91.67%	4.73	No	BSL
DI-N-BUTYL PHTHALATE	0.069	J	SM95-SO-22	0.069	J	SM95-SO-22	2.3	2.3	mg/kg	1/12	8.33%	200	No	BSL
DI-N-OCTYL PHTHALATE	0.18	LJQK	SM125	0.18	LJQK	SM125	2.3	2.3	mg/kg	1/12	8.33%	709	No	BSL
DIBENZO(A,H)ANTHRACENE	0.02	LJQK	SM120	0.46	=	SM95-SO-22	0.45	2.3	mg/kg	8/12	66.67%	1.2	Yes	DL
DIBENZOFURAN	0.032	LJQK	SM124	0.21	J	SM95-SO-22	0.92	2.3	mg/Kg	6/12	50.00%		Yes	NSL
DIETHYL PHTHALATE							2.3	2.3	mg/kg	0/12	0.00%	100	No	ND
DIMETHYL PHTHALATE							2.3	2.3	mg/kg	0/12	0.00%	200	No	ND
FLUORANTHENE	0.03	*	SM95-SO-26	2.5	=	SM95-SO-22	0.17	2.3	mg/kg	11/12	91.67%	0.1	Yes	ASL
FLUORENE	0.014	LJQK	SM127	0.34	J	SM95-SO-22	0.92	2.3	mg/Kg	7/12	58.33%	30	No	BSL
HEXACHLORO BENZENE							2.3	2.3	mg/kg	0/12	0.00%	0.0025	No	ND
HEXACHLOROBUTADIENE							2.3	2.3	mg/kg	0/12	0.00%		No	ND
HEXACHLOROCYCLOPENTADIENE							2.3	2.3	mg/kg	0/12	0.00%	10	No	ND
HEXACHLOROETHANE							2.3	2.3	mg/kg	0/12	0.00%		No	ND
INDENO(1,2,3-C,D)PYRENE	0.039	LJQK	SM121	3	*	SM95-SO-22	0.17	2.3	mg/kg	9/12	75.00%	1.2	Yes	ASL
ISOPHORONE							2.3	2.3	mg/kg	0/12	0.00%		No	ND
N-NITROSODI-N-PROPYLAMINE							2.3	2.3	mg/kg	0/12	0.00%	0.54368	No	ND
N-NITROSODIPHENYLAMINE	0.13	J	SM95-SO-22	0.13	J	SM95-SO-22	2.3	2.3	mg/kg	1/12	8.33%	20	No	BSL
NAPHTHALENE	0.07	LJQK	SM122	0.86	=	SM95-SO-22	0.92	2.3	mg/Kg	5/12	41.67%	0.1	Yes	ASL
NITROBENZENE							2.3	2.3	mg/kg	0/12	0.00%	40	No	ND
PENTACHLOROPHENOL							5.7	5.7	mg/kg	0/12	0.00%	0.032	No	ND
PHENANTHRENE	0.019	LJQK	SM121	2.5	=	SM95-SO-22	ND	2.3	mg/Kg	12/12	100.00%	0.1	Yes	ASL
PHENOL							2.3	2.3	mg/kg	0/12	0.00%	30	No	ND
PYRENE	0.042	J	SM95-SO-26	10	*	SM95-SO-22	0.17	2.3	mg/kg	11/12	91.67%	0.1	Yes	ASL
1,1,1-TRICHLOROETHANE	0.003	J	SM95-SO-26	0.006	*	SM95-SO-19	0.005	0.005	mg/kg	2/4	50.00%	0.1	No	BSL
1,1,1,2-TETRACHLOROETHANE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
1,1,2-TRICHLOROETHANE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
1,1-DICHLOROETHANE							0.005	0.005	mg/kg	0/4	0.00%	20.1	No	ND
1,1-DICHLOROETHENE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
1,2,3-TRICHLOROBENZENE							0.005	0.005	mg/kg	0/4	0.00%	20	No	ND
1,2,4-TRICHLOROBENZENE							0.005	0.005	mg/kg	0/4	0.00%	20	No	ND
1,2-DIBROMO-3-CHLOROPROPANE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)							0.005	0.005	mg/kg	0/4	0.00%		No	ND
1,2-DICHLOROBENZENE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
1,2-DICHLOROETHANE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
1,2-DICHLOROPROPANE							0.005	0.005	mg/kg	0/4	0.00%	700	No	ND
1,3-DICHLOROBENZENE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
1,4-DICHLOROBENZENE							0.005	0.005	mg/kg	0/4	0.00%	20	No	ND
1,4-DIOXANE (P-DIOXANE)							0.1	0.1	mg/kg	0/4	0.00%		No	ND
2-HEXANONE							0.01	0.01	mg/kg	0/4	0.00%	12.6	No	ND
ACETONE							0.01	0.01	mg/kg	0/4	0.00%	2.5	No	ND
BENZENE							0.005	0.005	mg/kg	0/4	0.00%	0.5	No	ND
BROMOCHLOROMETHANE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
BROMODICHLOROMETHANE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
BROMOFORM							0.005	0.005	mg/kg	0/4	0.00%		No	ND

Table 11
Occurrence, distribution, and selection of chemicals of potential concern in the Former Wastewater Impoundments S6
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Former Wastewater Impoundments
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
ALUMINUM	967	=	SM123	20600	=	SM122	ND	57.2	mg/Kg	12/12	100.00%	0	No	AI-SSL
ANTIMONY	1	LJvQ	SM127	44.7	=	SM95-SO-22	0.83	17.2	mg/Kg	8/12	66.67%	0.3	Yes	ASL
BARIUM	104	=	SM95-SO-26	534	=	SM123	ND	57.2	mg/Kg	12/12	100.00%	330	No	BKGD
CADMIUM	0.33	LQ	SM125	2.4	=	SM95-SO-22	0.16	1.4	mg/Kg	7/12	58.33%	0.4	Yes	ASL
CALCIUM	4970	=	SM124	12200	J	SM95-SO-22	ND	1430	mg/Kg	12/12	100.00%		No	NUT
CHROMIUM, TOTAL	5	JK	SM127	36.2	=	SM95-SO-22	ND	2.9	mg/Kg	12/12	100.00%	7.9	No	BKGD
COPPER	7.2	=	SM123	298	=	SM95-SO-26	ND	7.2	mg/Kg	12/12	100.00%	54	Yes	ASL
IRON	6050	=	SM123	51900	=	SM95-SO-22	ND	28.6	mg/Kg	12/12	100.00%	0	No	Fe-SSL
LEAD	12.6	=	SM123	435	=	SM95-SO-19	ND	0.86	mg/Kg	12/12	100.00%	15	Yes	ASL
BROMOMETHANE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
CARBON DISULFIDE							0.005	0.005	mg/kg	0/4	0.00%	0.09412	No	ND
CARBON TETRACHLORIDE							0.005	0.005	mg/kg	0/4	0.00%	1000	No	ND
CHLORO BENZENE							0.005	0.005	mg/kg	0/4	0.00%	40	No	ND
CHLOROETHANE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
CHLOROFORM							0.005	0.005	mg/kg	0/4	0.00%	25	No	ND
CHLOROMETHANE							0.005	0.005	mg/kg	0/4	0.00%	10.4	No	ND
CIS-1,2-DICHLOROETHYLENE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
CIS-1,3-DICHLOROPROPENE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
CYCLOHEXANE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
DIBROMOCHLOROMETHANE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
DICHLORODIFLUOROMETHANE							0.005	0.005	mg/kg	0/4	0.00%	39.5	No	ND
ETHYLBENZENE							0.005	0.005	mg/kg	0/4	0.00%	5	No	ND
ISOPROPYLBENZENE (CUMENE)							0.005	0.005	mg/kg	0/4	0.00%		No	ND
M,P-XYLENE (SUM OF ISOMERS)							0.005	0.005	mg/kg	0/4	0.00%		No	ND
METHYL ACETATE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
METHYL ETHYL KETONE (2-BUTANONE)							0.01	0.01	mg/kg	0/4	0.00%	89.6	No	ND
METHYL ISOBUTYL KETONE (4-METHYL-2-PENT)							0.01	0.01	mg/kg	0/4	0.00%	443	No	ND
METHYLCYCLOHEXANE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
METHYLENE CHLORIDE	0.003	=	SM95-SO-22	0.006	*	SM95-SO-19	0.005	0.005	mg/Kg	3/4	75.00%	2	No	BSL
O-XYLENE (1,2-DIMETHYLBENZENE)							0.005	0.005	mg/kg	0/4	0.00%	200	No	ND
STYRENE							0.005	0.005	mg/kg	0/4	0.00%	300	No	ND
TERT-BUTYL METHYL ETHER							0.005	0.005	mg/kg	0/4	0.00%		No	ND
TETRACHLOROETHYLENE(PCE)							0.005	0.005	mg/kg	0/4	0.00%		No	ND
TOLUENE	0.002	J	SM95-SO-26	0.004	*	SM95-SO-19	0.005	0.005	mg/kg	2/4	50.00%	200	No	BSL
TRANS-1,2-DICHLOROETHENE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
TRANS-1,3-DICHLOROPROPENE							0.005	0.005	mg/kg	0/4	0.00%		No	ND
TRICHLOROETHYLENE (TCE)							0.005	0.005	mg/kg	0/4	0.00%		No	ND
TRICHLOROFLUOROMETHANE							0.005	0.005	mg/kg	0/4	0.00%	16.4	No	ND
VINYL CHLORIDE							0.005	0.005	mg/kg	0/4	0.00%		No	ND

Rationale for Elimination/Selection
 ASL: Above Screening Levels
 BSL: Below Screening Level
 ND: Not Detected
 NSL: No Screening Level
 NUT: Essential Nutrient
 AI-SSL: Based on EPA Eco-SSL, only a COPC if pH<5.5 (USEPA 2003)
 Fe-SSL: Based on EPA Eco-SSL, not a COPC if 5<pH<8
 TOT: No individual compound exceedance because total PAHs were below benchmark
 BAC: Bioaccumulative Compunc
 GRA: Eliminated based upon gradient analysis
 TTL: Total PAHs is less than the individual benchmarks, so total PAHs is eliminated
 FD: Frequency of Detection (less than 5%)
 BKGD: Eliminated based on detection less than site specific background

Qualifier:
 J: Estimated Value
 B: Value is less than the Contract Required Detection Limit, and greater than the Instrument Detection Limit.
 JL: estimated low value
 JH: estimated high value
 mg/kg: milligram per kilogram

Table 12
Occurrence, distribution, and selection of chemicals of potential concern in the Wastwater Treatment Facility S_c
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Wastwater Treatment Facility
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
ALUMINUM	2380	J	SM95-SO-16	11100	=	SM119		58.9	MG/KG	7/7	100.00%	0	No	AI-SSL
ANTIMONY	1.1	LJvQ	SM118	5.7	LJvQ	SM117A	1.1	17.7	MG/KG	6/7	85.71%	0.3	Yes	ASL
ARSENIC	4.7	JK	SM118	14	=	SM95-SO-16		2.9	MG/KG	7/7	100.00%	31	No	BKGD
BARIUM	66.1	=	SM95-SO-14	292	=	SM118		58.9	MG/KG	7/7	100.00%	330	No	BKGD
BERYLLIUM	0.33	=	SM95-SO-16	1.2	=	SM95-SO-14		1.5	MG/KG	7/7	100.00%	30	No	BSL
CADMIUM	0.49	LQ	SM118	1.1	LQ	SM116	0.28	1.3	MG/KG	4/7	57.14%	0.4	Yes	ASL
CHROMIUM, TOTAL	11.3	JL	SM118	63.6	=	SM95-SO-16		2.9	MG/KG	7/7	100.00%	7.9	No	BKGD
COBALT	4.4	LQ	SM117A	14.2	=	SM95-SO-16		14.7	MG/KG	7/7	100.00%	32	No	BKGD
COPPER	14	=	SM95-SO-14	299	=	SM117		7.4	MG/KG	7/7	100.00%	54	Yes	ASL
CYANIDE	0.21	LQ	SM117A	0.21	LQ	SM117A	0.7	0.74	MG/KG	1/7	14.29%	0.9	No	BKGD
IRON	12700	=	SM95-SO-14	200000	=	SM95-SO-16		29.5	MG/KG	7/7	100.00%	0	No	Fe-SSL
LEAD	27.2	=	SM95-SO-14	161	=	SM95-SO-16		0.88	MG/KG	7/7	100.00%	15	Yes	ASL
MANGANESE	85.8	=	SM95-SO-14	11320	Jv	SM95-SO-16		4.4	MG/KG	7/7	100.00%	152	No	BKGD
MERCURY	0.06	LQ	SM116	0.98	=	SM117	0.14	0.14	MG/KG	5/7	71.43%	0.1	Yes	ASL
NICKEL	11.4	=	SM95-SO-14	77.2	=	SM95-SO-16		11.8	MG/KG	7/7	100.00%	48	No	BKGD
SELENIUM	0.77	LQ	SM119	4.5	=	SM95-SO-16	1.4	1.4	MG/KG	2/7	28.57%	1	No	BKGD
SILVER	0.64	LQ	SM118	1.4	LQ	SM116	0.56	2.9	MG/KG	5/7	71.43%	2	Yes	DL
THALLIUM	2.2	LQ	SM119	9.9	=	SM95-SO-16	1.5	2.7	MG/KG	2/7	28.57%	1	No	BKGD
VANADIUM	8.8	LQ	SM117A	26.2	=	SM119		14.7	MG/KG	7/7	100.00%	2	No	BKGD
ZINC	131	=	SM119	908	=	SM117A		5.9	MG/KG	7/7	100.00%	120	Yes	ASL
ALDRIN							0.0017	0.0017	mg/kg	0/2	0.00%	0.0025	No	ND
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
ALPHA ENDOSULFAN							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
ALPHA-CHLORDANE							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
BETA ENDOSULFAN							0.0033	0.0033	mg/kg	0/2	0.00%		No	ND
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
DIELDRIN							0.0033	0.0033	mg/kg	0/2	0.00%	0.000032	No	ND
ENDOSULFAN SULFATE							0.0033	0.0033	mg/kg	0/2	0.00%		No	ND
ENDRIN							0.0033	0.0033	mg/kg	0/2	0.00%		No	ND
ENDRIN ALDEHYDE							0.0033	0.0033	mg/kg	0/2	0.00%		No	ND
ENDRIN KETONE							0.0033	0.0033	mg/kg	0/2	0.00%		No	ND
GAMMA BHC (LINDANE)							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
GAMMA-CHLORDANE							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
HEPTACHLOR							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
HEPTACHLOR EPOXIDE							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
METHOXYCHLOR							0.017	0.017	mg/kg	0/2	0.00%		No	ND
P,P'-DDD							0.0033	0.0033	mg/kg	0/2	0.00%		No	ND
P,P'-DDE							0.0033	0.0033	mg/kg	0/2	0.00%		No	ND
P,P'-DDT							0.0033	0.0033	mg/kg	0/2	0.00%		No	ND
PCB-1016 (AROCHLOR 1016)							0.033	0.033	mg/kg	0/2	0.00%	40	No	ND
PCB-1221 (AROCHLOR 1221)							0.033	0.033	mg/kg	0/2	0.00%	40	No	ND
PCB-1232 (AROCHLOR 1232)							0.033	0.033	mg/kg	0/2	0.00%	40	No	ND
PCB-1242 (AROCHLOR 1242)							0.033	0.033	mg/kg	0/2	0.00%	40	No	ND
PCB-1248 (AROCHLOR 1248)							0.033	0.033	mg/kg	0/2	0.00%	10	No	ND
PCB-1254 (AROCHLOR 1254)							0.033	0.033	mg/kg	0/2	0.00%	10	No	ND
PCB-1260 (AROCHLOR 1260)							0.033	0.033	mg/kg	0/2	0.00%	10	No	ND
TOXAPHENE							0.17	0.17	mg/kg	0/2	0.00%		No	ND
1,2,4,5-TETRACHLORO BENZENE							0.17	0.17	mg/kg	0/2	0.00%		No	ND
2,2'-OXYBIS(1-CHLORO)PROPANE							0.48	0.48	MG/KG	0/7	0.00%		No	ND
2,3,4,6-TETRACHLOROPHENOL							0.17	0.17	mg/kg	0/2	0.00%	20	No	ND
2,4,5-TRICHLOROPHENOL							1.2	1.2	MG/KG	0/7	0.00%	1.3	No	ND
2,4,6-TRICHLOROPHENOL							0.48	0.48	MG/KG	0/7	0.00%	10	No	ND
2,4-DICHLOROPHENOL							0.48	0.48	MG/KG	0/7	0.00%	20	No	ND
2,4-DIMETHYLPHENOL							0.48	0.48	MG/KG	0/7	0.00%		No	ND
2,4-DINITROPHENOL							1.2	1.2	MG/KG	0/7	0.00%	20	No	ND
2,4-DINITROTOLUENE							0.48	0.48	MG/KG	0/7	0.00%	3.2	No	ND
2,6-DINITROTOLUENE							0.48	0.48	MG/KG	0/7	0.00%	0.03283	No	ND
2-CHLORONAPHTHALENE							0.48	0.48	MG/KG	0/7	0.00%	1	No	ND
2-CHLOROPHENOL							0.48	0.48	MG/KG	0/7	0.00%	20	No	ND
2-METHYLNAPHTHALENE	0.033	LJQK	SM119	0.22	LJQK	SM117	0.48	0.48	MG/KG	2/7	28.57%	0.1	Yes	ASL
2-METHYLPHENOL (O-CRESOL)							0.48	0.48	MG/KG	0/7	0.00%	0.5	No	ND
2-NITROANILINE							1.2	1.2	MG/KG	0/7	0.00%		No	ND
2-NITROPHENOL							0.48	0.48	MG/KG	0/7	0.00%		No	ND
3,3'-DICHLORO BENZIDINE							0.48	0.48	MG/KG	0/7	0.00%		No	ND
3-NITROANILINE							1.2	1.2	MG/KG	0/7	0.00%		No	ND
4,6-DINITRO-2-METHYLPHENOL							1.2	1.2	MG/KG	0/7	0.00%		No	ND
4-BROMOPHENYL PHENYL ETHER							0.48	0.48	MG/KG	0/7	0.00%		No	ND
4-CHLORO-3-METHYLPHENOL							0.48	0.48	MG/KG	0/7	0.00%	7.95	No	ND
4-CHLOROANILINE							0.48	0.48	MG/KG	0/7	0.00%		No	ND
4-CHLOROPHENYL PHENYL ETHER							0.48	0.48	MG/KG	0/7	0.00%		No	ND
4-METHYLPHENOL (P-CRESOL)	0.023	LJQK	SM117	0.023	LJQK	SM117	0.48	0.48	MG/KG	1/7	14.29%	0.5	No	BSL
4-NITROANILINE							1.2	1.2	MG/KG	0/7	0.00%		No	ND

Table 12
Occurrence, distribution, and selection of chemicals of potential concern in the Wastewater Treatment Facility S_c
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Location:	Wastewater Treatment Facility
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
4-NITROPHENOL	2.3	F+	SM95-SO-16	2.3	F+	SM95-SO-16	1.2	1.2	MG/KG	1/7	14.29%	7	No	BSL
ACENAPHTHENE	0.014	LJQK	SM117A	0.085	LJQK	SM119	0.41	0.48	MG/KG	3/7	42.86%	20	No	BSL
ACENAPHTHYLENE	0.042	LJQK	SM118	0.35	LJQK	SM117	0.41	0.48	MG/KG	4/7	57.14%	1.7	No	BSL
ACETOPHENONE	0.023	LJQK	SM119	0.12	LJQK	SM117	0.48	0.48	MG/KG	2/7	28.57%	300	No	BSL
ANTHRACENE	0.019	LJQK	SM116	0.45	LJQK	SM119	0.17	0.48	MG/KG	6/7	85.71%	0.1	Yes	ASL
ATRAZINE							0.48	0.48	MG/KG	0/7	0.00%	0.00005	No	ND
BENZALDEHYDE	0.025	LJQK	SM117A	0.051	LJQK	SM117	0.45	0.48	MG/KG	2/7	28.57%		Yes	NSL
BENZO(A)ANTHRACENE	0.1	LJQK	SM116	0.83	=	SM119	0.17	0.48	MG/KG	5/7	71.43%	1.2	No	BSL
BENZO(A)PYRENE	0.1	LJQK	SM116	0.65	=	SM119	0.17	0.48	MG/KG	5/7	71.43%	0.1	Yes	ASL
BENZO(A)PYRENE	0.1	LJQK	SM118	0.65	=	SM119	0.17	0.48	MG/KG	5/7	71.43%	0.1	Yes	ASL
BENZO(B)FLUORANTHENE	0.13	LJQK	SM117	1.1	=	SM119	0.17	0.48	MG/KG	5/7	71.43%	1.2	No	BSL
BENZO(G,H,I)PERYLENE	0.056	LJQK	SM118	0.24	LJQK	SM117	0.41	0.48	MG/KG	4/7	57.14%	119	No	BSL
BENZO(K)FLUORANTHENE	0.061	LJQK	SM116	0.34	LJQK	SM119	0.17	0.48	MG/KG	5/7	71.43%	25	No	BSL
BENZYL BUTYL PHTHALATE							0.48	0.48	MG/KG	0/7	0.00%	0.23889	No	ND
BIPHENYL (DIPHENYL)	0.013	LJQK	SM119	0.025	LJQK	SM117	0.48	0.48	MG/KG	2/7	28.57%	60	No	BSL
BIS(2-CHLOROETHOXY) METHANE							0.48	0.48	MG/KG	0/7	0.00%		No	ND
BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)							0.48	0.48	MG/KG	0/7	0.00%		No	ND
BIS(2-ETHYLHEXYL) PHTHALATE							0.48	0.48	MG/KG	0/7	0.00%	0.92594	No	ND
CAPROLACTAM							0.48	0.48	MG/KG	0/7	0.00%		No	ND
CARBAZOLE	0.031	LJQK	SM117A	0.13	LJ	SM119	0.41	0.48	MG/KG	3/7	42.86%		Yes	NSL
CHRYSENE	0.098	LJQK	SM116	1.3	=	SM119	0.17	0.48	MG/KG	5/7	71.43%	4.73	No	BSL
DI-N-BUTYL PHTHALATE							0.48	0.48	MG/KG	0/7	0.00%	200	No	ND
DI-N-OCTYL PHTHALATE	0.033	LJQK	SM119	0.033	LJQK	SM119	0.48	0.48	MG/KG	1/7	14.29%	709	No	BSL
DIBENZO(A,H)ANTHRACENE	0.025	LJQK	SM116	0.1	LJQK	SM117	0.17	0.48	MG/KG	5/7	71.43%	1.2	No	BSL
DIBENZO(A,H)ANTHRACENE	0.025	LJQK	SM116	0.1	LJQK	SM119	0.17	0.48	MG/KG	5/7	71.43%	1.2	No	BSL
DIBENZOFURAN	0.026	J	SM95-SO-16	0.033	LJQK	SM117	0.48	0.48	MG/KG	3/7	42.86%		Yes	NSL
DIETHYL PHTHALATE							0.48	0.48	MG/KG	0/7	0.00%	100	No	ND
DIMETHYL PHTHALATE							0.48	0.48	MG/KG	0/7	0.00%	200	No	ND
FLUORANTHENE	0.065	LJQK	SM117	2.2	=	SM119	0.17	0.48	MG/KG	5/7	71.43%	0.1	Yes	ASL
FLUORENE	0.044	J	SM95-SO-16	0.097	LJQK	SM119	0.48	0.48	MG/KG	3/7	42.86%	30	No	BSL
HEXACHLORO BENZENE							0.48	0.48	MG/KG	0/7	0.00%	0.0025	No	ND
HEXACHLOROBUTADIENE							0.48	0.48	MG/KG	0/7	0.00%		No	ND
HEXACHLOROCYCLOPENTADIENE							0.48	0.48	MG/KG	0/7	0.00%	10	No	ND
HEXACHLOROETHANE							0.48	0.48	MG/KG	0/7	0.00%		No	ND
INDENO(1,2,3-C,D)PYRENE	0.085	LJQK	SM116	0.42	LJQK	SM119	0.17	0.48	MG/KG	5/7	71.43%	1.2	No	BSL
ISOPHORONE							0.48	0.48	MG/KG	0/7	0.00%		No	ND
N-NITROSODI-N-PROPYLAMINE							0.48	0.48	MG/KG	0/7	0.00%	0.54368	No	ND
N-NITROSODIPHENYLAMINE							0.48	0.48	MG/KG	0/7	0.00%	20	No	ND
NAPHTHALENE	0.036	LJQK	SM119	0.12	LJQK	SM117	0.48	0.48	MG/KG	2/7	28.57%	0.1	Yes	ASL
NITROBENZENE							0.48	0.48	MG/KG	0/7	0.00%	40	No	ND
PENTACHLOROPHENOL							1.2	1.2	MG/KG	0/7	0.00%	0.032	No	ND
PHENANTHRENE	0.031	LJQK	SM118	1.1	=	SM119	0.17	0.48	MG/KG	6/7	85.71%	0.1	Yes	ASL
PHENOL							0.48	0.48	MG/KG	0/7	0.00%	30	No	ND
PYRENE	0.13	LJQK	SM116	1.6	=	SM119	0.17	0.48	MG/KG	5/7	71.43%	0.1	Yes	ASL
1,1,1-TRICHLOROETHANE	0.009	J	SM95-SO-16	0.009	J	SM95-SO-16	0.005	0.005	mg/kg	1/2	50.00%	0.1	No	BSL
1,1,2,2-TETRACHLOROETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,1,2-TRICHLOROETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,1-DICHLOROETHANE							0.005	0.005	mg/kg	0/2	0.00%	20.1	No	ND
1,1-DICHLOROETHENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,2,3-TRICHLOROBENZENE							0.005	0.005	mg/kg	0/2	0.00%	20	No	ND
1,2,4-TRICHLOROBENZENE							0.005	0.005	mg/kg	0/2	0.00%	20	No	ND
1,2-DIBROMO-3-CHLOROPROPANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,2-DICHLOROBENZENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,2-DICHLOROETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,2-DICHLOROPROPANE							0.005	0.005	mg/kg	0/2	0.00%	700	No	ND
1,3-DICHLOROBENZENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,4-DICHLOROBENZENE							0.005	0.005	mg/kg	0/2	0.00%	20	No	ND
1,4-DIOXANE (P-DIOXANE)							0.1	0.1	mg/kg	0/2	0.00%		No	ND
2-HEXANONE							0.01	0.01	mg/kg	0/2	0.00%	12.6	No	ND
ACETONE							0.01	0.01	mg/kg	0/2	0.00%	2.5	No	ND
BENZENE							0.005	0.005	mg/kg	0/2	0.00%	0.5	No	ND
BROMOCHLOROMETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
BROMODICHLOROMETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
BROMOFORM							0.005	0.005	mg/kg	0/2	0.00%		No	ND
BROMOMETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
CARBON DISULFIDE							0.005	0.005	mg/kg	0/2	0.00%	0.09412	No	ND
CARBON TETRACHLORIDE							0.005	0.005	mg/kg	0/2	0.00%	1000	No	ND
CHLOROBENZENE							0.005	0.005	mg/kg	0/2	0.00%	40	No	ND
CHLOROETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
CHLOROFORM							0.005	0.005	mg/kg	0/2	0.00%	25	No	ND
CHLOROMETHANE							0.005	0.005	mg/kg	0/2	0.00%	10.4	No	ND

Table 12
Occurrence, distribution, and selection of chemicals of potential concern in the Wastwater Treatment Facility S_c
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Location:	Wastwater Treatment Facility
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
CIS-1,2-DICHLOROETHYLENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
CIS-1,3-DICHLOROPROPENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
CYCLOHEXANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
DIBROMOCHLOROMETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
DICHLORODIFLUOROMETHANE							0.005	0.005	mg/kg	0/2	0.00%	39.5	No	ND
ETHYLBENZENE							0.005	0.005	mg/kg	0/2	0.00%	5	No	ND
ISOPROPYLBENZENE (CUMENE)							0.005	0.005	mg/kg	0/2	0.00%		No	ND
M,P-XYLENE (SUM OF ISOMERS)							0.005	0.005	mg/kg	0/2	0.00%		No	ND
METHYL ACETATE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
METHYL ETHYL KETONE (2-BUTANONE)							0.01	0.01	mg/kg	0/2	0.00%	89.6	No	ND
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)							0.01	0.01	mg/kg	0/2	0.00%	443	No	ND
METHYLCYCLOHEXANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
METHYLENE CHLORIDE	0.009	J	SM95-SO-16	0.009	J	SM95-SO-16	0.005	0.005	mg/kg	1/2	50.00%	2	No	BSL
O-XYLENE (1,2-DIMETHYLBENZENE)							0.005	0.005	mg/kg	0/2	0.00%	200	No	ND
STYRENE							0.005	0.005	mg/kg	0/2	0.00%	300	No	ND
TERT-BUTYL METHYL ETHER							0.005	0.005	mg/kg	0/2	0.00%		No	ND
TETRACHLOROETHYLENE(PCE)							0.005	0.005	mg/kg	0/2	0.00%		No	ND
TOLUENE							0.005	0.005	mg/kg	0/2	0.00%	200	No	ND
TRANS-1,2-DICHLOROETHENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
TRANS-1,3-DICHLOROPROPENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
TRICHLOROETHYLENE (TCE)							0.005	0.005	mg/kg	0/2	0.00%		No	ND
TRICHLOROFLUOROMETHANE							0.005	0.005	mg/kg	0/2	0.00%	16.4	No	ND
VINYL CHLORIDE							0.005	0.005	mg/kg	0/2	0.00%		No	ND

Rationale for Elimination/Selection
 ASL: Above Screening Levels
 BSL: Below Screening Level
 ND: Not Detected
 NSL: No Screening Level
 NUT: Essential Nutrient
 AI-SSL: Based on EPA Eco-SSL, only a COPC if pH<5.5 (USEPA 2003)
 Fe-SSL: Based on EPA Eco-SSL, not a COPC if 5<pH<8
 TOT: No individual compound exceedance because total PAHs were below benchmark
 BAC: Bioaccumulative Compound
 GRA: Eliminated based upon gradient analysis
 TTL: Total PAHs is less than the individual benchmarks, so total PAHs is eliminated
 FD: Frequency of Detection (less than 5%)
 BKGD: Eliminated based on detection less than site-specific background

Qualifier:
 J: Estimated Value
 B: Value is less than the Contract Required Detection Limit, and greater than the Instrument Detection Limit.
 JL: estimated low value
 JH: estimated high value
 mg/kg: milligram per kilogram

Table 13
Occurrence, distribution, and selection of chemicals of potential concern in the Current Aboveground Storage Tanks S
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Current Aboveground Storage Tanks
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
ALUMINUM	593	=	SM129	3490	=	SM128		67.6	MG/KG	5/5	100.00%	0	No	AI-SSL
ANTIMONY	2.1	LJvQ	SM128	2.5	LJvQ	SM131	0.77	20.3	MG/KG	2/3	66.67%	0.3	Yes	ASL
ARSENIC	1.5	LQ	SM129	7.9	JvL	SM128		3.4	MG/KG	5/5	100.00%	31	No	BSL
BARIUM	49.6	=	SM132	276	=	SM130		67.6	MG/KG	5/5	100.00%	330	No	BSL
BERYLLIUM	0.09	LQ	SM130	0.31	LQ	SM131	0.07	1.7	MG/KG	3/5	60.00%	30	No	BSL
CADMIUM	0.48	LQ	SM131	0.48	LQ	SM131	0.15	1.7	MG/KG	1/5	20.00%	0.4	Yes	ASL
CHROMIUM, TOTAL	1.6	LQ	SM129	126	=	SM131		3.4	MG/KG	5/5	100.00%	7.9	Yes	ASL
COBALT	0.67	LQ	SM129	3.1	LQ	SM131		16.9	MG/KG	5/5	100.00%	32	No	BSL
COPPER	4.4	LQ	SM129	36.7	=	SM131		8.4	MG/KG	5/5	100.00%	54	No	BSL
CYANIDE	0.12	LQ	SM128	0.31	L	SM131	0.12	0.84	MG/KG	2/5	40.00%	0.9	No	BSL
IRON	3460	=	SM129	14500	=	SM131		33.8	MG/KG	5/5	100.00%	0	No	Fe-SSL
LEAD	7.5	=	SM129	558	=	SM131		1	MG/KG	5/5	100.00%	15	Yes	ASL
MANGANESE	17.7	=	SM129	379	JvL	SM128		5.1	MG/KG	5/5	100.00%	152	Yes	ASL
MERCURY	0.1	LQ	SM128	0.13	LQ	SM131	0.06	0.17	MG/KG	2/5	40.00%	0.1	Yes	ASL
NICKEL	0.81	LQ	SM129	15.9	=	SM131		13.5	MG/KG	5/5	100.00%	48	No	BSL
SELENIUM								1.6	MG/KG	0/5	0.00%	1	No	ND
SILVER	0.26	LQ	SM132	0.96	LQ	SM131		0.24	MG/KG	4/5	80.00%	2	Yes	DL
THALLIUM								1.6	MG/KG	0/5	0.00%	1	No	ND
VANADIUM	3.4	L	SM129	31	=	SM131		16.9	MG/KG	5/5	100.00%	2	Yes	ASL
ZINC	13.2	=	SM129	484	=	SM131		6.8	MG/KG	5/5	100.00%	120	Yes	ASL
2,2'-OXYBIS(1-CHLORO)PROPANE							0.55	0.55	MG/KG	0/5	0.00%		No	ND
2,4,5-TRICHLOROPHENOL							1.4	1.4	MG/KG	0/5	0.00%	1.3	No	ND
2,4,6-TRICHLOROPHENOL							0.55	0.55	MG/KG	0/5	0.00%	10	No	ND
2,4-DICHLOROPHENOL							0.55	0.55	MG/KG	0/5	0.00%	20	No	ND
2,4-DIMETHYLPHENOL							0.55	0.55	MG/KG	0/5	0.00%		No	ND
2,4-DINITROPHENOL							1.4	1.4	MG/KG	0/5	0.00%	20	No	ND
2,4-DINITROTOLUENE							0.55	0.55	MG/KG	0/5	0.00%	3.2	No	ND
2,6-DINITROTOLUENE							0.55	0.55	MG/KG	0/5	0.00%	0.03283	No	ND
2-CHLORONAPHTHALENE							0.55	0.55	MG/KG	0/5	0.00%	1	No	ND
2-CHLOROPHENOL							0.55	0.55	MG/KG	0/5	0.00%	20	No	ND
2-METHYLNAPHTHALENE	0.02	Q	SM132	0.11	Q	SM131	0.42	0.55	MG/KG	2/5	40.00%	0.1	Yes	ASL
2-METHYLPHENOL (O-CRESOL)							0.55	0.55	MG/KG	0/5	0.00%	0.5	No	ND
2-NITROANILINE							1.4	1.4	MG/KG	0/5	0.00%		No	ND
2-NITROPHENOL							0.55	0.55	MG/KG	0/5	0.00%		No	ND
3,3'-DICHLOROENZIDINE							0.55	0.55	MG/KG	0/5	0.00%		No	ND
3-NITROANILINE							1.4	1.4	MG/KG	0/5	0.00%		No	ND
4,6-DINITRO-2-METHYLPHENOL							1.4	1.4	MG/KG	0/5	0.00%		No	ND
4-BROMOPHENYL PHENYL ETHER							0.55	0.55	MG/KG	0/5	0.00%		No	ND
4-CHLORO-3-METHYLPHENOL							0.55	0.55	MG/KG	0/5	0.00%	7.95	No	ND
4-CHLOROANILINE							0.55	0.55	MG/KG	0/5	0.00%		No	ND
4-CHLOROPHENYL PHENYL ETHER							0.55	0.55	MG/KG	0/5	0.00%		No	ND
4-METHYLPHENOL (P-CRESOL)	0.046	Q	SM131	0.046	Q	SM131	0.42	0.55	MG/KG	1/5	20.00%	0.5	Yes	DL
4-NITROANILINE							1.4	1.4	MG/KG	0/5	0.00%		No	ND
4-NITROPHENOL							1.4	1.4	MG/KG	0/5	0.00%	7	No	ND
ACENAPHTHENE	0.017	Q	SM132	0.46	Q	SM131	0.42	0.55	MG/KG	2/5	40.00%	20	No	BSL
ACENAPHTHYLENE	0.022	Q	SM129	0.18	Q	SM131	0.39	0.55	MG/KG	4/5	80.00%	1.7	No	BSL
ACETOPHENONE	0.016	Q	SM130	0.049	Q	SM131	0.39	0.55	MG/KG	4/5	80.00%	300	No	BSL
ANTHRACENE	0.014	Q	SM128	1.5	=	SM131	0.42	0.55	MG/KG	3/5	60.00%	0.1	Yes	ASL
ATRAZINE							0.55	0.55	MG/KG	0/5	0.00%	0.00005	No	ND
BENZALDEHYDE	0.008	Q	SM130	0.032	Q	SM131	0.4	0.55	MG/KG	3/5	60.00%		Yes	NSL
BENZO(A)ANTHRACENE	0.034	Q	SM129	3	=	SM131		0.55	MG/KG	5/5	100.00%	1.2	Yes	ASL
BENZO(A)PYRENE	0.043	Q	SM129	2.7	=	SM131		0.55	MG/KG	5/5	100.00%	0.1	Yes	ASL
BENZO(B)FLUORANTHENE	0.055	Q	SM129	4.4	=	SM131		0.55	MG/KG	5/5	100.00%	1.2	Yes	ASL
BENZO(G,H,I)PERYLENE	0.059	Q	SM128	0.97	=	SM131	0.42	0.55	MG/KG	3/5	60.00%	119	No	BSL
BENZO(K)FLUORANTHENE	0.019	Q	SM128	1.8	=	SM131		0.55	MG/KG	5/5	100.00%	25	No	BSL
BENZYL BUTYL PHTHALATE	0.03	Q	SM132	0.03	Q	SM132	0.55	0.55	MG/KG	1/5	20.00%	0.23889	Yes	DL
BIPHENYL (DIPHENYL)	0.04	Q	SM131	0.04	Q	SM131	0.42	0.55	MG/KG	1/5	20.00%	60	No	BSL
BIS(2-CHLOROETHOXY) METHANE							0.55	0.55	MG/KG	0/5	0.00%		No	ND
BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)							0.55	0.55	MG/KG	0/5	0.00%		No	ND
BIS(2-ETHYHEXYL) PHTHALATE							0.69	0.69	MG/KG	0/5	0.00%	0.92594	No	ND
CAPROLACTAM							0.55	0.55	MG/KG	0/5	0.00%		No	ND
CARBAZOLE	0.024	Q	SM132	0.23	Q	SM131	0.42	0.55	MG/KG	2/5	40.00%		Yes	NSL
CHRYSENE	0.036	Q	SM129	2.8	=	SM131		0.55	MG/KG	5/5	100.00%	4.73	No	BSL
DI-N-BUTYL PHTHALATE							0.55	0.55	MG/KG	0/5	0.00%	200	No	ND
DI-N-OCTYLPHTHALATE							0.55	0.55	MG/KG	0/5	0.00%	709	No	ND
DIBENZ(A,H)ANTHRACENE	0.031	Q	SM132	0.33	Q	SM131	0.42	0.55	MG/KG	2/5	40.00%	1.2	No	BSL
DIBENZOFURAN	0.009	Q	SM132	0.18	Q	SM131	0.42	0.55	MG/KG	2/5	40.00%		Yes	NSL
DIETHYL PHTHALATE							0.55	0.55	MG/KG	0/5	0.00%	100	No	ND
DIMETHYL PHTHALATE							0.55	0.55	MG/KG	0/5	0.00%	200	No	ND
FLUORANTHENE	0.021	Q	SM129	10	D	SM131		1.7	MG/KG	5/5	100.00%	0.1	Yes	ASL
FLUORENE	0.47	Q	SM131	0.47	Q	SM131	0.42	0.55	MG/KG	1/5	20.00%	30	No	BSL
HEXACHLOROENZENE							0.55	0.55	MG/KG	0/5	0.00%	0.0025	No	ND
HEXACHLOROBUTADIENE							0.55	0.55	MG/KG	0/5	0.00%		No	ND

Table 13
Occurrence, distribution, and selection of chemicals of potential concern in the Current Aboveground Storage Tanks S:
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Location:	Current Aboveground Storage Tanks
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
HEXACHLOROCYCLOPENTADIENE							0.55	0.55	MG/KG	0/5	0.00%	10	No	ND
HEXACHLOROETHANE							0.55	0.55	MG/KG	0/5	0.00%		No	ND
INDENO(1,2,3-C,D)PYRENE	0.029	Q	SM128	1.1	=	SM131		0.55	MG/KG	5/5	100.00%	1.2	No	BSL
ISOPHORONE							0.55	0.55	MG/KG	0/5	0.00%		No	ND
N-NITROSODI-N-PROPYLAMINE							0.55	0.55	MG/KG	0/5	0.00%	0.54368	No	ND
N-NITROSODIPHENYLAMINE							0.55	0.55	MG/KG	0/5	0.00%	20	No	ND
NAPHTHALENE	0.02	Q	SM132	0.078	Q	SM131	0.42	0.55	MG/KG	2/5	40.00%	0.1	Yes	DL
NITROBENZENE							0.55	0.55	MG/KG	0/5	0.00%	40	No	ND
PENTACHLOROPHENOL	0.28	Q	SM131	0.28	Q	SM131	1.1	1.4	MG/KG	1/5	20.00%	0.032	Yes	ASL
PHENANTHRENE	0.035	Q	SM130	3.8	=	SM131	0.4	0.55	MG/KG	4/5	80.00%	0.1	Yes	ASL
PHENOL							0.55	0.55	MG/KG	0/5	0.00%	30	No	ND
PYRENE	0.024	Q	SM129	8.4	D	SM131		1.7	MG/KG	5/5	100.00%	0.1	Yes	ASL

Rationale for Elimination/Selection
 ASL: Above Screening Levels
 BSL: Below Screening Level
 ND: Not Detected
 NSL: No Screening Level
 NUT: Essential Nutrient
 AI-SSL: Based on EPA Eco-SSL, only a COPC if pH<5.5 (USEPA 2003)
 Fe-SSL: Based on EPA Eco-SSL, not a COPC if 5<pH<8
 TOT: No individual compound exceedance because total PAHs were below benchmark
 BAC: Bioaccumulative Compound
 GRA: Eliminated based upon gradient analysis
 TTL: Total PAHs is less than the individual benchmarks, so total PAHs is eliminated
 FD: Frequency of Detection (less than 5%)
 BKGD: Eliminated based on detection less than site-specific background

Qualifier:
 J: Estimated Value
 B: Value is less than the Contract Required Detection Limit, and greater than the Instrument Detection Limit.
 JL: estimated low value
 JH: estimated high value
 mg/kg: milligram per kilogram

Table 14
Occurrence, distribution, and selection of chemicals of potential concern in the Maintenance Shed Area S1
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Maintenance Shed Area
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
ALUMINUM	269	=	SM95-SO-6	6610	=	SM95-SO-9		53.9	MG/KG	9/9	100.00%	0	No	AI-SSL
ANTIMONY	5.8	LJvQ	SM110	12	=	SM95-SO-4	1	13.2	MG/KG	4/8	50.00%	0.3	No	BKGD
ARSENIC	1.9	LQ	SM108	19	=	SM110		2.7	MG/KG	9/9	100.00%	31	No	BKGD
BARIIUM	13.7	=	SM95-SO-6	306	=	SM95-SO-5		53.9	MG/KG	9/9	100.00%	330	No	BKGD
BERYLLIUM	0.09	LQ	SM110	1.9	=	SM95-SO-12	0.25	1.3	MG/KG	7/8	87.50%	30	No	BKGD
CADMIUM	0.2	LQ	SM110	2.6	=	SM95-SO-5	0.25	1.1	MG/KG	4/8	50.00%	0.4	Yes	ASL
CHROMIUM, TOTAL	1.5	=	SM95-SO-6	32.5	=	SM110		2.7	MG/KG	9/9	100.00%	7.9	No	BKGD
COBALT	1.4	=	SM95-SO-6	6.6	=	SM95-SO-12		13.5	MG/KG	9/9	100.00%	32	No	BKGD
COPPER	1.7	Jv	SM95-SO-6	180	=	SM110		6.7	MG/KG	9/9	100.00%	54	No	BKGD
CYANIDE	0.15	LQ	SM110	0.15	LQ	SM110	0.77	0.77	MG/KG	1/8	12.50%	0.9	No	BKGD
IRON	3160	=	SM95-SO-6	54800	=	SM110		27	MG/KG	9/9	100.00%	0	No	Fe-SSL
LEAD	4.6	=	SM95-SO-6	290	=	SM110		0.81	MG/KG	9/9	100.00%	15	No	BKGD
MANGANESE	0.14	Jv	SM95-SO-10	588	=	SM110		4	MG/KG	9/9	100.00%	152	No	BKGD
MERCURY	0.06	LQ	SM108	0.16	=	SM95-SO-5	0.13	0.13	MG/KG	4/8	50.00%	0.1	No	BKGD
NICKEL	1.1	=	SM95-SO-6	36.3	=	SM110		10.8	MG/KG	9/9	100.00%	48	No	BKGD
SELENIUM							1.3	1.3	MG/KG	0/8	0.00%	1	No	BKGD
SILVER	0.96	LQ	SM111	3.3	=	SM110		0.62	MG/KG	2/8	25.00%	2	No	BKGD
THALLIUM	1.6	=	SM95-SO-12	237	J ^A	SM95-SO-10	1.2	2.2	MG/KG	3/9	33.33%	1	No	BKGD
VANADIUM	2.7	=	SM95-SO-6	18.3	=	SM95-SO-5		13.5	MG/KG	9/9	100.00%	2	No	BKGD
ZINC	11.9	=	SM95-SO-6	2220	=	SM95-SO-12		5.4	MG/KG	9/9	100.00%	120	Yes	ASL
ALDRIN	0.011	=	SM95-SO-12	0.011	=	SM95-SO-12	0.0017	0.0017	mg/kg	1/6	16.67%	0.0025	Yes	ASL
ALPHA BHC (ALPHA HEXACHLOROCHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/6	0.00%		No	ND
ALPHA ENDOSULFAN							0.0017	0.0017	mg/kg	0/6	0.00%		No	ND
ALPHA-CHLORDANE							0.0017	0.0017	mg/kg	0/6	0.00%		No	ND
BETA BHC (BETA HEXACHLOROCHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/6	0.00%		No	ND
BETA ENDOSULFAN	0.0057	J	SM95-SO-9	13	J	SM95-SO-5	0.0033	0.0033	mg/kg	3/6	50.00%		Yes	NSL
DELTA BHC (DELTA HEXACHLOROCHLOROCYCLOHEXANE)	0.023	J	SM95-SO-12	0.023	J	SM95-SO-12	0.0017	0.0017	mg/kg	1/6	16.67%		Yes	NSL
DIELDRIN	0.054	=	SM95-SO-12	0.054	=	SM95-SO-12	0.0033	0.0033	mg/kg	3/6	50.00%	0.000032	Yes	ASL
ENDOSULFAN SULFATE	0.039	Jv	SM95-SO-12	0.039	Jv	SM95-SO-12	0.0033	0.0033	mg/kg	1/6	16.67%		Yes	NSL
ENDRIN	18	J	SM95-SO-4	18	J	SM95-SO-4	0.0033	0.0033	mg/kg	1/6	16.67%		Yes	NSL
ENDRIN ALDEHYDE	0.0085	JT	SM95-SO-5	0.052	=	SM95-SO-12	0.0033	0.0033	mg/kg	3/6	50.00%		Yes	NSL
ENDRIN KETONE							0.0033	0.0033	mg/kg	0/6	0.00%		No	ND
GAMMA BHC (LINDANE)	0.0059	J	SM95-SO-12	0.0059	J	SM95-SO-12	0.0017	0.0017	mg/kg	1/6	16.67%		Yes	NSL
GAMMA-CHLORDANE	0.036	=	SM95-SO-12	0.036	=	SM95-SO-12	0.0017	0.0017	mg/kg	1/6	16.67%		Yes	NSL
HEPTACHLOR	0.0079	J	SM95-SO-12	0.0079	J	SM95-SO-12	0.0017	0.0017	mg/kg	1/6	16.67%		Yes	NSL
HEPTACHLOR EPOXIDE	0.041	=	SM95-SO-12	0.041	=	SM95-SO-12	0.0017	0.0017	mg/kg	1/6	16.67%		Yes	NSL
METHOXYCHLOR							0.017	0.017	mg/kg	0/6	0.00%		No	ND
P,P'-DDD	15	J	SM95-SO-4	15	J	SM95-SO-4	0.0033	0.0033	mg/kg	2/6	33.33%		Yes	NSL
P,P'-DDE	0.05	=	SM95-SO-12	0.05	=	SM95-SO-12	0.0033	0.0033	mg/kg	2/6	33.33%		Yes	NSL
P,P'-DDT	0.057	=	SM95-SO-12	18	J	SM95-SO-5	0.0033	0.0033	mg/kg	3/6	50.00%		Yes	NSL
PCB-1016 (AROCHLOR 1016)							0.033	0.033	mg/kg	0/6	0.00%	40	No	ND
PCB-1221 (AROCHLOR 1221)							0.033	0.033	mg/kg	0/6	0.00%	40	No	ND
PCB-1232 (AROCHLOR 1232)							0.033	0.033	mg/kg	0/6	0.00%	40	No	ND
PCB-1242 (AROCHLOR 1242)							0.033	0.033	mg/kg	0/6	0.00%	40	No	ND
PCB-1248 (AROCHLOR 1248)							0.033	0.033	mg/kg	0/6	0.00%	10	No	ND
PCB-1254 (AROCHLOR 1254)	1.1	J	SM95-SO-12	1.1	J	SM95-SO-12	0.033	0.033	mg/kg	1/6	16.67%	10	No	BSL
PCB-1260 (AROCHLOR 1260)							0.033	0.033	mg/kg	0/6	0.00%	10	No	ND
TOXAPHENE							0.17	0.17	mg/kg	0/6	0.00%		No	ND
1,2,4,5-TETRACHLOROCHLOROCYCLOHEXANE							0.17	0.17	mg/kg	0/6	0.00%		No	ND
2,2'-OXYBIS(1-CHLORO)PROPANE							0.79	0.79	MG/KG	0/9	0.00%		No	ND
2,3,4,6-TETRACHLOROPHENOL							0.17	0.17	mg/kg	0/6	0.00%	20	No	ND
2,4,5-TRICHLOROPHENOL							2	2	MG/KG	0/9	0.00%	1.3	No	ND
2,4,6-TRICHLOROPHENOL							0.79	0.79	MG/KG	0/9	0.00%	10	No	ND
2,4-DICHLOROPHENOL							0.79	0.79	MG/KG	0/9	0.00%	20	No	ND
2,4-DIMETHYLPHENOL							0.79	0.79	MG/KG	0/9	0.00%		No	ND
2,4-DINITROPHENOL							2	2	MG/KG	0/9	0.00%	20	No	ND
2,4-DINITROTOLUENE							0.79	0.79	MG/KG	0/9	0.00%	3.2	No	ND
2,6-DINITROTOLUENE							0.79	0.79	MG/KG	0/9	0.00%	0.03283	No	ND
2-CHLORONAPHTHALENE							0.79	0.79	MG/KG	0/9	0.00%	1	No	ND
2-CHLOROPHENOL							0.79	0.79	MG/KG	0/9	0.00%	20	No	ND
2-METHYLNAPHTHALENE	0.028	J	SM95-SO-5	0.18	J	SM95-SO-4	0.79	0.79	MG/KG	4/9	44.44%	0.1	Yes	ASL
2-METHYLPHENOL (O-CRESOL)							0.79	0.79	MG/KG	0/9	0.00%	0.5	No	ND
2-NITROANILINE							2	2	MG/KG	0/9	0.00%		No	ND
2-NITROPHENOL							0.79	0.79	MG/KG	0/9	0.00%		No	ND
3,3'-DICHLOROCHLOROCYCLOHEXANE							0.79	0.79	MG/KG	0/9	0.00%		No	ND
3-NITROANILINE							2	2	MG/KG	0/9	0.00%		No	ND
4,6-DINITRO-2-METHYLPHENOL							2	2	MG/KG	0/9	0.00%		No	ND
4-BROMOPHENYL PHENYL ETHER							0.79	0.79	MG/KG	0/9	0.00%		No	ND
4-CHLORO-3-METHYLPHENOL							0.79	0.79	MG/KG	0/9	0.00%	7.95	No	ND
4-CHLOROANILINE							0.79	0.79	MG/KG	0/9	0.00%		No	ND
4-CHLOROPHENYL PHENYL ETHER							0.79	0.79	MG/KG	0/9	0.00%		No	ND
4-METHYLPHENOL (P-CRESOL)							0.79	0.79	MG/KG	0/9	0.00%	0.5	No	ND
4-NITROANILINE							2	2	MG/KG	0/9	0.00%		No	ND

Table 14
Occurrence, distribution, and selection of chemicals of potential concern in the Maintenance Shed Area S1
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Maintenance Shed Area
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
4-NITROPHENOL							2	2	MG/KG	0/9	0.00%	7	No	ND
ACENAPHTHENE	0.033	J	SM95-SO-4	0.033	J	SM95-SO-4	0.79	0.79	MG/KG	1/9	11.11%	20	No	BSL
ACENAPHTHYLENE	0.012	LJQK	SM110	0.29	J	SM95-SO-4	0.45	0.79	MG/KG	4/9	44.44%	1.7	No	BSL
ACETOPHENONE	0.015	LJQK	SM110	0.015	LJQK	SM110	0.79	0.79	MG/KG	1/9	11.11%	300	No	BSL
ANTHRACENE	0.015	LJQK	SM110	0.29	J	SM95-SO-4	0.45	0.79	MG/KG	6/9	66.67%	0.1	Yes	ASL
ATRAZINE							0.79	0.79	MG/KG	0/9	0.00%	0.00005	No	ND
BENZALDEHYDE	0.011	Q	SM111	0.011	Q	SM111	0.79	0.79	MG/KG	1/9	11.11%		Yes	NSL
BENZO(A)ANTHRACENE	0.029	LJQK	SM110	0.97	=	SM95-SO-12	0.79	0.79	MG/KG	4/9	44.44%	1.2	No	BSL
BENZO(A)PYRENE	0.018	LJQK	SM108	1.3	=	SM95-SO-4	0.17	0.79	MG/KG	7/9	77.78%	0.1	Yes	ASL
BENZO(B)FLUORANTHENE	0.051	LJQK	SM110	3.4	=	SM95-SO-12	0.79	0.79	MG/KG	5/9	55.56%	1.2	Yes	ASL
BENZO(G,H,I)PERYLENE	0.049	LJQK	SM110	1.2	=	SM95-SO-4	0.17	0.79	MG/KG	7/9	77.78%	119	No	BSL
BENZO(K)FLUORANTHENE	0.027	LJQK	SM110	2.4	=	SM95-SO-4	0.79	0.79	MG/KG	4/9	44.44%	25	No	BSL
BENZYL BUTYL PHTHALATE	0.047	J	SM95-SO-4	0.13	=	SM95-SO-12	0.79	0.79	MG/KG	2/9	22.22%	0.23889	Yes	DL
BIPHENYL (DIPHENYL)							0.79	0.79	MG/KG	0/9	0.00%	60	No	ND
BIS(2-CHLOROETHOXY) METHANE							0.79	0.79	MG/KG	0/9	0.00%		No	ND
BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)							0.79	0.79	MG/KG	0/9	0.00%		No	ND
BIS(2-ETHYLHEXYL) PHTHALATE	0.032	J	SM95-SO-6	0.4	=	SM95-SO-12	0.92	0.92	MG/KG	2/9	22.22%	0.92594	No	BSL
CAPROLACTAM							0.79	0.79	MG/KG	0/9	0.00%		No	ND
CARBAZOLE	0.02	Q	SM111	0.3	J	SM95-SO-4	0.37	0.79	MG/KG	5/9	55.56%		Yes	NSL
CHRYSENE	0.05	LJQK	SM110	1.7	=	SM95-SO-12	0.79	0.79	MG/KG	5/9	55.56%	4.73	No	BSL
DI-N-BUTYL PHTHALATE	0.014	J	SM95-SO-5	0.057	J	SM95-SO-4	0.79	0.79	MG/KG	2/9	22.22%	200	No	BSL
DI-N-OCTYL PHTHALATE	0.074	=	SM95-SO-12	0.14	Q	SM111	0.79	0.79	MG/KG	2/9	22.22%	709	No	BSL
DIBENZO(A,H)ANTHRACENE	0.035	Q	SM111	0.49	=	SM95-SO-4	0.79	0.79	MG/KG	4/9	44.44%	1.2	No	BSL
DIBENZOFURAN	0.04	J	SM95-SO-12	0.082	J	SM95-SO-4	0.79	0.79	MG/KG	2/9	22.22%		Yes	NSL
DIETHYL PHTHALATE							0.79	0.79	MG/KG	0/9	0.00%	100	No	ND
DIMETHYL PHTHALATE							0.79	0.79	MG/KG	0/9	0.00%	200	No	ND
FLUORANTHENE	0.034	LJQK	SM110	3.5	=	SM95-SO-12	0.79	0.79	MG/KG	6/9	66.67%	0.1	Yes	ASL
FLUORENE	0.098	J	SM95-SO-4	0.098	J	SM95-SO-4	0.79	0.79	MG/KG	1/9	11.11%	30	No	BSL
HEXACHLORO BENZENE							0.79	0.79	MG/KG	0/9	0.00%	0.0025	No	ND
HEXACHLOROBUTADIENE							0.79	0.79	MG/KG	0/9	0.00%		No	ND
HEXACHLOROCYCLOPENTADIENE							0.79	0.79	MG/KG	0/9	0.00%	10	No	ND
HEXACHLOROETHANE							0.79	0.79	MG/KG	0/9	0.00%		No	ND
INDENO(1,2,3-C,D)PYRENE	0.027	LJQK	SM110	1	=	SM95-SO-4	0.17	0.79	MG/KG	7/9	77.78%	1.2	No	BSL
ISOPHORONE							0.79	0.79	MG/KG	0/9	0.00%		No	ND
N-NITROSODI-N-PROPYLAMINE							0.79	0.79	MG/KG	0/9	0.00%	0.54368	No	ND
N-NITROSODIPHENYLAMINE							0.79	0.79	MG/KG	0/9	0.00%	20	No	ND
NAPHTHALENE	0.026	J	SM95-SO-5	0.18	J	SM95-SO-4	0.79	0.79	MG/KG	4/9	44.44%	0.1	Yes	ASL
NITROBENZENE							0.79	0.79	MG/KG	0/9	0.00%	40	No	ND
PENTACHLOROPHENOL							2	2	MG/KG	0/9	0.00%	0.032	No	ND
PHENANTHRENE	0.028	LJQK	SM110	1.2	=	SM95-SO-12	0.79	0.79	MG/KG	6/9	66.67%	0.1	Yes	ASL
PHENOL							0.79	0.79	MG/KG	0/9	0.00%	30	No	ND
PYRENE	0.034	LJQK	SM108	4	=	SM95-SO-12	0.17	0.79	MG/KG	7/9	77.78%	0.1	Yes	ASL
1,1,1-TRICHLOROETHANE	0.002	J	SM95-SO-12	0.002	J	SM95-SO-12	0.005	0.005	mg/kg	1/6	16.67%	0.1	No	BSL
1,1,2,2-TETRACHLOROETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,1,2-TRICHLOROETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,1-DICHLOROETHANE							0.005	0.005	mg/kg	0/6	0.00%	20.1	No	ND
1,1-DICHLOROETHENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,2,3-TRICHLOROBENZENE							0.005	0.005	mg/kg	0/6	0.00%	20	No	ND
1,2,4-TRICHLOROBENZENE							0.005	0.005	mg/kg	0/6	0.00%	20	No	ND
1,2-DIBROMO-3-CHLOROPROPANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,2-DICHLOROBENZENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,2-DICHLOROETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,2-DICHLOROPROPANE							0.005	0.005	mg/kg	0/6	0.00%	700	No	ND
1,3-DICHLOROBENZENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,4-DICHLOROBENZENE							0.005	0.005	mg/kg	0/6	0.00%	20	No	ND
1,4-DIOXANE (P-DIOXANE)							0.1	0.1	mg/kg	0/6	0.00%		No	ND
2-HEXANONE							0.01	0.01	mg/kg	0/6	0.00%	12.6	No	ND
ACETONE							0.01	0.01	mg/kg	0/6	0.00%	2.5	No	ND
BENZENE							0.005	0.005	mg/kg	0/6	0.00%	0.5	No	ND
BROMOCHLOROMETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
BROMODICHLOROMETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
BROMOFORM							0.005	0.005	mg/kg	0/6	0.00%		No	ND
BROMOMETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
CARBON DISULFIDE							0.005	0.005	mg/kg	0/6	0.00%	0.09412	No	ND
CARBON TETRACHLORIDE							0.005	0.005	mg/kg	0/6	0.00%	1000	No	ND
CHLOROBENZENE							0.005	0.005	mg/kg	0/6	0.00%	40	No	ND
CHLOROETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
CHLOROFORM							0.005	0.005	mg/kg	0/6	0.00%	25	No	ND
CHLOROMETHANE							0.005	0.005	mg/kg	0/6	0.00%	10.4	No	ND
CIS-1,2-DICHLOROETHYLENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
CIS-1,3-DICHLOROPROPENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
CYCLOHEXANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND

Table 14
Occurrence, distribution, and selection of chemicals of potential concern in the Maintenance Shed Area S
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Location:	Maintenance Shed Area
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
DIBROMOCHLOROMETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
DICHLORODIFLUOROMETHANE							0.005	0.005	mg/kg	0/6	0.00%	39.5	No	ND
ETHYLBENZENE							0.005	0.005	mg/kg	0/6	0.00%	5	No	ND
ISOPROPYLBENZENE (CUMENE)							0.005	0.005	mg/kg	0/6	0.00%		No	ND
M.P.-XYLENE (SUM OF ISOMERS)							0.005	0.005	mg/kg	0/6	0.00%		No	ND
METHYL ACETATE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
METHYL ETHYL KETONE (2-BUTANONE)							0.01	0.01	mg/kg	0/6	0.00%	89.6	No	ND
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)							0.01	0.01	mg/kg	0/6	0.00%	443	No	ND
METHYLCYCLOHEXANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
METHYLENE CHLORIDE	0.001	J	SM95-SO-6	0.001	J	SM95-SO-6	0.005	0.005	mg/kg	1/6	16.67%	2	No	BSL
O-XYLENE (1,2-DIMETHYLBENZENE)							0.005	0.005	mg/kg	0/6	0.00%	200	No	ND
STYRENE							0.005	0.005	mg/kg	0/6	0.00%	300	No	ND
TERT-BUTYL METHYL ETHER							0.005	0.005	mg/kg	0/6	0.00%		No	ND
TETRACHLOROETHYLENE(PCE)							0.005	0.005	mg/kg	0/6	0.00%		No	ND
TOLUENE							0.005	0.005	mg/kg	0/6	0.00%	200	No	ND
TRANS-1,2-DICHLOROETHENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
TRANS-1,3-DICHLOROPROPENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
TRICHLOROETHYLENE (TCE)							0.005	0.005	mg/kg	0/6	0.00%		No	ND
TRICHLOROFLUOROMETHANE							0.005	0.005	mg/kg	0/6	0.00%	16.4	No	ND
VINYL CHLORIDE							0.005	0.005	mg/kg	0/6	0.00%		No	ND

Rationale for Elimination/Selection
 ASL: Above Screening Levels
 BSL: Below Screening Level
 ND: Not Detected
 NSL: No Screening Level
 NUT: Essential Nutrient
 AI-SSL: Based on EPA Eco-SSL, only a COPC if pH<5.5 (USEPA 2003)
 Fe-SSL: Based on EPA Eco-SSL, not a COPC if 5<pH<8
 TOT: No individual compound exceedance because total PAHs were below benchmark
 BAC: Bioaccumulative Compound
 GRA: Eliminated based upon gradient analysis
 TTL: Total PAHs is less than the individual benchmarks, so total PAHs is eliminated
 FD: Frequency of Detection (less than 5%)
 BKGD: Eliminated based on detection less than site-specific background

Qualifier:
 J: Estimated Value
 B: Value is less than the Contract Required Detection Limit, and greater than the Instrument Detection Limit.
 JL: estimated low value
 JH: estimated high value
 mg/kg: milligram per kilogram

Table 15

Occurrence, distribution, and selection of chemicals of potential concern in the Tar Burn Area Soil
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Tar Burn Area
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
ALUMINUM	3510	=	SM114	17900	=	SM113		60.3	MG/KG	4/4	100.00%	0	No	AI-SSL
ANTIMONY	1.3	LJvQ	SM115	6	LJvQ	SM114		18.1	MG/KG	4/4	100.00%	0.3	Yes	ASL
ARSENIC	4.3	JvL	SM115	7.9	JvL	SM112		3	MG/KG	4/4	100.00%	31	No	BKGD
BARIUM	89.6	=	SM112	146	=	SM114		80.3	MG/KG	4/4	100.00%	330	No	BKGD
BERYLLIUM	0.32	LQ	SM114	0.7	LQ	SM113		1.5	MG/KG	4/4	100.00%	30	No	BKGD
CADMIUM	0.37	LQ	SM115	1.1	LQ	SM113	0.16	1.5	MG/KG	3/4	75.00%	0.4	Yes	ASL
CADMIUM	0.37	LQ	SM115	1.1	LQ	SM114	0.16	1.5	MG/KG	3/4	75.00%	0.4	Yes	ASL
CHROMIUM, TOTAL	10.1	=	SM112	22.5	=	SM114		3	MG/KG	4/4	100.00%	7.9	No	BKGD
COBALT	3.3	LQ	SM115	6.7	LQ	SM112		15.1	MG/KG	4/4	100.00%	32	No	BKGD
COPPER	17.4	=	SM112	155	=	SM114		7.5	MG/KG	4/4	100.00%	54	Yes	ASL
CYANIDE	0.24	LQ	SM115	0.24	LQ	SM115	0.14	0.63	MG/KG	1/4	25.00%	0.9	No	BKGD
IRON	12000	=	SM115	18200	=	SM113		30.2	MG/KG	4/4	100.00%	0	No	Fe-SSL
LEAD	38.7	JK	SM112	967	JK	SM114		0.9	MG/KG	4/4	100.00%	15	No	BKGD
MANGANESE	182	JvL	SM115	413	JvL	SM113		4.5	MG/KG	4/4	100.00%	152	No	BKGD
MERCURY	0.06	LQ	SM115	0.31	=	SM114		0.15	MG/KG	4/4	100.00%	0.1	Yes	ASL
NICKEL	8	LQ	SM115	26.2	=	SM114		12.1	MG/KG	4/4	100.00%	48	No	BKGD
SELENIUM							1.4	1.4	MG/KG	0/4	0.00%	1	No	BKGD
SILVER	0.8	LQ	SM114	1	LQ	SM113		3	MG/KG	4/4	100.00%	2	No	BSL
THALLIUM	1.3	LQ	SM115	1.3	LQ	SM115	1.4	2.5	MG/KG	1/4	25.00%	1	No	BKGD
VANADIUM	11.6	LQ	SM114	17	=	SM115		15.1	MG/KG	4/4	100.00%	2	No	BKGD
ZINC	96.3	=	SM112	424	=	SM114		6	MG/KG	4/4	100.00%	120	Yes	ASL
2,2-OXYBIS(1-CHLORO)PROPANE							0.81	0.81	MG/KG	0/4	0.00%		No	ND
2,4,5-TRICHLOROPHENOL							2	2	MG/KG	0/4	0.00%	1.3	No	ND
2,4,6-TRICHLOROPHENOL							0.81	0.81	MG/KG	0/4	0.00%	10	No	ND
2,4-DICHLOROPHENOL							0.81	0.81	MG/KG	0/4	0.00%	20	No	ND
2,4-DIMETHYLPHENOL							0.81	0.81	MG/KG	0/4	0.00%		No	ND
2,4-DINITROPHENOL							2	2	MG/KG	0/4	0.00%	20	No	ND
2,4-DINITROTOLUENE							0.81	0.81	MG/KG	0/4	0.00%	3.2	No	ND
2,6-DINITROTOLUENE							0.81	0.81	MG/KG	0/4	0.00%	0.03283	No	ND
2-CHLORONAPHTHALENE							0.81	0.81	MG/KG	0/4	0.00%	1	No	ND
2-CHLOROPHENOL							0.81	0.81	MG/KG	0/4	0.00%	20	No	ND
2-METHYLNAPHTHALENE	0.025	LJQK	SM114	0.042	LJQK	SM115	0.47	0.81	MG/KG	2/4	50.00%	0.1	Yes	DL
2-METHYLPHENOL (O-CRESOL)							0.81	0.81	MG/KG	0/4	0.00%	0.5	No	ND
2-NITROANILINE							2	2	MG/KG	0/4	0.00%		No	ND
2-NITROPHENOL							0.81	0.81	MG/KG	0/4	0.00%		No	ND
3,3'-DICHLOROBENZIDINE							0.81	0.81	MG/KG	0/4	0.00%		No	ND
3-NITROANILINE							2	2	MG/KG	0/4	0.00%		No	ND
4,6-DINITRO-2-METHYLPHENOL							2	2	MG/KG	0/4	0.00%		No	ND
4-BROMOPHENYL PHENYL ETHER							0.81	0.81	MG/KG	0/4	0.00%		No	ND
4-CHLORO-3-METHYLPHENOL							0.81	0.81	MG/KG	0/4	0.00%	7.95	No	ND
4-CHLOROANILINE							0.81	0.81	MG/KG	0/4	0.00%		No	ND
4-CHLOROPHENYL PHENYL ETHER							0.81	0.81	MG/KG	0/4	0.00%		No	ND
4-METHYLPHENOL (P-CRESOL)							0.81	0.81	MG/KG	0/4	0.00%	0.5	No	ND
4-NITROANILINE							2	2	MG/KG	0/4	0.00%		No	ND
4-NITROPHENOL							2	2	MG/KG	0/4	0.00%	7	No	ND
ACENAPHTHENE	0.035	LJQK	SM115	0.035	LJQK	SM115	0.49	0.81	MG/KG	1/4	25.00%	20	No	BSL
ACENAPHTHYLENE	0.053	LJQK	SM114	0.45	LJQK	SM115	0.44	0.81	MG/KG	3/4	75.00%	1.7	No	BSL
ACETOPHENONE	0.027	LJQK	SM113	2	=	SM115	0.49	0.81	MG/KG	2/4	50.00%	300	No	BSL
ANTHRACENE	0.014	Q	SM112	0.39	LJQK	SM115		0.81	MG/KG	4/4	100.00%	0.1	Yes	ASL
ATRAZINE							0.81	0.81	MG/KG	0/4	0.00%	0.00005	No	ND
BENZALDEHYDE	0.025	LJQK	SM114	6.3	=	SM115	0.44	0.81	MG/KG	3/4	75.00%		Yes	NSL
BENZO(A)ANTHRACENE	0.065	Q	SM112	0.92	=	SM115		0.81	MG/KG	4/4	100.00%	1.2	No	ASL
BENZO(A)PYRENE	0.075	Q	SM112	1.2	=	SM115		0.81	MG/KG	4/4	100.00%	0.1	Yes	ASL
BENZO(B)FLUORANTHENE	0.15	Q	SM112	1.2	=	SM115		0.81	MG/KG	4/4	100.00%	1.2	No	BSL
BENZO(G,H)PERYLENE	0.061	Q	SM112	0.46	LJQK	SM115		0.81	MG/KG	4/4	100.00%	119	No	BSL
BENZO(K)FLUORANTHENE	0.056	Q	SM112	1.4	=	SM115		0.81	MG/KG	4/4	100.00%	25	No	BSL
BENZYL BUTYL PHTHALATE	0.051	LJQK	SM115	0.52	=	SM114	0.47	0.81	MG/KG	2/4	50.00%	0.23889	Yes	ASL
BIPHENYL (DIPHENYL)							0.81	0.81	MG/KG	0/4	0.00%	60	No	ND
BIS(2-CHLOROETHOXY) METHANE							0.81	0.81	MG/KG	0/4	0.00%		No	ND
BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)							0.81	0.81	MG/KG	0/4	0.00%		No	ND
BIS(2-ETHYLHEXYL) PHTHALATE	0.3	LJQK	SM115	4.7	D	SM114	0.5	0.99	MG/KG	2/4	50.00%	0.92594	Yes	ASL
CAPROLACTAM							0.81	0.81	MG/KG	0/4	0.00%		No	ND
CARBAZOLE	0.081	LJQK	SM114	0.29	LJQK	SM115	0.44	0.81	MG/KG	3/4	75.00%		Yes	NSL
CHRYSENE	0.098	Q	SM112	1.1	=	SM115		0.81	MG/KG	4/4	100.00%	4.73	No	BSL
DI-N-BUTYL PHTHALATE	0.034	LJQK	SM114	0.034	LJQK	SM114	0.81	0.81	MG/KG	1/4	25.00%	200	No	BSL
DI-N-OCTYLPHTHALATE							0.81	0.81	MG/KG	0/4	0.00%	709	No	ND
DIBENZ(A,H)ANTHRACENE	0.017	Q	SM112	0.23	LJQK	SM115		0.81	MG/KG	4/4	100.00%	1.2	No	BSL
DIBENZOFURAN	0.044	LJQK	SM115	0.044	LJQK	SM115	0.49	0.81	MG/KG	1/4	25.00%		Yes	NSL
DIETHYL PHTHALATE							0.81	0.81	MG/KG	0/4	0.00%	100	No	ND
DIMETHYL PHTHALATE							0.81	0.81	MG/KG	0/4	0.00%	200	No	ND
FLUORANTHENE	0.097	Q	SM112	1.9	=	SM115		0.81	MG/KG	4/4	100.00%	0.1	Yes	ASL
FLUORENE	0.019	LJQK	SM114	0.12	LJQK	SM115	0.47	0.81	MG/KG	2/4	50.00%	30	No	BSL
HEXACHLOROBENZENE							0.81	0.81	MG/KG	0/4	0.00%	0.0025	No	ND
HEXACHLOROBUTADIENE							0.81	0.81	MG/KG	0/4	0.00%		No	ND
HEXACHLOROCYCLOPENTADIENE							0.81	0.81	MG/KG	0/4	0.00%	10	No	ND
HEXACHLOROETHANE							0.81	0.81	MG/KG	0/4	0.00%		No	ND
INDENO(1,2,3-C,D)PYRENE	0.07	Q	SM112	0.74	LJQK	SM115		0.81	MG/KG	4/4	100.00%	1.2	No	BSL
ISOPHORONE							0.81	0.81	MG/KG	0/4	0.00%		No	ND
N-NITROSODI-N-PROPYLAMINE							0.81	0.81	MG/KG	0/4	0.00%	0.54368	No	ND
N-NITROSODIPHENYLAMINE							0.81	0.81	MG/KG	0/4	0.00%	20	No	ND
NAPHTHALENE	0.028	LJQK	SM114	0.052	LJQK	SM115	0.47	0.81	MG/KG	2/4	50.00%	0.1	Yes	DL
NITROBENZENE							0.81	0.81	MG/KG	0/4	0.00%	40	No	ND

Table 15

Occurrence, distribution, and selection of chemicals of potential concern in the Tar Burn Area Soil

Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Tar Burn Area
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
PENTACHLOROPHENOL							2	2	MG/KG	0/4	0.00%	0.032	No	ND
PHENANTHRENE	0.051	Q	SM112	0.93	=	SM115	0.81	0.81	MG/KG	4/4	100.00%	0.1	Yes	ASL
PHENOL							0.81	0.81	MG/KG	0/4	0.00%	30	No	ND
PYRENE	0.12	Q	SM112	1.5	=	SM115	0.81	0.81	MG/KG	4/4	100.00%	0.1	Yes	ASL

Rationale for Elimination/Selection:
 ASL: Above Screening Levels
 BSL: Below Screening Levels
 NSL: Not Detected
 NSL: No Screening Level
 NUT: Essential Nutrient
 AI-SSL: Based on EPA Eco-SSL, only a COPC if pH<5.5 (USEPA 2003)
 Fe-SSL: Based on EPA Eco-SSL, not a COPC if 5<pH<8
 TOT: No individual compound exceedance because total PAHs were below benchmark
 BAC: Bioaccumulative Compound
 GRA: Eliminated based upon gradient analysis
 TTL: Total PAHs is less than the individual benchmarks, so total PAHs is eliminated
 FD: Frequency of Detection (less than 5%)
 BKGD: Eliminated based on detection less than site-specific background

Qualifier:
 J: Estimated Value
 B: Value is less than the Contract Required Detection Limit, and greater than the Instrument Detection Limit.
 JL: estimated low value
 JH: estimated high value
 mg/kg: milligram per kilogram

Table 16

Occurrence, distribution, and selection of chemicals of potential concern in the Former Lauren Tank Farm Soil
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Former Lauren Tank Farm
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection	
ALUMINUM	3420	=	SM95-SO-30	10200	=	SM95-SO-28		54.8	MG/KG	13/13	100.00%	0	No	AI-SSL	
ANTIMONY	1.4	LjvQ	SM106	4.6	LjvQ	SM107	1.2	15.6	MG/KG	2/13	15.38%	0.3	No	BKGD	
ARSENIC	4.1	=	SM102	26.4	=	SM107		2.7	MG/KG	13/13	100.00%	31	No	BKGD	
BARIUM	63.8	=	SM95-SO-11	289	=	SM107		54.8	MG/KG	13/13	100.00%	330	No	BKGD	
BERYLLIUM	0.12	LQ	SM107	1.7	=	SM95-SO-29	0.55	1.4	MG/KG	10/13	76.92%	30	No	BKGD	
CADMIUM	0.48	=	SM95-SO-30	0.88	=	SM104	0.34	1.4	MG/KG	5/13	38.46%	0.4	Yes	ASL	
CHROMIUM, TOTAL	6.3	=	SM95-SO-11	503	JK	SM107		2.7	MG/KG	13/13	100.00%	7.9	No	BKGD	
COBALT	3	LQ	SM102	19.1	=	SM107		13.7	MG/KG	13/13	100.00%	32	No	BKGD	
COBALT	3	LQ	SM105	19.1	=	SM107		13.7	MG/KG	13/13	100.00%	32	No	BKGD	
COPPER	8.5	=	SM95-SO-11	7390	=	SM107		6.8	MG/KG	13/13	100.00%	54	Yes	ASL	
CYANIDE	0.98	=	SM95-SO-7	0.98	=	SM95-SO-7	0.71	0.71	MG/KG	1/13	7.69%	0.9	No	BKGD	
IRON	8470	=	SM102	134000	=	SM107		27.4	MG/KG	13/13	100.00%	0	No	Fe-SSL	
LEAD	15.7	=	SM95-SO-11	1030	=	SM107		0.82	MG/KG	13/13	100.00%	15	Yes	ASL	
MANGANESE	41.8	J	SM95-SO-11	1020	=	SM107		4.1	MG/KG	13/13	100.00%	152	No	BKGD	
MERCURY	0.1	LQ	SM102	5.8	JH	SM107	0.14	0.14	MG/KG	5/12	41.67%	0.1	No	BKGD	
NICKEL	3.4	=	SM95-SO-11	411	=	SM107		11	MG/KG	13/13	100.00%	48	No	BKGD	
SELENIUM	0.75	LQ	SM104	4.4	=	SM107	0.85	1.4	MG/KG	3/13	23.08%	1	No	BKGD	
SILVER	0.28	LQ	SM102	6.9	=	SM107	0.58	2.7	MG/KG	7/13	53.85%	2	No	BKGD	
THALLIUM	1	LQ	SM104	1.4	=	SM95-SO-28	2.7	2.7	MG/KG	2/13	15.38%	1	No	BKGD	
VANADIUM	11.8	LQ	SM102	19.3	=	SM95-SO-28		13.7	MG/KG	13/13	100.00%	2	No	BKGD	
VANADIUM	11.8	LQ	SM102	19.3	=	SM95-SO-29		13.7	MG/KG	13/13	100.00%	2	No	BKGD	
ZINC	27.1	=	SM95-SO-8	1480	=	SM107		5.5	MG/KG	13/13	100.00%	120	Yes	ASL	
ALDRIN							0.0017	0.0017	mg/kg	0/6	0.00%	0.0025	No	ND	
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/6	0.00%		No	ND	
ALPHA ENDO SULFAN							0.0017	0.0017	mg/kg	0/6	0.00%		No	ND	
ALPHA-CHLORDANE	13	=	SM95-SO-7	13	=	SM95-SO-7		0.0017	0.0017	mg/kg	1/6	16.67%	Yes	NSL	
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/6	0.00%		No	ND	
BETA ENDO SULFAN							0.0033	0.0033	mg/kg	0/6	0.00%		No	ND	
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/6	0.00%		No	ND	
DIELDRIN	0.0053	J	SM95-SO-7	0.0053	J	SM95-SO-7		0.0033	0.0033	mg/kg	1/6	16.67%	0.000032	Yes	ASL
ENDOSULFAN SULFATE							0.0033	0.0033	mg/kg	0/6	0.00%		No	ND	
ENDRIN							0.0033	0.0033	mg/kg	0/6	0.00%		No	ND	
ENDRIN ALDEHYDE	11	T	SM95-SO-30	11	T	SM95-SO-30		0.0033	0.0033	mg/kg	1/6	16.67%	Yes	NSL	
ENDRIN KETONE							0.0033	0.0033	mg/kg	0/6	0.00%		No	ND	
GAMMA BHC (LINDANE)							0.0017	0.0017	mg/kg	0/6	0.00%		No	ND	
GAMMA-CHLORDANE	0.0078	J	SM95-SO-7	0.0078	J	SM95-SO-7		0.0017	0.0017	mg/kg	1/6	16.67%	Yes	NSL	
HEPTACHLOR	0.0031	J	SM95-SO-7	0.0031	J	SM95-SO-7		0.0017	0.0017	mg/kg	1/6	16.67%	Yes	NSL	
HEPTACHLOR EPOXIDE							0.0017	0.0017	mg/kg	0/6	0.00%		No	ND	
METHOXYCHLOR							0.017	0.017	mg/kg	0/6	0.00%		No	ND	
P,P'-DDD	0.0091	J	SM95-SO-7	0.0091	J	SM95-SO-7		0.0033	0.0033	mg/kg	1/6	16.67%	Yes	NSL	
P,P'-DDE							0.0033	0.0033	mg/kg	0/6	0.00%		No	ND	
P,P'-DDT	0.0076	J	SM95-SO-7	0.0076	J	SM95-SO-7		0.0033	0.0033	mg/kg	1/6	16.67%	Yes	NSL	
PCB-1016 (AROCHLOR 1016)							0.033	0.033	mg/kg	0/6	0.00%	40	No	ND	
PCB-1221 (AROCHLOR 1221)							0.033	0.033	mg/kg	0/6	0.00%	40	No	ND	
PCB-1232 (AROCHLOR 1232)							0.033	0.033	mg/kg	0/6	0.00%	40	No	ND	
PCB-1242 (AROCHLOR 1242)							0.033	0.033	mg/kg	0/6	0.00%	40	No	ND	
PCB-1248 (AROCHLOR 1248)	0.46	J	SM95-SO-28	0.58	J	SM95-SO-29		0.033	0.033	mg/kg	2/6	33.33%	10	No	BSL
PCB-1254 (AROCHLOR 1254)							0.033	0.033	mg/kg	0/6	0.00%	10	No	ND	
PCB-1260 (AROCHLOR 1260)							0.033	0.033	mg/kg	0/6	0.00%	10	No	ND	
TOXAPHENE							0.17	0.17	mg/kg	0/6	0.00%		No	ND	
1,2,4,5-TETRACHLOROBENZENE							0.17	0.17	mg/kg	0/6	0.00%		No	ND	
2,2'-OXYBIS(1-CHLORO)PROPANE							4.4	4.4	MG/KG	0/13	0.00%		No	ND	
2,3,4,6-TETRACHLOROPHENOL							0.17	0.17	mg/kg	0/6	0.00%	20	No	ND	
2,4,5-TRICHLOROPHENOL							11	11	MG/KG	0/13	0.00%	1.3	No	ND	
2,4,6-TRICHLOROPHENOL							4.4	4.4	MG/KG	0/13	0.00%	10	No	ND	
2,4-DICHLOROPHENOL							4.4	4.4	MG/KG	0/13	0.00%	20	No	ND	
2,4-DIMETHYLPHENOL							4.4	4.4	MG/KG	0/13	0.00%		No	ND	
2,4-DINITROPHENOL							11	11	MG/KG	0/13	0.00%	20	No	ND	
2,4-DINITROTOLUENE							4.4	4.4	MG/KG	0/13	0.00%	3.2	No	ND	
2,6-DINITROTOLUENE							4.4	4.4	MG/KG	0/13	0.00%	0.03283	No	ND	
2-CHLORONAPHTHALENE							4.4	4.4	MG/KG	0/13	0.00%	1	No	ND	
2-CHLOROPHENOL							4.4	4.4	MG/KG	0/13	0.00%	20	No	ND	
2-METHYLNAPHTHALENE	0.022	J	SM95-SO-30	1.6	LJQK	SM107		0.43	4.4	MG/KG	8/13	61.54%	0.1	Yes	ASL
2-METHYLPHENOL (O-CRESOL)							4.4	4.4	MG/KG	0/13	0.00%	0.5	No	ND	
2-NITROANILINE							11	11	MG/KG	0/13	0.00%		No	ND	
2-NITROPHENOL							4.4	4.4	MG/KG	0/13	0.00%		No	ND	
3,3'-DICHLOROBENZIDINE							4.4	4.4	MG/KG	0/13	0.00%		No	ND	
3-NITROANILINE							11	11	MG/KG	0/13	0.00%		No	ND	
4,6-DINITRO-2-METHYLPHENOL							11	11	MG/KG	0/13	0.00%		No	ND	
4-BROMOPHENYL PHENYL ETHER							4.4	4.4	MG/KG	0/13	0.00%		No	ND	
4-CHLORO-3-METHYLPHENOL							4.4	4.4	MG/KG	0/13	0.00%	7.95	No	ND	
4-CHLOROANILINE							4.4	4.4	MG/KG	0/13	0.00%		No	ND	
4-CHLOROPHENYL PHENYL ETHER							4.4	4.4	MG/KG	0/13	0.00%		No	ND	
4-METHYLPHENOL (P-CRESOL)	0.11	LJQ	SM106	0.11	LJQ	SM106		4.4	4.4	MG/KG	1/13	7.69%	0.5	Yes	DL
4-NITROANILINE							11	11	MG/KG	0/13	0.00%		No	ND	
4-NITROPHENOL							11	11	MG/KG	0/13	0.00%	7	No	ND	
ACENAPHTHENE	0.031	J	SM95-SO-7	0.064	LJQ	SM106		4.4	4.4	MG/KG	2/13	15.38%	20	No	BSL
ACENAPHTHYLENE	0.036	LJQ	SM104	0.91	LJQ	SM106		0.17	4.4	MG/KG	9/13	69.23%	1.7	Yes	DL
ACETOPHENONE	0.023	LJQ	SM104	0.25	LJQK	SM101		0.45	4.4	MG/KG	6/13	46.15%	300	No	BSL
ANTHRACENE	0.031	LJQK	SM102	1.1	LJQK	SM107		0.17	4.4	MG/KG	9/13	69.23%	0.1	Yes	ASL
ATRAZINE							4.4	4.4	MG/KG	0/13	0.00%	0.00005	No	ND	
BENZALDEHYDE	0.021	LJQ	SM104	0.097	LJQ	SM106		4.4	4.4	MG/KG	5/13	38.46%	Yes	NSL	

Table 16

Occurrence, distribution, and selection of chemicals of potential concern in the Former Lauren Tank Farm Soil
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Former Lauren Tank Farm
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
BENZO(A)ANTHRACENE	0.03	LJQ	SM104	4.2	=	SM106	4.4	4.4	MG/KG	8/13	61.54%	1.2	Yes	ASL
BENZO(A)PYRENE	0.046	LJQK	SM105	5.1	=	SM106	4.4	4.4	MG/KG	10/13	76.92%	0.1	Yes	ASL
BENZO(B)FLUORANTHENE	0.063	LJQ	SM104	7.1	=	SM106	0.17	4.4	MG/KG	11/13	84.62%	1.2	Yes	ASL
BENZO(G,H)PERYLENE	0.059	LJQ	SM104	2.1	JK	SM106	4.4	4.4	MG/KG	10/13	76.92%	119	No	BSL
BENZO(K)FLUORANTHENE	0.023	LJQK	SM105	2.5	=	SM106	4.4	4.4	MG/KG	8/13	61.54%	25	No	BSL
BENZYL BUTYL PHTHALATE	0.024	LJQK	SM103	0.024	LJQK	SM103	4.4	4.4	MG/KG	1/13	7.69%	0.23889	Yes	DL
BIPHENYL (DIPHENYL)	0.018	LJQK	SM101	0.21	LJQ	SM106	4.4	4.4	MG/KG	2/13	15.38%	60	No	BSL
BIS(2-CHLOROETHOXY) METHANE							4.4	4.4	MG/KG	0/13	0.00%		No	ND
BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)							4.4	4.4	MG/KG	0/13	0.00%		No	ND
BIS(2-ETHYLHEXYL) PHTHALATE	0.094	LJQK	SM101	1.9	BJH	SM104	4.4	4.4	MG/KG	7/13	53.85%	0.92594	Yes	ASL
CAPROLACTAM							4.4	4.4	MG/KG	0/13	0.00%		No	ND
CARBAZOLE	0.03	J	SM95-SO-7	0.52	LJQ	SM106	4.4	4.4	MG/KG	3/13	23.08%		Yes	NSL
CHRYSENE	0.039	LJQK	SM102	5.4	=	SM106	4.4	4.4	MG/KG	10/13	76.92%	4.73	Yes	ASL
DI-N-BUTYL PHTHALATE	0.056	LJQ	SM104	0.056	LJQ	SM104	4.4	4.4	MG/KG	1/13	7.69%	200	No	BSL
DI-N-OCTYL PHTHALATE	0.013	LJQK	SM101	0.034	J	SM95-SO-28	4.4	4.4	MG/KG	3/13	23.08%	709	No	BSL
DIBENZO(A,H)ANTHRACENE	0.022	LJQK	SM102	0.94	LJQ	SM106	4.4	4.4	MG/KG	8/13	61.54%	1.2	Yes	DL
DIBENZOFURAN	0.017	LJQK	SM101	0.13	LJQ	SM106	4.4	4.4	MG/KG	2/13	15.38%		Yes	NSL
DIETHYL PHTHALATE							4.4	4.4	MG/KG	0/13	0.00%	100	No	ND
DIMETHYL PHTHALATE	0.025	J	SM95-SO-11	0.031	J	SM95-SO-30	4.4	4.4	MG/KG	2/13	15.38%	200	No	BSL
FLUORANTHENE	0.029	LJQK	SM105	7.6	=	SM106	0.17	4.4	MG/KG	11/13	84.62%	0.1	Yes	ASL
FLUORENE	0.029	LJQK	SM101	0.18	LJQ	SM106	4.4	4.4	MG/KG	3/13	23.08%	30	No	BSL
HEXACHLOROBENZENE							4.4	4.4	MG/KG	0/13	0.00%	0.0025	No	ND
HEXACHLOROBUTADIENE							4.4	4.4	MG/KG	0/13	0.00%		No	ND
HEXACHLOROCYCLOPENTADIENE							4.4	4.4	MG/KG	0/13	0.00%	10	No	ND
HEXACHLOROETHANE							4.4	4.4	MG/KG	0/13	0.00%		No	ND
INDENO(1,2,3-C,D)PYRENE	0.038	LJQ	SM104	2.2	JK	SM106	0.17	4.4	MG/KG	11/13	84.62%	1.2	Yes	ASL
ISOPHORONE							4.4	4.4	MG/KG	0/13	0.00%		No	ND
N-NITROSODI-N-PROPYLAMINE							4.4	4.4	MG/KG	0/13	0.00%	0.54368	No	ND
N-NITROSODIPHENYLAMINE							4.4	4.4	MG/KG	0/13	0.00%	20	No	ND
NAPHTHALENE	0.023	LJQ	SM104	1.4	LJQ	SM106	0.43	4.4	MG/KG	8/13	61.54%	0.1	Yes	ASL
NAPHTHALENE	0.023	LJQK	SM105	1.4	LJQ	SM106	0.43	4.4	MG/KG	8/13	61.54%	0.1	Yes	ASL
NITROBENZENE							4.4	4.4	MG/KG	0/13	0.00%	40	No	ND
PENTACHLOROPHENOL							11	11	MG/KG	0/13	0.00%	0.032	No	ND
PHENANTHRENE	0.017	LJQK	SM102	2	LJQ	SM106	0.17	4.4	MG/KG	9/13	69.23%	0.1	Yes	ASL
PHENOL							4.4	4.4	MG/KG	0/13	0.00%	30	No	ND
PYRENE	0.042	LJQ	SM104	7.4	=	SM106	0.17	4.4	MG/KG	11/13	84.62%	0.1	Yes	ASL
1,1,1-TRICHLOROETHANE							0.005	0.005	mg/kg	0/6	0.00%	0.1	No	ND
1,1,2,2-TETRACHLOROETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,1,2-TRICHLOROETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,1-DICHLOROETHANE							0.005	0.005	mg/kg	0/6	0.00%	20.1	No	ND
1,1-DICHLOROETHENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,2,3-TRICHLOROBENZENE							0.005	0.005	mg/kg	0/6	0.00%	20	No	ND
1,2,4-TRICHLOROBENZENE							0.005	0.005	mg/kg	0/6	0.00%	20	No	ND
1,2-DIBROMO-3-CHLOROPROPANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,2-DICHLOROBENZENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,2-DICHLOROETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,2-DICHLOROPROPANE							0.005	0.005	mg/kg	0/6	0.00%	700	No	ND
1,3-DICHLOROBENZENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
1,4-DICHLOROBENZENE							0.005	0.005	mg/kg	0/6	0.00%	20	No	ND
1,4-DIOXANE (P-DIOXANE)							0.1	0.1	mg/kg	0/6	0.00%		No	ND
2-HEXANONE							0.01	0.01	mg/kg	0/6	0.00%	12.6	No	ND
ACETONE	0.003	*	SM95-SO-28	0.055	J	SM95-SO-30	0.01	0.01	mg/kg	3/6	50.00%	2.5	No	BSL
BENZENE							0.005	0.005	mg/kg	0/6	0.00%	0.5	No	ND
BROMOCHLOROMETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
BROMODICHLOROMETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
BROMOFORM							0.005	0.005	mg/kg	0/6	0.00%		No	ND
BROMOMETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
CARBON DISULFIDE							0.005	0.005	mg/kg	0/6	0.00%	0.09412	No	ND
CARBON TETRACHLORIDE							0.005	0.005	mg/kg	0/6	0.00%	1000	No	ND
CHLOROBENZENE							0.005	0.005	mg/kg	0/6	0.00%	40	No	ND
CHLOROETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
CHLOROFORM							0.005	0.005	mg/kg	0/6	0.00%	25	No	ND
CHLOROMETHANE							0.005	0.005	mg/kg	0/6	0.00%	10.4	No	ND
CIS-1,2-DICHLOROETHYLENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
CIS-1,3-DICHLOROPROPENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
CYCLOHEXANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
DIBROMOCHLOROMETHANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
DICHLORODIFLUOROMETHANE							0.005	0.005	mg/kg	0/6	0.00%	39.5	No	ND
ETHYLBENZENE							0.005	0.005	mg/kg	0/6	0.00%	5	No	ND
ISOPROPYLBENZENE (CUMENE)							0.005	0.005	mg/kg	0/6	0.00%		No	ND
M,P-XYLENE (SUM OF ISOMERS)							0.005	0.005	mg/kg	0/6	0.00%		No	ND
METHYL ACETATE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
METHYL ETHYL KETONE (2-BUTANONE)	0.002	*	SM95-SO-29	0.002	*	SM95-SO-29	0.01	0.01	mg/kg	2/6	33.33%	89.6	No	BSL
METHYL ETHYL KETONE (2-BUTANONE)	0.002	*	SM95-SO-29	0.002	J	SM95-SO-8	0.01	0.01	mg/kg	2/6	33.33%	89.6	No	BSL
METHYL ETHYL KETONE (2-BUTANONE)	0.002	J	SM95-SO-8	0.002	*	SM95-SO-29	0.01	0.01	mg/kg	2/6	33.33%	89.6	No	BSL
METHYL ETHYL KETONE (2-BUTANONE)	0.002	J	SM95-SO-8	0.002	J	SM95-SO-8	0.01	0.01	mg/kg	2/6	33.33%	89.6	No	BSL
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)							0.01	0.01	mg/kg	0/6	0.00%	443	No	ND
METHYLCYCLOHEXANE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
METHYLENE CHLORIDE							0.005	0.005	mg/kg	0/6	0.00%	2	No	ND
O-XYLENE (1,2-DIMETHYLBENZENE)							0.005	0.005	mg/kg	0/6	0.00%	200	No	ND

Table 16

Occurrence, distribution, and selection of chemicals of potential concern in the Former Lauren Tank Farm Soil
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location: Former Lauren Tank Farm
 Medium: Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
STYRENE							0.005	0.005	mg/kg	0/6	0.00%	300	No	ND
TERT-BUTYL METHYL ETHER							0.005	0.005	mg/kg	0/6	0.00%		No	ND
TETRACHLOROETHYLENE(PCE)							0.005	0.005	mg/kg	0/6	0.00%		No	ND
TOLUENE							0.005	0.005	mg/kg	0/6	0.00%	200	No	ND
TRANS-1,2-DICHLOROETHENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
TRANS-1,3-DICHLOROPROPENE							0.005	0.005	mg/kg	0/6	0.00%		No	ND
TRICHLOROETHYLENE (TCE)							0.005	0.005	mg/kg	0/6	0.00%		No	ND
TRICHLOROFLUOROMETHANE							0.005	0.005	mg/kg	0/6	0.00%	16.4	No	ND
VINYL CHLORIDE							0.005	0.005	mg/kg	0/6	0.00%		No	ND

Rationale for Elimination/Selection:
 ASL: Above Screening Levels
 BSL: Below Screening Level
 ND: Not Detected
 NSL: No Screening Level
 NUT: Essential Nutrient
 AI-SSL: Based on EPA Eco-SSL, only a COPC if pH<5.5 (USEPA 2003)
 Fe-SSL: Based on EPA Eco-SSL, not a COPC if 5<pH<8
 TOT: No individual compound exceedance because total PAHs were below benchmark
 BAC: Bioaccumulative Compound
 GRA: Eliminated based upon gradient analysis
 TTL: Total PAHs is less than the individual benchmarks, so total PAHs is eliminated
 FD: Frequency of Detection (less than 5%)
 BKGD: Eliminated based on detection less than site-specific background

Qualifier:
 J: Estimated Value
 B: Value is less than the Contract Required Detection Limit, and greater than the Instrument Detection Limit.
 JL: estimated low value
 JH: estimated high value
 mg/kg: milligram per kilogram

Table 17
Occurrence, distribution, and selection of chemicals of potential concern in the Non-source Sc
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Location:	Non-source
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
ALUMINUM	841	=	SM081	19600	=	SM082		60	MG/KG	54/54	100.00%	0	No	AI-SSL
ANTIMONY	0.8	LJvQ	SM047	26.3	JvL	SM085	0.89	5.7	MG/KG	27/47	57.45%	0.3	No	BKGD
ARSENIC	1.7	LQ	SM097	48.7	=	SM098	5.7	18	MG/KG	52/54	96.30%	31	No	BKGD
BARIIUM	40.7	LQ	SM051	682	=	SM077		60	MG/KG	54/54	100.00%	330	No	BKGD
BERYLLIUM	0.12	LQ	SM081	27	=	SM95-SO-13	0.41	1.5	MG/KG	51/54	94.44%	30	No	BKGD
CADMIUM	0.18	LQ	SM058	11.5	=	SM098	0.24	1.5	MG/KG	25/54	46.30%	0.4	Yes	ASL
CHROMIUM, TOTAL	2.6	JK	SM081	81.7	=	SM098		3	MG/KG	54/54	100.00%	7.9	No	BKGD
COBALT	0.81	LQ	SM081	65.6	=	SM95-SO-13		15	MG/KG	54/54	100.00%	32	No	BKGD
COPPER	5.6	LQ	SM073	5480	JvL	SM078		7.5	MG/KG	54/54	100.00%	54	Yes	ASL
CYANIDE	0.12	LQ	SM079	0.37	LQ	SM058	0.56	0.68	MG/KG	8/54	14.81%	0.9	No	BKGD
IRON	4420	=	SM081	157000	=	SM098		30	MG/KG	54/54	100.00%	0	No	Fe-SSL
LEAD	8.6	=	SM081	4090	=	SM95-SO-13		0.9	MG/KG	54/54	100.00%	15	Yes	ASL
MANGANESE	24.9	JK	SM081	1360	J	SM95-SO-13		4.5	MG/KG	54/54	100.00%	152	No	BKGD
MERCURY	0.08	LQ	SM068	0.54	=	SM079	0.11	0.14	MG/KG	17/54	31.48%	0.1	No	BKGD
NICKEL	1.4	LQ	SM081	243	=	SM95-SO-13		12	MG/KG	54/54	100.00%	48	No	BKGD
SELENIUM	0.65	LQ	SM047	4.3	=	SM95-SO-13	1.4	1.4	MG/KG	4/54	7.41%	1	No	BKGD
SILVER	0.24	LQ	SM081	8.3	=	SM098	0.42	3	MG/KG	53/54	98.15%	2	Yes	ASL
THALLIUM	0.96	LQ	SM083	5.3	Jv	SM95-SO-13	5.9	5.9	MG/KG	10/54	18.52%	1	No	BKGD
VANADIUM	4.2	LQ	SM081	26.8	=	SM090		15	MG/KG	54/54	100.00%	2	No	BKGD
ZINC	12.6	=	SM081	38700	=	SM95-SO-13		6	MG/KG	54/54	100.00%	120	Yes	ASL
ALDRIN							0.0017	0.0017	mg/kg	0/2	0.00%	0.0025	No	ND
ALPHA BHC (ALPHA HEXACHLOROXYCLOHEXANE)							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
ALPHA ENDOSULFAN							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
ALPHA-CHLORDANE							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
BETA BHC (BETA HEXACHLOROXYCLOHEXANE)							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
BETA ENDOSULFAN							0.0033	0.0033	mg/kg	0/2	0.00%		No	ND
DELTA BHC (DELTA HEXACHLOROXYCLOHEXANE)							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
DIELDRIN	0.0099	J	SM95-SO-18	17	J	SM95-SO-5	0.0033	0.0033	mg/kg	1/2	50.00%	0.000032	Yes	ASL
ENDOSULFAN SULFATE							0.0033	0.0033	mg/kg	0/2	0.00%		No	ND
ENDRIN							0.0033	0.0033	mg/kg	0/2	0.00%		No	ND
ENDRIN ALDEHYDE	31	JT	SM95-SO-18	31	JT	SM95-SO-18	0.0033	0.0033	mg/kg	1/2	50.00%		Yes	NSL
ENDRIN KETONE							0.0033	0.0033	mg/kg	0/2	0.00%		No	ND
GAMMA BHC (LINDANE)							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
GAMMA-CHLORDANE							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
HEPTACHLOR							0.0017	0.0017	mg/kg	0/2	0.00%		No	ND
HEPTACHLOR EPOXIDE	24	J	SM95-SO-18	24	J	SM95-SO-18	0.0017	0.0017	mg/kg	1/2	50.00%		Yes	NSL
METHOXYCHLOR		JT			JT		0.017	0.017	mg/kg	0/2	0.00%		No	ND
P,P'-DDD	11	JT	SM95-SO-18	11	JT	SM95-SO-18	0.0033	0.0033	mg/kg	1/2	50.00%		Yes	NSL
P,P'-DDE		J		10	J	SM95-SO-5	0.0033	0.0033	mg/kg	0/2	0.00%		Yes	NSL
P,P'-DDT							0.0033	0.0033	mg/kg	0/2	0.00%		No	ND
PCB-1016 (AROCHLOR 1016)							0.033	0.033	mg/kg	0/2	0.00%	40	No	ND
PCB-1221 (AROCHLOR 1221)							0.033	0.033	mg/kg	0/2	0.00%	40	No	ND
PCB-1232 (AROCHLOR 1232)							0.033	0.033	mg/kg	0/2	0.00%	40	No	ND
PCB-1242 (AROCHLOR 1242)							0.033	0.033	mg/kg	0/2	0.00%	40	No	ND
PCB-1248 (AROCHLOR 1248)							0.033	0.033	mg/kg	0/2	0.00%	10	No	ND
PCB-1254 (AROCHLOR 1254)							0.033	0.033	mg/kg	0/2	0.00%	10	No	ND
PCB-1260 (AROCHLOR 1260)							0.033	0.033	mg/kg	0/2	0.00%	10	No	ND
TOXAPHENE							0.17	0.17	mg/kg	0/2	0.00%		No	ND
1,2,4,5-TETRACHLOROXYCLOHEXANE							0.17	0.17	mg/kg	0/2	0.00%		No	ND
2,2'-OXYBIS(1-CHLORO)PROPANE							6.6	6.6	MG/KG	0/55	0.00%		No	ND
2,3,4,6-TETRACHLOROPHENOL							0.17	0.17	mg/kg	0/2	0.00%	20	No	ND
2,4,5-TRICHLOROPHENOL							17	17	MG/KG	0/55	0.00%	1.3	No	ND
2,4,6-TRICHLOROPHENOL							6.6	6.6	MG/KG	0/55	0.00%	10	No	ND
2,4-DICHLOROPHENOL							6.6	6.6	MG/KG	0/55	0.00%	20	No	ND
2,4-DIMETHYLPHENOL							6.6	6.6	MG/KG	0/55	0.00%		No	ND
2,4-DINITROPHENOL							17	17	MG/KG	0/55	0.00%	20	No	ND
2,4-DINITROTOLUENE							6.6	6.6	MG/KG	0/55	0.00%	3.2	No	ND
2,6-DINITROTOLUENE							6.6	6.6	MG/KG	0/55	0.00%	0.03283	No	ND
2-CHLORONAPHTHALENE							6.6	6.6	MG/KG	0/55	0.00%	1	No	ND
2-CHLOROPHENOL							6.6	6.6	MG/KG	0/55	0.00%	20	No	ND
2-METHYLNAPHTHALENE	0.013	LJQK	SM090	1.9	LJQK	SM087	6.6	6.6	MG/KG	15/56	27.27%	0.1	Yes	ASL
2-METHYLPHENOL (O-CRESOL)							6.6	6.6	MG/KG	0/55	0.00%	0.5	No	ND
2-NITROANILINE							17	17	MG/KG	0/55	0.00%		No	ND
2-NITROPHENOL							6.6	6.6	MG/KG	0/55	0.00%		No	ND
3,3'-DICHLOROXYCLOHEXANE							6.6	6.6	MG/KG	0/55	0.00%		No	ND
3-NITROANILINE							17	17	MG/KG	0/55	0.00%		No	ND
4,6-DINITRO-2-METHYLPHENOL							17	17	MG/KG	0/55	0.00%		No	ND
4-BROMOPHENYL PHENYL ETHER							6.6	6.6	MG/KG	0/55	0.00%		No	ND
4-CHLORO-3-METHYLPHENOL							6.6	6.6	MG/KG	0/55	0.00%	7.95	No	ND
4-CHLOROANILINE							6.6	6.6	MG/KG	0/55	0.00%		No	ND
4-CHLOROPHENYL PHENYL ETHER							6.6	6.6	MG/KG	0/55	0.00%		No	ND
4-METHYLPHENOL (P-CRESOL)	0.021	LJQK	SM070	0.22	LJQK	SM087	6.6	6.6	MG/KG	2/55	3.64%	0.5	No	FD
4-NITROANILINE							17	17	MG/KG	0/55	0.00%		No	ND

Table 17
Occurrence, distribution, and selection of chemicals of potential concern in the Non-source Sc
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Non-source
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
4-NITROPHENOL							17	17	MG/KG	0/55	0.00%	7	No	ND
ACENAPHTHENE	0.012	LJQ	SM094	9.6	=	SM087	6.6	6.6	MG/KG	6/55	10.91%	20	No	BSL
ACENAPHTHYLENE	0.011	LJQ	SM095	5	=	SM058	6.6	6.6	MG/KG	28/55	50.91%	1.7	Yes	ASL
ACETOPHENONE	0.013	LJQ, LJQK,	SM094, SM081	0.82	LJQK	SM052	6.6	6.6	MG/KG	12/55	21.82%	300	No	BSL
ANTHRACENE	0.01	LJQ	SM096	13	=	SM087	6.6	6.6	MG/KG	34/55	61.82%	0.1	Yes	ASL
ATRAZINE							6.6	6.6	MG/KG	0/55	0.00%	0.00005	No	ND
BENZALDEHYDE	0.007	LJQ	SM095	0.15	LJQK	SM052	4.3	6.6	MG/KG	32/55	58.18%		Yes	NSL
BENZO(A)-FLUORANTHENE							0.35	0.35	mg/Kg	0/1	0.00%	20	No	ND
BENZO(A)ANTHRACENE	0.012	LJQK	SM061	24	D	SM087	6.6	12	MG/KG	40/55	72.73%	1.2	Yes	ASL
BENZO(A)PYRENE	0.015	LJQK	SM061	19	D	SM087	0.47	12	MG/KG	48/55	87.27%	0.1	Yes	ASL
BENZO(B)FLUORANTHENE	0.019	LJQK	SM061	25	D	SM087	0.47	12	MG/KG	45/55	81.82%	1.2	Yes	ASL
BENZO(G,H,I)PERYLENE	0.051	LJQ	SM095	4.3	=	SM087	1.3	6.6	MG/KG	24/55	43.64%	119	No	BSL
BENZO(K)FLUORANTHENE	0.02	LJ	SM077	12	=	SM087	6.6	6.6	MG/KG	33/55	60.00%	25	No	BSL
BENZYL BUTYL PHTHALATE	0.016	LJQK	SM071	0.26	LJQK	SM058	6.6	6.6	MG/KG	9/55	16.36%	0.23889	Yes	ASL
BIPHENYL (DIPHENYL)	0.026	Q	SM079	0.5	LJQK	SM087	6.6	6.6	MG/KG	4/55	7.27%	60	No	BSL
BIS(2-CHLOROETHOXY) METHANE							6.6	6.6	MG/KG	0/55	0.00%		No	ND
BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)							6.6	6.6	MG/KG	0/55	0.00%		No	ND
BIS(2-ETHYLHEXYL) PHTHALATE	0.031	LJQK	SM049	3.2	=	SM095	6.6	6.6	MG/KG	20/55	36.36%	0.92594	Yes	ASL
CAPROLACTAM							6.6	6.6	MG/KG	0/55	0.00%		No	ND
CARBAZOLE	0.012	Q	SM076	7.5	=	SM087	6.6	6.6	MG/KG	18/55	32.73%		Yes	NSL
CHRYSENE	0.021	Q	SM073	21	D	SM087	6.6	12	MG/KG	43/55	78.18%	4.73	Yes	ASL
DI-N-BUTYL PHTHALATE	0.014	J	SM95-SO-18	0.44	=	SM070	6.6	6.6	MG/KG	5/55	9.09%	200	No	BSL
DI-N-OCTYL PHTHALATE	0.027	LJQK	SM082	0.091	LJQK	SM080	6.6	6.6	MG/KG	4/55	7.27%	709	No	BSL
DIBENZO(A,H)ANTHRACENE	0.014	LJQ	SM096	2.2	LJQK	SM087	6.6	6.6	MG/KG	30/55	54.55%	1.2	Yes	ASL
DIBENZOFURAN	0.011	LJQ	SM086	3.8	=	SM087	6.6	6.6	MG/KG	7/55	12.73%		Yes	NSL
DIETHYL PHTHALATE							6.6	6.6	MG/KG	0/55	0.00%	100	No	ND
DIMETHYL PHTHALATE							6.6	6.6	MG/KG	0/55	0.00%	200	No	ND
FLUORANTHENE	0.01	LJQK	SM059	62	D	SM087	0.47	12	MG/KG	46/55	83.64%	0.1	Yes	ASL
FLUORENE	0.013	LJQK	SM082	8.1	=	SM087	6.6	6.6	MG/KG	9/55	16.36%	30	No	BSL
HEXACHLORO BENZENE							6.6	6.6	MG/KG	0/55	0.00%	0.0025	No	ND
HEXACHLOROBUTADIENE							6.6	6.6	MG/KG	0/55	0.00%		No	ND
HEXACHLOROCYCLOPENTADIENE							6.6	6.6	MG/KG	0/55	0.00%	10	No	ND
HEXACHLOROETHANE							6.6	6.6	MG/KG	0/55	0.00%		No	ND
INDENO(1,2,3-C,D)PYRENE	0.016	Q	SM073	6.9	=	SM087	0.47	6.6	MG/KG	42/55	76.36%	1.2	Yes	ASL
ISOPHORONE							6.6	6.6	MG/KG	0/55	0.00%		No	ND
N-NITROSODI-N-PROPYLAMINE							6.6	6.6	MG/KG	0/55	0.00%	0.54368	No	ND
N-NITROSODIPHENYLAMINE							6.6	6.6	MG/KG	0/55	0.00%	20	No	ND
NAPHTHALENE	0.014	LJQ	SM094	6.8	=	SM087	6.6	6.6	MG/KG	14/55	25.45%	0.1	Yes	ASL
NITROBENZENE							6.6	6.6	MG/KG	0/55	0.00%	40	No	ND
PENTACHLOROPHENOL							17	17	MG/KG	0/55	0.00%	0.032	No	ND
PHENANTHRENE	0.011	LJQK	SM077	53	D	SM087	6.6	12	MG/KG	38/55	69.09%	0.1	Yes	ASL
PHENOL							6.6	6.6	MG/KG	0/55	0.00%	30	No	ND
PYRENE	0.017	LJQK	SM083	40	D	SM087	6.6	12	MG/KG	43/55	78.18%	0.1	Yes	ASL
1,1,1-TRICHLOROETHANE							0.005	0.005	mg/kg	0/2	0.00%	0.1	No	ND
1,1,2,2-TETRACHLOROETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,1,2-TRICHLOROETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,1-DICHLOROETHANE							0.005	0.005	mg/kg	0/2	0.00%	20.1	No	ND
1,1-DICHLOROETHENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,2,3-TRICHLOROBENZENE							0.005	0.005	mg/kg	0/2	0.00%	20	No	ND
1,2,4-TRICHLOROBENZENE							0.005	0.005	mg/kg	0/2	0.00%	20	No	ND
1,2-DIBROMO-3-CHLOROPROPANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,2-DICHLOROBENZENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,2-DICHLOROETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,2-DICHLOROPROPANE							0.005	0.005	mg/kg	0/2	0.00%	700	No	ND
1,3-DICHLOROBENZENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
1,4-DICHLOROETHANE							0.005	0.005	mg/kg	0/2	0.00%	20	No	ND
1,4-DIOXANE (P-DIOXANE)							0.1	0.1	mg/kg	0/2	0.00%		No	ND
2-HEXANONE							0.01	0.01	mg/kg	0/2	0.00%	12.6	No	ND
ACETONE							0.01	0.01	mg/kg	0/2	0.00%	2.5	No	ND
BENZENE							0.005	0.005	mg/kg	0/2	0.00%	0.5	No	ND
BROMOCHLOROMETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
BROMODICHLOROMETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
BROMOFORM							0.005	0.005	mg/kg	0/2	0.00%		No	ND
BROMOMETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
CARBON DISULFIDE							0.005	0.005	mg/kg	0/2	0.00%	0.09412	No	ND
CARBON TETRACHLORIDE							0.005	0.005	mg/kg	0/2	0.00%	1000	No	ND
CHLOROBENZENE							0.005	0.005	mg/kg	0/2	0.00%	40	No	ND
CHLOROETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
CHLOROFORM							0.005	0.005	mg/kg	0/2	0.00%	25	No	ND

Table 17
Occurrence, distribution, and selection of chemicals of potential concern in the Non-source S_c

Baseline Ecological Risk Assessment
 State Marine Supertund Site, Port Arthur, TX

Location:	Non-source
Medium:	Surface Soil

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
CHLOROMETHANE							0.005	0.005	mg/kg	0/2	0.00%	10.4	No	ND
CIS-1,2-DICHLOROETHYLENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
CIS-1,3-DICHLOROPROPENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
CYCLOHEXANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
DIBROMOCHLOROMETHANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
DICHLORODIFLUOROMETHANE							0.005	0.005	mg/kg	0/2	0.00%	39.5	No	ND
ETHYLBENZENE							0.005	0.005	mg/kg	0/2	0.00%	5	No	ND
ISOPROPYLBENZENE (CUMENE)							0.005	0.005	mg/kg	0/2	0.00%		No	ND
M,P-XYLENE (SUM OF ISOMERS)							0.005	0.005	mg/kg	0/2	0.00%		No	ND
METHYL ACETATE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
METHYL ETHYL KETONE (2-BUTANONE)							0.01	0.01	mg/kg	0/2	0.00%	89.6	No	ND
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)							0.01	0.01	mg/kg	0/2	0.00%	443	No	ND
METHYLCYCLOHEXANE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
METHYLENE CHLORIDE							0.005	0.005	mg/kg	0/2	0.00%	2	No	ND
O-XYLENE (1,2-DIMETHYLBENZENE)							0.005	0.005	mg/kg	0/2	0.00%	200	No	ND
STYRENE							0.005	0.005	mg/kg	0/2	0.00%	300	No	ND
TERT-BUTYL METHYL ETHER							0.005	0.005	mg/kg	0/2	0.00%		No	ND
TETRACHLOROETHYLENE(PCE)	0.001	J	SM95-SO-18	0.001	J	SM95-SO-18	0.005	0.005	mg/kg	1/2	50.00%		Yes	NSL
TOLUENE							0.005	0.005	mg/kg	0/2	0.00%	200	No	ND
TRANS-1,2-DICHLOROETHENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
TRANS-1,3-DICHLOROPROPENE							0.005	0.005	mg/kg	0/2	0.00%		No	ND
TRICHLOROETHANE	0.003	J	SM95-SO-18	0.003	J	SM95-SO-18			mg/kg	1/1	100.00%		Yes	NSL
TRICHLOROETHYLENE (TCE)							0.005	0.005	mg/kg	0/2	0.00%		No	ND
TRICHLOROFUOROMETHANE							0.005	0.005	mg/kg	0/2	0.00%	16.4	No	ND
VINYL CHLORIDE							0.005	0.005	mg/kg	0/2	0.00%		No	ND

Rationale for Elimination/Selection
 ASL: Above Screening Levels
 BSL: Below Screening Level
 ND: Not Detected
 NSL: No Screening Level
 NUT: Essential Nutrient
 AI-SSL: Based on EPA Eco-SSL, only a COPC if pH<5.5 (USEPA 2003)
 Fe-SSL: Based on EPA Eco-SSL, not a COPC if 5<pH<8
 TOT: No individual compound exceedance because total PAHs were below benchmark
 BAC: Bioaccumulative Compound
 GRA: Eliminated based upon gradient analysis
 TTL: Total PAHs is less than the individual benchmarks, so total PAHs is eliminated
 FD: Frequency of Detection (less than 5%)
 BKGD: Eliminated based on detection less than site-specific background

Qualifier:
 J: Estimated Value
 B: Value is less than the Contract Required Detection Limit, and greater than the Instrument Detection Limit.
 JL: estimated low value
 JH: estimated high value
 mg/kg: milligram per kilogram

Table 18
Occurrence, distribution, and selection of chemicals of potential concern in the Lake Sabine Sediment - Intertic
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location: Lake Sabine - Intertidal
 Medium: Sediment

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
2,2'-OXYBIS(1-CHLORO)PROPANE							0.014	0.014	MG/KG	0/9	0.00%		No	ND
2,4,5-TRICHLOROPHENOL							0.035	0.035	MG/KG	0/9	0.00%		No	ND
2,4,6-TRICHLOROPHENOL							0.035	0.035	MG/KG	0/9	0.00%		No	ND
2,4-DICHLOROPHENOL							0.028	0.028	MG/KG	0/9	0.00%		No	ND
2,4-DIMETHYLPHENOL							0.035	0.035	MG/KG	0/9	0.00%	0.029	Yes	DL
2,4-DINITROPHENOL							0.71	0.71	MG/KG	0/9	0.00%		No	ND
2,4-DINITROTOLUENE							0.043	0.043	MG/KG	0/9	0.00%		No	ND
2,6-DINITROTOLUENE							0.035	0.035	MG/KG	0/9	0.00%		No	ND
2-CHLORONAPHTHALENE							0.021	0.021	MG/KG	0/9	0.00%		No	ND
2-CHLOROPHENOL							0.042	0.042	MG/KG	0/9	0.00%		No	ND
2-METHYLNAPHTHALENE	0.0034	JQ	SM005	0.091	J	SM003	0.028	0.11	MG/KG	7/9	77.78%	0.07	Yes	ASL
2-METHYLPHENOL (O-CRESOL)							0.021	0.021	MG/KG	0/9	0.00%	0.063	No	ND
2-NITROANILINE							0.057	0.057	MG/KG	0/9	0.00%	1.43	No	ND
2-NITROPHENOL							0.028	0.028	MG/KG	0/9	0.00%		No	ND
3,3'-DICHLOROBENZIDINE							0.13	0.13	MG/KG	0/9	0.00%		No	ND
3-NITROANILINE							0.11	0.11	MG/KG	0/9	0.00%	1.595669	No	ND
4,6-DINITRO-2-METHYLPHENOL							0.21	0.21	MG/KG	0/9	0.00%		No	ND
4-BROMOPHENYL PHENYL ETHER							0.014	0.014	MG/KG	0/9	0.00%		No	ND
4-CHLORO-3-METHYLPHENOL							0.035	0.035	MG/KG	0/9	0.00%		No	ND
4-CHLOROANILINE							0.035	0.035	MG/KG	0/9	0.00%		No	ND
4-CHLOROPHENYL PHENYL ETHER							0.028	0.028	MG/KG	0/9	0.00%		No	ND
4-METHYLPHENOL (P-CRESOL)	0.044	=	SM001	0.044	=	SM001	0.029	0.038	MG/KG	1/9	11.11%	0.67	No	BSL
4-NITROANILINE							0.071	0.071	MG/KG	0/9	0.00%	1.050937	No	ND
4-NITROPHENOL							0.28	0.28	MG/KG	0/9	0.00%		No	ND
ACENAPHTHENE	0.0014	JQ	SM005	0.098	=	SM003	0.021	0.08	MG/KG	8/9	88.89%	0.016	Yes	ASL
ACENAPHTHYLENE	0.0045	JQ	SM005	0.035	JQ	SM004	0.012	0.056	MG/KG	7/9	77.78%	0.044	Yes	DL
ACETOPHENONE	0.0033	JQ	SM008	0.043	JQ	SM003	0.028	0.11	MG/KG	2/9	22.22%		Yes	NSL
ALUMINUM	273	JH	SM005	3530	JH	SM008		33.2	MG/KG	9/9	100.00%	18000	No	BSL
ANTHRACENE	0.0052	JH	SM001	0.1	=	SM003	0.014	0.053	MG/KG	5/9	55.56%	0.0853	Yes	ASL
ANTIMONY	0.2	BJK	SM009	16.1	JK	SM007		3.3	MG/KG	9/9	100.00%	9.3	Yes	ASL
ARSENIC	1.8	=	SM006	13.7	=	SM007		1.3	MG/KG	9/9	100.00%	8.2	Yes	ASL
ATRAZINE							0.017	0.017	MG/KG	0/9	0.00%		No	ND
BARIUM	10.8	JH	SM005	83.6	JH	SM002		1.3	MG/KG	9/9	100.00%	48	Yes	ASL
BENZALDEHYDE	0.0085	JQ	SM009	0.11	J	SM003	0.075	0.11	MG/KG	3/9	33.33%		Yes	NSL
BENZO(A)ANTHRACENE	0.0057	JQ	SM009	0.13	=	SM004	0.014	0.053	MG/KG	6/9	66.67%	0.26	No	BSL
BENZO(A)PYRENE	0.024	=	SM009	0.24	=	SM003	0.002	0.053	MG/KG	8/9	88.89%	0.43	No	BSL
BENZO(B)FLUORANTHENE	0.019	JQL	SM002	0.25	=	SM004	0.007	0.16	MG/KG	8/9	88.89%	1.7	No	BSL
BENZO(G,H,I)PERYLENE	0.016	JQ	SM009	0.16	=	SM003	0.028	0.11	MG/KG	7/9	77.78%	0.67	No	BSL
BENZO(K)FLUORANTHENE	0.019	JQ	SM008	0.14	JQ	SM004	0.009	0.21	MG/KG	8/9	88.89%	1.7	No	BSL
BENZYL BUTYL PHTHALATE							0.17	0.17	MG/KG	0/9	0.00%	0.062	Yes	DL
BERYLLIUM	0.24	B	SM001	0.33	=	SM009	0.19	0.31	MG/KG	2/9	22.22%		Yes	NSL
BIPHENYL (DIPHENYL)							0.051	0.051	MG/KG	0/9	0.00%	1.1	No	ND
BIS(2-CHLOROETHOXY) METHANE							0.035	0.035	MG/KG	0/9	0.00%		No	ND
BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETH)							0.028	0.028	MG/KG	0/9	0.00%		No	ND
BIS(2-ETHYLHEXYL) PHTHALATE							3	3	MG/KG	0/9	0.00%	0.182	Yes	DL
CADMIUM	0.08	=	SM006	1.49	=	SM003		0.65	MG/KG	9/9	100.00%	1.2	Yes	ASL
CALCIUM	250	JK	SM006	172000	JK	SM001		6630	MG/KG	9/9	100.00%		Yes	NSL
CAPROLACTAM	0.11	J	SM003	0.11	J	SM003	0.075	0.11	MG/KG	1/9	11.11%		Yes	NSL
CARBAZOLE	0.011	JQ	SM006	0.2	=	SM003	0.021	0.08	MG/KG	4/9	44.44%		Yes	NSL
CHROMIUM, TOTAL	2.2	JK	SM006	87.2	JK	SM002		0.66	MG/KG	9/9	100.00%	81	Yes	ASL
CHRYSENE	0.074	=	SM006	0.12	=	SM003	0.014	0.053	MG/KG	4/9	44.44%	0.384	No	BSL
CHRYSENE	0.074	=	SM006	0.12	=	SM004	0.014	0.053	MG/KG	4/9	44.44%	0.384	No	BSL
COBALT	1.4	=	SM006	8.2	=	SM003		0.66	MG/KG	9/9	100.00%	10	No	BSL
COPPER	5	=	SM009	313	=	SM008		2.7	MG/KG	9/9	100.00%	34	Yes	ASL
CYANIDE	0.27	B	SM004	0.55	B	SM003	0.16	0.709	MG/KG	4/9	44.44%		Yes	NSL
DIBENZO(A,H)ANTHRACENE	0.025	JQ	SM006	0.029	=	SM007	0.028	0.028	MG/KG	2/9	22.22%	0.0634	No	BSL
DIBENZOFURAN	0.0051	JQ	SM004	0.079	J	SM003	0.021	0.08	MG/KG	4/9	44.44%	0.11	No	BSL
DIETHYL PHTHALATE							0.021	0.021	MG/KG	0/9	0.00%	0.2	No	ND
DIMETHYL PHTHALATE							0.01	0.01	MG/KG	0/9	0.00%		No	ND
DI-N-BUTYL PHTHALATE							0.037	0.037	MG/KG	0/9	0.00%	1.4	No	ND
DI-N-OCTYLPHTHALATE							0.021	0.021	MG/KG	0/9	0.00%	6.2	No	ND
FLUORANTHENE	0.009	JQ	SM009	0.24	=	SM003	0.004	0.08	MG/KG	8/9	88.89%	0.6	No	BSL
FLUORENE	0.012	JQ	SM006	0.11	=	SM003	0.014	0.053	MG/KG	4/9	44.44%	0.019	Yes	ASL
HEXACHLORO BENZENE							0.021	0.021	MG/KG	0/9	0.00%		No	ND
HEXACHLOROBUTADIENE							0.014	0.014	MG/KG	0/9	0.00%	0.02232653	No	ND
HEXACHLORO CYCLOPENTADIENE							0.021	0.021	MG/KG	0/9	0.00%		No	ND
HEXACHLOROETHANE							0.021	0.021	MG/KG	0/9	0.00%	0.1765725	No	ND
INDENO(1,2,3-C,D)PYRENE	0.027	JQ	SM008	0.18	=	SM003	0.035	0.13	MG/KG	5/9	55.56%	1.7	No	BSL
IRON	5300	JK	SM006	201000	JK	SM003		1330	MG/KG	9/9	100.00%	220000	No	BSL
ISOPHORONE							0.021	0.021	MG/KG	0/9	0.00%		No	ND
LEAD	14.1	=	SM009	942	=	SM003		13.8	MG/KG	9/9	100.00%	46.7	Yes	ASL
MAGNESIUM	189	=	SM006	3620	=	SM001		133	MG/KG	9/9	100.00%		Yes	NSL
MANGANESE	66.3	=	SM009	1500	=	SM002		2	MG/KG	9/9	100.00%	260	Yes	ASL

Table 18
Occurrence, distribution, and selection of chemicals of potential concern in the Lake Sabine Sediment - Intertid
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Lake Sabine - Intertidal Sediment
Medium:	Sediment

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
MERCURY	0.016	B	SM006	0.18	=	SM008		0.069	MG/KG	9/9	100.00%	0.15	Yes	ASL
NAPHTHALENE	0.014	JQ	SM005	0.4	=	SM003	0.021	0.08	MG/KG	7/9	77.78%	0.16	Yes	ASL
NICKEL	2.82	=	SM006	85	=	SM003		5.53	MG/KG	9/9	100.00%	20.9	Yes	ASL
NITROBENZENE							0.028	0.028	MG/KG	0/9	0.00%	0.1272913	No	ND
N-NITROSODI-N-PROPYLAMINE							0.042	0.042	MG/KG	0/9	0.00%		No	ND
N-NITROSODIPHENYLAMINE							0.014	0.014	MG/KG	0/9	0.00%		No	ND
PENTACHLOROPHENOL	0.082	JQ	SM001	0.16	JQ	SM003	0.21	0.8	MG/KG	2/9	22.22%	0.36	Yes	DL
PHENANTHRENE	0.0049	JQ	SM008	0.32	=	SM003	0.003	0.053	MG/KG	7/9	77.78%	0.24	Yes	ASL
PHENOL	0.0092	JQ	SM008	0.0092	JQ	SM008	0.028	0.028	MG/KG	1/9	11.11%	0.42	No	BSL
POTASSIUM	76.4	BJK	SM005	1230	JK	SM008		133	MG/KG	9/9	100.00%		Yes	NSL
PYRENE	0.0052	JQ	SM005	0.23	=	SM003		0.08	MG/KG	9/9	100.00%	0.665	No	BSL
PYRENE	0.0052	JQ	SM005	0.23	=	SM004		0.08	MG/KG	9/9	100.00%	0.665	No	BSL
SELENIUM	0.18	BJK	SM006	5.9	JK	SM003	1.9	2.6	MG/KG	8/9	88.89%	1	Yes	ASL
SILVER							0.092	0.092	MG/KG	0/9	0.00%	1	No	ND
SODIUM	584	=	SM006	1560	=	SM004		133	MG/KG	9/9	100.00%		Yes	NSL
THALLIUM							0.26	0.26	MG/KG	0/9	0.00%		No	ND
TRIBUTYL TIN							0.0022	0.0022	MG/KG	0/9	0.00%	3.4	No	ND
VANADIUM	2.5	=	SM005	15.5	=	SM001		0.66	MG/KG	9/9	100.00%	57	No	BSL
ZINC	25.5	=	SM009	594	=	SM003		1.38	MG/KG	9/9	100.00%	150	Yes	ASL

Rationale for Elimination/Selection
 ASL: Above Screening Levels
 BSL: Below Screening Level
 ND: Not Detected
 NSL: No Screening Level
 NUT: Essential Nutrient
 AI-SSL: Based on EPA Eco-SSL, only a COPC if pH<5.5 (USEPA 2003)
 Fe-SSL: Based on EPA Eco-SSL, not a COPC if 5<pH<8
 TOT: No individual compound exceedance because total PAHs were below benchmark
 BAC: Bioaccumulative Compound
 GRA: Eliminated based upon gradient analysis
 TTL: Total PAHs is less than the individual benchmarks so total PAHs is eliminated
 FD: Frequency of Detection (less than 5%)
 BKGD: Eliminated based on detection less than site specific background

Qualifier:
 J: Estimated Value
 B: Value is less than the Contract Required Detection Limit, and greater than the Instrument Detection Limit.
 JL: estimated low value
 JH: estimated high value
 mg/kg: milligram per kilogram

Table 19

Occurrence, distribution, and selection of chemicals of potential concern in the Lake Sabine Sediment - Nearsho

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Location:	Lake Sabine - Nearshore
Medium:	Sediment

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
1,1,1-TRICHLOROETHANE							0.005	0.005	mg/kg	0/10	0.00%	15.83	No	ND
1,1,2,2-TETRACHLOROETHANE							0.005	0.005	mg/kg	0/10	0.00%	3.69	No	ND
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
1,1,2-TRICHLOROETHANE							0.005	0.005	mg/kg	0/10	0.00%	1.8	No	ND
1,1-DICHLOROETHANE							0.005	0.005	mg/kg	0/10	0.00%	25.8	No	ND
1,1-DICHLOROETHENE							0.005	0.005	mg/kg	0/10	0.00%	92.47	No	ND
1,2,3-TRICHLOROBENZENE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
1,2,4,5-TETRACHLOROBENZENE							0.17	0.17	mg/kg	0/6	0.00%		No	ND
1,2,4-TRICHLOROBENZENE							0.005	0.005	mg/kg	0/10	0.00%	0.3866213	No	ND
1,2-DIBROMO-3-CHLOROPROPANE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)							0.005	0.005	mg/kg	0/10	0.00%		No	ND
1,2-DICHLOROBENZENE							0.005	0.005	mg/kg	0/10	0.00%	4.44	No	ND
1,2-DICHLOROETHANE							0.005	0.005	mg/kg	0/10	0.00%	25.8	No	ND
1,2-DICHLOROPROPANE							0.005	0.005	mg/kg	0/10	0.00%	2.822749	No	ND
1,3-DICHLOROBENZENE							0.005	0.005	mg/kg	0/10	0.00%	1.95	No	ND
1,4-DICHLOROBENZENE							0.005	0.005	mg/kg	0/10	0.00%	4.21	No	ND
1,4-DIOXANE (P-DIOXANE)							0.1	0.1	mg/kg	0/10	0.00%		No	ND
2,2'-OXYBIS(1-CHLORO)PROPANE							0.17	0.17	MG/KG	0/41	0.00%		No	ND
2,3,4,6-TETRACHLOROPHENOL							0.17	0.17	mg/kg	0/6	0.00%		No	ND
2,4,5-TRICHLOROPHENOL							0.17	0.17	MG/KG	0/41	0.00%		No	ND
2,4,6-TRICHLOROPHENOL							0.17	0.17	MG/KG	0/41	0.00%		No	ND
2,4-DICHLOROPHENOL							0.17	0.17	MG/KG	0/41	0.00%		No	ND
2,4-DIMETHYLPHENOL							0.17	0.17	MG/KG	0/41	0.00%	0.029	Yes	DL
2,4-DINITROPHENOL							0.34	0.34	MG/KG	0/41	0.00%		No	ND
2,4-DINITROTOLUENE							0.17	0.17	MG/KG	0/41	0.00%		No	ND
2,6-DINITROTOLUENE							0.17	0.17	MG/KG	0/41	0.00%		No	ND
2-CHLORONAPHTHALENE							0.17	0.17	MG/KG	0/41	0.00%		No	ND
2-CHLOROPHENOL							0.17	0.17	MG/KG	0/41	0.00%		No	ND
2-HEXANONE							0.01	0.01	mg/kg	0/10	0.00%		No	ND
2-METHYLNAPHTHALENE	0.0027	JQ	SM031	0.011	J	SM028	0.17	0.17	MG/KG	5/41	12.20%	0.07	Yes	DL
2-METHYLNAPHTHALENE	0.0027	JQ	SM031	0.011	JQ	SM030	0.17	0.17	MG/KG	5/41	12.20%	0.07	Yes	DL
2-METHYLPHENOL (O-CRESOL)							0.17	0.17	MG/KG	0/41	0.00%	0.063	Yes	DL
2-NITROANILINE							0.33	0.33	MG/KG	0/41	0.00%	1.43	No	ND
2-NITROPHENOL							0.17	0.17	MG/KG	0/41	0.00%		No	ND
3,3'-DICHLOROENZIDINE	0.046	J	PB009	0.075	J	PB010	0.17	0.17	MG/KG	2/41	4.88%		Yes	NSL
3-NITROANILINE							0.33	0.33	MG/KG	0/41	0.00%	1.595669	No	ND
4,6-DINITRO-2-METHYLPHENOL							0.33	0.33	MG/KG	0/41	0.00%		No	ND
4-BROMOPHENYL PHENYL ETHER							0.17	0.17	MG/KG	0/41	0.00%		No	ND
4-CHLORO-3-METHYLPHENOL							0.17	0.17	MG/KG	0/41	0.00%		No	ND
4-CHLOROANILINE							0.17	0.17	MG/KG	0/41	0.00%		No	ND
4-CHLOROPHENYL PHENYL ETHER							0.17	0.17	MG/KG	0/41	0.00%		No	ND
4-METHYLPHENOL (P-CRESOL)							0.17	0.17	MG/KG	0/41	0.00%	0.67	No	ND
4-NITROANILINE							0.33	0.33	MG/KG	0/41	0.00%	1.050937	No	ND
4-NITROPHENOL							0.33	0.33	MG/KG	0/41	0.00%		No	ND
ACENAPHTHENE	0.0042	JQ	SM031	0.58	=	SM95-SE-9	0.17	0.17	MG/KG	6/41	14.63%	0.016	Yes	ASL
ACENAPHTHYLENE	0.0037	JQ	SM032	0.12	JL	SM028	0.17	0.17	MG/KG	6/41	14.63%	0.044	Yes	ASL
ACETONE	0.065	JB	SM95-SE-9	0.095	-	SM95-SE-8	0.01	0.01	mg/kg	2/10	20.00%	1003.36	No	BSL
ACETOPHENONE	0.0057	JQ	SM027	0.0057	JQ	SM027	0.17	0.17	MG/KG	1/41	2.44%		Yes	NSL
ALDRIN							0.0017	0.0017	mg/kg	0/6	0.00%	0.08	No	ND
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/6	0.00%	0.00099	Yes	DL
ALPHA ENDOSULFAN							0.0017	0.0017	mg/kg	0/6	0.00%		No	ND
ALPHA-CHLORDANE							0.0017	0.0017	mg/kg	0/6	0.00%	0.00479	No	ND
ALUMINUM	408	JH	SM027	8820	JK	PB008		81.4	MG/KG	45/45	100.00%	18000	No	BSL
ANTHRACENE	0.002	JQ	SM017	2	=	SM95-SE-9	0.17	0.17	MG/KG	15/41	36.59%	0.0853	Yes	ASL
ANTIMONY	0.22	BJL	SM036	0.5	BJL	PB007	3.2	8.1	MG/KG	11/45	24.44%	9.3	No	BSL
ARSENIC	1.6	=	SM030	11.7	=	SM95-SE-15		3.3	MG/KG	45/45	100.00%	8.2	Yes	ASL
ATRAZINE							0.17	0.17	MG/KG	0/41	0.00%		No	ND
BARIUM	12.2	JH	SM022	220	JK	PB003	0.17	3.3	MG/KG	45/45	100.00%	48	Yes	ASL
BENZALDEHYDE	0.037	J	PB009	0.037	J	PB009	0.17	0.17	MG/KG	1/41	2.44%		Yes	NSL
BENZENE							0.005	0.005	mg/kg	0/10	0.00%	0.1360315	No	ND
BENZO(A)ANTHRACENE	0.006	JQ	SM016	4.1	-	SM95-SE-9	0.17	0.17	MG/KG	19/41	46.34%	0.26	Yes	ASL
BENZO(A)PYRENE	0.026	=	SM029	2.3	-	SM95-SE-9	0.17	0.17	MG/KG	22/41	53.66%	0.43	Yes	ASL
BENZO(B)FLUORANTHENE	0.017	JQ	SM015	3.6	-	SM95-SE-9	0.17	0.17	MG/KG	25/41	60.98%	1.7	Yes	ASL
BENZO(G,H,I)PERYLENE	0.021	JQK	SM027	0.24	-	SM95-SE-9	0.17	0.17	MG/KG	14/41	34.15%	0.67	No	BSL
BENZO(K)FLUORANTHENE	0.021	JQ	SM029	1.9	J	SM95-SE-9	0.17	0.17	MG/KG	19/41	46.34%	1.7	Yes	ASL
BENZO(K)FLUORANTHENE	0.021	JQ	SM033	1.9	J	SM95-SE-9	0.17	0.17	MG/KG	19/41	46.34%	1.7	Yes	ASL
BENZO(K)FLUORANTHENE	0.021	JQK	SM027	1.9	J	SM95-SE-9	0.17	0.17	MG/KG	19/41	46.34%	1.7	Yes	ASL
BENZYL BUTYL PHTHALATE	0.024	JQ	SM027	0.064	J	SM95-SE-9	0.17	0.17	MG/KG	14/41	34.15%	0.062	Yes	ASL
BENZYL BUTYL PHTHALATE	0.024	JQ	SM033	0.064	J	SM95-SE-9	0.17	0.17	MG/KG	14/41	34.15%	0.062	Yes	ASL
BERYLLIUM	0.1	B	SM031	2.7	=	SM95-SE-9	0.38	0.81	MG/KG	35/45	77.78%		Yes	NSL
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/6	0.00%	0.00099	Yes	DL
BETA ENDOSULFAN							0.0033	0.0033	mg/kg	0/6	0.00%		No	ND
BIPHENYL (DIPHENYL)	0.0012	JQ	SM030	0.037	J	PB009	0.17	0.17	MG/KG	3/41	7.32%	1.1	No	BSL
BIS(2-CHLOROETHOXY) METHANE							0.17	0.17	MG/KG	0/41	0.00%		No	ND

Table 19

Occurrence, distribution, and selection of chemicals of potential concern in the Lake Sabine Sediment - Nearshore

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Location:	Lake Sabine - Nearshore
Medium:	Sediment

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
1,1,1-TRICHLOROETHANE							0.005	0.005	mg/kg	0/10	0.00%	15.83	No	ND
BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)							0.17	0.17	MG/KG	0/41	0.00%		No	ND
BIS(2-ETHYLHEXYL) PHTHALATE	0.047	J	SM95-SE-14	0.26	J	SM95-SE-9	0.27	0.27	MG/KG	3/41	7.32%	0.182	Yes	ASL
BROMOCHLOROMETHANE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
BROMODICHLOROMETHANE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
BROMOFORM							0.005	0.005	mg/kg	0/10	0.00%	10.67	No	ND
BROMOMETHANE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
CADMIUM	0.04	B	SM036	0.27	=	SM95-SE-8	0.42	0.42	MG/KG	36/45	80.00%	1.2	No	BSL
CALCIUM	227	=	SM95-SE-26	30500	=	SM95-SE-16		326	MG/KG	45/45	100.00%		Yes	NSL
CAPROLACTAM	0.037	J	PB009	0.051	=	SM032	0.17	0.17	MG/KG	2/41	4.88%		Yes	NSL
CARBAZOLE	0.0068	JQ	SM030	0.31	J	SM95-SE-9	0.17	0.17	MG/KG	10/41	24.39%		Yes	NSL
CARBON DISULFIDE	0.002	*	SM95-SE-8	0.002	*	SM95-SE-8	0.005	0.005	mg/kg	1/10	10.00%	4.49971	No	BSL
CARBON TETRACHLORIDE							0.005	0.005	mg/kg	0/10	0.00%	3.674083	No	ND
CHLOROBENZENE							0.005	0.005	mg/kg	0/10	0.00%	0.2861527	No	ND
CHLOROETHANE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
CHLOROFORM							0.005	0.005	mg/kg	0/10	0.00%	25.8	No	ND
CHLOROMETHANE							0.005	0.005	mg/kg	0/10	0.00%	52.43	No	ND
CHROMIUM, TOTAL	1.6	=	SM95-SE-11	20	=	SM95-SE-8		1.6	MG/KG	45/45	100.00%	81	No	BSL
CHRYSENE	0.01	J	SM027	3.9	*	SM95-SE-9	0.17	0.17	MG/KG	19/41	46.34%	0.384	Yes	ASL
CIS-1,2-DICHLOROETHYLENE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
CIS-1,3-DICHLOROPROPENE							0.005	0.005	mg/kg	0/10	0.00%	0.26	No	ND
COBALT	1.5	=	SM027	21.2	JK	SM012		1.6	MG/KG	45/45	100.00%	10	Yes	ASL
COBALT	1.5	=	SM029	21.2	JK	SM012		1.6	MG/KG	45/45	100.00%	10	Yes	ASL
COBALT	1.5	=	SM030	21.2	JK	SM012		1.6	MG/KG	45/45	100.00%	10	Yes	ASL
COBALT	1.5	=	SM95-SE-26	21.2	JK	SM012		1.6	MG/KG	45/45	100.00%	10	Yes	ASL
COPPER	1.4	=	SM023	312	J	SM95-SE-8	0.2	0.5	MG/KG	43/44	97.73%	34	Yes	ASL
CYANIDE							1	1	MG/KG	0/45	0.00%		No	ND
CYCLOHEXANE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)							0.0017	0.0017	mg/kg	0/6	0.00%	0.00099	Yes	DL
DIBENZO(A,H)ANTHRACENE	0.019	JQ	SM033	0.23	*	SM95-SE-9	0.17	0.17	MG/KG	8/41	19.51%	0.0634	Yes	ASL
DIBENZOFURAN	0.0028	JQL	SM031	0.36	J	SM95-SE-9	0.17	0.17	MG/KG	5/41	12.20%	0.11	Yes	ASL
DIBROMOCHLOROMETHANE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
DICHLORODIFLUOROMETHANE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
DIELDRIN	0.0019	JQ	SM015	0.014	JQ	SM029	0.0033	0.0033	mg/kg	0/6	0.00%	0.0043	No	ND
DIETHYL PHTHALATE							0.17	0.17	MG/KG	4/41	9.76%	0.2	No	BSL
DIMETHYL PHTHALATE							0.17	0.17	MG/KG	0/41	0.00%		No	ND
DI-N-BUTYL PHTHALATE	0.0045	JQ	SM029	0.096	J	SM95-SE-15	0.17	0.17	MG/KG	13/41	31.71%	1.4	No	BSL
DI-N-OCTYL PHTHALATE	0.0048	JQ	SM030	0.22	*	SM95-SE-8	0.17	0.17	MG/KG	2/41	4.88%	6.2	No	BSL
ENDOSULFAN SULFATE							0.0033	0.0033	mg/kg	0/6	0.00%		No	ND
ENDRIN							0.0033	0.0033	mg/kg	0/6	0.00%	0.0035	No	ND
ENDRIN ALDEHYDE							0.0033	0.0033	mg/kg	0/6	0.00%		No	ND
ENDRIN KETONE							0.0033	0.0033	mg/kg	0/6	0.00%		No	ND
ETHYLBENZENE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
FLUORANTHENE	0.0032	JQ	SM017	9.1	J	SM95-SE-9	0.17	0.17	MG/KG	25/41	60.98%	0.6	Yes	ASL
FLUORENE	0.0065	JQ	SM031	0.79	=	SM95-SE-9	0.17	0.17	MG/KG	6/41	14.63%	0.019	Yes	ASL
GAMMA BHC (LINDANE)	0.0034	J	SM95-SE-8	0.0034	J	SM95-SE-8	0.0017	0.0017	mg/kg	1/6	16.67%	0.00099	Yes	ASL
GAMMA-CHLORDANE							0.0017	0.0017	mg/kg	0/6	0.00%	0.00479	No	ND
HEPTACHLOR							0.0017	0.0017	mg/kg	0/6	0.00%		No	ND
HEPTACHLOR EPOXIDE							0.0017	0.0017	mg/kg	0/6	0.00%	0.053	No	ND
HEXACHLOROBENZENE							0.17	0.17	MG/KG	0/41	0.00%		No	ND
HEXACHLOROBUTADIENE							0.17	0.17	MG/KG	0/41	0.00%	0.02232653	Yes	DL
HEXACHLOROCYCLOPENTADIENE							0.17	0.17	MG/KG	0/41	0.00%		No	ND
HEXACHLOROETHANE							0.17	0.17	MG/KG	0/41	0.00%	0.1765725	No	ND
INDENO(1,2,3-C,D)PYRENE	0.027	JQ	SM033	0.34	*	SM95-SE-9	0.17	0.17	MG/KG	15/41	36.59%	1.7	No	BSL
IRON	3850	=	SM030	36200	=	SM95-SE-15		65.1	MG/KG	45/45	100.00%	220000	No	BSL
ISOPHORONE							0.17	0.17	MG/KG	0/41	0.00%		No	ND
ISOPROPYLBENZENE (CUMENE)							0.005	0.005	mg/kg	0/10	0.00%		No	ND
LEAD	4.3	=	SM023	362	=	SM95-SE-9		14.6	MG/KG	45/45	100.00%	46.7	Yes	ASL
M,P-XYLENE (SUM OF ISOMERS)							0.005	0.005	mg/kg	0/10	0.00%	7.47	No	ND
MAGNESIUM	236	=	SM027	4240	JK	PB003		326	MG/KG	45/45	100.00%		Yes	NSL
MANGANESE	35.2	=	SM023	1270	JK	SM039		4.9	MG/KG	45/45	100.00%	260	Yes	ASL
MERCURY	0.011	B	SM033	0.045	B	SM034	0.21	0.21	MG/KG	11/45	24.44%	0.15	Yes	DL
METHOXYCHLOR							0.017	0.017	mg/kg	0/6	0.00%		No	ND
METHYL ACETATE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
METHYL ETHYL KETONE (2-BUTANONE)							0.01	0.01	mg/kg	0/10	0.00%	23.64406	No	ND
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)							0.01	0.01	mg/kg	0/10	0.00%	272.06	No	ND
METHYLCYCLOHEXANE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
METHYLENE CHLORIDE	0.005	*	SM95-SE-8	0.005	*	SM95-SE-8	0.005	0.005	mg/kg	1/10	10.00%	22.91	No	BSL
NAPHTHALENE	0.0046	JQ	PB003	0.014	JQ	SM028	0.17	0.17	MG/KG	7/41	17.07%	0.16	Yes	DL
NICKEL	1.5	=	SM95-SE-11	26.4	=	SM95-SE-9		2.91	MG/KG	45/45	100.00%	20.9	Yes	ASL
NICKEL	1.5	=	SM95-SE-26	26.4	=	SM95-SE-9		2.91	MG/KG	45/45	100.00%	20.9	Yes	ASL
NITROBENZENE							0.17	0.17	MG/KG	0/41	0.00%	0.1272913	Yes	DL
N-NITROSODI-N-PROPYLAMINE							0.17	0.17	MG/KG	0/41	0.00%		No	ND
N-NITROSODIPHENYLAMINE							0.17	0.17	MG/KG	0/41	0.00%		No	ND

Table 19
Occurrence, distribution, and selection of chemicals of potential concern in the Lake Sabine Sediment - Nearshore
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Location:	Lake Sabine - Nearshore
Medium:	Sediment

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
1,1,1-TRICHLOROETHANE							0.005	0.005	mg/kg	0/10	0.00%	15.83	No	ND
O-XYLENE (1,2-DIMETHYLBENZENE)							0.005	0.005	mg/kg	0/10	0.00%	7.47	No	ND
P,P'-DDD							0.0033	0.0033	mg/kg	0/6	0.00%	0.00781	No	ND
P,P'-DDE							0.0033	0.0033	mg/kg	0/6	0.00%	0.374	No	ND
P,P'-DDT							0.0033	0.0033	mg/kg	0/6	0.00%	0.046	No	ND
PCB-1016 (AROCHLOR 1016)							0.033	0.033	mg/kg	0/6	0.00%	0.18	No	ND
PCB-1221 (AROCHLOR 1221)							0.033	0.033	mg/kg	0/6	0.00%	0.18	No	ND
PCB-1232 (AROCHLOR 1232)							0.033	0.033	mg/kg	0/6	0.00%	0.18	No	ND
PCB-1242 (AROCHLOR 1242)	0.084	J	SM95-SE-9	0.084	J	SM95-SE-9	0.033	0.033	mg/kg	1/6	16.67%	0.18	No	BSL
PCB-1248 (AROCHLOR 1248)							0.033	0.033	mg/kg	0/6	0.00%	0.18	No	ND
PCB-1254 (AROCHLOR 1254)							0.033	0.033	mg/kg	0/6	0.00%	0.18	No	ND
PCB-1260 (AROCHLOR 1260)							0.033	0.033	mg/kg	0/6	0.00%	0.18	No	ND
PENTACHLOROPHENOL							0.33	0.33	MG/KG	0/41	0.00%	0.36	No	ND
PHENANTHRENE	0.0027	JQ	SM017	7.1	*	SM95-SE-9	0.17	0.17	MG/KG	21/41	51.22%	0.24	Yes	ASL
PHENOL							0.17	0.17	MG/KG	0/41	0.00%	0.42	No	ND
POTASSIUM	127	=	SM027	2340	JK	PB008		326	MG/KG	45/45	100.00%		Yes	NSL
POTASSIUM	127	=	SM027	2340	JK	PB009		326	MG/KG	45/45	100.00%		Yes	NSL
PYRENE	0.0023	JQ	SM017	8.8	*	SM95-SE-9	0.17	0.17	MG/KG	25/41	60.98%	0.665	Yes	ASL
SELENIUM	0.13	B	SM017	0.89	B	SM037	1.2	6.5	MG/KG	21/45	46.67%	1	Yes	DL
SILVER							0.83	0.83	MG/KG	0/45	0.00%	1	No	ND
SODIUM	432	=	SM95-SE-26	5450	JK	PB008		326	MG/KG	45/45	100.00%		Yes	NSL
STYRENE							0.005	0.005	mg/kg	0/10	0.00%	22.31	No	ND
TERT-BUTYL METHYL ETHER							0.005	0.005	mg/kg	0/10	0.00%		No	ND
TETRACHLOROETHYLENE(PCE)							0.005	0.005	mg/kg	0/10	0.00%	18.59	No	ND
THALLIUM	1	=	SM95-SE-11	2.1	=	SM95-SE-8	1.7	1.7	MG/KG	2/45	4.44%		Yes	NSL
TOLUENE	0.002	*	SM95-SE-8	0.002	*	SM95-SE-8	0.005	0.005	mg/kg	1/10	10.00%	5.66	No	BSL
TOXAPHENE							0.17	0.17	mg/kg	0/6	0.00%		No	ND
TRANS-1,2-DICHLOROETHENE							0.005	0.005	mg/kg	0/10	0.00%	0.4675266	No	ND
TRANS-1,3-DICHLOROPROPENE							0.005	0.005	mg/kg	0/10	0.00%	0.04	No	ND
TRIBUTYL TIN	0.00047	J	SM033	0.0063	=	SM037	0.014	0.014	MG/KG	12/35	34.29%	3.4	No	BSL
TRICHLOROETHYLENE (TCE)							0.005	0.005	mg/kg	0/10	0.00%		No	ND
TRICHLOROFLUOROMETHANE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
VANADIUM	3.3	=	SM95-SE-26	22.6	JK	PB008		1.6	MG/KG	45/45	100.00%	57	No	BSL
VINYL CHLORIDE							0.005	0.005	mg/kg	0/10	0.00%		No	ND
ZINC	14.2	=	SM95-SE-11	3910	=	SM95-SE-9		1.46	MG/KG	45/45	100.00%	150	Yes	ASL

Rationale for Elimination/Selection
 ASL: Above Screening Levels
 BSL: Below Screening Level
 ND: Not Detected
 NSL: No Screening Level
 NUT: Essential Nutrient
 AI-SSL: Based on EPA Eco-SSL, only a COPC if pH<5.5 (USEPA 2003)
 Fe-SSL: Based on EPA Eco-SSL, not a COPC if 5<pH<8
 TOT: No individual compound exceedance because total PAHs were below benchmark
 BAC: Bioaccumulative Compound
 GRA: Eliminated based upon gradient analysis
 TTL: Total PAHs is less than the individual benchmarks so total PAHs is eliminated
 FD: Frequency of Detection (less than 5%)
 BKGD: Eliminated based on detection less than site specific background

Qualifier:
 J: Estimated Value
 B: Value is less than the Contract Required Detection Limit, and greater than the Instrument Detection Limit.
 JL: estimated low value
 JH: estimated high value
 mg/kg: milligram per kilogram

Table 20
Occurrence, distribution, and selection of chemicals of potential concern in the Lake Sabine Sediment - Offshore
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Location: Lake Sabine - Offshore
 Medium: Sediment

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
ALUMINUM	562	JK	SM041	8150	JK	SM044		47.1	MG/KG	11/11	100.00%	18000	No	BSL
ANTIMONY	0.27	BJL	PB013	0.27	BJL	PB013	0.8	4.6	MG/KG	1/11	9.09%	9.3	No	BKGD
ARSENIC	2.9	=	SM041	8.9	=	PB014		1.9	MG/KG	11/11	100.00%	8.2	Yes	ASL
BARIUM	24.5	JH	SM021	115	JK	PB014		1.9	MG/KG	11/11	100.00%	48	Yes	ASL
BERYLLIUM	0.2	B	SM040	0.89	=	PB014	0.074	0.47	MG/KG	10/11	90.91%		Yes	NSL
CADMIUM	0.04	BQ	SM041	0.14	=	PB014		0.1	MG/KG	11/11	100.00%	1.2	No	BSL
CALCIUM	247	JK	SM041	5580	JK	SM045		188	MG/KG	11/11	100.00%		Yes	NSL
CHROMIUM, TOTAL	2.2	=	SM041	11.3	=	PB012		0.94	MG/KG	11/11	100.00%	81	No	BSL
COBALT	1.6	=	SM041	9.7	=	SM042		0.94	MG/KG	11/11	100.00%	10	No	BSL
COPPER	1.6	=	SM045	8.5	=	SM040		0.5	MG/KG	8/8	100.00%	34	No	BSL
CYANIDE							0.25	0.25	MG/KG	0/11	0.00%		No	ND
IRON	4690	JK	SM041	14900	JK	PB012		37.7	MG/KG	11/11	100.00%	220000	No	BSL
LEAD	6.8	=	SM041	14	=	PB012		10.2	MG/KG	11/11	100.00%	46.7	No	BSL
MAGNESIUM	320	JK	SM041	4300	JK	SM042		188	MG/KG	11/11	100.00%		Yes	NSL
MAGNESIUM	320	JK	SM041	4300	JK	SM044		188	MG/KG	11/11	100.00%		Yes	NSL
MANGANESE	51.8	=	SM021	745	JK	PB014		2.8	MG/KG	11/11	100.00%	260	Yes	ASL
MERCURY	0.024	B	SM040	0.024	B	SM040	0.089	0.089	MG/KG	1/11	9.09%	0.15	No	BSL
NICKEL	2.23	=	SM041	44.1	=	PB012		2.04	MG/KG	11/11	100.00%	20.9	Yes	ASL
POTASSIUM	202	JK	SM041	2460	JK	SM042		188	MG/KG	11/11	100.00%		Yes	NSL
SELENIUM	0.27	B	PB014	0.59	B	PB013	0.62	3.7	MG/KG	3/11	27.27%	1	Yes	DL
SILVER							0.13	0.13	MG/KG	0/11	0.00%	1	No	ND
SODIUM	705	JK	SM041	5200	JK	PB012		188	MG/KG	11/11	100.00%		Yes	NSL
THALLIUM							0.37	0.37	MG/KG	0/11	0.00%		No	ND
VANADIUM	2.9	JK	SM041	18.9	JK	PB013		0.94	MG/KG	11/11	100.00%	57	No	BSL
ZINC	18.4	=	SM041	45.6	=	PB012		1.02	MG/KG	11/11	100.00%	150	No	BSL
TRIBUTYL TIN	0.0018	=	SM040	0.0059	=	SM042	0.003	0.003	MG/KG	6/11	54.55%	3.4	No	BSL
2,2'-OXYBIS(1-CHLORO)PRC							0.004	0.004	MG/KG	0/11	0.00%		No	ND
2,4,5-TRICHLOROPHENOL							0.009	0.009	MG/KG	0/11	0.00%		No	ND
2,4,6-TRICHLOROPHENOL							0.009	0.009	MG/KG	0/11	0.00%		No	ND
2,4-DICHLOROPHENOL							0.006	0.006	MG/KG	0/11	0.00%		No	ND
2,4-DIMETHYLPHENOL							0.01	0.01	MG/KG	0/11	0.00%	0.029	No	ND
2,4-DINITROPHENOL							0.2	0.2	MG/KG	0/11	0.00%		No	ND
2,4-DINITROTOLUENE							0.011	0.011	MG/KG	0/11	0.00%		No	ND
2,6-DINITROTOLUENE							0.01	0.01	MG/KG	0/11	0.00%		No	ND
2-CHLORONAPHTHALENE							0.005	0.005	MG/KG	0/11	0.00%		No	ND
2-CHLOROPHENOL							0.012	0.012	MG/KG	0/11	0.00%		No	ND
2-METHYLNAPHTHALENE							0.007	0.007	MG/KG	0/11	0.00%	0.07	No	ND
2-METHYLPHENOL (O-CRES							0.003	0.003	MG/KG	0/11	0.00%	0.063	No	ND
2-NITROANILINE							0.014	0.014	MG/KG	0/11	0.00%	1.43	No	ND
2-NITROPHENOL							0.008	0.008	MG/KG	0/11	0.00%		No	ND
3,3'-DICHLOROBENZIDINE	0.031	J	SM041	0.049	J	PB012	0.049	0.049	MG/KG	4/11	36.36%		Yes	NSL
3-NITROANILINE							0.032	0.032	MG/KG	0/11	0.00%	1.595669	No	ND
4,6-DINITRO-2-METHYLPHEN							0.053	0.053	MG/KG	0/11	0.00%		No	ND
4-BROMOPHENYL PHENYL							0.004	0.004	MG/KG	0/11	0.00%		No	ND
4-CHLORO-3-METHYLPHEN							0.01	0.01	MG/KG	0/11	0.00%		No	ND
4-CHLOROANILINE							0.01	0.01	MG/KG	0/11	0.00%		No	ND
4-CHLOROPHENYL PHENYL							0.007	0.007	MG/KG	0/11	0.00%		No	ND
4-METHYLPHENOL (P-CRES							0.011	0.011	MG/KG	0/11	0.00%	0.67	No	ND
4-NITROANILINE							0.02	0.02	MG/KG	0/11	0.00%	1.050937	No	ND
4-NITROPHENOL							0.078	0.078	MG/KG	0/11	0.00%		No	ND
ACENAPHTHENE							0.006	0.006	MG/KG	0/11	0.00%	0.016	No	ND
ACENAPHTHYLENE							0.005	0.005	MG/KG	0/11	0.00%	0.044	No	ND
ACETOPHENONE							0.001	0.001	MG/KG	0/11	0.00%		No	ND
ANTHRACENE	0.00009	JQ	SM042	0.00009	JQ	SM042	0.003	0.02	MG/KG	1/11	9.09%	0.0853	No	BSL
ATRAZINE							0.0006	0.0006	MG/KG	0/11	0.00%		No	ND
BENZALDEHYDE	0.039	B	SM042	0.039	B	SM042	0.04	0.04	MG/KG	1/11	9.09%		Yes	NSL
BENZO(A)ANTHRACENE	0.0026	JQ	SM041	0.0084	JQ	PB012	0.003	0.02	MG/KG	3/11	27.27%	0.26	No	BSL

Table 20
Occurrence, distribution, and selection of chemicals of potential concern in the Lake Sabine Sediment - Offshore
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Location: Lake Sabine - Offshore
 Medium: Sediment

Chemical	Minimum concentration	Minimum qualifier	Minimum sample location	Maximum concentration	Maximum qualifier	Maximum sample location	Maximum Non-Detect Result	Maximum Non-Detect RL	Units	Frequency of detection	Percentage of detection	Screening Level Criteria	COPC flag	Rational for elimination or selection
BENZO(A)PYRENE	0.022	=	SM041	0.054	=	PB012	0.003	0.02	MG/KG	3/11	27.27%	0.43	No	BSL
BENZO(B)FLUORANTHENE	0.015	JQ	SM041	0.034	JQ	PB012	0.011	0.059	MG/KG	3/11	27.27%	1.7	No	BSL
BENZO(G,H,I)PERYLENE	0.017	JQ	SM040	0.017	JQ	SM040	0.007	0.028	MG/KG	1/11	9.09%	0.67	No	BSL
BENZO(K)FLUORANTHENE	0.017	JQ	SM041	0.033	JQ	PB012	0.014	0.079	MG/KG	3/11	27.27%	1.7	No	BSL
BENZYL BUTYL PHTHALATE	0.027	JQ	SM040	0.027	JQ	SM040	0.038	0.038	MG/KG	1/11	9.09%	0.062	No	BSL
BIPHENYL (DIPHENYL)	0.039	B	SM042	0.039	B	SM042	0.04	0.04	MG/KG	1/11	9.09%	1.1	No	BSL
BIS(2-CHLOROETHOXY) ME							0.01	0.01	MG/KG	0/11	0.00%		No	ND
BIS(2-CHLOROETHYL) ETHE							0.007	0.007	MG/KG	0/11	0.00%		No	ND
BIS(2-ETHYLHEXYL) PHTHA	0.05	=	SM043	0.06	=	PB012	0.067	0.067	MG/KG	2/11	18.18%	0.182	No	BSL
CAPROLACTAM	0.039	B	SM042	0.039	B	SM042	0.04	0.04	MG/KG	1/11	9.09%		Yes	NSL
CARBAZOLE							0.005	0.005	MG/KG	0/11	0.00%		No	ND
CHRYSENE	0.0022	JQ	SM041	0.0069	JQ	PB012	0.003	0.02	MG/KG	3/11	27.27%	0.384	No	BSL
DI-N-BUTYL PHTHALATE	0.006	J	SM043	0.0064	JQ	SM021	0.02	0.034	MG/KG	2/11	18.18%	1.4	No	BSL
DI-N-OCTYL PHTHALATE							0.005	0.005	MG/KG	0/11	0.00%	6.2	No	ND
DIBENZ(A,H)ANTHRACENE							0.007	0.007	MG/KG	0/11	0.00%	0.0634	No	ND
DIBENZOFURAN							0.006	0.006	MG/KG	0/11	0.00%	0.11	No	ND
DIETHYL PHTHALATE	0.0033	JQ	PB014	0.0033	JQ	PB014	0.006	0.029	MG/KG	1/11	9.09%	0.2	No	BSL
DIMETHYL PHTHALATE							0.004	0.004	MG/KG	0/11	0.00%		No	ND
FLUORANTHENE	0.003	JQ	SM041	0.0058	JQ	PB012	0.006	0.03	MG/KG	3/11	27.27%	0.6	No	BSL
FLUORENE							0.004	0.004	MG/KG	0/11	0.00%	0.019	No	ND
HEXACHLOROBENZENE							0.006	0.006	MG/KG	0/11	0.00%		No	ND
HEXACHLOROBUTADIENE							0.004	0.004	MG/KG	0/11	0.00%	0.02232653	No	ND
HEXACHLOROCYCLOPENT							0.001	0.001	MG/KG	0/11	0.00%		No	ND
HEXACHLOROETHANE							0.006	0.006	MG/KG	0/11	0.00%	0.1765725	No	ND
INDENO(1,2,3-C,D)PYRENE							0.009	0.009	MG/KG	0/11	0.00%	1.7	No	ND
ISOPHORONE							0.006	0.006	MG/KG	0/11	0.00%		No	ND
N-NITROSODI-N-PROPYLAM							0.011	0.011	MG/KG	0/11	0.00%		No	ND
N-NITROSODIPHENYLAMINI							0.003	0.003	MG/KG	0/11	0.00%		No	ND
NAPHTHALENE							0.005	0.005	MG/KG	0/11	0.00%	0.16	No	ND
NITROBENZENE							0.007	0.007	MG/KG	0/11	0.00%	0.1272913	No	ND
PENTACHLOROPHENOL							0.063	0.063	MG/KG	0/11	0.00%	0.36	No	ND
PHENANTHRENE	0.000089	JQ	SM042	0.000089	JQ	SM042	0.004	0.02	MG/KG	1/11	9.09%	0.24	No	BSL
PHENOL	0.008	J	SM045	0.008	J	SM045	0.007	0.034	MG/KG	1/11	9.09%	0.42	No	BSL
PYRENE	0.004	JQ	SM041	0.017	JQ	PB012	0.006	0.03	MG/KG	3/11	27.27%	0.665	No	BSL

Rationale for Elimination/Selection:

ASL: Above Screening Levels
 BSL: Below Screening Level
 ND: Not Detected
 NSL: No Screening Level
 NUT: Essential Nutrient
 AI-SSL: Based on EPA Eco-SSL, only a COPC if pH<5.5 (USEPA 2003)
 Fe-SSL: Based on EPA Eco-SSL, not a COPC if 5<pH<8
 TOT: No individual compound exceedance because total PAHs were below benchmark
 BAC: Bioaccumulative Compound
 GRA: Eliminated based upon gradient analysis
 TTL: Total PAHs is less than the individual benchmarks, so total PAHs is eliminated
 FD: Frequency of Detection (less than 5%)
 BKGD: Eliminated based on detection less than site-specific background

Qualifier:

J: Estimated Value
 B: Value is less than the Contract Required Detection Limit, and greater than the Instrument Detection Limit.
 JL: estimated low value
 JH: estimated high value
 mg/kg: milligram per kilogram

Table 21
Environmental Fate and Transport
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Analyte	Environmental Fate	Reference
Aluminum	Aluminum has only one oxidation state (3+); thus, its fate and transport in the environment depends upon its coordination chemistry and the characteristics of the local environmental system. Aluminum does not exist as a free metal in nature due to its reactivity; it partitions between the solid and liquid phases by reacting with water, chloride, fluoride, sulfate, nitrate, phosphate, humic materials, and clay. The greater the mineral content of the soil, the lower the mobility of aluminum. In water, aluminum forms relatively water-insoluble complexes, or is found as a water-soluble complex. Aluminum undergoes hydrolysis to form hydroxy aluminum species and pH determines the hydrolysis products that are formed. Aluminum adsorbs to suspended solids and sediment. At a pH greater than 5.5, aluminum compounds exist predominantly in undissolved forms. Decreasing pH generally results in an increase in mobility for monomeric forms of aluminum.	Bodek et al., 1988; James and Riha, 1989; Brusewitz, 1984; Snoeyink and Jenkins, 1980; Goenaga and Williams, 1988
Antimony	Antimony usually occurs with the valence of 3+ and occasionally of 5+. Antimony binds to soil particles, particularly those containing iron, manganese, or aluminum. In water, antimony is oxidized when exposed to atmospheric oxygen.	Ainsworth, 1988; Parris and Brinckman, 1976
Arsenic	The physical characteristics of the soil matrix determine the dominant form of arsenic and its transport. Insoluble arsenic compounds bind tightly to organic matter in soil or sediment. Various forms of arsenic in soil are interconverted by chemical reactions and microbial activity. The bioavailability of arsenic in soil is inversely proportional to the organic carbon and clay content of the soil matrix. Arsenic in soil is directly taken up by plants and soil microbes and invertebrates, and indirectly taken up by terrestrial receptors via ingestion. In surface water, soluble inorganic arsenate (As5+) predominates under normal conditions and is more stable than arsenite. Movement and partitioning of arsenic in water depends on the chemical form of arsenic and on interactions with other materials present. Soluble forms of arsenic remain dissolved in the water column or adsorb onto sediments or soils, especially those containing clays, iron oxides, aluminum hydroxides, manganese compounds, and organic matter. Sediment bound arsenic is released back into the water by pH, temperature, other metals, salinity, and biota. Uptake by plants from soil is influenced by soil elements, temperature and plant species. Aquatic organisms accumulate arsenic but do not biomagnify it. Arsenic is accumulated by aquatic organisms primarily through dietary exposure. Bioavailability is not dependent on the concentration of acid-volatile sulfides (AVS). Sediments are the major source of arsenic to infaunal organisms.	USEPA, 1984a; ATSDR, 1993a; Ghassemi et al., 1981; USEPA, 1980a; Callahan et al., 1979; Welch et al., 1988; Benson, 1989; Braman and Foreback, 1973; Oak Ridge, 1976; Woolson, 1975; Woodward et al., 1994; Jop et al., 1995; Bryan and Langston, 1992 in USEPA, 2000
Barium	In water, barium precipitates out of solution as an insoluble salt or adsorbs to suspended particulate matter. Barium in sediments is found mostly in the form of barium sulfate. Barium is not very mobile in most soil systems. The rate of transportation of barium in soil is dependent on soil characteristics such as cation exchange capacity and calcium carbonate content. Barium naturally forms compounds in the 2+ oxidation state. Only trace amounts of barium dissolve in surface water. In general, the solubility of barium compounds increases with decreasing pH.	Bodek et al., 1988; USEPA, 1984; Lagas et al., 1984; Benes et al., 1983; Bates, 1988; Kabata-Pendias and Pendias, 1984
Beryllium	Beryllium adsorbs to clays at low pH and precipitates as insoluble complexes at higher pH; therefore, beryllium has limited mobility in soil. In water, beryllium is speciated often by hydrolysis to form relatively insoluble beryllium hydroxide. Beryllium is not volatilized from water. Most beryllium in water will be present in either the sorbed state in suspended matter or in the sediment rather than in a dissolved form, thus limiting its mobility. At a high water pH, formation of water-soluble complexes with hydroxide ions may increase its solubility and mobility.	Callahan et al., 1979; ATSDR, 1993b

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Cadmium	<p>Cadmium exists primarily in the 2+ oxidation state. Cadmium in the water column can partition to dissolved and particulate organic carbon. Cadmium speciation yields primarily the divalent form (2+) between pH conc of 4.0 and 7.0 and it is this divalent form that is believed to be responsible for observed biological effects. Cadmium compounds in soil are stable and are not subject to degradation. Compounds can be transformed by precipitation, dissolution, complexation, and ion exchange. In aquatic environments, cadmium compounds are not affected by photolysis, volatilization, or biological methylation. Precipitation and sorption to mineral surfaces and organic materials are important removal processes. Concentrations are generally higher in sediments than in overlying water.</p> <p>Cadmium readily bioconcentrates in <i>Daphnia sp.</i>, aquatic insects, mollusks, and crayfish. Fish uptake occurs through both water and diet, however water is the primary uptake source. In mammals and birds, cadmium accumulates in the livers and kidneys following ingestion. The concentration of AVS is an important factor controlling the toxicity and bioaccumulation of cadmium in sediments.</p>	USEPA, 1980b; OHM/TADS, 1997; ATSDR, 1993c; McComish and Ong, 1988; Callahan et al., 1979; McCracken IR, 1987; Elinder CG, 1992; Stephenson and Mackie, 1989 in USEPA, 2000
Chromium	<p>In soil, chromium 3+ is readily hydrolyzed and precipitated as chromium hydroxide. It exists in soil primarily as insoluble oxide with very limited mobility. In water, chromium 6+ can occur in the soluble state. It can be adsorbed onto clay-like materials, organics, or iron oxides. chromium 6+ persists in water for 140 days, but is eventually reduced to chromium 3+ by organic matter or other reducing agents in water.</p> <p>Plants can bioaccumulate and reduce chromium. In aqueous solutions, within a pH range of 6 to 8, hexavalent chromium is distributed between two species: monovalent hydrochromate anion and divalent chromate anion. A log bioconcentration factor (BCF) of 2.74 was reported for <i>Daphnia magna</i>. Hexavalent chromium tends to accumulate in the gills of fish following exposure.</p>	USEPA, 1984c; Cary, 1982; Saleh et al., 1989; Beaubien et al., 1994; Klerks and Bartholomew, 1991; Van der Putte and Part, 1982; Enserink et al., 1991 in USEPA, 2000
Cobalt	The mobility of cobalt in soil increases as soil pH decreases. The speciation and transport of cobalt in surface water and sediment is controlled by the presence of ligands, anions, pH, and redox potential. The speciation in soil depends on the nature of the soil, concentration of chelating/complexing agents, pH, and redox potential.	Killey et al., 1984; McLaren et al., 1986; Toste et al., 1984; Mantoura et al., 1978; Smith and Carson, 1981
Copper	<p>Copper occurs naturally in many organisms and is an essential micronutrient. Copper may exist in two oxidation states: 1+ or 2+. Copper (1+) is unstable and oxidizes to the 2+ state in many aerated waters within the pH range of 6 to 8. In the aquatic environment, the fate of copper is determined by the formation of complexes. Copper concentrations remaining in solution depend on water chemistry, such as pH and temperature, and the concentration of other chemical species. The majority of copper released to surface waters settles out or adsorbs to sediments. Some copper complexes with both inorganic and organic ligand.</p>	Callahan et al., 1979; Tyler and McBride, 1982; Fuhrer, 1986; Moffett and Zika, 1987; Harrison and Bishop, 1984; Callahan et al., 1979; Woodward et al., 1994 in USEPA, 2000
	As an essential nutrient, copper is strongly bioaccumulated by plants and animals. All organisms have active transport mechanisms for it, but it does not biomagnify. Biogenic ligands play an important role in complexing copper (which affects precipitation and sorption behavior), an biological activity is a major factor in determining the distribution and occurrence of copper in the ecosystem. Free copper ions are the most bioavailable inorganic forms. The amount of bioavailable copper in sediment is controlled mostly by the concentration of AVS and organic matter. Copper is accumulated by aquatic organisms primarily through dietary exposure.	

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Iron	In the hydrosphere, iron minerals in igneous and metamorphic rocks are the primary sources of iron. Mobilization and redistribution occur with chemical weathering. Iron mobilizes mostly as dissolved Fe(II) in reducing conditions and as particulate Fe(III) oxyhydroxides in oxygenated conditions. In reducing conditions, Fe(II) is soluble and mobile below ~ pH 7 to 8. In oxidized surface waters and sediment, dissolved iron, Fe ³⁺ and Fe (III) inorganic complexes, are mobile below ~ pH 3 to 4. Fe (III) as ferric-organic complexes, are also mobile in many soils and in surface and groundwaters up to ~ pH 5 to 6; as colloidal ferric oxyhydroxides between ~ pH 3 to 8.	Langmuir, 1997
Lead	In water, lead is most soluble and bioavailable under conditions of low pH, low organic content, low suspended sediment concentrations, and low concentrations of salts of other metals. Therefore, the solubility in water is low. Most lead in natural waters is precipitated to sediment as carbonates and hydroxides. Lead is readily precipitated by many common anions. In sediments, lead is mobilized and released during sharp decreases in pH. In soils, the major sink for lead, is relatively immobile and can persist for long periods of time in numerous forms. Adsorption or precipitation of in soils is promoted by presence of organic matter, carbonates, and phosphate minerals. It usually accumulates in topsoil due to complexation with organic matter and the transformation of soluble lead compounds to relatively insoluble sulfate or phosphate derivatives. The efficient fixation of lead by most soils greatly limits the transfer of lead to aquatic systems and also inhibits absorption of lead by plants. However, leaching of lead can be relatively rapid from some soils, especially at highly contaminated sites or landfills. Aquatic biota (invertebrate and vertebrate) can bioconcentrate lead at levels greater than in water, and sometimes similar to those in sediments. Concentrations of lead tend to decrease with increasing aquatic trophic levels. However, lead does not appear to bioconcentrate significantly in fish but does in some shellfish such as mussels. Lead is accumulated by aquatic organisms equally from water and through dietary exposure. Bioaccumulation of organolead compounds is rapid and high and concentrated in the fatty tissues of aquatic organisms. Log BCFs of 5.15 (cladoceran) and 3.56 (midge) were reported in the literature.	Harrison and Laxen, 1981; Scoullos, 1986; May and McKinney, 1981; Boggess, 1977; Benes et al., 1985; Prause et al., 1985; Demayo et al., 1982; Kayser et al. 1982; USEPA, 1979; SRC, 2000; Hodson et al., 1984; Woodward et al., 1994; Timmermans et al., 1992
Manganese	Manganese transport and partitioning is controlled by the solubility of the chemical form present, which is determined by pH, oxidation-reduction potential, and the characteristics of available anions. Manganese may exist in water in any of four oxidation states (2+, 3+, 4+, or 7+). Mn ²⁺ is most common in waters (pH 4-7) but may become oxidized at pH greater than 8 or 9. Adsorption to soil and sediment may be highly variable because adsorption depends on the cation exchange capacity and the organic composition of the substrate. Manganese in water may undergo oxidation at high pH or oxidation-reduction potential and is also subject to microbial activity.	Schaanning et al., 1988; Curtin et al., 1980; Hemstock and Low, 1953; Kabata-Pendias and Pendias, 1984; Johnston and Kipphut, 1988
Mercury	In soil, mercury exists in the mercuric (Hg ⁺²) and mercurous (Hg ⁺¹) states. Mercury adsorbs to soil or is converted to volatile forms. Mercury can migrate by volatilization from aquatic and terrestrial sources through the reduction of metallic mercury to complex species. Atmospheric transport is a major environmental distribution pathway. Mercury 2+ is the predominant form of mercury in surface waters. Nonvolatile mercury in surface water binds to organic matter and sediment particles.	Krabbenhoft and Babiartz, 1992; Callahan et al. 1979; ATSDR, 1994a; Lee and Iverfeldt, 1991; SRC, 2000; Jenson and Jernelov, 1969; Braune, 1987; Elliott et al.,

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	<p>Where mercury is found in soil, water and sediment methylmercury may also be found since it is both produced and destroyed by microbial processes involving mercury compounds. Fish and other aquatic organisms readily bioconcentrate methyl mercury either directly through water or through components of the food chain. Subsequently, fish eating birds tend to show the highest concentrations. Factors which affect the observed levels of mercury in plants and animals at different trophic levels include age, surface area, metabolism, habitat, and activity. There is an inverse relationship between total mercury and percent methylmercury in tissues of various avian species. Among mammals, mercury burdens are higher in fish-eating species than in herbivorous ones. Bioconcentration factors for methylmercury are highly variable. Log BCFs for methylmercury in brook trout range from 4.84 to 5.80.</p> <p>Bioaccumulation factors increased with higher levels in both the pelagic and benthic components of aquatic food webs. Fish bioconcentrate methylmercury directly from water by uptake across the gills and piscivores readily accumulate mercury from dietary sources. Mercury is accumulated by all trophic levels with biomagnification occurring up the food web. The transfer of mercury through the food web is affected by the form of mercury. Although inorganic mercury is the dominant form in the environment and easily accumulated, it is also depurated quickly. Methylmercury accumulates quickly, depurates very slowly, and therefore has a greater potential to biomagnify in higher trophic-level species.</p>	<p>1992; Sheffy and St. Amant, 1982; Rodgers and Beamish, 1981; Wren et al., 1983; Xun et al., 1987; Mathers and Johansen, 1985; Wiener and Spry, 1996; Eisler, 2000</p>
Nickel	<p>Most nickel released into waterways is associated with particulate matter. Nickel is strongly adsorbed at mineral surfaces such as oxides and hydrous oxides of iron, manganese, and aluminum. It is strongly adsorbed by soil. Soil pH and clay content most influence nickel sorption. The 2+ valence is the predominant species in solution.</p> <p>Nickel BCFs ranging from 40-100 suggest that the potential for bioconcentration in aquatic organisms is low to moderate. Although aquatic organisms may accumulate nickel from their surroundings, there is little evidence for significant biomagnification along the food chain. Water-soluble nickel compounds, such as the chloride and sulfate compounds, are poorly absorbed by most living organisms. The uptake of nickel by plants depends upon the extractable nickel content of a soil which is a function of physical, chemical and biological factors of the soil environment. Higher nickel concentrations have been observed in shellfish and crustacea than in fish.</p> <p>Bioaccumulation of nickel is most pronounced in sediments when the ratio of simultaneously extracted metals to acid-volatile sulfide (SEM/AVS) is greater than 1. Although nickel concentrations in animals from sediments with SEM/AVS ratios >1 were approximately 2- to 10-fold greater than nickel concentrations in benthic organisms from sediments with SEM/AVS <1, nickel uptake (tissue concentration) was proportional to the concentration in sediment.</p>	<p>Bowman et al., 1981; Evans, 1989; Rai and Zachara, 1984; Anderson and Christensen, 1988; Sunderman and Oskarsson, 1991; SRC, 2000; National Research Council Canada, 1981; DiToro et al., 1990</p>
Selenium	<p>In nature, selenium exists as six stable isotopes. Changes in the valence state of selenium are associated with its geologic distribution, redistribution, and use. Soluble selenates occur in alkaline soils and are slowly reduced to selenites, which are then readily taken up by plants. Selenium volatilizes from soils and sediments.</p>	<p>Cappon and Smith, 1982; Lo and Sandi, 1980; SRC, 2000; EPA, 1995 in EPA, 2000.</p>

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	BCFs ranging from 200 to 3,600 for selenite and 65 to 500 for selenate suggest bioconcentration in aquatic organisms will be moderate to very high. In sediments, reduced and tightly bound selenium will remain relatively immobile unless the sediments are chemically or biologically oxidized. Selenium is normally found at low levels in aquatic ecosystems. Female fish have been shown to transfer selenium to their progeny and embryos showed an increased incidence of edema and lordosis. Selenium can biomagnify sufficiently to cause acute toxicity to fishes.	
Silver	Transport and partitioning is influenced by the particular form of the compound. Under oxidizing conditions, the primary silver compounds would be bromides, chlorides, and iodides, while under reducing conditions the free metal and silver sulfide would predominate. Mobility in soils is affected by oxidation-reduction potential, pH, and the presence of organic matter. In fresh water, silver often forms complex ions with chlorides, ammonium, and sulfates; forms soluble organic compounds; and adsorbs onto humic complexes and suspended particulates. Silver tends to form complexes with inorganic chemicals and humic substances in soil.	Lindsay and Sadiq, 1979; Boyle, 1968
Thallium	In soil, thallium exists in either the monovalent (thallous) or trivalent (thallic) form. The monovalent form is more common and stable. Thallium is reactive with air and moisture. Moisture increases the oxidation of thallium. Thallium adsorbs to soil and is not transformed or biodegraded. Elemental thallium is relatively insoluble in water.	Hampel, 1968; Standen, 1967; Callahan et al., 1979; Windholz, 1976; Weast, 1975; Frantz and Carlson, 1987
Vanadium	Transport and partitioning in water and soil is influenced by pH, redox potential, and the presence of particulates. In fresh water, vanadium generally exists in solution as V ⁴⁺ under reducing conditions and as V ⁵⁺ under oxidizing conditions. Mobility in soil is affected by pH and is fairly mobile in neutral or alkaline soils, but its mobility decreases in acidic soils. Under oxidizing, unsaturated conditions some mobility is observed, but under reducing, saturated conditions vanadium is immobile. Vanadium entering water is generally converted from the less soluble trivalent state to the more soluble pentavalent state.	Wehrli and Stumm, 1989; Van Zinderen Bakker and Jaworski, 1980; Byerrum et al., 1974
Zinc	<p>Zinc occurs naturally in the 2+ oxidation state. Sorption to suspended and bed sediments is the dominant reaction involving zinc. The relative mobility of zinc in soil and aquatic systems is determined by factors such as the solubility of the compound, pH, redox potential, and salinity. Zinc generally remains as a free ion at low pH conc.s. It partitions to sediments or suspended solids in surface water through sorption onto hydrous iron and manganese oxides, clay minerals, and organic material. Zinc tends to sorb more readily at a high pH (pH>7) than at a low pH. Zinc sorbs strongly onto soil particulates and its mobility depends on the solubility of the speciated forms of the element and on soil properties such as cation exchange capacity, pH, redox potential, and the chemical species present in soil.</p> <p>Zinc compounds have low mobility in soils and are absorbed by plants and vegetables. Adsorption to suspended solids and sediments is expected. Studies indicate that zinc is not a highly mobile element in most aquatic habitats. In fish, zinc tends to accumulate in the gills, liver, kidney and opercular bone, but not the muscle. A log BCF of 2.90 was determined for the midge <i>Chironomus riparius</i>.</p>	Callahan et al., 1979; Clement, 1985; Pita and Hyne, 1975; USEPA, 1980e; Kalbasi et al., 1978; Camusso et al, 1995; SRC, 2000; Timmermans et al., 1992

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Analyte	Environmental Fate	Reference
Pesticides	Pesticides can be transferred by volatilization, runoff, leaching, absorption and physical removal. Increasing temperature, movement, and low relative humidity increase the chances of volatilization. A higher vapor pressure signifies a more volatile pesticide. Microbial, chemical, and photodegradation are types of pesticide degradation. Stability greatly depends on the intensity of natural light, chemical and physical properties, and application site. Accelerated microbial degradation may occur when the same pesticide is repeatedly used at the same site because of the rapid build up of the microorganisms. The most significant reaction is hydrolysis. Chemical reactivity increases with temperature.	Brown, C.L. and Hock W.K., 1990
Polynuclear Aromatic Hydrocarbons (PAHs)	Polynuclear aromatic hydrocarbons are a diverse group of organic molecules composed of two or more fused aromatic (benzene) rings. They are moderately persistent in the environment. In general, as the number of rings increases, mobility and volatility decrease. Because of these physical-chemical properties, PAHs have low solubility, low volatility, and a high tendency to sorb to organic matter. In water, PAHs have high boiling points and are insoluble. When oil is spilled in water, PAH in the oil can enter the water column in dispersed form or be absorbed on organic and inorganic compounds. In the terrestrial environment, PAHs tend to be associated with soil particulates and have low mobility in soil. PAHs generally do not biomagnify in food chains despite high lipid solubility, because they are rapidly metabolized. However, some PAHs can be detected in tissues of aquatic organisms and wildlife at high concentrations immediately following exposure. In general, biodegradation rates are inversely related to the number of fused benzene rings and are further slowed by substitutions, including alkylation. Bioaccumulation and metabolism vary greatly among clams, invertebrates, shrimp, and fish. Bioaccumulation was substantially higher for amphipods than for clams, shrimp, or fish. Clams unable to metabolize PAHs had higher concentration levels of PAHs than amphipods, shrimp, and fish.	Eisler, 2000; RTI, 1995; Varanasi, 1985
Bis(2-Ethylhexyl)Phthalate	In the environment, bis(2-ethylhexyl)phthalate undergoes biodegradation in water and soil. It is predicted to react with hydroxyl radicals in the atmosphere. It has an estimated half-life of 12 hours in the air, 10 - 20 days in soil, and days to weeks in water. The half-life of the molecule, due to evaporation from bodies of water, is about 15 years. Bis(2-ethylhexyl)phthalate rapidly degrades in the marine environment by experimental microcosms. This chemical has been found to bind organic acids in the soil and water, resulting in an increase in its solubility and mobility in the environment. It also absorbs to both freshwater and marine sediments.	Callahan et al., 1979; Davey et al., 1990; Matsuda and Schnitzer, 1971; USEPA, 1987a,b.
Dibenzofuran	In the atmosphere, dibenzofuran exists primarily in the gas-phase and sometimes in the particulate -phase. As a gas, this chemical reacts with photochemically - produced hydroxyl radicals and has a half-life of 4.1 days. As a particulate, wet and dry deposition are expected to be the dominant tropospheric removal process. In soil, this chemical has very low mobility. It is biodegraded in areas where populations of adapted microorganisms are present. In an aquatic environment, dibenzofuran is expected to strongly absorb to particulates and sediment. Dissolved dibenzofuran may volatilize from water. Adapted microbes supplied with sufficient oxygen can readily biodegrade dibenzofuran.	Kwok et al., 1994; Mueller et al., 1991; Wilson et al., 1985; SRC, 2001

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Perchlorate	Perchlorate (ClO ₄) is an anion that originates as a contaminant in ground water and surface waters from the dissolution of ammonium, potassium, magnesium, or sodium salts. Because perchlorate is nonlabile kinetically (i.e., the reduction of the central chlorine atom occurs extremely slowly) and sorption or natural chemical reduction in the environment is not significant, perchlorate is exceedingly mobile in aqueous systems and can persist for many decades under typical ground and surface water conditions.	USEPA, 2002; NCEA web page (http://www.epa.gov/ncea/archive/perchlorate/perch2.htm)

Notes:

Information on the fate and transport of chemicals was researched through TOXNET (<http://toxnet.nlm.nih.gov/>) in the Hazardous Substances Data Bank. Full citations for the primary references listed can be found on the HSDB summary for each chemical listed.

Table 22
Mechanisms of Ecotoxicity
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Analyte	Mechanisms of Ecotoxicity	References
Aluminum	Aluminum is a cytotoxin that interferes with enzymes associated with adenosine triphosphate and maintenance of neurotransmitters; it disrupts neuromotor activity and cognitive abilities; decreases offspring growth, body weights and neurological development; increases resorption rates; alters calcium and phosphorus metabolism; causes embryo lethality; minor skeletal malformations; decrease in egg shell strength and production.	ATSDR, 1992; Sparling and Lowe, 1996.
Antimony	Mutagenic in bacteria or phage; induces chromosomal aberrations or abnormal cell division; antimony combines with sulfhydryl groups in several respiratory enzymes; trivalent antimony induces heme oxygenase, which causes heme degradation in the liver and kidney; causes pulmonary, hepatic and reproductive effects in mammals.	ATSDR, 1990a; Drummond and Kappas, 1981 (HSDB); Flessel, 1977 (HSDB); Hays et al., 1991
Arsenic	Reaction of trivalent form (arsenite) with sulfhydryl groups leads to enzyme (oxidative respiration) inhibition. Methylated arsenic is transferred efficiently in food webs, but does not bioaccumulate. Arsenic reduces growth and development in plants and causes inhibition of light activation, wilting, chlorosis, browning, dehydration and death in plants. Arsenic causes malformations and death in toad embryos. It is carcinogenic and mutagenic and causes impaired behavior, reduced growth, lack of appetite, suffocation by gill clogging and vascular collapse in the gills, testicular and ovarian degeneration, liver damage, and failure to metabolize food in fish. Inorganic arsenic destroys the blood vessel lining in the gut and lowers blood pressure in birds. It also causes hepatocyte damage in birds by inhibition of the sodium pump. Behavioral, systemic, growth, systemic and reproductive effects occur as a result of chronic exposures. It is teratogenic, carcinogenic and possibly mutagenic in mammals. Its developmental effects include malformations (exencephaly, eye defects and renal and gonadal	Sadiq 1992; Eisler, 2000; NRCC 1978 as cited in Eisler 1998b; Nystrom 1984, as cited in Eisler 1998b; Stanley et al. 1994; Whitworth et al. 1991; Camardese et al. 1990; ATSDR 1993a; Domingo 1994; Sorensen 1991, as cited in Irwin et al. 1997; Mance, 1990.
Barium	Barium can inhibit intestinal absorption in the winter flounder. Barium accumulates in plants and the bones in birds and mammals. It affects affects potassium metabolism in muscles and causes respiratory weakness, muscle paralysis and stimulation, irregular cardiac contractions and lowered pulse rate in mammals. Some reproductive effects (reduced ovary weight) have been observed.	Amdur et al. 1991; ATSDR 1990b; Schroeder 1970 as cited in ATSDR 1990b; Charney and Taglietta 1992; Borzelleca et al., 1988.
Beryllium	Beryllium exerts its effects in amphibians on the physiological processes (ion regulation and gas exchange) on the gill surface and skin. Gill abnormalities have been observed in exposed fish. Beryllium is primarily an inhalation stressor in mammals, with exposure resulting in hypersensitivity, pneumonitis and chronic granulomatous pulmonary disease. Phytotoxicity is caused by the inhibition of enzyme activity.	Amdur et al., 1991; Jagoe et al. 1993; Brown et al., 1983 (HSDB)

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Analyte	Mechanisms of Ecotoxicity	References
Cadmium	Cadmium causes mutagenesis, teratogenesis, carcinogenesis; It inhibits enzyme reactions by replacement of essential divalent nutrients (e.g., zinc) at critical sites on proteins and enzymes; combines with sulfhydryl groups in enzymes; inhibition of Phase I and Phase II biotransformation reactions; kidney lesions; reduces growth rates and feed consumption; causes reproductive effects in birds; testicular damage; decreases hemoglobin and hematocrit; causes behavior, growth, and physiological changes in aquatic organisms; accumulates primarily in the kidneys; immunosuppressive effects have been shown in mice, fish, and oysters. Soluble form is highly available for plant uptake and can disturb enzyme activity.	ATSDR, 1990c; Eisler, 2000; Hammons et al., 1978; Siewicki et al., 1983; Rompala et al, 1994 as cited in Irwin et al, 1997; Wren et al., 1995, as cited in Irwin et al., 1997; Malins and Ostrander, 1994, as cited in Irwin et al., 1997; Bodek et al., 1988.
Chromium	Beneficial but not essential for plants; trivalent form essential form in mammals for maintaining efficient lipid, glucose and protein metabolism; mutagenic, teratogenic and carcinogenic; hexavalent form associated with inhibition of photosynthesis and interference with transport and mobilization of essential nutrients. Hexavalent form can cause oxidation stress in cells, abnormal enzyme activity, lowered resistance to pathogens, disrupted feeding, disrupted osmoregulation, histopathology, and damage to beta cells of pancreatic islets. Can cause nephron and liver damage. Decreased weight gain, increased oxygen consumption, impaired reproduction, and increased hematocrit have been noted in aquatic organisms. High deposition of trivalent form in fish gills leads to tissue damage including hyperplasia, clubbing of lamellae, and necrosis.	ATSDR, 1993c; Eisler, 2000; Moore et al., 1990, as cited in Irwin et al., 1997.
Cobalt	Cobalt produces adverse systemic and hematological effects and reduction in sperm development, fertilization and implantation in mammals. A decrease in testicular size has been noted in exposed rodents. It can cause interstitial fibrosis, enzyme inhibition and effects associated with mixed function monooxygenases. Cobalt chloride has been noted to produce neurotropic effects in rats.	ATSDR, 1992b

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Copper	Essential element for animals as a component of metalloenzymes and respiratory pigments, iron utilization, function of enzymes in pigmentation, connective tissue formation and energy production; forms stable inhibitory complexes with cytochrome P-450; impairs function of NADPH-cytochrome C reductase; inhibits heme biosynthesis; teratogen and possible carcinogen; accumulates in the liver and reduces liver's ability to excrete copper; decreases growth and food consumption in birds; disrupts internal ion balance in aquatic organisms; alters hematology, respiratory physiology, and cardiac physiology in fish; causes histological changes in the gills, kidneys, hematopoietic tissue, mechanoreceptors, and chemoreceptors in fish. Reproductive effects in fish include blockage of spawning, reduced egg production, abnormalities in young, and reduced survival of young.	ATSDR, 1990d; Rand and Petrocelli, 1985, as cited in Irwin et al., 1997; Sorenson, 1991, as cited in Irwin et al., 1997.
Iron	Essential for the production of proteins in plants and hemoglobin in animals. Toxicity related to cellular oxidative stress, dysfunction and toxicity due to peroxide formation.	HSDB, 1/19/00
Lead	Inhibits growth in plants. Reduces photosynthetic activity by blocking sulfhydryl groups and inhibiting the conversion of coproporphyrinogen to protoporphyrinogen. Reduces mitosis and water absorption. In animals, lead inhibits the formation of heme and reduces amino-levulinic acid dehydratase activity in blood. Toxic effects in animals include reduced growth and reproductive output, accumulation in hematopoietic organs, changes in the central nervous system (at high concentrations near those causing mortality) kidney dysfunction, enzyme inhibition, and behavioral changes. In birds, lead decreases egg shell thickness and limits growth, ovulation, and sperm formation. In fish, lead can increase mucous formation and cause death from suffocation.	ATSDR, 1993b; Eisler, 2000; Finley and Stendell, 1978; Friberg et al., 1986; Heinz, 1979; Rompala et al., 1984, as cited in Irwin et al., 1997.
Manganese	Manganese is cytotoxic and causes chromosomal aberrations in rodents. Reduction in testicular growth (weight) and reduced seminal vesicle weight have been noted in rodents exposed to manganese. Can cause dopamine depletion in nerve cells. Adverse behavioral and systemic effects have been noted in birds exposed to manganese above nutrient levels.	ATSDR, 1992c

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Analyte	Mechanisms of Ecotoxicity	References
Mercury	Mercury binds strongly with sulfhydryl groups and interferes with thiol metabolism, inhibiting or inactivating proteins containing thiol ligands. This leads to mitotic disturbances and inhibition of cell division. Organic mercury compounds are potent inhibitors of cell division. Methylmercury irreversibly destroys central nervous system neurons in mammals and aquatic organisms and is the most toxic form. Mercury compounds adversely affect metabolism, growth, development and behavior in birds and mammals at relatively low exposure levels. The most sensitive target organ of inorganic mercury appears to be the kidneys.	ATSDR, 1994a; Eisler, 2000; Leland and Kuwabara, 1985, as cited in Irwin et al., 1997.
Nickel	Nickel is nephrotoxic, carcinogenic, and immunotoxic in mammals. Elevated levels of nickel cause tremors, edema in joints and reduction in body weight and humerus length in birds; decreased reproductive capacity has been noted. Retarded growth, anemia, and decreased enzyme activity have been observed in rats.	ATSDR, 1995; Friberg et al., 1986, as cited in Irwin et al., 1997.
Selenium	Selenium causes systemic and reproductive effects in birds and mammals. In birds, there are embryo development effects, including an increase in malformed embryos and decreased hatchling and adult weight. Adverse effects on body weight and increases in the death of young animals and the frequency of runts have been observed in mammals. In fish, selenium can cause reproductive failures, including an increase in birth defects. Decreased seed germination and growth have been observed in plants.	Eisler 1985b; ATSDR, 1994b; Sorensen, 1991, as cited in Irwin et al., 1997; Moore et al., as cited in Irwin et al., 1997.
Silver	Silver has a strong affinity for sulfhydryl groups and proteins, resulting in cytotoxicity. Respiratory depression in aquatic organisms has been noted; can cause cardiac enlargement, vascular hypertension, hepatic necrosis, anemia, lowered immunological activity, kidney pathology, enzyme inhibition, growth retardation, and shortened life span in mammals and birds.	ATSDR, 1990e; Eisler, 2000.
Thallium	Exposure to elevated levels of thallium causes neuromorphological changes and systemic effects in mammals (hair loss, increases in skeletal abnormalities and weight loss). No information was located for birds.	ATSDR, 1992d

Table 22**Mechanisms of Ecotoxicity***Baseline Ecological Risk Assessment**State Marine Superfund Site, Port Arthur, TX*

Analyte	Mechanisms of Ecotoxicity	References
Vanadium	Essential for growth in some fungi and algae; stimulates photosynthesis in higher plants and carries oxygen in some invertebrates; toxicity increases with valence (+5 most toxic); the pentavalent form inhibits enzyme systems such as monoamine oxidase, Na-K ATPase, tyrosinase, choline esterase, cholesterol synthetase; In mammals, toxic effects occur in the respiratory tracts as a result of inhalation of fumes and dust; dietary exposure causes adverse effects on blood cell production; embryotoxicity observed in pregnant Sprague-Dawley rates exposed to sodium metavanadate; in chickens, egg production suppressed upon exposure to dietary vanadium; genotoxic in invitro test systems using bacteria, yeast and mouse cells (recombination repair, gene mutation, DNA synthesis).	ATSDR, 1992e; Irwin et al., 1997; Luckey and Venugopal, 1977
Zinc	Zinc is essential for normal reproduction and growth in plants and animals. In animals, it is regulated by metallothioneins, which temporarily store zinc, reducing its toxicity. Zinc-dependent enzymes regulate the rates of biosynthesis and catabolism of RNA and DNA. At high exposures, zinc interferes with the metabolism of calcium and iron and induces copper deficiency. Zinc causes cytoplasmic vacuolation, cellular atrophy and cell death in the pancreas. It accumulates preferentially in bone and induces osteomalacia (softening of the bone) as a result of a deficiency of minerals, including calcium and phosphorous. In fish, zinc causes destruction of gill epithelium and tissue hypoxia. In rainbow trout, disruption of internal ion balance has been noted.	Eisler, 2000; Rand and Petrocelli, 1985, as cited in Irwin et al., 1997.
Pesticides	Toxicity and mode of action are highly variable and are related to the structure of the pesticides. Potent estrogenic and enzyme-inducing properties, which interfered with fertility and reproduction, of the Organoc Chlorine pesticides (OCs) have been demonstrated in wildlife and lab species. In avian species, OCs interferes with steroid metabolism, causing egg thinning. Reproduction in fish is adversely affected by the bioconcentration of the pesticides in the yolk sac of the fry. Gradual accumulation of residues of these compounds and their metabolites in body tissues as well as the slow elimination from the system has been well documented. As many other pesticide, OCs and carbamate pesticides affect the nervous systems. They inhibit anticholinesterase activities, increasing secretions, broncho constriction, miosis, gastrointestinal cramps, urination, bradycardia)	Klaassen , 1996 (Stickel, 1968; McFarland and Lacy, 1969; Longcore et al., 1971, McBlain et al, 1968;p Crum et al, 1993)(Carson, 1962; Peakall, 1970)

Table 22**Mechanisms of Ecotoxicity***Baseline Ecological Risk Assessment**State Marine Superfund Site, Port Arthur, TX*

Analyte	Mechanisms of Ecotoxicity	References
Polycyclic Aromatic Hydrocarbons (PAHs)	Toxicity is highly variable and related to the number of ring structures and molecular weight. Low molecular weight compounds of 2 or three rings (e. g., naphthalene) cause acute toxicity, but are not carcinogenic. Higher molecular weight PAHs with > 4 rings (e. g., benzo(a)pyrene) are mutagenic, teratogenic and carcinogenic to a wider variety of animals. PAHs are toxic to a variety of animal tissues. Causes narcosis toxicity in aquatic animals.	Eisler, 2000.
Phthalates	Little information is known about the ecotoxicological effects that might be caused by this type of chemical. Adverse effects in animals were generally seen only at high doses or with long term exposures. Mildly harmful effects have been seen in the livers and kidneys of some rats and mice given very high doses (e.g., di (2-ethylhexyl)phthalate, di-n-octylphthalate). Longer exposures to high doses might affect the ability of both males and females to reproduce and caused birth defects.	ATSDR, 09/22/00

Full citations for the primary references listed can be found on the HSDB summary for each chemical listed.

Table 23
Assessment and Measurement Endpoints
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Assessment Endpoint	Guild (Food Web)	Representative Species	Measurement Endpoints	Exposure Routes	Null Hypotheses
1. Impairment of growth, reproduction, or survival of populations of herbivorous birds that use the habitat on-site due to exposure to COCs attributable to the site	Herbivorous Bird (Terrestrial)	northern bobwhite quail	Comparison of exposure doses to NOAELs or LOAELs based on published values for survival, growth and reproduction	Direct exposure, ingestion	Exposure doses do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs
2. Impairment of growth, reproduction, or survival of populations of omnivorous mammals that use the habitat on-site due to exposure to COCs attributable to the site	Omnivorous Mammal (Terrestrial)	white-footed mouse	Comparison of exposure doses to NOAELs or LOAELs based on published values for survival, growth and reproduction	Direct exposure, ingestion	Exposure doses do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs
3. Impairment of growth, reproduction, or survival of populations of carnivorous mammals that use the habitat on-site due to exposure to COCs attributable to the site	Carnivorous Mammal (Terrestrial)	coyote	Comparison of exposure doses to NOAELs or LOAELs based on published values for survival, growth and reproduction	Direct exposure, ingestion	Exposure doses do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs
4. Impairment of growth, reproduction, or survival of populations of benthic invertebrates that use the habitat on-site due to exposure to COCs attributable to the site	Benthic Invertebrates (Aquatic)	NA	Comparison of concentrations of chemicals in on-site surface sediment to literature-based screening levels	Direct exposure, ingestion	measured concentrations do not exceed literature-based screening levels
5. Impairment of growth, reproduction, or survival of populations of insectivorous shore birds that use the habitat on-site due to exposure to COCs attributable to the site	Insectivorous Shore Bird (Aquatic)	spotted sandpiper	Comparison of exposure doses to NOAELs or LOAELs based on published values for survival, growth and reproduction	Direct exposure, ingestion	Exposure doses do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs
6. Impairment of growth, reproduction, or survival of populations of carnivorous shore birds that use the habitat on-site due to exposure to COCs attributable to the site	Carnivorous Bird (Aquatic)	belted kingfisher	Comparison of exposure doses to NOAELs or LOAELs based on published values for survival, growth and reproduction	Direct exposure, ingestion	Exposure doses do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs

Notes:

NA = not applicable

NOAEL = no observed adverse effect level

Table 23

Assessment and Measurement Endpoints

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Assessment Endpoint	Guild (Food Web)	Representative Species	Measurement Endpoints	Exposure Routes	Null Hypotheses
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95th UCL = 95th percent upper confidence level

LOAEL = lowest observed adverse effect level

Table 24
Wildlife Exposure Factors for Ecological Receptors
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Fort Arthur, TX

Species	Feeding Guild	Body Weight		Food Ingestion Rate ^b		Home Range		Dietary Composition (%)								
		kg	Reference ^a	kg/kg-bw/d	Reference ^a	Value ^c	Reference ^a	Terrestrial Invertebrates	Soil	Terrestrial Vertebrates	Plants	Aquatic Invertebrates	Aquatic Vertebrates	Sediment	Reference for Dietary Food Items ^a	Reference for Incidental Ingestion ^a
Northern Bobwhite Quail	Herbivorous Bird	0.157	Guthery et al., 1988	0.111	Nagy, 1987	16.8	Yoho and Dimmick, 1972	0.0	9.3	0.0	100.0	0.0	0.0	0.0	Campbell-Kissock et al., 1985	Beyer et al. 1984. Estimated / Value for wild turkey; Considered an upper bound value
White-footed Mouse	Omnivorous Mammal	0.021	Assumed comparable to deer mouse, Millar, 1989	0.165	Nagy, 1987	0.247	Lackey, 1985	50.0	2.4	0.0	50.0	0.0	0.0	0.0	Assumed	Used Meadow Vole Information from Beyer et. al. 1994
Coyote	Carnivorous Mammal	10.33	Average of values from California and Arizona presented in Sample et al., 1997	0.04534	Nagy, 1987	3010	Bekoff 1982, Bekoff and Wells 1980	0.0	2.8	99.0	1.0	0.0	0.0	0.0	Ransom, 1981	Used Red Fox Data from Beyer et al., 1994
Spotted Sandpiper	Insectivorous Bird	0.0425	Average of males and females from Maxson and Oring, 1980	0.42376	Nagy, 1987	12.0	Miller and Miller, 1948	0.0	0.0	0.0	0.0	100.0	0.0	18.0	Maxson and Oring, 1980	Beyer et al, in Press
Belted Kingfisher	Piscivorous Bird	0.147	Brooks and Davis, 1987 in EPA, 1993 average of adult values	0.11364	Nagy, 1987	2.2	Brooks & Davis, 1987	0.0	0.0	0.0	0.0	0.0	100.0	0.0	Salyer & Lagler, 1946 in EPA, 1993	Used green heron information from Sample et al., 1997

NOTES:

References a) Complete references are available in the references section of the main text.

Food Ingestion Rate

b) Food ingestion rates were calculated from body weight using Nagy's (1987) allometric equations as presented in Sample et al., 1997 Mammals

$I_{fd} = (0.0687(BW)^{0.822})/BW$ - Placental Mammals (coyote)
 $I_{fd} = (0.0306(BW)^{0.564})/BW$ - Rodents (white-footed mouse)

Avian Species

$I_{fd} = (0.0582(BW)^{0.651})/BW$ - All Birds (quail, sandpiper, and kingfisher)

Home Range

c) the home range values are all area measurements in units of acres except for the belted kingfisher, which is a linear measurement in kilometers

Acronyms

BW = body weight
 I_{fd} = ingestion rate food

I_w = ingestion rate water
 kg = kilogram
 kg/kg-bw/d = kilograms food per kilogram bodyweight per day
 l/kg-bw/d = liters water per kilogram body weight per day

Table 25
Chemical Specific Biotransfer, Bioconcentration and Bioaccumulation Factors from Media to Prey Tissue
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Parameter Name	Soil to Plant (mg/kg-dry)/ (mg/kg-soil)	Source	Soil to Terrestrial Invertebrate (mg/kg-dry)/ (mg/kg-soil)	Source	Soil to Vertebrates (mg/kg-dry)/ (mg/kg-soil)	Source	Log Kow	Source	Sediment to Benthic Invertebrates (mg/kg-dry)/ (mg/kg- sediment)	Source	Sediment to Fish BSAF (mg/kg-wet)/ (mg/kg- sediment)	Source
2-METHYLPHENOL (o-CRESOL)	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA/assumed	1	NA/assumed
2,4-DIMETHYLPHENOL	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA/assumed	1	NA/assumed
2-METHYLNAPHTHALENE	0.757	USEPA, 2000	0.200	Beyer and Stafford, 1993	0.000	USEPA, 2005	3.716	TCEQ, 2004	2.09	naphthalene used as a surrogate	0.000	TNRCC, 2001
3,3'-DICHLOROBENZIDINE	1.186	EPA, 2000	28.464	EPA, 2000	0.000	Travis and Arms, 1988	3.210	TCEQ, 2004	1.00	NA/assumed	1.000	NA/assumed
4,6-DINITRO-2-METHYLPHENOL	3.265	USEPA, 2000	27.219	USEPA, 2000	0.000	Travis and Arms, 1988	2.068	TCEQ, 2004	1.00	NA/assumed	1.000	NA/assumed
4-METHYLPHENOL (P-CRESOL)	3.3	EPA, 2000	27.2	EPA, 2000	1.0947	EPA, 2000	2.06	TCEQ, 2004	1.00	NA/assumed	1.000	NA/assumed
ACENAPHTHENE	0.515	USEPA, 2000	0.300	Beyer and Stafford, 1993	0.000	USEPA, 2005	4.151	TCEQ, 2004	2.04	Maruya et al, 1997	0.000	TNRCC, 2001
ACENAPHTHYLENE	0.6	USEPA, 2000	0.2	Beyer and Stafford, 1993	0.0	USEPA, 2005	3.94	TCEQ, 2004	1.62	Maruya et al, 1997	0.000	TNRCC, 2001
ACETONE	25.146	USEPA, 2000	24.873	USEPA, 2000	0.000	Travis and Arms, 1988	0.235	TCEQ, 2004	1.00	NA/assumed	1.000	NA/assumed
ACETOPHENONE	4.646	EPA, 2000	26.798	EPA, 2000	0.000	Travis and Arms, 1988	1.670	TCEQ, 2004	1.00	NA/assumed	1.000	NA/assumed
ALDRIN	0.05	USEPA, 2000	32.69	USEPA, 2000	0.17238934	Travis and Arms, 1988	6.75	TCEQ, 2004	1.00	NA/assumed	7.310	Tracy and Hansen, 1996
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	0.5	EPA, 2000	29.7	EPA, 2000	0.525416	EPA, 2000	4.26	TNRCC, 2002a	5.6	highest value ACOE, 2004	7.310	Tracy and Hansen, 1996
ALPHA-CHLORDANE	0.04	USEPA, 2000	32.98	USEPA, 2000	0.29	Travis and Arms, 1988	6.97	TCEQ, 2004	1.00	NA/assumed	7.31	Tracy and Hansen, 1996
ALUMINIUM	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA/assumed	1	NA/assumed
ARSENIC	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA/assumed	1	NA/assumed
ANTHRACENE	0.43	USEPA, 2000	0.32	Beyer and Stafford, 1993	0.00	USEPA, 2005	4.35	TCEQ, 2004	0.19	Maruya et al, 1997	0	TNRCC, 2001
ANTIMONY	0.050	ORNL, 2003	1.000	NA/assumed	1.000	NA/assumed	0.000	TCEQ, 2004	1.00	NA/assumed	1.00	NA/assumed
BARIIUM	0.100	ORNL, 2003	0.160	Sample et al, 1998a	0.112	Sample et al, 1998b	0.000	TCEQ, 2004	1.00	NA/assumed	1.000	NA/assumed
Benzaldehyde	3.788785337	USEPA, 2000	27.04082889	USEPA, 2000	1.68927E-06	Travis and Arms, 1988	1.90	TCEQ, 2004	1.0	NA/assumed	1.000	NA/assumed
BENZENE	25.14635255	USEPA, 2000	24.87281846	USEPA, 2000	1.05256E-08	Travis and Arms, 1988	-0.24	TCEQ, 2004	1.0	NA/assumed	1.000	NA/assumed
BENZO(a)ANTHRACENE	0.15	USEPA, 2000	0.27	Beyer and Stafford, 1993	0.00	USEPA, 2005	5.52	TCEQ, 2004	0.36	Maruya et al, 1997	0.000	TNRCC, 2001
BENZO(a)PYRENE	0.091	USEPA, 2000	0.340	Beyer and Stafford, 1993	0.000	USEPA, 2005	6.109	TCEQ, 2004	0.13	Maruya et al, 1997	0.000	TNRCC, 2001
BENZO(b)FLUORANTHENE	0.091	USEPA, 2000	0.210	Beyer and Stafford, 1993	0.000	USEPA, 2005	6.109	TCEQ, 2004	0.15	Maruya et al, 1997	0.000	TNRCC, 2001
BENZO(g,h,i)PERYLENE	0.054	USEPA, 2000	0.150	Beyer and Stafford, 1993	0.000	USEPA, 2005	6.697	TCEQ, 2004	0.22	Maruya et al, 1997	0.000	TNRCC, 2001
BENZO(k)FLUORANTHENE	0.091	USEPA, 2000	0.210	Beyer and Stafford, 1993	0.000	USEPA, 2005	6.109	TCEQ, 2004	0.21	Maruya et al, 1997	0.000	TNRCC, 2001
BENZYL BUTYL PHTHALATE	0.279	EPA, 2000	30.344	EPA, 2000	0.432	EPA, 2000	4.845	TCEQ, 2004	1.00	NA/assumed	1.000	NA/assumed
BERYLLIUM	0.010	ORNL, 2003	1.182	Sample et al, 1998a	0.410	Beyer and Stafford, 1993	0.571	TCEQ, 2004	0.05	Bechtel-Jacobs, 1998	1.000	NA/assumed
BETA ENDOSULFAN	0.203	EPA, 2000	30.769	EPA, 2000	0.004	Travis and Arms, 1988	5.200	TCEQ, 2004	27.95	endosulfan sulfate a	7.310	Tracy and Hansen, 1996
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	0.5	EPA, 2000	1.0	NA/assumed	0.5	EPA, 2000	4.26	TCEQ, 2004	11.18	ACOE, 2004, Delta BHC as a surrogate	7.310	Tracy and Hansen, 1996
BIPHENYL (DIPHENYL)	NA	NA	NA	NA	NA	NA	3.76	TCEQ, 2004	NA	NA	10.000	assumed
BIS(2-ETHYLHEXYL) PHTHALATE	0.0	EPA, 2000	34.9	EPA, 2000	0.132	EPA, 2000	8.39	TCEQ, 2004	1.00	NA/assumed	1	NA/assumed
CADMIUM	RM	Bechtel Jacobs, 1998a	RM	Sample et al, 1998a	RM	Sample et al, 1998b	-0.07	TCEQ, 2004	0.12	maximum from Weston, 2001	0.53	maximum from Weston, 2001
CAPROLACTAM	12.4	EPA, 2000	25.7	EPA, 2000	0.0	Travis and Arms, 1988	0.6	TCEQ, 2004	1.00	NA/assumed	1	NA/assumed
CARBAZOLE	1.2	USEPA, 2000	28.5	USEPA, 2000	0.0	Travis and Arms, 1988	3.23	TCEQ, 2004	1.00	NA/assumed	1.000	NA/assumed
CHROMIUM, TOTAL	0.04	ORNL, 2003	3.16	Sample et al, 1998a	RM	Sample et al, 1998b	0.00	TCEQ, 2004	RM	Bechtel-Jacobs, 1998b	1	NA/assumed
CHRYSENE	0.2	USEPA, 2000	0.4	Beyer and Stafford, 1993	0.00000000	USEPA, 2005	5.52	TCEQ, 2004	0.20	Maruya et al, 1997	0.000	TNRCC, 2001
COBALT	0.054	ORNL, 2003	0.291	Sample et al, 1998a	0.100	Sample et al, 1998b	0.000	TCEQ, 2004	0.12	Bechtel-Jacobs, 1998	1.000	NA/assumed
COPPER	RM	Bechtel Jacobs, 1998a	RM	Sample et al, 1998a	RM	Sample et al, 1998b	-0.571	TCEQ, 2004	RM	Bechtel-Jacobs, 1998	1.130	maximum from Weston, 2001
CYANIDE	1.000	NA/assumed	1.000	NA/assumed	1.000	NA/assumed	NA	NA	0.00	NA/assumed	1.000	NA/assumed
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	0.589	EPA, 2000	29.358	EPA, 2000	0.000	Travis and Arms, 1988	4.000	TCEQ, 2004	11.18	highest value ACOE, 2004	7.310	Tracy and Hansen, 1996
DIBENZ(a,h)ANTHRACENE	0.054	USEPA, 2000	0.490	Beyer and Stafford, 1993	0.000	USEPA, 2005	6.697	TCEQ, 2004	0.21	Maruya et al, 1997	0.000	TNRCC, 2001

Table 25
Chemical Specific Biotransfer, Bioconcentration and Bioaccumulation Factors from Media to Prey Tissue
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Parameter Name	Soil to Plant (mg/kg-dry)/ (mg/kg-soil)	Source	Soil to Terrestrial Invertebrate (mg/kg-dry)/ (mg/kg-soil)	Source	Soil to Vertebrates (mg/kg-dry)/ (mg/kg-soil)	Source	Log Kow	Source	Sediment to Benthic Invertebrates (mg/kg-dry)/ (mg/kg- sediment)	Source	Sediment to Fish BSAF (mg/kg-wet)/ (mg/kg- sediment)	Source
DIBENZOFURAN	0.590715048	USEPA, 2000	29.35344995	USEPA, 2000	0.000247345	Travis and Arms, 1988	4.00	TCEQ, 2004	1.0	NA/assumed	0.000	TNRCC, 2001
DIELDRIN	0.2	USEPA, 2000	3.9	Beyer and Gish, 1980	0.0078	Travis and Arms, 1988	5.45	TCEQ, 2004	1.00	NA/assumed	7.31	Tracy and Hansen, 1996
DIETHYL PHTHALATE	0.591	USEPA, 2000	29.353	USEPA, 2000	0.000	halene used as a surr	3.996	TCEQ, 2004	2.09	halene used as a surr	1.000	NA/assumed
ENDOSULFAN SULFATE	0.81	EPA, 2000	1.00	NA/assumed	1.0000	NA/assumed	6.01	TCEQ, 2004	27.95	hest value ACOE, 20	7.310	Tracy and Hansen, 1996
ENDRIN	0.08	ORNL, 2003	0.36	USEPA, 2000	0.00	Travis and Arms, 1988	4.56	TCEQ, 2004	1.00	NA/assumed	7.31	Tracy and Hansen, 1996
ENDRIN ALDEHYDE	0.068	USEPA, 2000	32.300	USEPA, 2000	0.083	Travis and Arms, 1988	6.440	TCEQ, 2004	1.00	NA/assumed	7.310	Tracy and Hansen, 1996
ENDRIN KETONE	0.2	USEPA, 2000	30.92644495	USEPA, 2000	0.005900516	Travis and Arms, 1988	5.33	TCEQ, 2004	1.00	NA/assumed	7.31	Tracy and Hansen, 1996
FLUORANTHENE	0.26	USEPA, 2000	0.37	Beyer and Stafford, 1993	0.000	USEPA, 2005	4.93	TCEQ, 2004	0.21	Maruya et al, 1997	0	TNRCC, 2001
FLUORENE	0.58	USEPA, 2000	0.20	Beyer and Stafford, 1993	0.00	Travis and Arms, 1988	4.02	TCEQ, 2004	776.44	Beauchamp, and Sch	0	TNRCC, 2001
GAMMA BHC (LINDANE)	0.47	EPA, 2000	29.66	EPA, 2000	0.00	Travis and Arms, 1988	4.26	TCEQ, 2004	5.59	hest value ACOE, 20	7.31	Tracy and Hansen, 1996
GAMMA-CHLORDANE	0.042	USEPA, 2000	32.972	USEPA, 2000	0.289	Travis and Arms, 1988	6.966	TCEQ, 2004	1.00	NA/assumed	7.310	Tracy and Hansen, 1996
HEPTACHLOR	0.08	USEPA, 2000	8.40	Beyer and Gish, 1980	0.0475	Travis and Arms, 1988	6.21	TCEQ, 2004	21281.13	EPA, 1999	7.310	Tracy and Hansen, 1996
HEPTACHLOR EPOXIDE	0.3	USEPA, 2000	8.4	Beyer and Gish, 1980	0.0021	Travis and Arms, 1988	4.91	TCEQ, 2004	1.00	NA/assumed	7.31	Tracy and Hansen, 1996
HEXACHLOROBUTADIENE	0.03	USEPA, 2000	33.56	EPA, 2000	0.85	Travis and Arms, 1988	7.42	TCEQ, 2004	1.00	NA/assumed	1	NA/assumed
INDENO(1,2,3-c,d)PYRENE	0.05	USEPA, 2000	0.21	Beyer and Stafford, 1993	0.15	Travis and Arms, 1988	6.70	TCEQ, 2004	0.17	Maruya et al, 1997	0	TNRCC, 2001
IRON	NA	NA	NA	NA	NA	NA	NA	NA	1.00	NA/assumed	1	NA/assumed
LEAD	RM	Bechtel Jacobs, 1998a	1.5	Sample et al, 1998a	RM	Sample et al, 1998b	0.729	TCEQ, 2004	RM	Bechtel-Jacobs, 1998b	1.00	NA/assumed
MANGANESE	0.680	ORNL, 2003	RM	Sample et al, 1998a	0.06	Sample et al, 1998b	0.000	TCEQ, 2004	1.00	NA/assumed	1.000	NA/assumed
MERCURY	RM	Bechtel Jacobs, 1998a	RM	Sample et al, 1998a	0.192	Sample et al, 1998b	-0.471	TCEQ, 2004	RM	Bechtel-Jacobs, 1998b	3.23	maximum from Weston, 2001
METHOXYCHLOR	0.134	USEPA, 2000	31.337	USEPA, 2000	0.013	Travis and Arms, 1988	5.667	TCEQ, 2004	1.00	NA/assumed	7.310	Tracy and Hansen, 1996
NAPHTHALENE	1.23	USEPA, 2000	0.21	Beyer and Stafford, 1993	0.00	Travis and Arms, 1988	3.17	TCEQ, 2004	157.33	Southworth, Beauchamp, and Schmieder, 1978	0.000	TNRCC, 2001
NICKEL	RM	Bechtel Jacobs, 1998a	4.73	Sample et al, 1998a	RM	Sample et al, 1998b	-0.57	TCEQ, 2004	RM	Bechtel-Jacobs, 1998	0.05	maximum from Weston, 2001
NITROBENZENE	1.23	USEPA, 2000	0.21	Beyer and Stafford, 1993	0.00	USEPA, 2005	3.17	TCEQ, 2004	2.09	Maruya et al, 1997	1	NA/assumed
PENTACHLOROPHENOL	0.31	EPA, 2000	37.13	EPA, 2000	0.07727	EPA, 2000	4.74	TNRCC, 2002a	1.00	NA/assumed	10.000	assumed
p,p'-DDD	0.112	USEPA, 2000	0.270	Beyer and Gish, 1980	0.021	Travis and Arms, 1988	5.873	TCEQ, 2004	1.00	NA/assumed	7.310	Tracy and Hansen, 1996
p,p'-DDE	0.100	USEPA, 2000	6.000	Beyer and Gish, 1980	0.029	Travis and Arms, 1988	5.996	TCEQ, 2004	66688.70	EPA, 1999	7.310	Tracy and Hansen, 1996
p,p'-DDT	0.0	USEPA, 2000	0.6	Beyer and Gish, 1980	0.2	Travis and Arms, 1988	6.79	TCEQ, 2004	1.00	NA/assumed	7.310	Tracy and Hansen, 1996
PHENANTHRENE	0.43	USEPA, 2000	0.28	Beyer and Stafford, 1993	0.00	Travis and Arms, 1988	4.35	TCEQ, 2004	1445.33	Southworth, Beauchamp, and Schmieder, 1978	0	TNRCC, 2001
PHENOL	0.43	USEPA, 2000	0.28	Beyer and Stafford, 1993	0.00	USEPA, 2005	4.35	TCEQ, 2004	0.29	Maruya et al, 1997	1	NA/assumed
PYRENE	0.26	USEPA, 2000	0.39	Beyer and Stafford, 1993	0.00	USEPA, 2005	4.93	TCEQ, 2004	0.44	Maruya et al, 1997	0	TNRCC, 2001

Table 25
Chemical Specific Biotransfer, Bioconcentration and Bioaccumulation Factors from Media to Prey Tissue
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Parameter Name	Soil to Plant (mg/kg-dry)/ (mg/kg-soil)	Source	Soil to Terrestrial Invertebrate (mg/kg-dry)/ (mg/kg-soil)	Source	Soil to Vertebrates (mg/kg-dry)/ (mg/kg-soil)	Source	Log Kow	Source	Sediment to Benthic Invertebrates (mg/kg-dry)/ (mg/kg- sediment)	Source	Sediment to Fish BSAF (mg/kg-wet)/ (mg/kg- sediment)	Source
SELENIUM	RM	Bechtel Jacobs, 1998a	RM	Sample et al, 1998a	RM	Sample et al, 1998a	0.24	TCEQ, 2004	1.17	maximum from Weston, 2001	1.230	maximum from Weston, 2001
SILVER	1.000	NA/assumed	1.710	SWDIV, 1996	0.810	Sample et al, 1998b	0.000	TCEQ, 2004	1.71	Bechtel-Jacobs, 1998	1.000	NA/assumed
THALLIUM	0.004	ORNL, 2003	1.000	NA/assumed	0.120	Sample et al, 1998b	NA	TCEQ, 2004	1.00	NA/assumed	1.000	NA/assumed
TRIBUTYL TIN	NA	NA	NA	NA	NA	NA	NA	NA	7.97	Best value ACOE, 2001	10.000	assumed
VANADIUM	0.0055	ORNL, 2003	0.088	Sample et al, 1998a	0.019	Sample et al, 1998b	0.00	TCEQ, 2004	0.04	Bechtel-Jacobs, 1998b	1.000	NA/assumed
ZINC	RM	Bechtel Jacobs, 1998a	RM	Sample et al, 1998a	RM	Sample et al, 1998b	-0.47	TCEQ, 2004	RM	Bechtel-Jacobs, 1998b	1.140	maximum from Weston, 2001
Notes:												
NA = not applicable												
N/A = not available												

RM = Regression model used to estimate tissue concentration, see table 9b-14

- 1) All biotransfer factors are expressed as dry weight
- 2) Soil-to-plant transfer factors for organics were derived using $\log BAF_p = 1.31 - 0.385 \cdot \log Kow$ (USEPA, 2000)
- 3) Bioaccumulation data for birds and reptiles were unavailable. Bioaccumulation data for small mammals were assumed to be equal for all vertebrates.
- 4) Soil-to-invertebrate transfer factors for organics were derived using $BAF = 10^{(0.01 \cdot \log(Kow - 0.6) + 0.983 \cdot \log Kow + 0.00028)}$ from EPA, 2000.
- 5) Soil-to-small mammal transfer factors for organics were derived using $BAF = 10^{(1.033 - 7.735 \cdot \log Kow)}$ from Travis and Arms, 1988
- 6) The BAFs for Beyer and Stafford, 1993 are for undepurated worms as opposed to the Sample et al., 1998a data which is for depurated worms
- 7) Soil to small mammal values were not available for organics or for tin. Values for Baes et al, 1984 and for Travis and Arms, 1984 are the ratio of concentration in diet to concentration in tissue. As a result, it was assumed that the diets of the small vertebrates consumed by carnivores consisted of 75% plants and 25% insects.

Table 26
Log-linear Regression Models for Estimating Tissue Concentrations
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Parameter Name	Receptor	Soil/Sediment		B1	Prey Conc. (dry)
		Conc	B0		
Plants in Former Wastewater Impoundments					
COPPER	General	1.4E+02	6.7E-01	3.9E-01	1.3E+01
LEAD	General	2.2E+02	-1.3E+00	5.6E-01	5.4E+00
CADMIUM	General	1.2E+00	-0.476	0.546	7.0E-01
ZINC	General	2.8E+02	1.6E+00	5.6E-01	1.1E+02
Terrestrial Invertebrates in Former Wastewater Impoundments					
COPPER	Earthworm	1.4E+02	1.7E+00	2.6E-01	2.0E+01
LEAD	Earthworm	2.2E+02	-2.2E-01	8.1E-01	6.2E+01
CADMIUM	Earthworm	1.2E+00	2.1E+00	8.0E-01	9.9E+00
ZINC	Earthworm	2.8E+02	4.4E+00	3.3E-01	5.5E+02
Terrestrial Vertebrates in Former Wastewater Impoundments					
COPPER	General	1.4E+02	2.0E+00	1.4E-01	1.6E+01
LEAD	General	2.2E+02	7.6E-02	4.4E-01	1.2E+01
CADMIUM	General	1.2E+00	-0.4306	0.4865	7.2E-01
ZINC	General	2.8E+02	4.5E+00	7.4E-02	1.3E+02
Plants in Waste Treatment Facility					
COPPER	General	2.6E+02	6.7E-01	3.9E-01	1.7E+01
LEAD	General	1.3E+02	-1.3E+00	5.6E-01	4.1E+00
MERCURY	General	6.5E-01	-1.0E+00	5.4E-01	2.9E-01
CADMIUM	General	8.3E-01	-0.476	0.546	5.6E-01
ZINC	General	6.0E+02	1.6E+00	5.6E-01	1.7E+02
Terrestrial Invertebrates in Waste Treatment Facility					
COPPER	Earthworm	2.6E+02	1.7E+00	2.6E-01	2.3E+01
LEAD	Earthworm	1.3E+02	-2.2E-01	8.1E-01	4.1E+01
MERCURY	Earthworm	6.5E-01	-6.8E-01	1.2E-01	4.8E-01
CADMIUM	Earthworm	8.3E-01	2.1E+00	8.0E-01	7.2E+00
ZINC	Earthworm	6.0E+02	4.4E+00	3.3E-01	7.0E+02

Table 26
Log-linear Regression Models for Estimating Tissue Concentrations
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Parameter Name	Receptor	Soil/Sediment Conc	B0	B1	Prey Conc. (dry)
Terrestrial Vertebrates in Waste Treatment Facility					
COPPER	General	2.6E+02	2.0E+00	1.4E-01	1.7E+01
LEAD	General	1.3E+02	7.6E-02	4.4E-01	9.3E+00
CADMIUM	General	8.3E-01	-0.4306	0.4865	6.0E-01
ZINC	General	6.0E+02	4.5E+00	7.4E-02	1.4E+02
Plants in Current Aboveground Storage Tanks					
LEAD	General	5.6E+02	-1.3E+00	5.6E-01	9.2E+00
PENTACHLOROPHENOL	General	2.8E-01	0.0E+00	5.9E+00	5.3E-04
MERCURY	General	1.3E-01	-1.0E+00	5.4E-01	1.2E-01
CADMIUM	General	4.8E-01	-0.476	0.546	4.2E-01
ZINC	General	4.8E+02	1.6E+00	5.6E-01	1.5E+02
Terrestrial Invertebrates in Current Aboveground Storage Tanks					
LEAD	Earthworm	5.6E+02	-2.2E-01	8.1E-01	1.3E+02
PENTACHLOROPHENOL	Earthworm	2.8E-01	5.5E+00	3.3E-01	1.7E+02
MANGANESE	Earthworm	3.8E+02	-8.1E-01	6.8E-01	2.6E+01
MERCURY	Earthworm	1.3E-01	-6.8E-01	1.2E-01	4.0E-01
CADMIUM	Earthworm	4.8E-01	2.1E+00	8.0E-01	4.6E+00
ZINC	Earthworm	4.8E+02	4.4E+00	3.3E-01	6.5E+02
Terrestrial Vertebrates in Current Aboveground Storage Tanks					
CHROMIUM, TOTAL	General	1.3E+02	-1.5E+00	7.3E-01	8.1E+00
LEAD	General	5.6E+02	7.6E-02	4.4E-01	1.8E+01
PENTACHLOROPHENOL	Chicken	2.8E-01	2.0E-01	4.5E-03	1.2E+00
CADMIUM	General	4.8E-01	-0.4306	0.4865	4.5E-01
ZINC	General	4.8E+02	4.5E+00	7.4E-02	1.4E+02
Plants in Maintenance Shed Area					
CADMIUM	General	4.2E-01	-0.476	0.546	3.9E-01

Table 26
Log-linear Regression Models for Estimating Tissue Concentrations
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Parameter Name	Receptor	Soil/Sediment			Prey Conc. (dry)
		Conc	B0	B1	
ZINC	General	1.1E+03	1.6E+00	5.6E-01	2.3E+02
Terrestrial Invertebrates in Maintenance Shed Area					
CADMIUM	Earthworm	4.2E-01	2.1E+00	8.0E-01	4.2E+00
ZINC	Earthworm	1.1E+03	4.4E+00	3.3E-01	8.4E+02
Terrestrial Vertebrates in Maintenance Shed Area					
CADMIUM	General	4.2E-01	-0.4306	0.4865	4.3E-01
ZINC	General	1.1E+03	4.5E+00	7.4E-02	1.5E+02
Plants in Tar Burn Area					
COPPER	General	1.6E+02	6.7E-01	3.9E-01	1.4E+01
MERCURY	General	3.1E-01	-1.0E+00	5.4E-01	2.0E-01
CADMIUM	General	1.1E+00	-0.476	0.546	6.5E-01
ZINC	General	4.2E+02	1.6E+00	5.6E-01	1.4E+02
Terrestrial Invertebrates in Tar Burn Area					
COPPER	Earthworm	1.6E+02	1.7E+00	2.6E-01	2.0E+01
MERCURY	Earthworm	3.1E-01	-6.8E-01	1.2E-01	4.4E-01
CADMIUM	Earthworm	1.1E+00	2.1E+00	8.0E-01	8.9E+00
ZINC	Earthworm	4.2E+02	4.4E+00	3.3E-01	6.2E+02
Terrestrial Vertebrates in Tar Burn Area					
CADMIUM	General	1.1E+00	-0.4306	0.4865	6.8E-01
ZINC	General	4.2E+02	4.5E+00	7.4E-02	1.4E+02
Plants in Lauren Tank Farm					
COPPER	General	1.3E+03	6.7E-01	3.9E-01	3.3E+01
LEAD	General	1.0E+03	-1.3E+00	5.6E-01	1.3E+01
CADMIUM	General	1.7E+00	-0.476	0.546	8.3E-01

Table 26
Log-linear Regression Models for Estimating Tissue Concentrations
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Parameter Name	Receptor	Soil/Sediment			Prey Conc. (dry)
		Conc	B0	B1	
ZINC	General	4.4E+02	1.6E+00	5.6E-01	1.4E+02
Terrestrial Invertebrates in Lauren Tank Farm					
COPPER	Earthworm	1.3E+03	1.7E+00	2.6E-01	3.6E+01
LEAD	Earthworm	1.0E+03	-2.2E-01	8.1E-01	2.2E+02
CADMIUM	Earthworm	1.7E+00	2.1E+00	8.0E-01	1.3E+01
ZINC	Earthworm	4.4E+02	4.4E+00	3.3E-01	6.3E+02
Terrestrial Vertebrates in Lauren Tank Farm					
COPPER	General	1.3E+03	2.0E+00	1.4E-01	2.2E+01
LEAD	General	1.0E+03	7.6E-02	4.4E-01	2.3E+01
CADMIUM	General	1.7E+00	-0.4306	0.4865	8.4E-01
ZINC	General	4.4E+02	4.5E+00	7.4E-02	1.4E+02
Plants in Non-source Area					
COPPER	General	5.5E+03	6.7E-01	3.9E-01	5.8E+01
LEAD	General	4.1E+03	-1.3E+00	5.6E-01	2.8E+01
MERCURY	General	5.4E-01	-1.0E+00	5.4E-01	2.6E-01
CADMIUM	General	1.2E+01	-0.476	0.546	2.4E+00
ZINC	General	5.1E+01	1.6E+00	5.6E-01	4.3E+01
Terrestrial Invertebrates in Non-source Area					
COPPER	Earthworm	5.5E+03	1.7E+00	2.6E-01	5.2E+01
LEAD	Earthworm	4.1E+03	-2.2E-01	8.1E-01	6.6E+02
MANGANESE	Earthworm	1.4E+03	-8.1E-01	6.8E-01	6.1E+01
MERCURY	Earthworm	5.4E-01	-6.8E-01	1.2E-01	4.7E-01
CADMIUM	Earthworm	1.2E+01	2.1E+00	8.0E-01	5.8E+01
ZINC	Earthworm	5.1E+01	4.4E+00	3.3E-01	3.1E+02
Terrestrial Vertebrates in Non-source Area					

Table 26
Log-linear Regression Models for Estimating Tissue Concentrations
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Parameter Name	Receptor	Soil/Sediment			Prey Conc. (dry)
		Conc	B0	B1	
COPPER	General	5.5E+03	2.0E+00	1.4E-01	2.7E+01
LEAD	General	4.1E+03	7.6E-02	4.4E-01	4.3E+01
CADMIUM	General	1.2E+01	-0.4306	0.4865	2.1E+00
ZINC	General	5.1E+01	4.5E+00	7.4E-02	1.2E+02
Plants in All Upland Area Soil					
COPPER	General	3.0E+02	6.7E-01	3.9E-01	1.8E+01
LEAD	General	4.7E+02	-1.3E+00	5.6E-01	8.3E+00
PENTACHLOROPHENOL	General	2.8E-01	0.0E+00	5.9E+00	5.3E-04
MERCURY	General	1.3E-01	-1.0E+00	5.4E-01	1.2E-01
CADMIUM	General	1.2E+01	-0.476	0.546	2.4E+00
ZINC	General	4.8E+02	1.6E+00	5.6E-01	1.5E+02
Terrestrial Invertebrates in All Upland Area Soil					
COPPER	Earthworm	3.0E+02	1.7E+00	2.6E-01	2.4E+01
LEAD	Earthworm	4.7E+02	-2.2E-01	8.1E-01	1.1E+02
PENTACHLOROPHENOL	Earthworm	2.8E-01	5.5E+00	3.3E-01	1.7E+02
MANGANESE	Earthworm	3.8E+02	-8.1E-01	6.8E-01	2.6E+01
MERCURY	Earthworm	1.3E-01	-6.8E-01	1.2E-01	4.0E-01
CADMIUM	Earthworm	1.2E+01	2.1E+00	8.0E-01	5.8E+01
ZINC	Earthworm	4.8E+02	4.4E+00	3.3E-01	6.5E+02
Terrestrial Vertebrates in All Upland Area Soil					
CHROMIUM, TOTAL	General	1.3E+02	-1.5E+00	7.3E-01	8.1E+00
COPPER	General	3.0E+02	2.0E+00	1.4E-01	1.8E+01
LEAD	General	4.7E+02	7.6E-02	4.4E-01	1.6E+01
PENTACHLOROPHENOL	Chicken	2.8E-01	2.0E-01	4.5E-03	1.2E+00
CADMIUM	General	1.2E+01	-0.4306	0.4865	2.1E+00
ZINC	General	4.8E+02	4.5E+00	7.4E-02	1.4E+02
Aquatic Invertebrates in Lake Sabine - Intertidal					

Table 26
Log-linear Regression Models for Estimating Tissue Concentrations
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Parameter Name	Receptor	Soil/Sediment			Prey Conc. (dry)
		Conc	B0	B1	
CHROMIUM, TOTAL	depurated	1.3E+02	0.0445	0.448	5.78E+00
COPPER	depurated	2.1E+01	1.2E+00	7.9E-02	4.4E+00
LEAD	depurated	2.0E+02	-5.2E-01	6.5E-01	1.9E+01
MERCURY	depurated	1.8E-01	-6.7E-01	3.3E-01	2.9E-01
NICKEL	depurated	8.5E+01	-4.4E-01	7.0E-01	1.4E+01
ZINC	depurated	5.9E+02	1.9E+00	1.3E-01	1.5E+01
Aquatic Invertebrates in Lake Sabine - Nearshore					
COPPER	depurated	2.1E+01	1.2E+00	7.9E-02	4.4E+00
LEAD	depurated	2.0E+02	-5.2E-01	6.5E-01	1.9E+01
MERCURY	depurated	1.8E-01	-6.7E-01	3.3E-01	2.9E-01
NICKEL	depurated	8.5E+01	-4.4E-01	7.0E-01	1.4E+01
ZINC	depurated	5.9E+02	1.9E+00	1.3E-01	1.5E+01
Aquatic Invertebrates in Lake Sabine - All Sediment					
COPPER	depurated	2.1E+01	1.2E+00	7.9E-02	4.4E+00
LEAD	depurated	2.0E+02	-5.2E-01	6.5E-01	1.9E+01
MERCURY	depurated	1.8E-01	-6.7E-01	3.3E-01	2.9E-01
NICKEL	depurated	8.5E+01	-4.4E-01	7.0E-01	1.4E+01
ZINC	depurated	5.9E+02	1.9E+00	1.3E-01	1.5E+01

Notes:

All values are reported as dry weight.

mg/kg = Milligrams per kilogram.

Equations:

$$\ln(\text{Prey Conc}) = B1 * (\ln[\text{Site Specific Soil/Sediment Concentration}]) + B0$$

where:

B0 = Slope.

B1 = Intercept.

References:

Bechtel Jacobs, 1998a. Empirical Model for the Uptake of Inorganic Chemicals from Soil by Plants. Prepared for the US Department of Energy Office of Environmental Management. BJC/OR-133. September, 1998.

Bechtel Jacobs, 1998. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Reservation. Prepared for the US Department of Energy Office of Environmental Management. BJC/OR-133. September, 1998.

Sample et al., 1998a. Development and Validation of Bioaccumulation Models for Earthworms. Prepared for the US Department of Energy Office of Environmental Management. BJC/OR-133. September, 1998.

Table 26
Log-linear Regression Models for Estimating Tissue Concentrations
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Parameter Name	Receptor	Soil/Sediment			Prey Conc. (dry)
		Conc	B0	B1	
		US Department of Energy Office of Environmental Management. ES/ER/TM-220. February, 1998.			
		Sample et al., 1998b. Development and Validation of Bioaccumulation Models for Small Mammals. Prepared for the US Department of Energy Office of Environmental Management. ES/ER/TM-219. February, 1998.			
		USEPA, 2005. OSWER Directive 9285.7-55. Attachment 4-1. Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs). Revised February 2005.			

Table 27

Exposure Point Concentrations for Wildlife COPECs in Soil

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Parameter Name	Units	Former Wastewater Impoundments	Wastewater Treatment Facility	Current Aboveground Storage Tanks	Maintenance Shed Area	Tar Burn Area	Former Lauren Tank Farm	Non-source	All Upland Soil (mg/kg)
2-METHYLNAPHTHALENE	mg/Kg	7.00E-01	2.20E-01	1.10E-01	1.80E-01	4.20E-02	1.60E+00	1.90E+00	1.90E+00
4-METHYLPHENOL (P-CRESOL)	mg/Kg	NA	NA	4.60E-02	NA	NA	1.10E-01	NA	1.10E-01
ACENAPHTHENE	mg/Kg	3.90E-01	8.50E-02	4.60E-01	3.30E-02	3.50E-02	6.40E-02	9.60E+00	9.60E+00
ACENAPHTHYLENE	mg/Kg	2.90E+00	3.50E-01	1.80E-01	2.90E-01	4.50E-01	9.10E-01	5.00E+00	5.00E+00
ALPHA-CHLORDANE	mg/Kg	3.00E-03	NA	NA	NA	NA	2.16E+00	NA	1.30E+01
ALDRIN	mg/Kg	NA	NA	NA	1.10E-02	NA	NA	NA	1.10E-02
ANTHRACENE	mg/Kg	2.90E+00	4.50E-01	1.50E+00	2.90E-01	3.90E-01	1.10E+00	1.30E+01	1.30E+01
ANTIMONY	mg/Kg	4.47E+01	5.70E+00	2.50E+00	NA	6.00E+00	NA	2.63E+01	4.47E+01
BENZALDEHYDE	mg/Kg	NA	5.10E-02	3.20E-02	1.10E-02	6.30E+00	9.70E-02	1.50E-01	6.30E+00
BENZO(A)ANTHRACENE	mg/Kg	1.30E+00	8.30E-01	3.00E+00	9.70E-01	9.20E-01	3.99E+00	2.40E+01	2.40E+01
BENZO(A)PYRENE	mg/Kg	2.60E+00	6.50E-01	2.70E+00	1.30E+00	1.20E+00	4.68E+00	1.90E+01	1.90E+01
BENZO(B)FLUORANTHENE	mg/Kg	3.60E+00	1.10E+00	4.40E+00	3.40E+00	1.20E+00	6.02E+00	2.50E+01	2.50E+01
BENZO(K)FLUORANTHENE	mg/Kg	6.50E-01	3.40E-01	1.80E+00	2.40E+00	1.40E+00	<i>2.50E+00</i>	1.20E+01	1.20E+01
BENZO(G,H,I)PERYLENE	mg/Kg	8.80E+00	2.40E-01	9.70E-01	1.20E+00	4.60E-01	<i>2.10E+00</i>	4.30E+00	8.80E+00
BENZYL BUTYL PHTHALATE	mg/Kg	1.60E-01	NA	3.00E-02	1.30E-01	5.20E-01	2.40E-02	2.60E-01	5.20E-01
BETA ENDOSULFAN	mg/Kg	8.10E-03	NA	NA	<i>1.00E-01</i>	NA	NA	3.30E-03	1.30E+01
BIS(2-ETHYLHEXYL) PHTHALATE	mg/Kg	4.90E+00	NA	NA	NA	4.70E+00	1.90E+00	3.20E+00	4.90E+00
CADMIUM	mg/Kg	1.25E+00	8.34E-01	<i>4.80E-01</i>	4.20E-01	<i>1.10E+00</i>	<i>1.70E+00</i>	1.15E+01	1.15E+01
CARBAZOLE	mg/Kg	7.70E-01	1.30E-01	2.30E-01	3.00E-01	2.90E-01	5.20E-01	1.29E+00	7.50E+00
CHROMIUM, TOTAL	mg/Kg	NA	NA	1.26E+02	NA	NA	NA	8.17E+01	1.26E+02
CHRYSENE	mg/Kg	3.40E+00	1.30E+00	2.80E+00	1.70E+00	1.10E+00	4.91E+00	2.10E+01	2.10E+01
COPPER	mg/Kg	1.35E+02	2.55E+02	NA	NA	1.55E+02	1.33E+03	5.48E+03	2.98E+02
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	mg/Kg	NA	NA	NA	2.30E-02	NA	NA	1.70E-03	2.30E-02
DIBENZ(A,H)ANTHRACENE	mg/Kg	4.60E-01	1.00E-01	3.30E-01	4.90E-01	2.30E-01	<i>9.40E-01</i>	2.20E+00	2.20E+00
DIBENZOFURAN	mg/Kg	2.10E-01	3.30E-02	1.80E-01	8.20E-02	4.40E-02	1.30E-01	3.80E+00	3.80E+00
DIELDRIN	mg/Kg	NA	NA	NA	5.40E-02	NA	5.30E-03	6.75E+00	1.09E+01
ENDOSULFAN SULFATE	mg/Kg	9.20E-03	NA	NA	3.90E-02	NA	NA	3.30E-03	3.90E-02
ENDRIN	mg/Kg	1.40E-02	NA	NA	1.65E-03	NA	NA	3.30E-03	9.86E+00
ENDRIN ALDEHYDE	mg/Kg	1.00E-02	NA	NA	5.20E-02	NA	1.83E+00	1.30E+01	7.74E+00
ENDRIN KETONE	mg/Kg	9.90E-03	NA	NA	NA	NA	NA	3.30E-03	9.90E-03
FLUORENE	mg/Kg	3.40E-01	9.70E-02	4.70E-01	9.80E-02	1.20E-01	1.80E-01	8.10E+00	8.10E+00
FLUORANTHENE	mg/Kg	2.50E+00	2.20E+00	1.00E+01	3.50E+00	1.90E+00	6.44E+00	6.20E+01	6.20E+01
GAMMA BHC (LINDANE)	mg/Kg	NA	NA	NA	5.90E-03	NA	NA	1.70E-03	5.90E-03
GAMMA-CHLORDANE	mg/Kg	5.60E-03	NA	NA	3.60E-02	NA	7.80E-03	1.70E-03	3.60E-02
HEPTACHLOR	mg/Kg	NA	NA	NA	7.90E-03	NA	3.10E-03	1.70E-03	7.90E-03
HEPTACHLOR EPOXIDE	mg/Kg	5.10E-03	NA	NA	4.10E-02	NA	NA	6.00E+00	1.31E+01
INDENO(1,2,3-C,D)PYRENE	mg/Kg	3.00E+00	4.20E-01	1.10E+00	1.00E+00	7.40E-01	6.30E-01	6.90E+00	6.90E+00
LEAD	mg/Kg	2.17E+02	1.29E+02	<i>5.58E+02</i>	NA	NA	1.03E+03	4.09E+03	4.67E+02
MANGANESE	mg/Kg	NA	NA	3.79E+02	NA	NA	NA	1.36E+03	3.79E+02
MERCURY	mg/Kg	NA	6.48E-01	<i>1.30E-01</i>	NA	3.10E-01	NA	5.40E-01	1.30E-01
NAPHTHALENE	mg/Kg	8.60E-01	1.20E-01	7.80E-02	1.80E-01	5.20E-02	1.40E+00	6.80E+00	6.80E+00
PENTACHLOROPHENOL	mg/Kg	NA	NA	<i>2.80E-01</i>	NA	NA	NA	NA	2.80E-01
P,P'-DDD	mg/Kg	NA	NA	NA	1.50E+01	NA	9.10E-03	1.10E+01	1.50E+01
P,P'-DDE	mg/Kg	NA	NA	NA	5.00E-02	NA	NA	2.50E+00	1.00E+01
P,P'-DDT	mg/Kg	9.10E-03	NA	NA	5.70E-02	NA	7.60E-03	3.30E-03	1.80E+01
PHENANTHRENE	mg/Kg	2.50E+00	1.10E+00	3.80E+00	1.20E+00	9.30E-01	2.00E+00	5.30E+01	5.30E+01
PYRENE	mg/Kg	1.00E+01	1.60E+00	8.40E+00	4.00E+00	1.50E+00	6.32E+00	4.00E+01	4.00E+01
SILVER	mg/Kg	2.60E+00	1.40E+00	9.60E-01	NA	NA	NA	8.30E+00	2.60E+00
VANADIUM	mg/Kg	NA	NA	3.10E+01	NA	NA	NA	2.68E+01	3.10E+01
ZINC	mg/Kg	2.83E+02	5.96E+02	<i>4.84E+02</i>	1.06E+03	<i>4.24E+02</i>	4.44E+02	5.05E+01	4.76E+02

Notes:

Table 27
Exposure Point Concentrations for Wildlife COPECs in Soil
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Parameter Name	Units	Former Wastewater Impoundments	Wastewater Treatment Facility	Current Aboveground Storage Tanks	Maintenance Shed Area	Tar Burn Area	Former Lauren Tank Farm	Non-source	All Upland Soil (mg/kg)
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NA - Eliminated during COPC selection or were not analyzed in the AOC

Concentrations in **Bold** = 95% UCL

Concentrations in *Italics* = Max concentration used in lieu of UCL because UCL is greater than max. concentration

Concentrations in shaded cells = average concentration across exposure area

Table 28
Exposure Point Concentrations for Wildlife COPECs in Sediment
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Parameter Name	Units	Lake Sabine - Intertidal	Lake Sabine - Nearshore	Lake Sabine - Offshore	All Sediment
2-METHYLNAPHTHALENE	mg/Kg	9.10E-02	1.10E-02	NA	9.10E-02
2-METHYLPHENOL (O-CRESOL)		NA	1.70E-01	NA	1.70E-01
2,4-DIMETHYLPHENOL	mg/Kg	3.50E-02	1.70E-01	NA	1.70E-01
3,3'-DICHLOROBENZIDINE	mg/Kg	NA	7.50E-02	4.90E-02	7.50E-02
4-METHYLPHENOL (P-CRESOL)	mg/Kg	NA	NA	NA	0.00E+00
ACENAPHTHENE	mg/Kg	9.80E-02	5.80E-01	NA	5.80E-01
ACENAPHTHYLENE	mg/Kg	3.50E-02	1.20E-01	NA	1.20E-01
ACETOPHENONE	mg/Kg	4.30E-02	5.70E-03	NA	4.30E-02
ALPHA BHC (ALPHA HEXACHLORO)	mg/Kg	NA	1.70E-03	NA	1.70E-03
ALUMINUM	mg/Kg	NA	NA	NA	3.53E+03
ANTHRACENE	mg/Kg	1.00E-01	2.00E+00	NA	2.00E+00
ANTIMONY	mg/Kg	1.61E+01	NA	NA	1.61E+01
ARSENIC	mg/Kg	1.37E+01	1.17E+01	8.90E+00	1.37E+01
BARIUM	mg/Kg	4.59E+01	6.40E+01	1.15E+02	1.15E+02
BENZALDEHYDE	mg/Kg	1.10E-01	3.70E-02	3.90E-02	1.10E-01
BENZO(A)ANTHRACENE	mg/Kg	NA	4.10E+00	NA	4.10E+00
BENZO(A)PYRENE	mg/Kg	NA	2.30E+00	NA	2.30E+00
BENZO(B)FLUORANTHENE	mg/Kg	NA	3.60E+00	NA	3.60E+00
BENZO(G,H,I)PERYLENE	mg/Kg	NA	2.40E-01	NA	2.40E-01
BENZO(K)FLUORANTHENE	mg/Kg	NA	1.90E+00	NA	1.90E+00
BENZYL BUTYL PHTHALATE	mg/Kg	1.70E-01	6.40E-02	NA	1.70E-01
BERYLLIUM	mg/Kg	3.30E-01	2.70E+00	8.90E-01	2.70E+00
BETA BHC (BETA HEXACHLORO)	mg/Kg	NA	1.70E-03	NA	1.70E-03
BIPHENYL (DIPHENYL)	mg/Kg	NA	NA	NA	0.00E+00
BIS(2-ETHYLHEXYL) PHTHALATE	mg/Kg	3.00E+00	2.60E-01	NA	2.00E-01
CADMIUM	mg/Kg	1.49E+00	NA	NA	1.49E+00
CALCIUM	mg/Kg	1.72E+05	NA	5.58E+03	1.72E+05
CAPROLACTAM	mg/Kg	1.10E-01	5.10E-02	3.90E-02	1.10E-01
CARBAZOLE	mg/Kg	2.00E-01	3.10E-01	NA	3.10E-01
CHROMIUM, TOTAL	mg/Kg	8.72E+01	NA	NA	8.72E+01
CHRYSENE	mg/Kg	NA	3.90E+00	NA	3.90E+00
COBALT	mg/Kg	NA	8.46E+00	NA	8.46E+00
COPPER	mg/Kg	2.14E+01	1.56E+01	NA	7.05E+01

Table 28
Exposure Point Concentrations for Wildlife COPECs in Sediment
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Parameter Name	Units	Lake Sabine - Intertidal	Lake Sabine - Nearshore	Lake Sabine - Offshore	All Sediment
CYANIDE	mg/Kg	5.50E-01	NA	NA	5.50E-01
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	mg/Kg	NA	1.70E-03	NA	1.70E-03
DIBENZ(A,H)ANTHRACENE	mg/Kg	NA	2.30E-01	NA	2.30E-01
DIBENZOFURAN	mg/Kg	NA	3.60E-01	NA	3.60E-01
FLUORANTHENE	mg/Kg	NA	9.10E+00	NA	9.10E+00
FLUORENE	mg/Kg	1.10E-01	7.90E-01	NA	7.90E-01
GAMMA BHC (LINDANE)	mg/Kg	NA	3.40E-03	NA	3.40E-03
HEXACHLOROBUTADIENE	mg/Kg	NA	1.70E-01	NA	1.70E-01
INDENO(1,2,3-C,D)PYRENE	mg/Kg	NA	3.40E-01	NA	3.40E-01
IRON	mg/Kg	NA	NA	NA	0.00E+00
LEAD	mg/Kg	2.04E+02	2.22E+01	NA	1.50E+02
MAGNESIUM	mg/Kg	3.62E+03	NA	4.30E+03	4.30E+03
MANGANESE	mg/Kg	1.50E+03	1.27E+03	7.45E+02	1.50E+03
MERCURY	mg/Kg	1.80E-01	4.50E-02	NA	1.80E-01
NICKEL	mg/Kg	8.50E+01	2.64E+01	4.41E+01	8.50E+01
NAPHTHALENE	mg/Kg	4.00E-01	1.40E-02	NA	4.00E-01
NITROBENZENE	mg/Kg	NA	1.70E-01	NA	1.70E-01
PENTACHLOROPHENOL	mg/Kg	1.60E-01	NA	NA	1.60E-01
PHENANTHRENE	mg/Kg	3.20E-01	2.37E-01	NA	7.10E+00
POTASSIUM	mg/Kg	1.23E+03	NA	2.46E+03	2.46E+03
PYRENE	mg/Kg	NA	8.80E+00	NA	8.80E+00
SELENIUM	mg/Kg	2.97E+00	3.71E-01	5.90E-01	5.90E+00
THALLIUM	mg/Kg	NA	5.42E-01	NA	5.42E-01
TRIBUTYL TIN	mg/Kg	NA	NA	NA	0.00E+00
VANADIUM	mg/Kg	NA	NA	NA	0.00E+00
ZINC	mg/Kg	5.94E+02	1.54E+02	NA	3.91E+03

Notes:

NA - Eliminated during COPC selection or were not analyzed in the AOC

Concentrations in **Bold** = 95% UCL

Concentrations in shaded cells = average concentration across exposure area

Table 29
Toxicity Reference Values Considered for Avian Wildlife Receptors
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Study Selection	Chemical	Form	Primary Reference	Test species	Endpoint	Measured Effect	Duration	NOAEL Dose (mg/kgbw-d)	LOAEL Dose (mg/kgbw-d)	Uncertainty Factor (for normalized NOAEL)	Normalized NOAEL TRV (mg/kgbw-d)	Uncertainty Factor (for normalized LOAEL)	Normalized LOAEL TRV (mg/kgbw-d)
>	2-METHYLPHENOL (o-CRESOL)	4-METHYLPHENOL (p-CRESOL)	Hancock, 1993	northern bobwhite	mortality, growth	mortality, growth, and feed consumption	(acute)	125	NA	0.033	4,167	NA	NA
>	2,4-DIMETHYLPHENOL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>	4-METHYLPHENOL (p-CRESOL)	NA	Hancock, 1993	northern bobwhite	mortality, growth	mortality, growth, and feed consumption	(acute)	1.25E+02	NA	0.01	1.25E+00	NA	NA
>	3,3'-DICHLORO BENZIDINE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>	ACETOPHENONE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>+	ALDRIN	NA	USFWS, 1984	northern bobwhite	survivorship	LD50	acute	NA	7.30E-01	0.01	7.30E-03	0.1	7.30E-02
>+	ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	gamma BHC used as surrogate	Chakravarty and Lahiri 1986; Charkravarty et al. 1986	mallard duck	reproduction	LOAEL	8 weeks (during a critical life stage) (chronic)	NA	2.00E+01	0.1	2.00E+00	1	2.00E+01
>+	ALPHA-CHLORDANE	chlordanes used as surrogate	Stickel et al. 1983	red-winged blackbird	mortality	% survival	84 days (chronic)	2.14E+00	1.07E+01	1	2.14E+00	1	1.07E+01
>	ALUMINUM	Al ₂ (SO ₄) ₃	Carriere et al., 1986	ringed dove	reproduction	egg production, fertility, hatchability, egg shell thickness	4 months (critical life stage) (chronic)	1.10E+02	NA	1	1.10E+02	NA	NA
>	ANTIMONY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>+	ARSENIC	sodium arsenate	Stanley et al., 1994	mallard duck	reproduction	number of ducklings per successful nest	10 weeks (critical life stage) (chronic)	9.30E+00	4.03E+01	1	9.30E+00	1	4.00E+01
>+	BARIIUM	Barium hydroxide	Johnson et al. 1960	one day old chick	survivorship	% survival	4 weeks (not a critical life stage) (subchronic)	2.08E+02	4.17E+02	0.1	2.08E+01	0.1	4.17E+01
>	BENZALDEHYDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>	BENZYL BUTYL PHTHALATE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>	BERYLLIUM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>+	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	gamma BHC used as surrogate	Chakravarty and Lahiri 1986; Charkravarty et al. 1986	mallard duck	reproduction	LOAEL	8 weeks (during a critical life stage) (chronic)	NA	2.00E+01	0.1	2.00E+00	1	2.00E+01
>	BETA ENDOSULFAN	endosulfan used as a surrogate	Abiola 1992	gray partridge	reproduction	NOAEL	4 weeks (during critical lifestyle) (chronic)	1.00E+01	NA	1	1.00E+01	NA	NA
>	BIPHENYL (DIPHENYL)	Arochlor 1242 used as a surrogate	Britton and Huston 1973	chicken	reproduction	NA	6 weeks (subchronic)	5	10	0.1	0.5	0.1	1
>	bis(2-ETHYLHEXYL) PHTHALATE	NA	Peakall 1974	ringed dove	reproduction	egg shell thickness, water absorbed into shell, breaking strength	4 weeks (critical life-stage) (chronic)	1.11E+00	NA	1	1.11E+00	NA	NA
>+	CADMIUM	cadmium sulfate	Leach et al., 1979	chicken	reproduction	egg production	1 year (chronic)	6.10E-01	2.40E+00	1	6.10E-01	1	2.40E+00
>	CAPROLACTAM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>	CARBAZOLE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>+	CHROMIUM, TOTAL	CrK(SO ₄)	Haseltine et al., 1985	black duck	reproduction	duckling survival	10 months (chronic)	1.00E+00	5.00E+00	1	1.00E+00	1	5.00E+00
>	COBALT	NA	Eco-SSL (EPA, 2000)	NA	NA	NA	(chronic)	1.30E+00	NA	1	1.30E+00	NA	NA
+	COBALT	NA	Diaz et al., 1994	broiler chicken	growth	weight	14 days (during critical life stage) (chronic)	1.24E+01	2.47E+01	NA	NA	1	2.47E+01
>+	COPPER	copper oxide	Mehring et al. 1960	chicken	survivorship, growth	% survival, weight	10 weeks (subchronic)	4.70E+01	6.17E+01	0.1	4.70E+00	0.1	6.17E+00
>+	CYANIDE	NA	Wremeyer et al. 1986	American kestrel	Mortality	LD50	(acute)	NA	4.00E+00	0.01	4.00E-02	0.1	4.00E-01
>+	DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	gamma BHC used as surrogate	Chakravarty and Lahiri 1986; Charkravarty et al. 1986	mallard duck	reproduction	LOAEL	8 weeks (during a critical life stage) (chronic)	NA	2.00E+01	0.1	2.00E+00	1	2.00E+01
>+	Dibenzofuran	aromatic hydrocarbon mixture	Patton and Dieter 1980	mallard	growth	body weight	7 months (chronic)	NA	3.25E+02	0.1	3.25E+01	1	3.25E+02
>	DIELDRIN	NA	Mendenhall et al. 1983	barn owl	reproduction	reproductive success	2 years (chronic)	7.70E-02	NA	1	7.70E-02	NA	NA
>	ENDOSULFAN SULFATE	endosulfan used as a surrogate	Abiola 1992	gray partridge	reproduction	NOAEL	4 weeks (during critical lifestyle) (chronic)	1.00E+01	NA	1	1.00E+01	NA	NA
>	ENDRIN	NA	Spann et al. 1986	mallard duck	reproduction	NOAEL	>200 days (chronic)	3.00E-01	NA	1	3.00E-01	NA	NA
>	ENDRIN ALDEHYDE	endrin used as surrogate	Spann et al. 1986	mallard duck	reproduction	NOAEL	>200 days (chronic)	3.00E-01	NA	1	3.00E-01	NA	NA
>	ENDRIN KETONE	endrin used as surrogate	Spann et al. 1986	mallard duck	reproduction	NOAEL	>200 days (chronic)	3.00E-01	NA	1	3.00E-01	NA	NA
>+	GAMMA BHC (LINDANE)	NA	Chakravarty and Lahiri 1986; Charkravarty et al. 1986	mallard duck	reproduction	LOAEL	8 weeks (during a critical life stage) (chronic)	NA	2.00E+01	0.1	2.00E+00	1	2.00E+01
>+	GAMMA-CHLORDANE	chlordanes used as surrogate	Stickel et al. 1983	red-winged blackbird	mortality	% survival	84 days (chronic)	2.14E+00	1.07E+01	1	2.14E+00	1	1.07E+01
>+	HEPTACHLOR	NA	Hill and Camardese 1986	quail	mortality	% survival	5 day (acute)	NA	6.50E+00	0.01	6.50E-02	0.1	6.50E-01
>+	HEPTACHLOR EPOXIDE	heptachlor used as surrogate	Hill and Camardese 1986	quail	mortality	LOAEL	5 day (acute)	NA	6.50E+00	0.01	6.50E-02	0.1	6.50E-01
>	HEXACHLOROBUTADIENE	NA	Coulston and Kolbye 1994; TERRETOX 2002	Japanese quail	reproduction	reproduction	90 days	3.39E+00	NA	1	3.39E+00	NA	NA
>+	HPAH	crude oil	Stubblefield et al. 1995	mallard	reproduction	egg shell thickness	7 months (chronic)	1.96E+01	NA	1	1.96E+01	NA	NA
>	HPAH	benzo(a)pyrene	Rigdon and Neal, 1963	white leghorn chicken	reproduction	fertility and malformations	Subchronic	3.95E+01	NA	0.1	3.95E+00	NA	NA
>	IRON	NA	National Academy of Science, 1980	poultry	general	impaired performance, fast of residue for human consumption	unknown	7.03E+01	NA	0.1	7.32E+00	NA	NA
>	LEAD	metallic lead	Pattee 1984	American kestrel	reproduction	NA	7 months (critical life stage) (chronic)	3.85E+00	NA	1	3.85E+00	NA	NA
+	LEAD	metallic lead	Hoffman et al. 1985	American kestrel	survivorship	% survival	10 days (subacute)	1.25E+02	6.25E+02	NA	NA	0.01	6.25E+00
>	LPAH	aromatic hydrocarbon mixture	Patton and Dieter 1980	mallard	growth	body weight	7 months (chronic)	NA	3.25E+02	0.1	3.25E+01	1	3.25E+02
>+	MANGANESE	manganese oxide	Laskey and Edens, 1985	Coturnix japonica	growth, behavior	wight gain, aggressive behavior	75 days (chronic)	9.80E+01	9.77E+02	1	9.80E+01	1	9.77E+02
>+	MERCURY	MeHgCl	Heinz, 1976; Heinz and Hoffman, 1998	mallard duck	reproduction	duckling 7 day survival	2.5 mo. to 2 generations (chronic)	6.80E-02	3.70E-01	1	6.80E-02	1	3.70E-01
>+	METHOXYCHLOR	NA	NA	mallard duck	mortality	LD50	unknown	NA	1.15E+02	0.01	1.15E+00	0.1	1.15E+01
>+	NICKEL	nickel sulfate	Cain and Pafford, 1981	mallard duck	growth, survivorship	% survival, weight gain	90 days (chronic)	7.74E+01	1.07E+02	1	7.74E+01	1	1.07E+02
>+	NITROBENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>+	p,p'-DDD	DDT used as a surrogate	USEPA, 1995	mallard	reproduction	LOAEL	2 years (chronic)	NA	6.00E-01	0.1	6.00E-02	1	6.00E-01
>+	p,p'-DDE	DDT used as a surrogate	USEPA, 1995	mallard	reproduction	LOAEL	2 years (chronic)	NA	6.00E-01	0.1	6.00E-02	1	6.00E-01
>+	p,p'-DDT	NA	USEPA, 1995	mallard	reproduction	LOAEL	2 years (chronic)	NA	6.00E-01	0.1	6.00E-02	1	6.00E-01
>+	PCB-1260 (AROCHLOR 1260)	arochlor 1254 used as a surrogate	Platonow and Reinhart, 1973	chicken	reproduction	decreased egg production, concentration passed to the egg	39 weeks (chronic)	NA	8.80E-01	0.1	8.80E-02	1	8.80E-01

Table 29
Toxicity Reference Values Considered for Avian Wildlife Receptors
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Study Selection	Chemical	Form	Primary Reference	Test species	Endpoint	Measured Effect	Duration	NOAEL Dose (mg/kgbw-d)	LOAEL Dose (mg/kgbw-d)	Uncertainty Factor (for normalized NOAEL)	Normalized NOAEL TRV (mg/kgbw-d)	Uncertainty Factor (for normalized LOAEL)	Normalized LOAEL TRV (mg/kgbw-d)
>+	PENTACHLOROPHENOL	NA	Campbell and Jaber, 1993	northern bobwhite	survivorship	% survival	Subacute	292	486	0.01	2.92	0.01	4.86
>+	SELENIUM	selenomethionine	Heinz et al., 1989	mallard duck	reproduction	impaired reproduction	100 days (chronic)	4.00E-01	8.00E-01	1	4.00E-01	1	8.00E-01
>	SILVER	NA	USEPA 1997	mallard duck	NA	NOAEL	14 days (acute)	1.78E+03	NA	0.01	1.78E+01	NA	NA
+	SILVER	NA	QPP, 2000	northern bobwhite	survivorship	LD50	14 days (acute)	NA	2.25E+03	NA	NA	0.01	22.5
>+	THALLIUM	NA	Schafer 1972	starling	survivorship	% survival	(acute)	NA	5.30E+00	0.01	5.30E-02	0.1	5.30E-01
>+	TRIBUTYL TIN	bis tributyltin oxide	Schlatterer et al., 1993	Coturnix japonica	reproduction	hatchability	6 weeks (critical life stage) (chronic)	6.76E+00	1.69E+01	1	6.76E+00	1	1.69E+01
	TETRACHLOROETHYLENE(PCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	TRICHLOROETHANE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>	VANADIUM	vanadyl sulfate	White and Dieter, 1978	mallard duck	survivorship, growth, systemic	mortality, body weight, blood chemistry	12 weeks (chronic)	1.14E+01	NA	1	1.14E+01	NA	NA
>+	ZINC	zinc sulfate	Stahl et al. 1990	chicken	reproduction	egg hatchability	44 weeks (chronic)	1.45E+01	1.31E+02	1	1.45E+01	1	1.31E+02

- Notes:
- NOAEL = no observed adverse effect level
 - LOAEL = lowest observed adverse effect level
 - 1) Selections of TRVs and application of Uncertainty Factors was performed in accordance with *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA, 1997)
 - 2) > denotes selected NOAEL endpoint study; + denotes selected LOAEL endpoint study; >+ denotes both NOAEL and LOAEL were selected from the same study
 - 3) the following preferences were used when selecting studies:
 - NOAEL endpoints were given preference over LOAEL endpoints when both were available. Studies with LD50s as endpoints were only selected when studies for sublethal effects were not available.
 - Chronic studies were selected over subchronic studies and subchronic studies were selected over acute studies when multiple studies of varying duration were available for selection.
 - Studies with reproduction as the endpoint were selected before studies with mortality as the endpoint which were selected before studies with growth as the endpoint which were selected before studies with systemic effects as the endpoint.
 - Studies with the most complete information and therefore the least resulting uncertainty were given preference in study selection.
 - Studies from surrogate chemicals were only selected when no other study for a particular COC was found.
 - 4) Uncertainty factors were used to adjust all measured effect concentrations to chronic NOAELs and chronic LOAELs as follows:
 - chronic LOAELs to chronic NOAELs = 0.1
 - subchronic NOAELs to chronic NOAELs = 0.1
 - subchronic LOAELs to chronic LOAELs = 0.1
 - acute NOAELs to chronic NOAELs = 0.1
 - acute LOAELs to chronic LOAELs = 0.1
 - 5) Definitions of study duration for birds
 - chronic = >10 weeks or during critical life stage
 - subchronic = 4-10 weeks
 - subacute = <4 weeks, multiple doses
 - acute = only one dose
 - 6) The one day old chick body weight from the Johnson et al. 1960 study on Barium was used as the body weight for chicken embryos in the Brunstrom et al. 1991 study on benzo(a)pyrene as a conservative measure (larger weight is conservative when used in c
 - 7) The weight of the red-winged black bird from the chlordane study (Stickel et al., 1983) was used for the weight for starling in Schafer 1972 Thallium study
 - 8) The study on aromatic hydrocarbon mixtures was selected for all PAHs because using a mixture of these chemicals is more appropriate than using the value for just naphthalene.
 - 9) Complete references are available in the references section of the main body of the ERA.

Table 30
Toxicity Reference Values Considered for Mammalian Wildlife Receptors
 Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Study Selection	Chemical	Form	Reference	Test species	Endpoint	Measured Effect	Duration	NOAEL Dose (mg/kgbw-d)	LOAEL Dose (mg/kgbw-d)	Uncertainty Factor (for normalized NOAEL)	Normalized NOAEL TRV (mg/kgbw-d)	Uncertainty Factor (for normalized LOAEL)	Normalized LOAEL TRV (mg/kgbw-d)
>	4-METHYLPHENOL (p-CRESOL)	0-cresol used as a surrogate	Hornshaw et al., 1986	mink	reproduction	NA	6 months (chronic)	2.19E+02	NA	1	2.19E+02	1	NA
>+	ALDRIN	NA	Treon and Cleveland, 1955	rat	reproduction	NOAEL and LOAEL	3 generations (chronic)	2.00E-01	1.00E+00	1	2.00E-01	1	1.00E+00
>+	ALPHA BHC (ALPHA HEXACHLOROCHLOROCYCLOHEXANE)	BHC mixed isomers	Grant et al. 1977	rat	reproduction	decreases litter size, reduced birth weight, maternal mortality	3 generations (>1 yr and critical life stage) chronic	5.63E-01	2.25E+00	1	5.63E-01	1	2.25E+00
>+	ALPHA-CHLORDANE	chlordane used as surrogate	WHO 1984 from Keplinger et al., 1968	mouse	reproduction	NA	6 generations (chronic)	4.58E+00	9.16E+00	1	4.58E+00	1	9.16E+00
+	ANTIMONY	antimony potassium tartrate	Poon et al., 1998	rat	growth	body weight	13 weeks (chronic)	6.10E+00	4.60E+01	1	6.10E+00	1	4.60E+01
>	BARIIUM	barium chloride	Perry et al., 1983	rat	growth	growth and cardiovascular hypertension	16 months (chronic)	5.06E+00	NA	1	5.06E+00	NA	NA
>	BENZALDEHYDE	NA	Kluwe et al., 1983	mouse	systemic	forestomach lesions, kidney toxicity	13 weeks (chronic)	1.43E+02	2.86E+02	1	1.43E+02	1	2.86E+02
>	BENZYL BUTYL PHTHALATE	NA	NTP, 1997	rat	systemic	altered liver weight	chronic	2.40E+02	NA	1	2.40E+02	NA	NA
>+	BETA BHC (BETA HEXACHLOROCHLOROCYCLOHEXANE)	BHC mixed isomers	Grant et al. 1977	rat	reproduction	decreases litter size, reduced birth weight, maternal mortality	3 generations (>1 yr and critical life stage) chronic	5.63E-01	2.25E+00	1	5.63E-01	1	2.25E+00
>	BETA ENDOSULFAN	endosulfan used as a surrogate	Dikshith et al., 1984	rat	reproduction, blood chemistry	reproductive effects	30 days (subchronic)	1.50E+00	NA	0.1	1.50E-01	NA	NA
>+	bis(2-ETHYLHEXYL) PHTHALATE	NA	Lamb et al., 1987	mouse	reproduction	reproductive effects	105 days (critical life stage) (chronic)	1.83E+01	1.83E+02	1	1.83E+01	1	1.83E+02
>+	CADMIUM	cadmium chloride	Sutou et al., 1980	rat	reproduction	no. live fetuses/female	6 weeks through reproduction (critical life stage) (chronic)	1.00E+00	1.00E+01	1	1.00E+00	1	1.00E+01
>+	CARBAZOLE	NA	Tsuda et al. 1982	mouse	survivorship	mortality	104 weeks (chronic)	2.71E+00	5.42E+00	1	2.71E+00	1	5.42E+00
>	CHROMIUM, TOTAL	NA	Eco-SSL (USEPA, 2000)	NA	NA	NA	(chronic)	2.45E+01	NA	1	2.45E+01	NA	NA
+	CHROMIUM, TOTAL	K ₂ Cr ₂ O ₄	Steven et al., 1976	rat	mortality	mortality	3 months (chronic)	NA	1.31E+02	NA	NA	1	1.31E+02
>+	COPPER	CuSO ₄ ·5H ₂ O	Aulerich et al., 1982	mink	reproduction	% kit survival	357 days (chronic)	1.17E+01	1.51E+01	1	1.17E+01	1	1.51E+01
>+	DELTA BHC (DELTA HEXACHLOROCHLOROCYCLOHEXANE)	BHC mixed isomers	Grant et al. 1977	rat	reproduction	decreases litter size, reduced birth weight, maternal mortality	3 generations (>1 yr and critical life stage) chronic	5.63E-01	2.25E+00	1	5.63E-01	1	2.25E+00
>+	DIELDRIN	NA	Treon and Cleveland, 1955	rat	reproduction	number of pregnancies	3 generations (chronic)	NA	2.00E-01	0.1	2.00E-02	1	2.00E-01
>	ENDOSULFAN SULFATE	endosulfan used as a surrogate	Dikshith et al., 1984	rat	reproduction, blood chemistry	reproductive effects	30 days (subchronic)	1.50E+00	NA	0.1	1.50E-01	NA	NA
>+	ENDRIN	NA	Good and Waer 1969	mouse	reproduction	LOAEL	120 days (during a critical life stage) (chronic)	NA	9.20E-01	0.1	9.20E-02	1	9.20E-01
>+	ENDRIN ALDEHYDE	endrin used as surrogate	Good and Waer 1969	mouse	reproduction	LOAEL	120 days (during a critical life stage) (chronic)	NA	9.20E-01	0.1	9.20E-02	1	9.20E-01
>+	ENDRIN KETONE	endrin used as surrogate	Good and Waer 1969	mouse	reproduction	LOAEL	120 days (during a critical life stage) (chronic)	NA	9.20E-01	0.1	9.20E-02	1	9.20E-01
>+	GAMMA BHC (LINDANE)	BHC mixed isomers	Grant et al. 1977	rat	reproduction	decreases litter size, reduced birth weight, maternal mortality	3 generations (>1 yr and critical life stage) chronic	5.63E-01	2.25E+00	1	5.63E-01	1	2.25E+00
>+	GAMMA-CHLORDANE	chlordane used as surrogate	WHO 1984 from Keplinger et al., 1968	mouse	reproduction	NA	6 generations (chronic)	4.58E+00	9.16E+00	1	4.58E+00	1	9.16E+00
>+	HEPTACHLOR	NA	Crum et al., 1993	mink	reproduction	LOAEL	181 days (chronic)	NA	1.00E+00	0.1	1.00E-01	1	1.00E+00
>+	HEPTACHLOR EPOXIDE	heptachlor used as surrogate	Crum et al., 1993	mink	reproduction	LOAEL	181 days (chronic)	NA	1.00E+00	0.1	1.00E-01	1	1.00E+00
>+	HPAH	benzo(a)pyrene	Mackenzie and Angevine, 1981	mouse	reproduction	reduced fertility in offspring	10 days (critical life-stage) (chronic)	NA	1.00E+01	0.1	1.00E+00	1	1.00E+01
>+	LEAD	lead acetate	Ronis et al., 1998	rat	reproduction	pup mortality	gestation through parturition (critical life stage) (chronic)	3.20E+01	9.60E+01	1	3.20E+01	1	9.60E+01
>+	LPAH	naphthalene	Navarro et al., 1991	rat	reproduction	maternal weight gain, litter size, fetal weight	d 6-15 of gestation (critical life-stage) (chronic)	5.00E+01	1.50E+02	1	5.00E+01	1	1.50E+02
>+	MANGANESE	manganese oxide	Laskey et al., 1982	rat	reproduction	fertility	224 days (critical life stage) (chronic)	8.80E+01	2.84E+02	1	8.80E+01	1	2.84E+02
>+	MERCURY	MeHgCl	Aulerich, 1974, Wobeser, 1976, Wren et al., 1987, Dansereau et al., 1999	mink	survivorship	% survival	up to 2 generations (chronic)	7.70E-02	1.10E-01	1	7.70E-02	1	1.10E-01
>+	METHOXYCHLOR	NA	Grey et al. 1988	rat	reproduction	NOAEL and LOAEL	11 months (during critical life stage) (chronic)	4.00E+00	8.00E+00	1	4.00E+00	1	8.00E+00
>+	NICKEL	nickel sulfate hexahydrate	Ambrose et al., 1976	rat	reproduction	reduced offspring body weight and kidney damage in young	3 generations, 1 year (critical life stage) (chronic)	4.00E+01	8.00E+01	1	4.00E+01	1	8.00E+01
>+	PENTACHLOROPHENOL	NA	Exon and Koller 1982	rat	reproduction	significantly decreased litter size at 500 ppm, no significant change number of kits, lit survival at 50 ppm (PCP was 85.5% pure)	90 days (critical life stage) (chronic)	42.75	427.5	1	42.75	1	427.5
>+	p,p'-DDD	DDT used as surrogate	Fitzhugh 1948	rat	reproduction	NOAEL and LOAEL	2 years (chronic)	8.00E-01	4.00E+00	1	8.00E-01	1	4.00E+00
>+	p,p'-DDE	DDT used as surrogate	Fitzhugh 1948	rat	reproduction	NOAEL and LOAEL	2 years (chronic)	8.00E-01	4.00E+00	1	8.00E-01	1	4.00E+00
>+	p,p'-DDT	NA	Fitzhugh 1948	rat	reproduction	NOAEL and LOAEL	2 years (chronic)	8.00E-01	4.00E+00	1	8.00E-01	1	4.00E+00
>+	SILVER	Silver nitrate	ACGIH, 1991	rat	growth	weight gain reduction, elevated mortality	37 weeks (chronic)	NA	2.22E+02	0.1	2.22E+01	1	2.22E+02
>+	THALLIUM	NA	Formigli et al. 1986	rat	reproduction	male testicular function	60 days prior to gestation (delivery and lactation) (subchronic)	NA	7.40E-01	0.01	7.40E-03	1	7.40E-01
>	TETRACHLOROETHYLENE(PCE)	NA	Buben & O'Flaherty, 1985	mouse	systemic	hepatotoxicity	subchronic	1.43E+01	7.14E+01	0.1	1.43E+00	0.1	7.14E+00
>	TRICHLOROETHANE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>	VANADIUM	vanadyl sulfate	Schroeder et al., 1970	rat	growth, survivorship	growth rate, survival and longevity, blood levels, heart weight and accumulation	540 days (chronic)	1.34E+00	NA	1	1.34E+00	NA	NA
+	VANADIUM	sodium metavanadate	Domingo et al., 1986b	rat	reproduction	number of dead pups per litter	60 days prior to gestation (delivery and lactation) (chronic)	NA	2.10E+00	NA	NA	1	2.10E+00
>+	ZINC	zinc oxide	Straube et al. 1980	ferret	survivorship	mortality	~197 days (chronic)	3.80E+01	1.10E+02	1	3.80E+01	1	1.10E+02

Notes:
 NOAEL = no observed adverse effect level
 LOAEL = lowest observed adverse effect level
 1) Selections of TRVs and application of Uncertainty Factors was performed in accordance with Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessment (EPA, 1997)

Table 30
Toxicity Reference Values Considered for Mammalian Wildlife Receptors
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Study Selection	Chemical	Form	Reference	Test species	Endpoint	Measured Effect	Duration	NOAEL Dose (mg/kgbw-d)	LOAEL Dose (mg/kgbw-d)	Uncertainty Factor (for normalized NOAEL)	Normalized NOAEL TRV (mg/kgbw-d)	Uncertainty Factor (for normalized LOAEL)	Normalized LOAEL TRV (mg/kgbw-d)
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2) -- denotes selected NOAEL endpoint study; + denotes selected LOAEL endpoint study; --+ denotes both NOAEL and LOAEL were selected from the same study

3) the following preferences were used when selecting studies:

NOAEL endpoints were given preference over LOAEL endpoints when both were available. Studies with LD50s as endpoints were only selected when studies for sublethal effects were not available.

Chronic studies were selected over subchronic studies and subchronic studies were selected over acute studies when multiple studies of varying duration were available for selection.

Studies with reproduction as the endpoint were selected before studies with mortality as the endpoint which were selected before studies with growth as the endpoint which were selected before studies with systemic effects as the endpoint.

Studies with the most complete information and therefore the least resulting uncertainty were given preference in study selection.

Studies from surrogate chemicals were only selected when no other study for a particular COC was found.

4) Uncertainty factors were used to adjust all measured effect concentrations to chronic NOAELs and chronic LOAELs as follows:

chronic LOAELs to chronic NOAELs = 0.1

subchronic NOAELs to chronic NOAELs = 0.1

subchronic LOAELs to chronic LOAELs = 0.1

acute NOAELs to chronic NOAELs = .01

acute LOAELs to chronic LOAELs = .01

5) Definitions of study duration for mammals.

chronic = >12 weeks or during critical life stage

subchronic = 4-12 weeks

subacute = <4 weeks, multiple doses

acute = only one dose

6) the weight of the ferret for the zinc TRV comes from <http://www.ferrets-ferrets.com/>

Table 31
HQs for the White-footed Mouse in the Former Wastewater Impoundments
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV
 Total Dose = Food Intake + Incidental Soil Intake
 Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Assumptions used in Risk Calculation for the White-footed Mouse

Where

FIR - food ingestion rate (kg/kg bw/d) 1.65E-01
 AUF - area use factor (exposure area 1.00E+00
 PF - plant fraction 5.00E-01
 TIF - terrestrial invertebrate fraction 5.00E-01
 VPF - vertebrate prey fraction 0.00E+00
 ISF - incidental soil ingestion fraction 2.40E-02

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)
 Food Intake = Conc. COC * FIR * AUF * ((TIF * BAFTI) + (PF * BAFF) + (VPF* BAFV))

Where

BAFTI = bioaccumulation factor for terrestrial invertebrates
 BAFF = bioaccumulation factor for plants
 BAFV = bioaccumulation factor for vertebrates

Contaminat of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Chemical Intake from Terrestrial Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
2-METHYLNAPHTHALENE	7.00E-01	5.00E+01	1.50E+02	4.37E-02	1.15E-02	5.52E-02	2.77E-03	5.80E-02	1.16E-03	3.87E-04
ACENAPHTHENE	3.90E-01	5.00E+01	1.50E+02	1.66E-02	9.65E-03	2.62E-02	1.54E-03	2.78E-02	5.55E-04	1.85E-04
ACENAPHTHYLENE	2.90E+00	5.00E+01	1.50E+02	1.49E-01	5.26E-02	2.02E-01	1.15E-02	2.13E-01	4.26E-03	1.42E-03
ALPHA-CHLORDANE	3.00E-03	4.58E+00	9.16E+00	1.05E-05	8.16E-03	8.17E-03	1.19E-05	8.18E-03	1.79E-03	8.93E-04
ANTHRACENE	2.90E+00	5.00E+01	1.50E+02	1.04E-01	7.65E-02	1.80E-01	1.15E-02	1.92E-01	3.83E-03	1.28E-03
ANTIMONY	4.47E+01	6.10E+00	4.60E+01	1.84E-01	3.69E+00	3.87E+00	1.77E-01	4.05E+00	6.63E-01	8.80E-02
BENZO(A)ANTHRACENE	1.30E+00	1.00E+00	1.00E+01	1.64E-02	2.89E-02	4.53E-02	5.15E-03	5.05E-02	5.05E-02	5.05E-03
BENZO(A)PYRENE	2.60E+00	1.00E+00	1.00E+01	1.95E-02	7.29E-02	9.24E-02	1.03E-02	1.03E-01	1.03E-01	1.03E-02
BENZO(B)FLUORANTHENE	3.60E+00	1.00E+00	1.00E+01	2.69E-02	6.23E-02	8.93E-02	1.42E-02	1.04E-01	1.04E-01	1.04E-02
BENZO(K)FLUORANTHENE	6.50E-01	1.00E+00	1.00E+01	4.87E-03	1.13E-02	1.61E-02	2.57E-03	1.87E-02	1.87E-02	1.87E-03
BENZO(G,H,I)PERYLENE	8.80E+00	1.00E+00	1.00E+01	3.91E-02	1.09E-01	1.48E-01	3.48E-02	1.83E-01	1.83E-01	1.83E-02
BETA ENDOSULFAN	8.10E-03	1.50E-01	NA	1.36E-04	2.05E-02	2.07E-02	3.21E-05	2.07E-02	1.38E-01	NA
BIS(2-ETHYLHEXYL) PHTHALATE	4.90E+00	1.83E+01	1.83E+02	4.85E-03	1.41E+01	1.41E+01	1.94E-02	1.41E+01	7.70E-01	7.70E-02
CADMIUM	1.25E+00	1.00E+00	1.00E+01	5.78E-02	8.13E-01	8.71E-01	4.93E-03	8.76E-01	8.76E-01	8.76E-02
CARBAZOLE	7.70E-01	2.71E+00	5.42E+00	7.39E-02	1.81E+00	1.88E+00	3.05E-03	1.89E+00	6.96E-01	3.48E-01
CHRYSENE	3.40E+00	1.00E+00	1.00E+01	4.29E-02	1.23E-01	1.66E-01	1.35E-02	1.80E-01	1.80E-01	1.80E-02
COPPER	1.35E+02	1.17E+01	1.51E+01	1.11E+00	1.61E+00	2.72E+00	5.36E-01	3.26E+00	2.78E-01	2.15E-01
DIBENZ(A,H)ANTHRACENE	4.60E-01	1.00E+00	1.00E+01	2.04E-03	1.86E-02	2.06E-02	1.82E-03	2.24E-02	2.24E-02	2.24E-03
DIBENZOFURAN	2.10E-01	5.00E+01	1.50E+02	1.02E-02	5.08E-01	5.18E-01	8.31E-04	5.19E-01	1.04E-02	3.46E-03
ENDOSULFAN SULFATE	9.20E-03	1.50E-01	NA	6.15E-04	7.59E-04	1.37E-03	3.64E-05	1.41E-03	9.40E-03	NA
ENDRIN	1.40E-02	9.20E-02	9.20E-01	9.47E-05	4.14E-04	5.08E-04	5.54E-05	5.64E-04	6.13E-03	6.13E-04
ENDRIN ALDEHYDE	1.00E-02	9.20E-02	9.20E-01	5.58E-05	2.66E-02	2.67E-02	3.96E-05	2.67E-02	2.91E-01	2.91E-02
ENDRIN KETONE	9.90E-03	9.20E-02	9.20E-01	1.48E-04	2.52E-02	2.54E-02	3.92E-05	2.54E-02	2.76E-01	2.76E-02
FLUORENE	3.40E-01	5.00E+01	1.50E+02	1.63E-02	5.61E-02	2.19E-02	1.35E-03	2.32E-02	4.65E-04	1.55E-04
FLUORANTHENE	2.50E+00	1.00E+00	1.00E+01	5.31E-02	7.63E-02	1.29E-01	9.89E-03	1.39E-01	1.39E-01	1.39E-02
GAMMA-CHLORDANE	5.60E-03	4.58E+00	9.16E+00	1.96E-05	1.52E-02	1.52E-02	2.22E-05	1.53E-02	3.33E-03	1.67E-03
HEPTACHLOR EPOXIDE	5.10E-03	1.00E-01	1.00E+00	1.11E-04	3.53E-03	3.64E-03	2.02E-05	3.66E-03	3.66E-02	3.66E-03

Table 31
HQs for the White-footed Mouse in the Former Wastewater Impoundments
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations Equation
Hazard Quotient = Total Dose / TRV
Total Dose = Food Intake + Incidental Soil Intake
Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Assumptions used in Risk Calculation for the White-footed Mouse

Where

FIR - food ingestion rate (kg/kg bw/d) 1.65E-01
AUF - area use factor (exposure area 1.00E+00
PF - plant fraction 5.00E-01
TIF - terrestrial invertebrate fraction 5.00E-01
VPF - vertebrate prey fraction 0.00E+00
ISF - incidental soil ingestion fraction 2.40E-02

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)
Food Intake = Conc. COC * FIR * AUF * ((TIF * BAFTI) + (PF * BAFF) + (VPF* BAFV))
Where
BAFTI = bioaccumulation factor for terrestrial invertebrates
BAFF = bioaccumulation factor for plants
BAFV = bioaccumulation factor for vertebrates

Contaminat of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Chemical Intake from Terrestrial Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
INDENO(1,2,3-C,D)PYRENE	3.00E+00	1.00E+00	1.00E+01	1.33E-02	5.19E-02	6.53E-02	1.19E-02	7.72E-02	7.72E-02	7.72E-03
LEAD	2.17E+02	3.20E+01	9.60E+01	4.46E-01	5.09E+00	5.53E+00	8.57E-01	6.39E+00	2.00E-01	6.66E-02
NAPHTHALENE	8.60E-01	5.00E+01	1.50E+02	8.72E-02	1.49E-02	1.02E-01	3.40E-03	1.06E-01	2.11E-03	7.03E-04
P,P'-DDT	9.10E-03	8.00E-01	4.00E+00	3.71E-05	4.20E-04	4.57E-04	3.60E-05	4.93E-04	6.17E-04	1.23E-04
PHENANTHRENE	2.50E+00	5.00E+01	1.50E+02	8.94E-02	5.77E-02	1.47E-01	9.89E-03	1.57E-01	3.14E-03	1.05E-03
PYRENE	1.00E+01	1.00E+00	1.00E+01	2.12E-01	3.22E-01	5.34E-01	3.96E-02	5.73E-01	5.73E-01	5.73E-02
SILVER	2.60E+00	2.22E+01	2.22E+02	2.14E-01	3.67E-01	5.81E-01	1.03E-02	5.91E-01	2.66E-02	2.66E-03
ZINC	2.83E+02	3.80E+01	1.10E+02	9.15E+00	4.50E+01	5.41E+01	1.12E+00	5.52E+01	1.45E+00	5.01E-01
Hazard Index for LPAHs				5.16E-01	7.37E-01	1.25E+00	4.27E-02	1.30E+00	2.59E-02	8.64E-03
Hazard Index for HPAHs				4.30E-01	8.76E-01	1.31E+00	1.44E-01	1.45E+00	1.45E+00	1.45E-01

Notes:

LPAH: low molecular weight (<200 atomic mass units) PAH
HPAH: high molecular weight (>200 atomic mass units) polycyclic aromatic hydrocarbon (PAH)

mg/kg-bw/d: milligrams chemical per kilogram
body weight of receptor per day

Table 32

HQs for the White-footed Mouse in the Wastewater Treatment Facility

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV

Total Dose = Food Intake + Incidental Soil Intake

Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Assumptions used in Risk Calculation for the White-footed Mouse

FIR - food ingestion rate (kg/kg

bw/d) 1.65E-01

AUF - area use factor 1.00E+00

PF - plant fraction 5.00E-01

TIF - terrestrial invertebrate 5.00E-01

VPF - vertebrate prey fraction 0.00E+00

ISF - incidental soil ingestion 2.40E-02

Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)

Food Intake = Conc. COC * FIR * AUF * ((TIF * BAFTI) + (PF * BAFP) + (VPF* BAFV))

Where

BAFTI = bioaccumulation factor for terrestrial invertebrates

BAFP = bioaccumulation factor for plants

BAFV = bioaccumulation factor for vertebrates

Contaminant of Potential Concern	Surface Soil Exposure Point	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant	Chemical Intake from Terrestrial Invertebrates	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
2-METHYLNAPHTHALENE	2.20E-01	5.00E+01	1.50E+02	1.37E-02	3.63E-03	1.74E-02	8.71E-04	1.82E-02	3.65E-04	1.22E-04
ACENAPHTHENE	8.50E-02	5.00E+01	1.50E+02	3.61E-03	2.10E-03	5.71E-03	3.36E-04	6.05E-03	1.21E-04	4.03E-05
ACENAPHTHYLENE	3.50E-01	5.00E+01	1.50E+02	1.80E-02	6.35E-03	2.43E-02	1.39E-03	2.57E-02	5.14E-04	1.71E-04
ANTHRACENE	4.50E-01	5.00E+01	1.50E+02	1.61E-02	1.19E-02	2.80E-02	1.78E-03	2.97E-02	5.95E-04	1.98E-04
ANTIMONY	5.70E+00	6.10E+00	4.60E+01	2.35E-02	4.70E-01	4.93E-01	2.26E-02	5.16E-01	8.46E-02	1.12E-02
BENZALDEHYDE	5.10E-02	1.43E+02	2.86E+02	1.59E-02	1.14E-01	1.30E-01	2.02E-04	1.30E-01	9.08E-04	4.54E-04
BENZO(A)ANTHRACENE	8.30E-01	1.00E+00	1.00E+01	1.05E-02	1.85E-02	2.89E-02	3.28E-03	3.22E-02	3.22E-02	3.22E-03
BENZO(A)PYRENE	6.50E-01	1.00E+00	1.00E+01	4.87E-03	1.82E-02	2.31E-02	2.57E-03	2.57E-02	2.57E-02	2.57E-03
BENZO(B)FLUORANTHENE	1.10E+00	1.00E+00	1.00E+01	8.23E-03	1.90E-02	2.73E-02	4.35E-03	3.16E-02	3.16E-02	3.16E-03
BENZO(G,H,I)PERYLENE	2.40E-01	1.00E+00	1.00E+01	1.07E-03	2.97E-03	4.04E-03	9.50E-04	4.98E-03	4.98E-03	4.98E-04
BENZO(K)FLUORANTHENE	3.40E-01	1.00E+00	1.00E+01	2.55E-03	5.89E-03	8.43E-03	1.35E-03	9.78E-03	9.78E-03	9.78E-04
CADMIUM	8.34E-01	1.00E+00	1.00E+01	4.64E-02	5.91E-01	6.37E-01	3.30E-03	6.41E-01	6.41E-01	6.41E-02
CARBAZOLE	1.30E-01	2.71E+00	5.42E+00	1.25E-02	3.05E-01	3.18E-01	5.15E-04	3.18E-01	1.17E-01	5.87E-02
CHRYSENE	1.30E+00	1.00E+00	1.00E+01	1.64E-02	4.72E-02	6.36E-02	5.15E-03	6.87E-02	6.87E-02	6.87E-03
COPPER	2.55E+02	1.17E+01	1.51E+01	1.43E+00	1.90E+00	3.33E+00	1.01E+00	4.34E+00	3.71E-01	2.87E-01
DIBENZ(A,H)ANTHRACENE	1.00E-01	1.00E+00	1.00E+01	4.44E-04	4.04E-03	4.48E-03	3.96E-04	4.88E-03	4.88E-03	4.88E-04
DIBENZOFURAN	3.30E-02	5.00E+01	1.50E+02	1.61E-03	7.99E-02	8.15E-02	1.31E-04	8.16E-02	1.63E-03	5.44E-04
FLUORANTHENE	2.20E+00	1.00E+00	1.00E+01	4.67E-02	6.71E-02	1.14E-01	8.71E-03	1.23E-01	1.23E-01	1.23E-02
FLUORENE	9.70E-02	5.00E+01	1.50E+02	4.65E-03	1.60E-03	6.24E-03	3.84E-04	6.63E-03	1.33E-04	4.42E-05
INDENO(1,2,3-C,D)PYRENE	4.20E-01	1.00E+00	1.00E+01	1.87E-03	7.27E-03	9.14E-03	1.66E-03	1.08E-02	1.08E-02	1.08E-03
LEAD	1.29E+02	3.20E+01	9.60E+01	3.34E-01	1.62E+01	1.66E+01	5.12E-01	1.71E+01	5.34E-01	1.78E-01
MERCURY	6.48E-01	7.70E-02	1.10E-01	2.40E-02	3.95E-02	6.36E-02	2.56E-03	6.61E-02	8.59E-01	6.01E-01
NAPHTHALENE	1.20E-01	5.00E+01	1.50E+02	1.22E-02	2.08E-03	1.42E-02	4.75E-04	1.47E-02	2.94E-04	9.82E-05
PHENANTHRENE	1.10E+00	5.00E+01	1.50E+02	3.93E-02	2.54E-02	6.47E-02	4.35E-03	6.91E-02	1.38E-03	4.61E-04
PYRENE	1.60E+00	1.00E+00	1.00E+01	3.40E-02	5.15E-02	8.54E-02	6.33E-03	9.18E-02	9.18E-02	9.18E-03
SILVER	1.40E+00	2.22E+01	2.22E+02	1.15E-01	1.97E-01	3.13E-01	5.54E-03	3.18E-01	1.43E-02	1.43E-03

Table 32
HQs for the White-footed Mouse in the Wastewater Treatment Facility
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations Equation
Hazard Quotient = Total Dose / TRV
Total Dose = Food Intake + Incidental Soil Intake
Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Assumptions used in Risk Calculation for the White-footed Mouse

FIR - food ingestion rate (kg/kg
bw/d) 1.65E-01
AUF - area use factor 1.00E+00
PF - plant fraction 5.00E-01
TIF - terrestrial invertebrate 5.00E-01
VPF - vertebrate prey fraction 0.00E+00
ISF - incidental soil ingestion 2.40E-02

Where
Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)
Food Intake = Conc. COC * FIR * AUF * ((TIF * BAFTI) + (PF * BAFP) + (VPF* BAFV))
Where
BAFTI = bioaccumulation factor for terrestrial invertebrates
BAFP = bioaccumulation factor for plants
BAFV = bioaccumulation factor for vertebrates

Contaminat of Potential Concern	Surface Soil Exposure Point	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant	Chemical Intake from Terrestrial Invertebrates	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
ZINC	5.96E+02	3.80E+01	1.10E+02	1.38E+01	5.74E+01	7.12E+01	2.36E+00	7.35E+01	1.93E+00	6.67E-01
Hazard Index for LPAHs				1.09E-01	1.33E-01	2.42E-01	9.72E-03	2.52E-01	5.04E-03	1.68E-03
Hazard Index for HPAHs				1.27E-01	2.42E-01	3.68E-01	3.47E-02	4.03E-01	4.03E-01	4.03E-02

Notes:

LPAH: low molecular weight (<200 atomic mass units) PAH
HPAH: high molecular weight (>200 atomic mass units) polycyclic aromatic hydro

mg/kg-bw/d: milligrams chemical per kilogram
body weight of receptor per day

Table 33

HQs for the White-footed Mouse in the Current Aboveground Storage Tanks

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV

Total Dose = Food Intake + Incidental Soil Intake

Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Assumptions used in Risk Calculation for the White-footed Mouse

FIR - food ingestion rate (kg/kg bw/d) 1.65E-01
 AUF - area use factor (exposure) 9.31E-01
 PF - plant fraction 5.00E-01
 TIF - terrestrial invertebrate fraction 5.00E-01
 VPF - vertebrate prey fraction 0.00E+00
 ISF - incidental soil ingestion 2.40E-02

Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)
 Food Intake = Conc. COC * FIR * AUF * ((TIF * BAFTI) + (PF * BAFP) + (VPF* BAFV))
 Where
 BAFTI = bioaccumulation factor for terrestrial invertebrates
 BAFP = bioaccumulation factor for plants
 BAFV = bioaccumulation factor for vertebrates

Contaminant of Potential Concern	Soil Exposure Point Concentrat	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Intake from Terrestrial Plant (mg/kg bw/d)	Intake from Terrestrial Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
2-METHYLNAPHTHALENE	1.10E-01	5.00E+01	1.50E+02	6.40E-03	1.69E-03	8.08E-03	4.05E-04	8.49E-03	1.70E-04	5.66E-05
4-METHYLPHENOL (P-CRESOL)	4.60E-02	2.19E+02	NA	1.16E-02	9.61E-02	1.08E-01	1.70E-04	1.08E-01	4.92E-04	NA
ACENAPHTHENE	4.60E-01	5.00E+01	1.50E+02	1.82E-02	1.06E-02	2.88E-02	1.70E-03	3.05E-02	6.10E-04	2.03E-04
ACENAPHTHYLENE	1.80E-01	5.00E+01	1.50E+02	8.61E-03	3.04E-03	1.17E-02	6.63E-04	1.23E-02	2.46E-04	8.21E-05
ANTHRACENE	1.50E+00	5.00E+01	1.50E+02	4.99E-02	3.69E-02	8.68E-02	5.53E-03	9.23E-02	1.85E-03	6.16E-04
ANTIMONY	2.50E+00	6.10E+00	4.60E+01	9.60E-03	1.92E-01	2.02E-01	9.21E-03	2.11E-01	3.45E-02	4.58E-03
BENZALDEHYDE	3.20E-02	1.43E+02	2.86E+02	9.31E-03	6.64E-02	7.57E-02	1.18E-04	7.59E-02	5.31E-04	2.65E-04
BENZO(A)ANTHRACENE	3.00E+00	1.00E+00	1.00E+01	3.52E-02	6.22E-02	9.74E-02	1.11E-02	1.08E-01	1.08E-01	1.08E-02
BENZO(A)PYRENE	2.70E+00	1.00E+00	1.00E+01	1.88E-02	7.05E-02	8.93E-02	9.95E-03	9.93E-02	9.93E-02	9.93E-03
BENZO(B)FLUORANTHENE	4.40E+00	1.00E+00	1.00E+01	3.07E-02	7.09E-02	1.02E-01	1.62E-02	1.18E-01	1.18E-01	1.18E-02
BENZO(G,H,I)PERYLENE	9.70E-01	1.00E+00	1.00E+01	4.01E-03	1.12E-02	1.52E-02	3.57E-03	1.88E-02	1.88E-02	1.88E-03
BENZO(K)FLUORANTHENE	1.80E+00	1.00E+00	1.00E+01	1.25E-02	2.90E-02	4.16E-02	6.63E-03	4.82E-02	4.82E-02	4.82E-03
BENZYL BUTYL PHTHALATE	3.00E-02	2.40E+02	NA	6.42E-04	6.99E-02	7.05E-02	1.11E-04	7.06E-02	2.94E-04	NA
CADMIUM	4.80E-01	1.00E+00	1.00E+01	3.19E-02	3.55E-01	3.87E-01	1.77E-03	3.88E-01	3.88E-01	3.88E-02
CARBAZOLE	2.30E-01	2.71E+00	5.42E+00	2.06E-02	5.03E-01	5.24E-01	8.48E-04	5.24E-01	1.94E-01	9.68E-02
CHROMIUM, TOTAL	1.26E+02	2.45E+01	1.31E+02	3.87E-01	3.06E+01	3.10E+01	4.64E-01	3.14E+01	1.28E+00	2.39E-01
CHRYSENE	2.80E+00	1.00E+00	1.00E+01	3.29E-02	9.46E-02	1.27E-01	1.03E-02	1.38E-01	1.38E-01	1.38E-02
DIBENZ(A,H)ANTHRACENE	3.30E-01	1.00E+00	1.00E+01	1.37E-03	1.24E-02	1.38E-02	1.22E-03	1.50E-02	1.50E-02	1.50E-03
DIBENZOFURAN	1.80E-01	5.00E+01	1.50E+02	8.16E-03	4.06E-01	4.14E-01	6.63E-04	4.14E-01	8.29E-03	2.76E-03
FLUORANTHENE	1.00E+01	1.00E+00	1.00E+01	1.98E-01	2.84E-01	4.82E-01	3.69E-02	5.19E-01	5.19E-01	5.19E-02
FLUORENE	4.70E-01	5.00E+01	1.50E+02	2.10E-02	7.22E-03	2.82E-02	1.73E-03	2.99E-02	5.98E-04	1.99E-04
INDENO(1,2,3-C,D)PYRENE	1.10E+00	1.00E+00	1.00E+01	4.55E-03	1.77E-02	2.23E-02	4.05E-03	2.63E-02	2.63E-02	2.63E-03
LEAD	5.58E+02	3.20E+01	9.60E+01	7.07E-01	6.52E+01	6.59E+01	2.06E+00	6.80E+01	2.12E+00	7.08E-01
MANGANESE	3.79E+02	8.80E+01	2.84E+02	1.98E+01	1.96E+00	2.17E+01	1.40E+00	2.31E+01	2.63E-01	8.15E-02
MERCURY	1.30E-01	7.70E-02	1.10E-01	9.35E-03	3.05E-02	3.98E-02	4.79E-04	4.03E-02	5.23E-01	3.66E-01
NAPHTHALENE	7.80E-02	5.00E+01	1.50E+02	7.37E-03	1.26E-03	8.62E-03	2.87E-04	8.91E-03	1.78E-04	5.94E-05
PENTACHLOROPHENOL	2.80E-01	4.28E+01	4.28E+02	4.04E-05	1.29E+01	1.29E+01	1.03E-03	1.29E+01	3.02E-01	3.02E-02
PHENANTHRENE	3.80E+00	5.00E+01	1.50E+02	1.27E-01	8.17E-02	2.08E-01	1.40E-02	2.22E-01	4.44E-03	1.48E-03

Table 33

HQs for the White-footed Mouse in the Current Aboveground Storage Tanks

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV

Total Dose = Food Intake + Incidental Soil Intake

Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Assumptions used in Risk Calculation for the White-footed Mouse

FIR - food ingestion rate (kg/kg bw/d) 1.65E-01
 AUF - area use factor (exposure) 9.31E-01
 PF - plant fraction 5.00E-01
 TIF - terrestrial invertebrate fraction 5.00E-01
 VPF - vertebrate prey fraction 0.00E+00
 ISF - incidental soil ingestion 2.40E-02

Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)
 Food Intake = Conc. COC * FIR * AUF * ((TIF * BAFTI) + (PF * BAFP) + (VPF* BAFV))
 Where
 BAFTI = bioaccumulation factor for terrestrial invertebrates
 BAFP = bioaccumulation factor for plants
 BAFV = bioaccumulation factor for vertebrates

Contaminat of Potential Concern	Soil Exposure Point Concentrat	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Intake from Terrestrial Plant (mg/kg bw/d)	Intake from Terrestrial Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
PYRENE	8.40E+00	1.00E+00	1.00E+01	1.66E-01	2.52E-01	4.18E-01	3.10E-02	4.49E-01	4.49E-01	4.49E-02
SILVER	9.60E-01	2.22E+01	2.22E+02	7.37E-02	1.26E-01	2.00E-01	3.54E-03	2.03E-01	9.16E-03	9.16E-04
VANADIUM	3.10E+01	1.34E+00	2.10E+00	1.31E-02	2.09E-01	2.23E-01	1.14E-01	3.37E-01	2.51E-01	1.60E-01
ZINC	4.84E+02	3.80E+01	1.10E+02	1.15E+01	4.99E+01	6.14E+01	1.78E+00	6.31E+01	1.66E+00	5.73E-01
Hazard Index for LPAHs				2.46E-01	5.48E-01	7.94E-01	2.50E-02	8.19E-01	1.64E-02	5.46E-03
Hazard Index for HPAHs				5.04E-01	9.04E-01	1.41E+00	1.31E-01	1.54E+00	1.54E+00	1.54E-01

Notes:

LPAH: low molecular weight (<200 atomic mass units) PAH

HPAH: high molecular weight (>200 atomic mass units) polycyclic aromatic hydrocarbon (PAH)

mg/kg-bw/d: milligrams chemical per kilogram body weight of receptor per day

Table 34

HQs for the White-footed Mouse in the Maintenance Shed Area

Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Assumptions used in Risk Calculation for the White-footed Mouse

FIR - food ingestion rate (kg/kg bw/d) 1.65E-01
 AUF - area use factor (exposure area divided by home range) 1.00E+00
 PF - plant fraction 5.00E-01
 TIF - terrestrial invertebrate fraction 5.00E-01
 VPF - vertebrate prey fraction 0.00E+00

 ISF - incidental soil ingestion fraction 2.40E-02

Hazard Quotient Calculation Equations

Hazard Quotient = Total Dose / TRV
 Total Dose = Food Intake + Incidental Soil Intake
 Incidental Soil Intake = FIR * AUF * Conc. COC * ISF
 Where
 Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)

 Food Intake = Conc. COC * FIR * AUF * ((TIF * BAFTI) + (PF * BAFP) + (VPF* BAFV))
 Where
 BAFTI = bioaccumulation factor for terrestrial invertebrates
 BAFP = bioaccumulation factor for plants

 BAFV = bioaccumulation factor for vertebrates

Contaminant of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Chemical Intake from Terrestrial Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
2-METHYLNAPHTHALENE	1.80E-01	5.00E+01	1.50E+02	1.12E-02	2.97E-03	1.42E-02	7.12E-04	1.49E-02	2.98E-04	9.95E-05
ACENAPHTHENE	3.30E-02	5.00E+01	1.50E+02	1.40E-03	8.16E-04	2.22E-03	1.31E-04	2.35E-03	4.70E-05	1.57E-05
ACENAPHTHYLENE	2.90E-01	5.00E+01	1.50E+02	1.49E-02	5.26E-03	2.02E-02	1.15E-03	2.13E-02	4.26E-04	1.42E-04
ALDRIN	1.10E-02	2.00E-01	1.00E+00	4.67E-05	2.97E-02	2.97E-02	4.35E-05	2.97E-02	1.49E-01	2.97E-02
ANTHRACENE	2.90E-01	5.00E+01	1.50E+02	1.04E-02	7.65E-03	1.80E-02	1.15E-03	1.92E-02	3.83E-04	1.28E-04
BENZALDEHYDE	1.10E-02	1.43E+02	2.86E+02	3.44E-03	2.45E-02	2.80E-02	4.35E-05	2.80E-02	1.96E-04	9.79E-05
BENZO(A)ANTHRACENE	9.70E-01	1.00E+00	1.00E+01	1.22E-02	2.16E-02	3.38E-02	3.84E-03	3.77E-02	3.77E-02	3.77E-03
BENZO(A)PYRENE	1.30E+00	1.00E+00	1.00E+01	9.73E-03	3.64E-02	4.62E-02	5.15E-03	5.13E-02	5.13E-02	5.13E-03
BENZO(B)FLUORANTHENE	3.40E+00	1.00E+00	1.00E+01	2.55E-02	5.89E-02	8.43E-02	1.35E-02	9.78E-02	9.78E-02	9.78E-03
BENZO(G,H,I)PERYLENE	1.20E+00	1.00E+00	1.00E+01	5.33E-03	1.48E-02	2.02E-02	4.75E-03	2.49E-02	2.49E-02	2.49E-03
BENZO(K)FLUORANTHENE	2.40E+00	1.00E+00	1.00E+01	1.80E-02	4.16E-02	5.95E-02	9.50E-03	6.90E-02	6.90E-02	6.90E-03
BENZYL BUTYL PHTHALATE	1.30E-01	2.40E+02	NA	2.99E-03	3.25E-01	3.28E-01	5.15E-04	3.29E-01	1.37E-03	NA
BETA ENDOSULFAN	1.00E-01	1.50E-01	NA	1.68E-03	2.54E-01	2.55E-01	3.96E-04	2.56E-01	1.71E+00	NA
CADMIUM	4.20E-01	1.00E+00	1.00E+01	3.19E-02	3.43E-01	3.74E-01	1.66E-03	3.76E-01	3.76E-01	3.76E-02
CARBAZOLE	3.00E-01	2.71E+00	5.42E+00	2.88E-02	7.05E-01	7.33E-01	1.19E-03	7.35E-01	2.71E-01	1.36E-01
CHRYSENE	1.70E+00	1.00E+00	1.00E+01	2.14E-02	6.17E-02	8.31E-02	6.73E-03	8.98E-02	8.98E-02	8.98E-03
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	2.30E-02	5.63E-01	2.25E+00	1.12E-03	5.57E-02	5.68E-02	9.10E-05	5.69E-02	1.01E-01	2.53E-02
DIBENZ(A,H)ANTHRACENE	4.90E-01	1.00E+00	1.00E+01	2.18E-03	1.98E-02	2.20E-02	1.94E-03	2.39E-02	2.39E-02	2.39E-03
DIBENZOFURAN	8.20E-02	5.00E+01	1.50E+02	3.99E-03	1.98E-01	2.02E-01	3.25E-04	2.03E-01	4.06E-03	1.35E-03
DIELDRIN	5.40E-02	2.00E-02	2.00E-01	7.26E-04	1.74E-02	1.81E-02	2.14E-04	1.83E-02	9.15E-01	9.15E-02
ENDOSULFAN SULFATE	3.90E-02	1.50E-01	NA	2.61E-03	3.22E-03	5.82E-03	1.54E-04	5.98E-03	3.98E-02	NA
ENDRIN	1.65E-03	9.20E-02	9.20E-01	1.12E-05	4.88E-05	5.99E-05	6.53E-06	6.64E-05	7.22E-04	7.22E-05
ENDRIN ALDEHYDE	5.20E-02	9.20E-02	9.20E-01	2.90E-04	1.38E-01	1.39E-01	2.06E-04	1.39E-01	1.51E+00	1.51E-01

Table 34

HQs for the White-footed Mouse in the Maintenance Shed Area

Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Assumptions used in Risk Calculation for the White-footed Mouse

FIR - food ingestion rate (kg/kg bw/d) 1.65E-01
 AUF - area use factor (exposure area divided by home range) 1.00E+00
 PF - plant fraction 5.00E-01
 TIF - terrestrial invertebrate fraction 5.00E-01
 VPF - vertebrate prey fraction 0.00E+00
 ISF - incidental soil ingestion fraction 2.40E-02

Hazard Quotient Calculation Equations

Hazard Quotient = Total Dose / TRV
 Total Dose = Food Intake + Incidental Soil Intake
 Incidental Soil Intake = FIR * AUF * Conc. COC * ISF
 Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)

Food Intake = Conc. COC * FIR * AUF * ((TIF * BAFTI) + (PF * BAFP) + (VPF* BAFV))

Where

BAFTI = bioaccumulation factor for terrestrial invertebrates

BAFP = bioaccumulation factor for plants

BAFV = bioaccumulation factor for vertebrates

Contaminant of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Chemical Intake from Terrestrial Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
FLUORANTHENE	3.50E+00	1.00E+00	1.00E+01	7.43E-02	1.07E-01	1.81E-01	1.39E-02	1.95E-01	1.95E-01	1.95E-02
FLUORENE	9.80E-02	5.00E+01	1.50E+02	4.69E-03	1.62E-03	6.31E-03	3.88E-04	6.70E-03	1.34E-04	4.46E-05
GAMMA BHC (LINDANE)	5.90E-03	5.63E-01	2.25E+00	2.28E-04	1.44E-02	1.47E-02	2.34E-05	1.47E-02	2.61E-02	6.52E-03
GAMMA-CHLORDANE	3.60E-02	4.58E+00	9.16E+00	1.26E-04	9.79E-02	9.80E-02	1.42E-04	9.81E-02	2.14E-02	1.07E-02
HEPTACHLOR	7.90E-03	1.00E-01	1.00E+00	5.42E-05	5.47E-03	5.53E-03	3.13E-05	5.56E-03	5.56E-02	5.56E-03
HEPTACHLOR EPOXIDE	4.10E-02	1.00E-01	1.00E+00	8.92E-04	2.84E-02	2.93E-02	1.62E-04	2.95E-02	2.95E-01	2.95E-02
INDENO(1,2,3-C,D)PYRENE	1.00E+00	1.00E+00	1.00E+01	4.44E-03	1.73E-02	2.18E-02	3.96E-03	2.57E-02	2.57E-02	2.57E-03
NAPHTHALENE	1.80E-01	5.00E+01	1.50E+02	1.83E-02	3.12E-03	2.14E-02	7.12E-04	2.21E-02	4.42E-04	1.47E-04
P,P'-DDD	1.50E+01	8.00E-01	4.00E+00	1.38E-01	3.34E-01	4.72E-01	5.94E-02	5.32E-01	6.65E-01	1.33E-01
P,P'-DDE	5.00E-02	8.00E-01	4.00E+00	4.14E-04	2.47E-02	2.51E-02	1.98E-04	2.53E-02	3.17E-02	6.34E-03
P,P'-DDT	5.70E-02	8.00E-01	4.00E+00	2.32E-04	2.63E-03	2.86E-03	2.26E-04	3.09E-03	3.86E-03	7.72E-04
PHENANTHRENE	1.20E+00	5.00E+01	1.50E+02	4.29E-02	2.77E-02	7.06E-02	4.75E-03	7.54E-02	1.51E-03	5.02E-04
PYRENE	4.00E+00	1.00E+00	1.00E+01	8.49E-02	1.29E-01	2.14E-01	1.58E-02	2.29E-01	2.29E-01	2.29E-02
ZINC	1.06E+03	3.80E+01	1.10E+02	1.90E+01	6.93E+01	8.84E+01	4.20E+00	9.26E+01	2.44E+00	8.40E-01
Hazard Index for LPAHs				1.08E-01	2.48E-01	3.55E-01	9.31E-03	3.65E-01	7.29E-03	2.43E-03
Hazard Index for HPAHs				1.73E-01	3.79E-01	5.52E-01	6.32E-02	6.15E-01	6.15E-01	6.15E-02

Notes:

LPAH: low molecular weight (<200 atomic mass units) PAH

HPAH: high molecular weight (>200 atomic mass units) polycyclic aromatic hydrocarbon (PAH)

mg/kg-bw/d: milligrams chemical per kilogram body weight of receptor per day

Table 35

HQs for the White-footed Mouse in the Tar Burn Area

Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Assumptions used in Risk Calculation for the White-footed Mouse

FIR - food ingestion rate (kg/kg bw/d)	1.65E-01
AUF - area use factor (exposure area divided by home range)	1.00E+00
PF - plant fraction	5.00E-01
TIF - terrestrial invertebrate fraction	5.00E-01
VPF - vertebrate prey fraction	0.00E+00
ISF - incidental soil ingestion fraction	2.40E-02

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV
Total Dose = Food Intake + Incidental Soil Intake
Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)
Food Intake = Conc. COC * FIR * AUF * ((TIF * BAFTI) + (PF * BAFP) + (VPF* BAFV))

Where

BAFTI = bioaccumulation factor for terrestrial invertebrates
BAFP = bioaccumulation factor for plants
BAFV = bioaccumulation factor for vertebrates

Contaminant of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Chemical Intake from Terrestrial Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
2-METHYLNAPHTHALENE	4.20E-02	5.00E+01	1.50E+02	2.62E-03	6.93E-04	3.31E-03	1.66E-04	3.48E-03	6.96E-05	2.32E-05
ACENAPHTHENE	3.50E-02	5.00E+01	1.50E+02	1.49E-03	8.66E-04	2.35E-03	1.39E-04	2.49E-03	4.98E-05	1.66E-05
ACENAPHTHYLENE	4.50E-01	5.00E+01	1.50E+02	2.31E-02	8.16E-03	3.13E-02	1.78E-03	3.31E-02	6.61E-04	2.20E-04
ANTHRACENE	3.90E-01	5.00E+01	1.50E+02	1.39E-02	1.03E-02	2.42E-02	1.54E-03	2.58E-02	5.16E-04	1.72E-04
ANTIMONY	6.00E+00	6.10E+00	4.60E+01	2.47E-02	4.95E-01	5.19E-01	2.37E-02	5.43E-01	8.90E-02	1.18E-02
BENZALDEHYDE	6.30E+00	1.43E+02	2.86E+02	1.97E+00	1.40E+01	1.60E+01	2.49E-02	1.60E+01	1.12E-01	5.61E-02
BENZO(A)ANTHRACENE	9.20E-01	1.00E+00	1.00E+01	1.16E-02	2.05E-02	3.21E-02	3.64E-03	3.57E-02	3.57E-02	3.57E-03
BENZO(A)PYRENE	1.20E+00	1.00E+00	1.00E+01	8.98E-03	3.36E-02	4.26E-02	4.75E-03	4.74E-02	4.74E-02	4.74E-03
BENZO(B)FLUORANTHENE	1.20E+00	1.00E+00	1.00E+01	8.98E-03	2.08E-02	2.98E-02	4.75E-03	3.45E-02	3.45E-02	3.45E-03
BENZO(G,H,I)PERYLENE	4.60E-01	1.00E+00	1.00E+01	2.04E-03	5.69E-03	7.73E-03	1.82E-03	9.55E-03	9.55E-03	9.55E-04
BENZO(K)FLUORANTHENE	1.40E+00	1.00E+00	1.00E+01	1.05E-02	2.42E-02	3.47E-02	5.54E-03	4.03E-02	4.03E-02	4.03E-03
BENZYL BUTYL PHTHALATE	5.20E-01	2.40E+02	NA	1.19E-02	1.30E+00	1.31E+00	2.06E-03	1.32E+00	5.48E-03	NA
BIS(2-ETHYLHEXYL) PHTHALATE	4.70E+00	1.83E+01	1.83E+02	4.65E-03	1.35E+01	1.35E+01	1.86E-02	1.35E+01	7.38E-01	7.38E-02
CADMIUM	1.10E+00	1.00E+00	1.00E+01	5.40E-02	7.37E-01	7.91E-01	4.35E-03	7.95E-01	7.95E-01	7.95E-02
CARBAZOLE	2.90E-01	2.71E+00	5.42E+00	2.78E-02	6.81E-01	7.09E-01	1.15E-03	7.10E-01	2.62E-01	1.31E-01
CHRYSENE	1.10E+00	1.00E+00	1.00E+01	1.39E-02	3.99E-02	5.38E-02	4.35E-03	5.81E-02	5.81E-02	5.81E-03
COPPER	1.55E+02	1.17E+01	1.51E+01	1.17E+00	1.67E+00	2.84E+00	6.13E-01	3.45E+00	2.95E-01	2.28E-01
DIBENZ(A,H)ANTHRACENE	2.30E-01	1.00E+00	1.00E+01	1.02E-03	9.29E-03	1.03E-02	9.10E-04	1.12E-02	1.12E-02	1.12E-03
DIBENZOFURAN	4.40E-02	5.00E+01	1.50E+02	2.14E-03	1.06E-01	1.09E-01	1.74E-04	1.09E-01	2.18E-03	7.25E-04
FLUORANTHENE	1.90E+00	1.00E+00	1.00E+01	4.03E-02	5.80E-02	9.83E-02	7.52E-03	1.06E-01	1.06E-01	1.06E-02
FLUORENE	1.20E-01	5.00E+01	1.50E+02	5.75E-03	1.98E-03	7.73E-03	4.75E-04	8.20E-03	1.64E-04	5.47E-05
INDENO(1,2,3-C,D)PYRENE	7.40E-01	1.00E+00	1.00E+01	3.29E-03	1.28E-02	1.61E-02	2.93E-03	1.90E-02	1.90E-02	1.90E-03
MERCURY	3.10E-01	7.70E-02	1.10E-01	1.61E-02	3.62E-02	5.23E-02	1.23E-03	5.36E-02	6.96E-01	4.87E-01
NAPHTHALENE	5.20E-02	5.00E+01	1.50E+02	5.27E-03	9.00E-04	6.17E-03	2.06E-04	6.38E-03	1.28E-04	4.25E-05

Table 35

HQs for the White-footed Mouse in the Tar Burn Area

Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Assumptions used in Risk Calculation for the White-footed Mouse

FIR - food ingestion rate (kg/kg bw/d)	1.65E-01
AUF - area use factor (exposure area divided by home range)	1.00E+00
PF - plant fraction	5.00E-01
TIF - terrestrial invertebrate fraction	5.00E-01
VPF - vertebrate prey fraction	0.00E+00
ISF - incidental soil ingestion fraction	2.40E-02

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV
 Total Dose = Food Intake + Incidental Soil Intake
 Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)
 Food Intake = Conc. COC * FIR * AUF * ((TIF * BAFTI) + (PF * BAFP) + (VPF* BAFV))

Where

BAFTI = bioaccumulation factor for terrestrial invertebrates
 BAFP = bioaccumulation factor for plants
 BAFV = bioaccumulation factor for vertebrates

Contaminant of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Chemical Intake from Terrestrial Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
PHENANTHRENE	9.30E-01	5.00E+01	1.50E+02	3.33E-02	2.15E-02	5.47E-02	3.68E-03	5.84E-02	1.17E-03	3.89E-04
PYRENE	1.50E+00	1.00E+00	1.00E+01	3.18E-02	4.82E-02	8.01E-02	5.94E-03	8.60E-02	8.60E-02	8.60E-03
ZINC	4.24E+02	3.80E+01	1.10E+02	1.14E+01	5.13E+01	6.27E+01	1.68E+00	6.44E+01	1.69E+00	5.85E-01
Hazard Index for LPAHs				8.76E-02	1.51E-01	2.38E-01	8.16E-03	2.47E-01	4.93E-03	1.64E-03
Hazard Index for HPAHs				1.32E-01	2.73E-01	4.06E-01	4.21E-02	4.48E-01	4.48E-01	4.48E-02

Notes:

LPAH: low molecular weight (<200 atomic mass units) PAH

HPAH: high molecular weight (>200 atomic mass units) polycyclic aromatic hydrocarbon (PAH)

mg/kg-bw/d: milligrams chemical per kilogram

body weight of receptor per day

Table 36

HQs for the White-footed Mouse in the Lauren Tank Farm

Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Assumptions used in Risk Calculation for the White-footed Mouse

FIR - food ingestion rate (kg/kg bw/d)	1.65E-01
AUF - area use factor (exposure area divided by home range)	1.00E+00
PF - plant fraction	5.00E-01
TIF - terrestrial invertebrate fraction	5.00E-01
VPF - vertebrate prey fraction	0.00E+00
ISF - incidental soil ingestion fraction	2.40E-02

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV
Total Dose = Food Intake + Incidental Soil Intake
Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)
Food Intake = Conc. COC * FIR * AUF * ((TIF * BAFTI) + (PF * BAFP) + (VPF* BAFV))
Where
BAFTI = bioaccumulation factor for terrestrial invertebrates
BAFP = bioaccumulation factor for plants
BAFV = bioaccumulation factor for vertebrates

Contaminant of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Chemical Intake from Terrestrial Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
2-METHYLNAPHTHALENE	1.60E+00	5.00E+01	1.50E+02	9.99E-02	2.64E-02	1.26E-01	6.33E-03	1.33E-01	2.65E-03	8.84E-04
4-METHYLPHENOL (P-CRESOL)	1.10E-01	2.19E+02	NA	2.98E-02	2.47E-01	2.77E-01	4.35E-04	2.77E-01	1.26E-03	NA
ACENAPHTHENE	6.40E-02	5.00E+01	1.50E+02	2.72E-03	1.58E-03	4.30E-03	2.53E-04	4.55E-03	9.11E-05	3.04E-05
ACENAPHTHYLENE	9.10E-01	5.00E+01	1.50E+02	4.68E-02	1.65E-02	6.33E-02	3.60E-03	6.69E-02	1.34E-03	4.46E-04
ALPHA-CHLORDANE	2.16E+00	4.58E+00	9.16E+00	7.54E-03	5.87E+00	5.88E+00	8.55E-03	5.89E+00	1.29E+00	6.43E-01
ANTHRACENE	1.10E+00	5.00E+01	1.50E+02	3.93E-02	2.90E-02	6.84E-02	4.35E-03	7.27E-02	1.45E-03	4.85E-04
BENZALDEHYDE	9.70E-02	1.43E+02	2.86E+02	3.03E-02	2.16E-01	2.47E-01	3.84E-04	2.47E-01	1.73E-03	8.63E-04
BENZO(A)ANTHRACENE	3.99E+00	1.00E+00	1.00E+01	5.03E-02	8.87E-02	1.39E-01	1.58E-02	1.55E-01	1.55E-01	1.55E-02
BENZO(A)PYRENE	4.68E+00	1.00E+00	1.00E+01	3.50E-02	1.31E-01	1.66E-01	1.85E-02	1.85E-01	1.85E-01	1.85E-02
BENZO(B)FLUORANTHENE	6.02E+00	1.00E+00	1.00E+01	4.51E-02	1.04E-01	1.49E-01	2.38E-02	1.73E-01	1.73E-01	1.73E-02
BENZO(G,H,I)PERYLENE	2.10E+00	1.00E+00	1.00E+01	9.33E-03	2.60E-02	3.53E-02	8.31E-03	4.36E-02	4.36E-02	4.36E-03
BENZO(K)FLUORANTHENE	2.50E+00	1.00E+00	1.00E+01	1.87E-02	4.33E-02	6.20E-02	9.89E-03	7.19E-02	7.19E-02	7.19E-03
BENZYL BUTYL PHTHALATE	2.40E-02	2.40E+02	NA	5.51E-04	6.00E-02	6.06E-02	9.50E-05	6.07E-02	2.53E-04	NA
BIS(2-ETHYLHEXYL) PHTHALATE	1.90E+00	1.83E+01	1.83E+02	1.88E-03	5.46E+00	5.46E+00	7.52E-03	5.47E+00	2.98E-01	2.98E-02
CADMIUM	1.70E+00	1.00E+00	1.00E+01	6.84E-02	1.04E+00	1.11E+00	6.73E-03	1.12E+00	1.12E+00	1.12E-01
CARBAZOLE	5.20E-01	2.71E+00	5.42E+00	4.99E-02	1.22E+00	1.27E+00	2.06E-03	1.27E+00	4.70E-01	2.35E-01
CHRYSENE	4.91E+00	1.00E+00	1.00E+01	6.19E-02	1.78E-01	2.40E-01	1.94E-02	2.60E-01	2.60E-01	2.60E-02
COPPER	1.33E+03	1.17E+01	1.51E+01	2.74E+00	2.94E+00	5.68E+00	5.27E+00	1.09E+01	9.36E-01	7.23E-01
DIBENZ(A,H)ANTHRACENE	9.40E-01	1.00E+00	1.00E+01	4.18E-03	3.80E-02	4.22E-02	3.72E-03	4.59E-02	4.59E-02	4.59E-03
DIBENZOFURAN	1.30E-01	5.00E+01	1.50E+02	6.33E-03	3.15E-01	3.21E-01	5.15E-04	3.21E-01	6.43E-03	2.14E-03
DIELDRIN	5.30E-03	2.00E-02	2.00E-01	7.13E-05	1.70E-03	1.78E-03	2.10E-05	1.80E-03	8.98E-02	8.98E-03
ENDRIN ALDEHYDE	1.83E+00	9.20E-02	9.20E-01	1.02E-02	4.87E+00	4.88E+00	7.24E-03	4.89E+00	5.32E+01	5.32E+00
FLUORANTHENE	6.44E+00	1.00E+00	1.00E+01	1.37E-01	1.96E-01	3.33E-01	2.55E-02	3.58E-01	3.58E-01	3.58E-02
FLUORENE	1.80E-01	5.00E+01	1.50E+02	8.62E-03	2.97E-03	1.16E-02	7.12E-04	1.23E-02	2.46E-04	8.20E-05
GAMMA-CHLORDANE	7.80E-03	4.58E+00	9.16E+00	2.73E-05	2.12E-02	2.12E-02	3.09E-05	2.13E-02	4.64E-03	2.32E-03
HEPTACHLOR	3.10E-03	1.00E-01	1.00E+00	2.13E-05	2.15E-03	2.17E-03	1.23E-05	2.18E-03	2.18E-02	2.18E-03
INDENO(1,2,3-C,D)PYRENE	6.30E-01	1.00E+00	1.00E+01	2.80E-03	1.09E-02	1.37E-02	2.49E-03	1.62E-02	1.62E-02	1.62E-03
LEAD	1.03E+03	3.20E+01	9.60E+01	1.07E+00	1.79E+01	1.90E+01	4.08E+00	2.30E+01	7.20E-01	2.40E-01
NAPHTHALENE	1.40E+00	5.00E+01	1.50E+02	1.42E-01	2.42E-02	1.66E-01	5.54E-03	1.72E-01	3.44E-03	1.15E-03

Table 36

HQs for the White-footed Mouse in the Lauren Tank Farm

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Assumptions used in Risk Calculation for the White-footed Mouse

FIR - food ingestion rate (kg/kg bw/d)	1.65E-01
AUF - area use factor (exposure area divided by home range)	1.00E+00
PF - plant fraction	5.00E-01
TIF - terrestrial invertebrate fraction	5.00E-01
VPF - vertebrate prey fraction	0.00E+00
ISF - incidental soil ingestion fraction	2.40E-02

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV

Total Dose = Food Intake + Incidental Soil Intake

Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)

Food Intake = Conc. COC * FIR * AUF * ((TIF * BAFTI) + (PF * BAFP) + (VPF* BAFV))

Where

BAFTI = bioaccumulation factor for terrestrial invertebrates

BAFP = bioaccumulation factor for plants

BAFV = bioaccumulation factor for vertebrates

Contaminant of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Chemical Intake from Terrestrial Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
P,P'-DDD	9.10E-03	8.00E-01	4.00E+00	8.39E-05	2.03E-04	2.87E-04	3.60E-05	3.23E-04	4.03E-04	8.06E-05
P,P'-DDT	7.60E-03	8.00E-01	4.00E+00	3.10E-05	3.51E-04	3.82E-04	3.01E-05	4.12E-04	5.15E-04	1.03E-04
PHENANTHRENE	2.00E+00	5.00E+01	1.50E+02	7.15E-02	4.62E-02	1.18E-01	7.92E-03	1.26E-01	2.51E-03	8.37E-04
PYRENE	6.32E+00	1.00E+00	1.00E+01	1.34E-01	2.03E-01	3.37E-01	2.50E-02	3.62E-01	3.62E-01	3.62E-02
ZINC	4.44E+02	3.80E+01	1.10E+02	1.17E+01	5.21E+01	6.38E+01	1.76E+00	6.56E+01	1.73E+00	5.95E-01
Hazard Index for LPAHs				4.17E-01	4.62E-01	8.79E-01	2.92E-02	9.08E-01	1.82E-02	6.05E-03
Hazard Index for HPAHs				4.98E-01	1.02E+00	1.52E+00	1.52E-01	1.67E+00	1.67E+00	1.67E-01

Notes:

LPAH: low molecular weight (<200 atomic mass units) PAH

HPAH: high molecular weight (>200 atomic mass units) polycyclic aromatic hydrocarbon (PAH)

mg/kg-bw/d: milligrams chemical per kilogram

body weight of receptor per day

Table 37

HQs for the White-footed Mouse in the Non-source Area

Baseline Ecological Risk Assessment
 State Marine Superfund Site, Port Arthur, TX

Assumptions used in Risk Calculation for the White-footed Mouse

FIR - food ingestion rate (kg/kg bw/d)	1.65E-01
AUF - area use factor (exposure area divided by home range)	1.00E+00
PF - plant fraction	5.00E-01
TIF - terrestrial invertebrate fraction	5.00E-01
VPF - vertebrate prey fraction	0.00E+00
ISF - incidental soil ingestion fraction	2.40E-02

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV
 Total Dose = Food Intake + Incidental Soil Intake
 Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)
 Food Intake = Conc. COC * FIR * AUF * ((TIF * BAFTI) + (PF * BAFP) + (VPF* BAFV))

Where

BAFTI = bioaccumulation factor for terrestrial invertebrates
 BAFP = bioaccumulation factor for plants
 BAFV = bioaccumulation factor for vertebrates

Contaminat of Potential Concern	Surface Soil Exposure Point Concentrat ion (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Chemical Intake from Terrestrial Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
2-METHYLNAPHTHALENE	1.90E+00	5.00E+01	1.50E+02	1.19E-01	3.13E-02	1.50E-01	7.52E-03	1.57E-01	3.15E-03	1.05E-03
ACENAPHTHENE	9.60E+00	5.00E+01	1.50E+02	4.08E-01	2.37E-01	6.45E-01	3.80E-02	6.83E-01	1.37E-02	4.55E-03
ACENAPHTHYLENE	5.00E+00	5.00E+01	1.50E+02	2.57E-01	9.07E-02	3.48E-01	1.98E-02	3.67E-01	7.35E-03	2.45E-03
ANTHRACENE	1.30E+01	5.00E+01	1.50E+02	4.65E-01	3.43E-01	8.08E-01	5.15E-02	8.59E-01	1.72E-02	5.73E-03
BENZALDEHYDE	1.50E-01	1.43E+02	2.86E+02	4.69E-02	3.34E-01	3.81E-01	5.94E-04	3.82E-01	2.67E-03	1.34E-03
BENZO(A)ANTHRACENE	2.40E+01	1.00E+00	1.00E+01	3.03E-01	5.34E-01	8.37E-01	9.50E-02	9.32E-01	9.32E-01	9.32E-02
BENZO(A)PYRENE	1.90E+01	1.00E+00	1.00E+01	1.42E-01	5.33E-01	6.75E-01	7.52E-02	7.50E-01	7.50E-01	7.50E-02
BENZO(B)FLUORANTHENE	2.50E+01	1.00E+00	1.00E+01	1.87E-01	4.33E-01	6.20E-01	9.89E-02	7.19E-01	7.19E-01	7.19E-02
BENZO(G,H,I)PERYLENE	4.30E+00	1.00E+00	1.00E+01	1.91E-02	5.32E-02	7.23E-02	1.70E-02	8.93E-02	8.93E-02	8.93E-03
BENZO(K)FLUORANTHENE	1.20E+01	1.00E+00	1.00E+01	8.98E-02	2.08E-01	2.98E-01	4.75E-02	3.45E-01	3.45E-01	3.45E-02
BENZYL BUTYL PHTHALATE	2.60E-01	2.40E+02	NA	5.97E-03	6.51E-01	6.56E-01	1.03E-03	6.58E-01	2.74E-03	NA
BIS(2-ETHYLHEXYL) PHTHALATE	3.20E+00	1.83E+01	1.83E+02	3.17E-03	9.20E+00	9.20E+00	1.27E-02	9.21E+00	5.03E-01	5.03E-02
CADMIUM	1.15E+01	1.00E+00	1.00E+01	1.94E-01	4.76E+00	4.95E+00	4.55E-02	5.00E+00	5.00E+00	5.00E-01
CARBAZOLE	1.29E+00	2.71E+00	5.42E+00	1.24E-01	3.02E+00	3.15E+00	5.10E-03	3.15E+00	1.16E+00	5.82E-01
CHRYSENE	2.10E+01	1.00E+00	1.00E+01	2.65E-01	7.62E-01	1.03E+00	8.31E-02	1.11E+00	1.11E+00	1.11E-01
DIBENZ(A,H)ANTHRACENE	2.20E+00	1.00E+00	1.00E+01	9.78E-03	8.89E-02	9.87E-02	8.71E-03	1.07E-01	1.07E-01	1.07E-02
DIBENZOFURAN	3.80E+00	5.00E+01	1.50E+02	1.85E-01	9.20E+00	9.38E+00	1.50E-02	9.40E+00	1.88E-01	6.26E-02
DIELDRIN	6.75E+00	2.00E-02	2.00E-01	9.08E-02	2.17E+00	2.26E+00	2.67E-02	2.29E+00	1.14E+02	1.14E+01
ENDRIN ALDEHYDE	1.30E+01	9.20E-02	9.20E-01	7.26E-02	3.46E+01	3.47E+01	5.15E-02	3.47E+01	3.78E+02	3.78E+01
FLUORANTHENE	6.20E+01	1.00E+00	1.00E+01	1.32E+00	1.89E+00	3.21E+00	2.45E-01	3.45E+00	3.45E+00	3.45E-01
FLUORENE	8.10E+00	5.00E+01	1.50E+02	3.88E-01	1.34E-01	5.21E-01	3.21E-02	5.54E-01	1.11E-02	3.69E-03
HEPTACHLOR EPOXIDE	6.00E+00	1.00E-01	1.00E+00	1.31E-01	4.16E+00	4.29E+00	2.37E-02	4.31E+00	4.31E+01	4.31E+00
INDENO(1,2,3-C,D)PYRENE	6.90E+00	1.00E+00	1.00E+01	3.07E-02	1.19E-01	1.50E-01	2.73E-02	1.77E-01	1.77E-01	1.77E-02
NAPHTHALENE	6.80E+00	5.00E+01	1.50E+02	6.90E-01	1.18E-01	8.07E-01	2.69E-02	8.34E-01	1.67E-02	5.56E-03
P,P'-DDD	1.10E+01	8.00E-01	4.00E+00	1.01E-01	2.45E-01	3.46E-01	4.35E-02	3.90E-01	4.87E-01	9.75E-02
P,P'-DDE	2.50E+00	8.00E-01	4.00E+00	2.07E-02	1.24E+00	1.26E+00	9.89E-03	1.27E+00	1.58E+00	3.17E-01
PHENANTHRENE	5.30E+01	5.00E+01	1.50E+02	1.90E+00	1.22E+00	3.12E+00	2.10E-01	3.33E+00	6.66E-02	2.22E-02
PYRENE	4.00E+01	1.00E+00	1.00E+01	8.49E-01	1.29E+00	2.14E+00	1.58E-01	2.29E+00	2.29E+00	2.29E-01
ZINC	5.05E+01	3.80E+01	1.10E+02	3.51E+00	2.55E+01	2.90E+01	2.00E-01	2.92E+01	7.69E-01	2.65E-01
Hazard Index for LPAHs				4.41E+00	1.14E+01	1.58E+01	4.01E-01	1.62E+01	3.24E-01	1.08E-01

Hazard Index for HPAHs				3.21E+00	5.91E+00	9.12E+00	8.56E-01	9.98E+00	9.98E+00	9.98E-01
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Notes:

LPAH: low molecular weight (<200 atomic mass units) PAH

HPAH: high molecular weight (>200 atomic mass units) polycyclic aromatic hydrocarbon (PAH)

mg/kg-bw/d: milligrams chemical per kilogram
body weight of receptor per day

Table 38

HQs for the Northern Bobwhite Quail in the Upland Area

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV

Total Dose = Food Intake + Incidental Soil Intake

Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Assumptions used in Risk Calculation for the Northern Bobwhite Quail

- FIR - food ingestion rate (kg/kg bw/d) 1.11E-01
- AUF - area use factor (exposure area) 9.54E-01
- PF - plant fraction 1.00E+00
- TIF - terrestrial invertebrate fraction 0.00E+00
- VPF - vertebrate prey fraction 0.00E+00
- ISF - incidental soil ingestion fraction 9.30E-02

Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)

Food Intake = Conc. COC * FIR * AUF * (PF * BAFF)

Where

BAFF = bioaccumulation factor for plants

Contaminant of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
2-METHYLNAPHTHALENE	1.90E+00	3.25E+01	3.25E+02	1.52E-01	1.52E-01	1.87E-02	1.71E-01	5.26E-03	5.26E-04
4-METHYLPHENOL (P-CRESOL)	1.10E-01	1.25E+00	NA	3.83E-02	3.83E-02	1.08E-03	3.94E-02	3.15E-02	NA
ACENAPHTHENE	9.60E+00	3.25E+01	3.25E+02	0.523269365	5.23E-01	9.45E-02	6.18E-01	1.90E-02	1.90E-03
ACENAPHTHYLENE	5.00E+00	3.25E+01	3.25E+02	3.30E-01	3.30E-01	4.92E-02	3.79E-01	1.17E-02	1.17E-03
ALPHA-CHLORDANE	1.30E+01	2.14E+00	1.07E+01	5.82E-02	5.82E-02	1.28E-01	1.86E-01	8.70E-02	1.74E-02
ALDRIN	1.10E-02	7.30E-03	7.30E-02	5.99E-05	5.99E-05	1.08E-04	1.68E-04	2.30E-02	2.30E-03
ANTHRACENE	1.30E+01	3.25E+01	3.25E+02	5.97E-01	5.97E-01	1.28E-01	7.25E-01	2.23E-02	2.23E-03
ANTIMONY	4.47E+01	NA	NA	2.37E-01	2.37E-01	4.40E-01	6.77E-01	NA	NA
BENZALDEHYDE	6.30E+00	NA	NA	2.53E+00	2.53E+00	6.20E-02	2.59E+00	NA	NA
BENZO(A)ANTHRACENE	2.40E+01	1.96E+01	NA	3.88E-01	3.88E-01	2.36E-01	6.25E-01	3.19E-02	NA
BENZO(A)PYRENE	1.90E+01	1.96E+01	NA	1.83E-01	1.83E-01	1.87E-01	3.70E-01	1.89E-02	NA
BENZO(B)FLUORANTHENE	2.50E+01	1.96E+01	NA	2.40E-01	2.40E-01	2.46E-01	4.86E-01	2.48E-02	NA
BENZO(K)FLUORANTHENE	1.20E+01	1.96E+01	NA	1.15E-01	1.15E-01	1.18E-01	2.33E-01	1.19E-02	NA
BENZO(G,H,I)PERYLENE	8.80E+00	1.96E+01	NA	5.02E-02	5.02E-02	8.66E-02	1.37E-01	6.98E-03	NA
BENZYL BUTYL PHTHALATE	5.20E-01	NA	NA	1.53E-02	1.53E-02	5.12E-03	2.04E-02	NA	NA
BETA ENDOSULFAN	1.30E+01	1.00E+01	NA	2.80E-01	2.80E-01	1.28E-01	4.08E-01	4.08E-02	NA
BIS(2-ETHYLHEXYL) PHTHALATE	4.90E+00	1.11E+00	NA	6.22E-03	6.22E-03	4.82E-02	5.45E-02	4.91E-02	NA
CADMIUM	1.15E+01	6.10E-01	2.40E+00	2.50E-01	2.50E-01	1.13E-01	3.63E-01	5.95E-01	1.51E-01
CARBAZOLE	7.50E+00	NA	NA	9.24E-01	9.24E-01	7.38E-02	9.98E-01	NA	NA
CHROMIUM, TOTAL	1.26E+02	1.00E+00	5.00E+00	5.33E-01	5.33E-01	1.24E+00	1.77E+00	1.77E+00	3.55E-01
CHRYSENE	2.10E+01	1.96E+01	NA	3.40E-01	3.40E-01	2.07E-01	5.47E-01	2.79E-02	NA
COPPER	2.98E+02	4.70E+00	6.17E+00	1.95E+00	1.95E+00	2.93E+00	4.88E+00	1.04E+00	7.91E-01

Table 38
HQs for the Northern Bobwhite Quail in the Upland Area
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations Equation
Hazard Quotient = Total Dose / TRV
Total Dose = Food Intake + Incidental Soil Intake
Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Assumptions used in Risk Calculation for the Northern Bobwhite Quail

FIR - food ingestion rate (kg/kg bw/d) 1.11E-01
AUF - area use factor (exposure area) 9.54E-01
PF - plant fraction 1.00E+00
TIF - terrestrial invertebrate fraction 0.00E+00
VPF - vertebrate prey fraction 0.00E+00
ISF - incidental soil ingestion fraction 9.30E-02

Where

Conc COC = the estimated exposure concentration of the COC
in soil at the site (mg/kg)
Food Intake = Conc. COC * FIR * AUF * (PF * BAFF)
Where
BAFF = bioaccumulation factor for plants

Contaminant of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	2.30E-02	2.00E+00	2.00E+01	1.43E-03	1.43E-03	2.26E-04	1.66E-03	8.30E-04	8.30E-05
DIBENZ(A,H)ANTHRACENE	2.20E+00	1.96E+01	NA	1.26E-02	1.26E-02	2.17E-02	3.42E-02	1.75E-03	NA
DIBENZOFURAN	3.80E+00	3.25E+01	3.25E+02	2.38E-01	2.38E-01	3.74E-02	2.75E-01	8.46E-03	8.46E-04
DIELDRIN	1.09E+01	7.70E-02	NA	1.89E-01	1.89E-01	1.08E-01	2.96E-01	3.85E+00	NA
ENDOSULFAN SULFATE	3.90E-02	1.00E+01	NA	3.34E-03	3.34E-03	3.84E-04	3.73E-03	3.73E-04	NA
ENDRIN	9.86E+00	3.00E-01	NA	8.55E-02	8.55E-02	9.70E-02	1.83E-01	6.09E-01	NA
ENDRIN ALDEHYDE	7.74E+00	3.00E-01	NA	5.55E-02	5.55E-02	7.62E-02	1.32E-01	4.39E-01	NA
ENDRIN KETONE	9.90E-03	3.00E-01	NA	1.90E-04	1.90E-04	9.75E-05	2.87E-04	9.57E-04	NA
FLUORENE	8.10E+00	3.25E+01	3.25E+02	4.98E-01	4.98E-01	7.97E-02	5.78E-01	1.78E-02	1.78E-03
FLUORANTHENE	6.20E+01	1.96E+01	NA	1.69E+00	1.69E+00	6.10E-01	2.30E+00	1.17E-01	NA
GAMMA BHC (LINDANE)	5.90E-03	2.00E+00	2.00E+01	2.92E-04	2.92E-04	5.81E-05	3.50E-04	1.75E-04	1.75E-05
GAMMA-CHLORDANE	3.60E-02	2.14E+00	1.07E+01	1.62E-04	1.62E-04	3.54E-04	5.16E-04	2.41E-04	4.82E-05
HEPTACHLOR	7.90E-03	6.50E-02	6.50E-01	6.96E-05	6.96E-05	7.78E-05	1.47E-04	2.27E-03	2.27E-04
HEPTACHLOR EPOXIDE	1.31E+01	6.50E-02	6.50E-01	3.67E-01	3.67E-01	1.29E-01	4.96E-01	7.64E+00	7.64E-01
INDENO(1,2,3-C,D)PYRENE	6.90E+00	1.96E+01	NA	3.94E-02	3.94E-02	6.79E-02	1.07E-01	5.47E-03	NA
LEAD	4.67E+02	3.85E+00	6.25E+00	8.82E-01	8.82E-01	4.60E+00	5.48E+00	1.42E+00	8.77E-01
MANGANESE	3.79E+02	9.80E+01	9.77E+02	2.73E+01	2.73E+01	3.73E+00	3.10E+01	3.16E-01	3.17E-02
MERCURY	1.30E-01	6.80E-02	3.70E-01	1.29E-02	1.29E-02	1.28E-03	1.42E-02	2.08E-01	3.83E-02
NAPHTHALENE	6.80E+00	3.25E+01	3.25E+02	8.85E-01	8.85E-01	6.69E-02	9.52E-01	2.93E-02	2.93E-03
PENTACHLOROPHENOL	2.80E-01	2.92E+00	4.86E+00	5.58E-05	5.58E-05	2.76E-03	2.81E-03	9.63E-04	5.79E-04
P,P'-DDD	1.50E+01	6.00E-02	6.00E-01	1.78E-01	1.78E-01	1.48E-01	3.25E-01	5.42E+00	5.42E-01

Table 38
HQs for the Northern Bobwhite Quail in the Upland Area
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations
Hazard Quotient = Total Dose / TRV
Total Dose = Food Intake + Incidental Soil Intake
Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Assumptions used in Risk Calculation for the Northern Bobwhite Quail

FIR - food ingestion rate (kg/kg bw/d) 1.11E-01
AUF - area use factor (exposure area) 9.54E-01
PF - plant fraction 1.00E+00
TIF - terrestrial invertebrate fraction 0.00E+00
VPF - vertebrate prey fraction 0.00E+00
ISF - incidental soil ingestion fraction 9.30E-02

Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)
Food Intake = Conc. COC * FIR * AUF * (PF * BAFF)
Where
BAFF = bioaccumulation factor for plants

Contaminant of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
P,P'-DDE	1.00E+01	6.00E-02	6.00E-01	1.06E-01	1.06E-01	9.84E-02	2.05E-01	3.41E+00	3.41E-01
P,P'-DDT	1.80E+01	6.00E-02	6.00E-01	9.42E-02	9.42E-02	1.77E-01	2.71E-01	4.52E+00	4.52E-01
PHENANTHRENE	5.30E+01	3.25E+01	3.25E+02	2.43E+00	2.43E+00	5.22E-01	2.95E+00	9.09E-02	9.09E-03
PYRENE	4.00E+01	1.96E+01	NA	1.09E+00	1.09E+00	3.94E-01	1.48E+00	7.57E-02	NA
SILVER	2.60E+00	1.78E+01	NA	2.75E-01	2.75E-01	2.56E-02	3.01E-01	1.69E-02	NA
VANADIUM	3.10E+01	1.14E+01	NA	1.80E-02	1.80E-02	3.05E-01	3.23E-01	2.84E-02	NA
ZINC	4.76E+02	1.45E+01	1.31E+02	1.57E+01	1.57E+01	4.69E+00	2.04E+01	1.40E+00	1.55E-01
Hazard Index for LPAHs				2.34E+00	2.34E+00	4.08E-01	2.75E+00	2.05E-01	2.05E-02
Hazard Index for HPAHs				3.02E+00	3.02E+00	1.71E+00	4.73E+00	3.23E-01	0.00E+00

Notes:

LPAH: low molecular weight (<200 atomic mass units) PAH

HPAH: high molecular weight (>200 atomic mass units) polycyclic aromatic hydrocarbon

mg/kg-bw/d: milligrams chemical per kilogram body weight of receptor per day

Table 39
HQs for the Coyote in the Upland Area
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV
 Total Dose = Food Intake + Incidental Soil Intake
 Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Assumptions used in Risk Calculation for the Coyote

FIR - food ingestion rate (kg/kg
 bw/d) 4.53E-02
 AUF - area use factor (exposure 5.32E-03
 PF - plant fraction 1.00E-02
 TIF - terrestrial invertebrate fraction 0.00E+00
 VPF - vertebrate prey fraction 9.90E-01
 ISF - incidental soil ingestion 2.80E-02

Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)
 Food Intake = Conc. COC * FIR * AUF * ((PF * BAFF) + (VPF* BAFV))
 Where
 BAFF = bioaccumulation factor for plants
 BAFV = bioaccumulation factor for vertebrates

Contaminant of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Chemical Intake from Vertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
2-METHYLNAPHTHALENE	1.90E+00	5.00E+01	1.50E+02	3.47E-06	0.00E+00	3.47E-06	1.28E-05	1.63E-05	3.26E-07	1.09E-07
4-METHYLPHENOL (P-CRESOL)	1.10E-01	2.19E+02	NA	8.73E-07	2.88E-05	2.96E-05	7.43E-07	3.04E-05	1.39E-07	NA
ACENAPHTHENE	9.60E+00	5.00E+01	1.50E+02	1.19E-05	0.00E+00	1.19E-05	6.49E-05	7.68E-05	1.54E-06	5.12E-07
ACENAPHTHYLENE	5.00E+00	5.00E+01	1.50E+02	7.52E-06	0.00E+00	7.52E-06	3.38E-05	4.13E-05	8.26E-07	2.75E-07
ALPHA-CHLORDANE	1.30E+01	4.58E+00	9.16E+00	1.33E-06	9.06E-04	9.07E-04	8.78E-05	9.95E-04	2.17E-04	1.09E-04
ALDRIN	1.10E-02	2.00E-01	1.00E+00	1.37E-09	4.53E-07	4.54E-07	7.43E-08	5.29E-07	2.64E-06	5.29E-07
ANTHRACENE	1.30E+01	5.00E+01	1.50E+02	1.36E-05	0.00E+00	1.36E-05	8.78E-05	1.01E-04	2.03E-06	6.76E-07
ANTIMONY	4.47E+01	6.10E+00	4.60E+01	5.39E-06	1.07E-02	1.07E-02	3.02E-04	1.10E-02	1.80E-03	2.39E-04
BENZALDEHYDE	6.30E+00	1.43E+02	2.86E+02	5.76E-05	2.54E-09	5.76E-05	4.26E-05	1.00E-04	7.00E-07	3.50E-07
BENZO(A)ANTHRACENE	2.40E+01	1.00E+00	1.00E+01	8.85E-06	0.00E+00	8.85E-06	1.62E-04	1.71E-04	1.71E-04	1.71E-05
BENZO(A)PYRENE	1.90E+01	1.00E+00	1.00E+01	4.16E-06	0.00E+00	4.16E-06	1.28E-04	1.33E-04	1.33E-04	1.33E-05
BENZO(B)FLUORANTHENE	2.50E+01	1.00E+00	1.00E+01	5.48E-06	0.00E+00	5.48E-06	1.69E-04	1.74E-04	1.74E-04	1.74E-05
BENZO(K)FLUORANTHENE	1.20E+01	1.00E+00	1.00E+01	2.63E-06	0.00E+00	2.63E-06	8.11E-05	8.37E-05	8.37E-05	8.37E-06
BENZO(G,H,I)PERYLENE	8.80E+00	1.00E+00	1.00E+01	1.14E-06	0.00E+00	1.14E-06	5.95E-05	6.06E-05	6.06E-05	6.06E-06
BENZYL BUTYL PHTHALATE	5.20E-01	2.40E+02	NA	3.49E-07	5.37E-05	5.40E-05	3.51E-06	5.75E-05	2.40E-07	NA
BETA ENDOSULFAN	1.30E+01	1.50E-01	NA	6.38E-06	1.34E-05	1.98E-05	8.78E-05	1.08E-04	7.18E-04	NA
BIS(2-ETHYLHEXYL) PHTHALATE	4.90E+00	1.83E+01	1.83E+02	1.42E-07	1.55E-04	1.55E-04	3.31E-05	1.88E-04	1.03E-05	1.03E-06
CADMIUM	1.15E+01	1.00E+00	1.00E+01	5.69E-06	5.10E-04	5.15E-04	7.77E-05	5.93E-04	5.93E-04	5.93E-05
CARBAZOLE	7.50E+00	2.71E+00	5.42E+00	2.11E-05	7.17E-08	2.11E-05	5.07E-05	7.18E-05	2.65E-05	1.33E-05
CHROMIUM, TOTAL	1.26E+02	2.45E+01	1.31E+02	1.22E-05	1.93E-03	1.94E-03	8.51E-04	2.79E-03	1.14E-04	2.13E-05
CHRYSENE	2.10E+01	1.00E+00	1.00E+01	7.75E-06	0.00E+00	7.75E-06	1.42E-04	1.50E-04	1.50E-04	1.50E-05
COPPER	2.98E+02	1.17E+01	1.51E+01	4.45E-05	4.19E-03	4.24E-03	2.01E-03	6.25E-03	5.34E-04	4.13E-04
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	2.30E-02	5.63E-01	2.25E+00	3.27E-08	1.37E-09	3.40E-08	1.55E-07	1.89E-07	3.36E-07	8.42E-08
DIBENZ(A,H)ANTHRACENE	2.20E+00	1.00E+00	1.00E+01	2.86E-07	0.00E+00	2.86E-07	1.49E-05	1.51E-05	1.51E-05	1.51E-06
DIBENZOFURAN	3.80E+00	5.00E+01	1.50E+02	5.42E-06	2.25E-07	5.64E-06	2.57E-05	3.13E-05	6.26E-07	2.09E-07

Table 39
HQs for the Coyote in the Upland Area
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV
 Total Dose = Food Intake + Incidental Soil Intake
 Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Assumptions used in Risk Calculation for the Coyote

FIR - food ingestion rate (kg/kg
 bw/d) 4.53E-02
 AUF - area use factor (exposure 5.32E-03
 PF - plant fraction 1.00E-02
 TIF - terrestrial invertebrate fraction 0.00E+00
 VPF - vertebrate prey fraction 9.90E-01
 ISF - incidental soil ingestion 2.80E-02

Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)
 Food Intake = Conc. COC * FIR * AUF * ((PF * BAFF) + (VPF* BAFV))
 Where
 BAFF = bioaccumulation factor for plants
 BAFV = bioaccumulation factor for vertebrates

Contaminant of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Chemical Intake from Vertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
DIELDRIN	1.09E+01	2.00E-02	2.00E-01	4.30E-06	2.04E-05	2.47E-05	7.38E-05	9.85E-05	4.93E-03	4.93E-04
ENDOSULFAN SULFATE	3.90E-02	1.50E-01	NA	7.62E-08	9.32E-06	9.39E-06	2.63E-07	9.66E-06	6.44E-05	NA
ENDRIN	9.86E+00	9.20E-02	9.20E-01	1.95E-06	2.23E-06	4.18E-06	6.66E-05	7.08E-05	7.69E-04	7.69E-05
ENDRIN ALDEHYDE	7.74E+00	9.20E-02	9.20E-01	1.26E-06	1.53E-04	1.54E-04	5.23E-05	2.06E-04	2.24E-03	2.24E-04
ENDRIN KETONE	9.90E-03	9.20E-02	9.20E-01	4.33E-09	1.40E-08	1.83E-08	6.69E-08	8.52E-08	9.26E-07	9.26E-08
FLUORENE	8.10E+00	5.00E+01	1.50E+02	1.14E-05	5.01E-07	1.19E-05	5.47E-05	6.66E-05	1.33E-06	4.44E-07
FLUORANTHENE	6.20E+01	1.00E+00	1.00E+01	3.85E-05	0.00E+00	3.85E-05	4.19E-04	4.57E-04	4.57E-04	4.57E-05
GAMMA BHC (LINDANE)	5.90E-03	5.63E-01	2.25E+00	6.67E-09	6.53E-10	7.32E-09	3.99E-08	4.72E-08	8.38E-08	2.10E-08
GAMMA-CHLORDANE	3.60E-02	4.58E+00	9.16E+00	3.69E-09	2.49E-06	2.49E-06	2.43E-07	2.73E-06	5.97E-07	2.98E-07
HEPTACHLOR	7.90E-03	1.00E-01	1.00E+00	1.59E-09	8.96E-08	9.11E-08	5.34E-08	1.45E-07	1.45E-06	1.45E-07
HEPTACHLOR EPOXIDE	1.31E+01	1.00E-01	1.00E+00	8.37E-06	6.75E-06	1.51E-05	8.88E-05	1.04E-04	1.04E-03	1.04E-04
INDENO(1,2,3-C,D)PYRENE	6.90E+00	1.00E+00	1.00E+01	8.98E-07	2.51E-04	2.52E-04	4.66E-05	2.99E-04	2.99E-04	2.99E-05
LEAD	4.67E+02	3.20E+01	9.60E+01	2.01E-05	3.91E-03	3.93E-03	3.16E-03	7.08E-03	2.21E-04	7.38E-05
MANGANESE	3.79E+02	8.80E+01	2.84E+02	6.22E-04	5.31E-03	5.94E-03	2.56E-03	8.50E-03	9.66E-05	2.99E-05
MERCURY	1.30E-01	7.70E-02	1.10E-01	2.94E-07	5.96E-06	6.26E-06	8.78E-07	7.13E-06	9.27E-05	6.49E-05
NAPHTHALENE	6.80E+00	5.00E+01	1.50E+02	2.02E-05	5.61E-08	2.02E-05	4.59E-05	6.62E-05	1.32E-06	4.41E-07
PENTACHLOROPHENOL	2.80E-01	4.28E+01	4.28E+02	1.27E-09	2.90E-04	2.90E-04	1.89E-06	2.91E-04	6.82E-06	6.82E-07
P,P'-DDD	1.50E+01	8.00E-01	4.00E+00	4.05E-06	7.70E-05	8.10E-05	1.01E-04	1.82E-04	2.28E-04	4.56E-05
P,P'-DDE	1.00E+01	8.00E-01	4.00E+00	2.42E-06	6.86E-05	7.11E-05	6.76E-05	1.39E-04	1.73E-04	3.47E-05
P,P'-DDT	1.80E+01	8.00E-01	4.00E+00	2.15E-06	8.26E-04	8.29E-04	1.22E-04	9.50E-04	1.19E-03	2.38E-04
PHENANTHRENE	5.30E+01	5.00E+01	1.50E+02	5.55E-05	7.18E-06	6.26E-05	3.58E-04	4.21E-04	8.41E-06	2.80E-06
PYRENE	4.00E+01	1.00E+00	1.00E+01	2.49E-05	0.00E+00	2.49E-05	2.70E-04	2.95E-04	2.95E-04	2.95E-05
SILVER	2.60E+00	2.22E+01	2.22E+02	6.27E-06	5.03E-04	5.09E-04	1.76E-05	5.27E-04	2.37E-05	2.37E-06
VANADIUM	3.10E+01	1.34E+00	2.10E+00	4.11E-07	1.41E-04	1.41E-04	2.09E-04	3.51E-04	2.62E-04	1.67E-04
ZINC	4.76E+02	3.80E+01	1.10E+02	3.57E-04	3.29E-02	3.33E-02	3.22E-03	3.65E-02	9.60E-04	3.31E-04
Hazard Index for LPAHs				5.33E-05	7.25E-07	5.40E-05	2.80E-04	3.34E-04	6.67E-06	2.22E-06

Table 39
HQs for the Coyote in the Upland Area
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV
 Total Dose = Food Intake + Incidental Soil Intake
 Incidental Soil Intake = FIR * AUF * Conc. COC * ISF

Assumptions used in Risk Calculation for the Coyote

FIR - food ingestion rate (kg/kg
 bw/d) 4.53E-02
 AUF - area use factor (exposure 5.32E-03
 PF - plant fraction 1.00E-02
 TIF - terrestrial invertebrate fraction 0.00E+00
 VPF - vertebrate prey fraction 9.90E-01
 ISF - incidental soil ingestion 2.80E-02

Where

Conc COC = the estimated exposure concentration of the COC in soil at the site (mg/kg)
 Food Intake = Conc. COC * FIR * AUF * ((PF * BAFP) + (VPF* BAFV))
 Where
 BAFP = bioaccumulation factor for plants
 BAFV = bioaccumulation factor for vertebrates

Contaminant of Potential Concern	Surface Soil Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Terrestrial Plant (mg/kg bw/d)	Chemical Intake from Vertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Soil Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
Hazard Index for HPAHs				6.88E-05	0.00E+00	6.88E-05	1.18E-03	1.24E-03	1.24E-03	1.24E-04

Notes:

LPAH: low molecular weight (<200 atomic mass units) PAH
 HPAH: high molecular weight (>200 atomic mass units) polycyclic aromatic hydrocarbon
 mg/kg-bw/d: milligrams chemical per kilogram body weight of receptor per day

Table 40
Analysis of Risk to Benthic Invertebrates in the Lake Sabine - Intertidal
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

COPC	Units	# Samples	# Detects	FOD	Minimum Detect	Maximum Detect	Primary Effect Screening Level	Maximum HQ - Primary Effect Level	# Non-detects > Primary Effect Level	# Detects > Primary Effect Level	Secondary Effect Screening Level	Maximum HQ - Secondary Effect Level	# Non-detects > Secondary Effect Level	# Detects > Secondary Effect Level	Magnitude of Primary Effect Exceedance	Frequency of Secondary Effect Exceedance	Identified as a COC?
2,4-DIMETHYLPHENOL	MG/KG	9	0	0.00%	--	--	0.029	--	1	0	--	--	--	--	<10	--	No
2-METHYLNAPHTHALENE	MG/KG	9	7	77.78%	0.0034	0.091	0.07	1.3	0	1	0.67	0.1358	0	0	<10	0	No
ACENAPHTHENE	MG/KG	9	8	88.89%	0.0014	0.098	0.016	6.125	1	2	0.5	0.196	0	0	<10	0	No
ACENAPHTHYLENE	MG/KG	9	7	77.78%	0.0045	0.035	0.044	0.7955	0	0	0.64	0.05469	0	0	<10	0	No
ACETOPHENONE	MG/KG	9	2	22.22%	0.0033	0.043	--	--	--	--	--	--	--	--	<10	--	No
ANTHRACENE	MG/KG	9	5	55.56%	0.0052	0.1	0.0853	1.172	0	1	1.1	0.09091	0	0	<10	0	No
ANTIMONY	MG/KG	9	9	100.00%	0.2	16.1	--	--	--	--	--	--	--	--	<10	--	No
ARSENIC	MG/KG	9	9	100.00%	1.8	13.7	8.2	1.671	0	3	70	0.1957	0	0	<10	0	No
ARIUM	MG/KG	9	9	100.00%	10.8	83.6	48	1.742	0	4	--	--	--	--	<10	--	No
BENZALDEHYDE	MG/KG	9	3	33.33%	0.0085	0.11	--	--	--	--	--	--	--	--	<10	--	No
BENZYL BUTYL PHTHALATE	MG/KG	9	0	0.00%	--	--	--	--	--	--	--	--	--	--	<10	--	No
BERYLLIUM	MG/KG	9	2	22.22%	0.24	0.33	--	--	--	--	--	--	--	--	<10	--	No
BIS(2-ETHYLHEXYL) PHTHA	MG/KG	9	0	0.00%	--	--	0.182	--	3	0	2.647	--	1	0	<10	0	No
CADIUM	MG/KG	9	9	100.00%	0.08	1.49	1.2	1.242	0	3	9.6	0.1552	0	0	<10	0	No
CALCIUM	MG/KG	9	9	100.00%	250	172000	--	--	--	--	--	--	--	--	<10	--	No
CAPROLACTAM	MG/KG	9	1	11.11%	0.11	0.11	--	--	--	--	--	--	--	--	<10	--	No
CARBAZOLE	MG/KG	9	4	44.44%	0.011	0.2	--	--	--	--	--	--	--	--	<10	--	No
CHROMIUM, TOTAL	MG/KG	9	9	100.00%	2.2	87.2	81	1.077	0	1	370	0.2357	0	0	<10	0	No
COPPER	MG/KG	9	9	100.00%	5	313	34	9.206	0	5	270	1.159	0	1	<10	0.1111111	No
CYANIDE	MG/KG	9	4	44.44%	0.27	0.55	--	--	--	--	--	--	--	--	<10	--	No
FLUORENE	MG/KG	9	4	44.44%	0.012	0.11	0.019	5.789	0	2	0.54	0.2037	0	0	<10	0	No
LEAD	MG/KG	9	9	100.00%	14.1	942	46.7	20.17	0	5	218	4.321	0	2	<10	0.2222222	Yes
MAGNESIUM	MG/KG	9	9	100.00%	189	3620	--	--	--	--	--	--	--	--	<10	--	No
MANGANESE	MG/KG	9	9	100.00%	66.3	1500	260	5.769	0	5	--	--	--	--	<10	--	No
MERCURY	MG/KG	9	9	100.00%	0.016	0.18	0.15	1.2	0	1	0.71	0.2535	0	0	<10	0	No
NAPHTHALENE	MG/KG	9	7	77.78%	0.014	0.4	0.16	2.5	0	5	2.1	0.1905	0	0	<10	0	No
NICKEL	MG/KG	9	9	100.00%	2.82	85	20.9	4.067	0	2	51.6	1.647	0	1	<10	0.1111111	No
PENTACHLOROPHENOL	MG/KG	9	2	22.22%	0.082	0.16	0.36	0.4444	0	0	--	--	--	--	<10	--	No
PHENANTHRENE	MG/KG	9	7	77.78%	0.0049	0.32	0.24	1.333	0	2	1.5	0.2133	0	0	<10	0	No
POTASSIUM	MG/KG	9	9	100.00%	76.4	1230	--	--	--	--	--	--	--	--	<10	--	No
SELENIUM	MG/KG	9	8	88.89%	0.18	5.9	1	5.9	1	3	--	--	--	--	<10	--	No
SODIUM	MG/KG	9	9	100.00%	584	1560	--	--	--	--	--	--	--	--	<10	--	No
ZINC	MG/KG	9	9	100.00%	25.5	594	150	3.96	0	5	410	1.449	0	1	<10	0.1111111	No

Notes:

-- = Not available

mg/kg = milligrams per kilogram

Compounds were identified as COCs if the magnitude of exceedance exceeded 10 or if the frequency of exceedance exceeded 20 %

HQ = Hazard Quotient = Maximum Detect / Benchmark

Table 41

Analysis of Risk to Benthic Invertebrates in the Lake Sabine - Nearshore

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

COPC	Units	# Samples	# Detects	FOD	Minimum Detect	Maximum Detect	Primary Effect Screening Level	Maximum HQ - Primary Effect Level	# Non-detects > Primary Effect Level	# Detects > Primary Effect Level	Secondary Effect Screening Level	Maximum HQ - Secondary Effect Level	# Non-detects > Secondary Effect Level	# Detects > Secondary Effect Level	Magnitude of Primary Effect Exceedance	Frequency of Secondary Effect Exceedance	Identified as a COC?
ACENAPHTHENE	MG/KG	41	6	14.63%	0.0042	0.58	0.016	36.25	4	3	0.5	1.16	0	1	<10	2.44%	No
ACENAPHTHYLENE	MG/KG	41	6	14.63%	0.0037	0.12	0.044	2.727	6	1	0.64	0.1875	0	0	<10	0.00%	No
ACETOPHENONE	MG/KG	41	1	2.44%	0.0057	0.0057	--	--	--	--	--	--	--	--	<10	--	No
ANTHRACENE	MG/KG	41	15	36.59%	0.002	2	0.0853	23.45	4	2	1.1	1.818	0	1	<10	2.44%	No
ARSENIC	MG/KG	45	45	100.00%	1.6	11.7	8.2	1.427	0	2	70	0.1671	0	0	<10	0.00%	No
BARIIUM	MG/KG	45	45	100.00%	12.2	220	48	4.583	0	20	--	--	--	--	>10	--	No
BENZYL BUTYL PHTHALATE	MG/KG	41	14	34.15%	0.024	0.064	--	--	--	--	--	--	--	--	<10	--	No
BERYLLIUM	MG/KG	45	35	77.78%	0.1	2.7	--	--	--	--	--	--	--	--	<10	--	No
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	MG/KG	6	0	0.00%	--	--	--	--	--	--	--	--	--	--	<10	--	No
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	MG/KG	6	0	0.00%	--	--	--	--	--	--	--	--	--	--	<10	--	No
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	MG/KG	6	0	0.00%	--	--	--	--	--	--	--	--	--	--	<10	--	No
GAMMA BHC (LINDANE)	MG/KG	6	1	16.67%	0.0034	0.0034	--	--	--	--	--	--	--	--	<10	--	No
BIS(2-ETHYLHEXYL) PHTHALATE	MG/KG	41	3	7.32%	0.047	0.26	0.182	1.429	1	1	2.647	0.09822	0	0	<10	0.00%	No
BENZO(A)ANTHRACENE	MG/KG	41	19	46.34%	0.006	4.1	0.26	15.77	0	3	1.6	2.562	0	1	<10	2.44%	No
BENZALDEHYDE	MG/KG	41	1	2.44%	0.037	0.037	--	--	--	--	--	--	--	--	<10	--	No
BENZO(A)PYRENE	MG/KG	41	22	53.66%	0.026	2.3	0.43	5.349	0	2	1.6	1.437	0	1	<10	2.44%	No
BENZO(B)FLUORANTHENE	MG/KG	41	25	60.98%	0.017	3.6	1.7	2.118	0	1	9.6	0.375	0	0	<10	0.00%	No
BENZO(K)FLUORANTHENE	MG/KG	41	19	46.34%	0.021	1.9	1.7	1.118	0	1	9.6	0.1979	0	0	<10	0.00%	No
CALCIUM	MG/KG	45	45	100.00%	227	30500	--	--	--	--	--	--	--	--	<10	--	No
CAPROLACTAM	MG/KG	41	2	4.88%	0.037	0.051	--	--	--	--	--	--	--	--	<10	--	No
CARBAZOLE	MG/KG	41	10	24.39%	0.0068	0.31	--	--	--	--	--	--	--	--	<10	--	No
CHRYSENE	MG/KG	41	19	46.34%	0.01	3.9	0.384	10.16	0	3	2.8	1.393	0	1	<10	2.44%	No
COBALT	MG/KG	45	45	100.00%	1.5	21.2	10	2.12	0	3	--	--	--	--	<10	--	No
COPPER	MG/KG	45	44	97.78%	1.4	312	34	9.176	0	3	270	1.156	0	1	<10	2.22%	No
DIBENZO(A,H)ANTHRACENE	MG/KG	41	8	19.51%	0.019	0.23	0.0634	3.628	4	1	0.26	0.8846	0	0	<10	0.00%	No
DIBENZOFURAN	MG/KG	41	5	12.20%	0.0028	0.36	--	--	--	--	--	--	--	--	<10	--	No
3,3'-DICHLOROBENZIDINE	MG/KG	41	2	4.88%	0.046	0.075	--	--	--	--	--	--	--	--	<10	--	No
2,4-DIMETHYLPHENOL	MG/KG	41	0	0.00%	--	--	0.029	--	6	0	--	--	--	--	<10	--	No
FLUORENE	MG/KG	41	6	14.63%	0.0065	0.79	0.019	41.58	4	3	0.54	1.463	0	1	<10	2.44%	No
FLUORANTHENE	MG/KG	41	25	60.98%	0.0032	9.1	0.6	15.17	0	2	5.1	1.784	0	1	<10	2.44%	No
HEXACHLOROBUTADIENE	MG/KG	41	0	0.00%	--	--	--	--	--	--	--	--	--	--	<10	--	No
MERCURY	MG/KG	45	11	24.44%	0.011	0.045	0.15	0.3	7	0	0.71	0.06338	0	0	<10	0.00%	No
POTASSIUM	MG/KG	45	45	100.00%	127	2340	--	--	--	--	--	--	--	--	<10	--	No
2-METHYLPHENOL (O-CRESOL)	MG/KG	41	0	0.00%	--	--	0.063	--	6	0	--	--	--	--	<10	--	No
MAGNESIUM	MG/KG	45	45	100.00%	236	4240	--	--	--	--	--	--	--	--	<10	--	No
MANGANESE	MG/KG	45	45	100.00%	35.2	1270	260	4.885	0	10	--	--	--	--	<10	--	No
2-METHYLNAPHTHALENE	MG/KG	41	5	12.20%	0.0027	0.011	0.07	0.1571	6	0	0.67	0.01642	0	0	<10	0.00%	No
SODIUM	MG/KG	45	45	100.00%	432	5450	--	--	--	--	--	--	--	--	<10	--	No
NAPHTHALENE	MG/KG	41	7	17.07%	0.0046	0.014	0.16	0.0875	6	0	2.1	0.006667	0	0	<10	0.00%	No
NICKEL	MG/KG	45	45	100.00%	1.5	26.4	20.9	1.263	0	2	51.6	0.5116	0	0	<10	0.00%	No
NITROBENZENE	MG/KG	41	0	0.00%	--	--	--	--	--	--	--	--	--	--	<10	--	No
LEAD	MG/KG	45	45	100.00%	4.3	362	46.7	7.752	0	2	218	1.661	0	1	<10	2.22%	No
PHENANTHRENE	MG/KG	41	21	51.22%	0.0027	7.1	0.24	29.58	0	2	1.5	4.733	0	2	<10	4.88%	No
PYRENE	MG/KG	41	25	60.98%	0.0023	8.8	0.665	13.23	0	3	2.6	3.385	0	1	<10	2.44%	No
SELENIUM	MG/KG	45	21	46.67%	0.13	0.89	1	0.89	3	0	--	--	--	--	<10	--	No
THALLIUM	MG/KG	45	2	4.44%	1	2.1	--	--	--	--	--	--	--	--	<10	--	No
ZINC	MG/KG	45	45	100.00%	14.2	3910	150	26.07	0	2	410	9.537	0	2	<10	4.44%	No

Notes:

-- = Not available
mg/kg = milligrams per kilogram

Compounds were identified as COCs if the magnitude of exceedance exceeded 10 or if the frequency of exceedance exceeded 20 %
HQ = Hazard Quotient = Maximum Detect / Benchmark

Table 42
Analysis of Risk to Benthic Invertebrates in the Lake Sabine - Offshore
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

COPC	Units	# Samples	# Detects	FOD	Minimum Detect	Maximum Detect	Primary Effect Screening Level	Maximum HQ - Primary Effect Level	# Non-detects > Primary Effect Level	# Detects > Primary Effect Level	Secondary Effect Screening Level	Maximum HQ - Secondary Effect Level	# Non-detects > Secondary Effect Level	# Detects > Secondary Effect Level	Magnitude of Primary Effect Exceedance	Frequency of Secondary Effect Exceedance	Identified as a COC?
3,3'-DICHLOROBENZIDINE	MG/KG	11	4	36.36%	0.031	0.049									<10		No
ARSENIC	MG/KG	11	11	100.00%	2.9	8.9	8.2	1.085	0	1	70	0.1271	0	0	<10	0.00%	No
BARIUM	MG/KG	11	11	100.00%	24.5	115	48	2.396	0	4					<10		No
BENZALDEHYDE	MG/KG	11	1	9.09%	0.039	0.039									<10		No
BERYLLIUM	MG/KG	11	10	90.91%	0.2	0.89									<10		No
CALCIUM	MG/KG	11	11	100.00%	247	5580									<10		No
CAPROLACTAM	MG/KG	11	1	9.09%	0.039	0.039									<10		No
MAGNESIUM	MG/KG	11	11	100.00%	320	4300									<10		No
MANGANESE	MG/KG	11	11	100.00%	51.8	745	260	2.865	0	8					<10		No
NICKEL	MG/KG	11	11	100.00%	2.23	44.1	20.9	2.11	0	1	51.6	0.8547	0	0	<10	0.00%	No
POTASSIUM	MG/KG	11	11	100.00%	202	2460									<10		No
SELENIUM	MG/KG	11	3	27.27%	0.27	0.59	1	0.59	0	0					<10		No
SODIUM	MG/KG	11	11	100.00%	705	5200									<10		No

Notes:

-- = Not available

mg/kg = milligrams per kilogram

Compounds were identified as COCs if the magnitude of exceedance exceeded 10 or if the frequency of exceedance exceeded 20 %

HQ = Hazard Quotient = Maximum Detect / Benchmark

Table 43

HQs for the Spotted Sandpiper in the Lake Sabine - Intertidal

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Assumptions used in Risk Calculation for the Spotted Sandpiper

FIR - food ingestion rate (kg/kg bw/d)	4.24E-01
SUF - area use factor X site use factor	1.00E-01
PF - plant fraction	0.00E+00
AIF - aquatic invertebrate fraction	1.00E+00
FPF - fish prey fraction	0.00E+00
ISF - incidental sediment ingestion fraction	1.80E-01

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV

Total Dose = Food Intake + Incidental Sediment Intake

Incidental Sediment Intake = FIR * AUF * Conc. COC * ISF

Where

ConcSed = the estimated exposure concentration of the COC

in sediment at the site (mg/kg)

Food Intake = FIR * AUF * ConcSed*(AIF * BAFI)

Where

BAFI = bioaccumulation factor for invertebrates

Contaminant of Potential Concern	Sediment Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Sediment Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
2-METHYLNAPHTHALENE	9.10E-02	3.25E+01	3.25E+02	8.06E-03	8.06E-03	6.94E-04	8.75E-03	2.69E-04	2.69E-05
2,4-DIMETHYLPHENOL	3.50E-02	NA	NA	1.48E-03	1.48E-03	2.67E-04	1.75E-03	NA	NA
ACENAPHTHENE	9.80E-02	3.25E+01	3.25E+02	8.47E-03	8.47E-03	7.48E-04	9.22E-03	2.84E-04	2.84E-05
ACENAPHTHYLENE	3.50E-02	3.25E+01	3.25E+02	2.41E-03	2.41E-03	2.67E-04	2.67E-03	8.22E-05	8.22E-06
ACETOPHENONE	4.30E-02	NA	NA	1.82E-03	1.82E-03	3.28E-04	2.15E-03	NA	NA
ANTIMONY	1.61E+01	NA	NA	6.82E-01	6.82E-01	1.23E-01	8.05E-01	NA	NA
ANTHRACENE	1.00E-01	3.25E+01	3.25E+02	8.09E-04	8.09E-04	7.63E-04	1.57E-03	4.84E-05	4.84E-06
ARSENIC	1.37E+01	9.30E+00	4.00E+01	5.81E-01	5.81E-01	1.04E-01	6.85E-01	7.37E-02	1.71E-02
BARIUM	4.59E+01	2.08E+01	4.17E+01	1.95E+00	1.95E+00	3.50E-01	2.30E+00	1.10E-01	5.51E-02
BENZALDEHYDE	1.10E-01	NA	NA	4.66E-03	4.66E-03	8.39E-04	5.50E-03	NA	NA
BENZYL BUTYL PHTHALATE	1.70E-01	NA	NA	7.20E-03	7.20E-03	1.30E-03	8.50E-03	NA	NA
BERYLLIUM	3.30E-01	NA	NA	6.29E-04	6.29E-04	2.52E-03	3.15E-03	NA	NA
BIS(2-ETHYLHEXYL) PHTHALATE	3.00E+00	1.11E+00	NA	1.27E-01	1.27E-01	2.29E-02	1.50E-01	1.35E-01	NA
CADMIUM	1.49E+00	6.10E-01	2.40E+00	7.58E-03	7.58E-03	1.14E-02	1.89E-02	3.11E-02	7.89E-03
CAPROLACTAM	1.10E-01	NA	NA	4.66E-03	4.66E-03	8.39E-04	5.50E-03	NA	NA
CARBAZOLE	2.00E-01	NA	NA	8.48E-03	8.48E-03	1.53E-03	1.00E-02	NA	NA
CHROMIUM, TOTAL	8.72E+01	1.00E+00	5.00E+00	0.00E+00	0.00E+00	6.65E-01	6.65E-01	6.65E-01	1.33E-01
COPPER	2.14E+01	4.70E+00	6.17E+00	1.85E-01	1.85E-01	1.64E-01	3.48E-01	7.41E-02	5.64E-02
CYANIDE	5.50E-01	4.00E-02	4.00E-01	0.00E+00	0.00E+00	4.20E-03	4.20E-03	1.05E-01	1.05E-02
FLUORENE	1.10E-01	3.25E+01	3.25E+02	3.62E+00	3.62E+00	8.39E-04	3.62E+00	1.11E-01	1.11E-02
LEAD	2.04E+02	3.85E+00	6.25E+00	8.16E-01	8.16E-01	1.56E+00	2.37E+00	6.16E-01	3.80E-01
MANGANESE	1.50E+03	9.80E+01	9.77E+02	6.36E+01	6.36E+01	1.14E+01	7.50E+01	7.65E-01	7.68E-02
MERCURY	1.80E-01	6.80E-02	3.70E-01	1.24E-02	1.24E-02	1.37E-03	1.37E-02	2.02E-01	3.72E-02
NAPHTHALENE	4.00E-01	3.25E+01	3.25E+02	2.67E+00	2.67E+00	3.05E-03	2.67E+00	8.22E-02	8.22E-03
NICKEL	8.50E+01	7.74E+01	1.07E+02	5.98E-01	5.98E-01	6.48E-01	1.25E+00	1.61E-02	1.17E-02
PENTACHLOROPHENOL	1.60E-01	2.92E+00	4.86E+00	6.78E-03	6.78E-03	1.22E-03	8.00E-03	2.74E-03	1.65E-03
SELENIUM	2.97E+00	4.00E-01	8.00E-01	1.47E-01	1.47E-01	2.27E-02	1.70E-01	4.25E-01	2.12E-01
ZINC	5.94E+02	1.45E+01	1.31E+02	6.27E-01	6.27E-01	4.53E+00	5.16E+00	3.56E-01	3.94E-02

Notes:

mg/kg-bw/d: milligrams chemical per kilogram body weight of receptor per day

HPAH: high molecular weight (>200 atomic mass units) polycyclic aromatic hydrocarbon (PAH)

LPAH: low molecular weight (<200 atomic mass units) PAH

Table 44

HQs for the Spotted Sandpiper in the Lake Sabine - Near Shore
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV
 Total Dose = Food Intake + Incidental Sediment Intake
 Incidental Sediment Intake = FIR * AUF * Conc. COC * ISF
 Where

Assumptions used in Risk Calculation for the Spotted Sandpiper

FIR - food ingestion rate (kg/kg bw/d) 4.24E-01
 SUF - area use factor X site use factor 4.00E-01
 PF - plant fraction 0.00E+00
 AIF - aquatic invertebrate fraction 1.00E+00
 FPF - fish prey fraction 0.00E+00
 ISF - incidental sediment ingestion 1.80E-01

ConcSed = the estimated exposure concentration of the COC

in sediment at the site (mg/kg)

Food Intake = FIR * AUF * ConcSed*(AIF * BAFI)

Where

BAFI = bioaccumulation factor for invertebrates

Contaminant of Potential Concern	Sediment Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Sediment Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
3,3'-DICHLOROBENZIDINE	7.50E-02	NA	NA	1.27E-02	1.27E-02	2.29E-03	1.50E-02	NA	NA
2-METHYLNAPHTHALENE	1.10E-02	3.25E+01	3.25E+02	3.90E-03	3.90E-03	3.36E-04	4.23E-03	1.30E-04	1.30E-05
ACENAPHTHENE	5.80E-01	3.25E+01	3.25E+02	2.01E-01	2.01E-01	1.77E-02	2.18E-01	6.72E-03	6.72E-04
ACENAPHTHYLENE	1.20E-01	3.25E+01	3.25E+02	3.30E-02	3.30E-02	3.66E-03	3.67E-02	1.13E-03	1.13E-04
ACETOPHENONE	5.70E-03	NA	NA	9.66E-04	9.66E-04	1.74E-04	1.14E-03	NA	NA
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	1.70E-03	2.00E+00	2.00E+01	1.61E-03	1.61E-03	5.19E-05	1.66E-03	8.31E-04	8.31E-05
ANTHRACENE	2.00E+00	3.25E+01	3.25E+02	6.47E-02	6.47E-02	6.10E-02	1.26E-01	3.87E-03	3.87E-04
ARSENIC	1.17E+01	9.30E+00	4.00E+01	1.98E+00	1.98E+00	3.57E-01	2.34E+00	2.52E-01	5.85E-02
BARIUM	6.40E+01	2.08E+01	4.17E+01	1.08E+01	1.08E+01	1.95E+00	1.28E+01	6.15E-01	3.07E-01
BENZALDEHYDE	3.70E-02	NA	NA	6.27E-03	6.27E-03	1.13E-03	7.40E-03	NA	NA
BENZO(A)ANTHRACENE	4.10E+00	1.96E+01	NA	2.49E-01	2.49E-01	1.25E-01	3.74E-01	1.91E-02	NA
BENZO(A)PYRENE	2.30E+00	1.96E+01	NA	4.95E-02	4.95E-02	7.02E-02	1.20E-01	6.11E-03	NA
BENZO(B)FLUORANTHENE	3.60E+00	1.96E+01	NA	9.15E-02	9.15E-02	1.10E-01	2.01E-01	1.03E-02	NA
BENZO(G,H,I)PERYLENE	2.40E-01	1.96E+01	NA	8.75E-03	8.75E-03	7.32E-03	1.61E-02	8.20E-04	NA
BENZO(K)FLUORANTHENE	1.90E+00	1.96E+01	NA	6.76E-02	6.76E-02	5.80E-02	1.26E-01	6.41E-03	NA
BENZYL BUTYL PHTHALATE	6.40E-02	NA	NA	1.08E-02	1.08E-02	1.95E-03	1.28E-02	NA	NA
BERYLLIUM	2.70E+00	NA	NA	2.06E-02	2.06E-02	8.24E-02	1.03E-01	NA	NA
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	1.70E-03	2.00E+00	2.00E+01	3.22E-03	3.22E-03	5.19E-05	3.27E-03	1.64E-03	1.64E-04
BIS(2-ETHYLHEXYL) PHTHALATE	2.60E-01	1.11E+00	NA	4.41E-02	4.41E-02	7.93E-03	5.20E-02	4.68E-02	NA
CAPROLACTAM	5.10E-02	NA	NA	8.64E-03	8.64E-03	1.56E-03	1.02E-02	NA	NA
CARBAZOLE	3.10E-01	NA	NA	5.25E-02	5.25E-02	9.46E-03	6.20E-02	NA	NA
CHRYSENE	3.90E+00	1.96E+01	NA	1.31E-01	1.31E-01	1.19E-01	2.50E-01	1.27E-02	NA
COBALT	8.46E+00	1.30E+00	NA	1.75E-01	1.75E-01	2.58E-01	4.33E-01	3.33E-01	NA

Table 44

HQs for the Spotted Sandpiper in the Lake Sabine - Near Shore
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV
 Total Dose = Food Intake + Incidental Sediment Intake
 Incidental Sediment Intake = FIR * AUF * Conc. COC * ISF
 Where

Assumptions used in Risk Calculation for the Spotted Sandpiper

FIR - food ingestion rate (kg/kg bw/d) 4.24E-01
 SUF - area use factor X site use factor 4.00E-01
 PF - plant fraction 0.00E+00
 AIF - aquatic invertebrate fraction 1.00E+00
 FPF - fish prey fraction 0.00E+00
 ISF - incidental sediment ingestion 1.80E-01

ConcSed = the estimated exposure concentration of the COC
 in sediment at the site (mg/kg)
 Food Intake = FIR * AUF * ConcSed*(AIF * BAFI)
 Where
 BAFI = bioaccumulation factor for invertebrates

Contaminant of Potential Concern	Sediment Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Sediment Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
COPPER	1.56E+01	4.70E+00	6.17E+00	5.37E-01	5.37E-01	4.75E-01	1.01E+00	2.15E-01	1.64E-01
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	1.70E-03	2.00E+00	2.00E+01	3.22E-03	3.22E-03	5.19E-05	3.27E-03	1.64E-03	1.64E-04
DIBENZ(A,H)ANTHRACENE	2.30E-01	1.96E+01	NA	8.15E-03	8.15E-03	7.02E-03	1.52E-02	7.74E-04	NA
DIBENZOFURAN	3.60E-01	3.25E+01	3.25E+02	6.10E-02	6.10E-02	1.10E-02	7.20E-02	2.22E-03	2.22E-04
FLUORANTHENE	9.10E+00	1.96E+01	NA	3.27E-01	3.27E-01	2.78E-01	6.05E-01	3.08E-02	NA
FLUORENE	7.90E-01	3.25E+01	3.25E+02	1.04E+02	1.04E+02	2.41E-02	1.04E+02	3.20E+00	3.20E-01
GAMMA BHC (LINDANE)	3.40E-03	2.00E+00	2.00E+01	3.22E-03	3.22E-03	1.04E-04	3.33E-03	1.66E-03	1.66E-04
HEXACHLOROBUTADIENE	1.70E-01	3.39E+00	NA	2.88E-02	2.88E-02	5.19E-03	3.40E-02	1.00E-02	NA
INDENO(1,2,3-C,D)PYRENE	3.40E-01	1.96E+01	NA	9.97E-03	9.97E-03	1.04E-02	2.03E-02	1.04E-03	NA
LEAD	2.22E+01	3.85E+00	6.25E+00	3.55E-01	3.55E-01	6.77E-01	1.03E+00	2.68E-01	1.65E-01
MANGANESE	1.27E+03	9.80E+01	9.77E+02	2.15E+02	2.15E+02	3.87E+01	2.54E+02	2.59E+00	2.60E-01
MERCURY	4.50E-02	6.80E-02	3.70E-01	1.24E-02	1.24E-02	1.37E-03	1.37E-02	2.02E-01	3.72E-02
NAPHTHALENE	1.40E-02	3.25E+01	3.25E+02	3.73E-01	3.73E-01	4.27E-04	3.74E-01	1.15E-02	1.15E-03
NICKEL	2.64E+01	7.74E+01	1.07E+02	7.43E-01	7.43E-01	8.05E-01	1.55E+00	2.00E-02	1.45E-02
NITROBENZENE	1.70E-01	NA	NA	6.02E-02	6.02E-02	5.19E-03	6.54E-02	NA	NA
PHENANTHRENE	2.37E-01	3.25E+01	3.25E+02	5.81E+01	5.81E+01	7.23E-03	5.81E+01	1.79E+00	1.79E-01
PYRENE	8.80E+00	1.96E+01	NA	6.49E-01	6.49E-01	2.68E-01	9.17E-01	4.68E-02	NA
SELENIUM	3.71E-01	4.00E-01	8.00E-01	7.36E-02	7.36E-02	1.13E-02	8.49E-02	2.12E-01	1.06E-01
THALLIUM	5.42E-01	5.30E-02	5.30E-01	9.19E-02	9.19E-02	1.65E-02	1.08E-01	2.05E+00	2.05E-01
ZINC	1.54E+02	1.45E+01	1.31E+02	6.50E-01	6.50E-01	4.70E+00	5.35E+00	3.69E-01	4.08E-02
Hazard Index for LPAHs				1.04E+02	1.04E+02	1.18E-01	1.04E+02	5.01E+00	5.01E-01
Hazard Index for HPAHs				9.42E-01	9.42E-01	7.84E-01	1.73E+00	1.35E-01	0.00E+00

Notes:

HPAH: high molecular weight (>200 atomic mass units) polycyclic aromatic hydrocarbon (PAH)

mg/kg-bw/d: milligrams chemical per kilogram

Table 44
HQs for the Spotted Sandpiper in the Lake Sabine - Near Shore
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Assumptions used in Risk Calculation for the Spotted Sandpiper

FIR - food ingestion rate (kg/kg bw/d) 4.24E-01
 SUF - area use factor X site use factor 4.00E-01
 PF - plant fraction 0.00E+00
 AIF - aquatic invertebrate fraction 1.00E+00
 FPF - fish prey fraction 0.00E+00
 ISF - incidental sediment ingestion 1.80E-01

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV
 Total Dose = Food Intake + Incidental Sediment Intake
 Incidental Sediment Intake = FIR * AUF * Conc. COC * ISF
 Where

ConcSed = the estimated exposure concentration of the COC
 in sediment at the site (mg/kg)

Food Intake = FIR * AUF * ConcSed*(AIF * BAFI)

Where
 BAFI = bioaccumulation factor for invertebrates

Contaminant of Potential Concern	Sediment Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Invertebrates (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Sediment Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
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LPAH: low molecular weight (<200 atomic mass units) PAH

body weight of receptor per day

Table 45
HQ Summary for the Spotted Sandpiper
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Contaminat of Potential Concern	Multi-Media NOAEL Hazard Quotients		Total Multi-Media NOAEL Hazard Quotient all Exposure Areas	Multi-Media LOAEL Hazard Quotients		Total Multi-Media LOAEL Hazard Quotient all Exposure Areas
	Lake Sabine - Intertidal	Lake Sabine - Near Shore		Lake Sabine - Intertidal	Lake Sabine - Near Shore	
2-METHYLNAPHTHALENE	2.69E-04	1.30E-04	4.00E-04	2.69E-05	1.30E-05	4.00E-05
3,3'-DICHLOROBENZIDINE	NA	NA	0.00E+00	NA	NA	0.00E+00
4-METHYLPHENOL (P-CRESOL)	NA	NA	0.00E+00	NA	NA	0.00E+00
ACENAPHTHENE	2.84E-04	6.72E-03	7.00E-03	2.84E-05	6.72E-04	7.00E-04
ACENAPHTHYLENE	8.22E-05	1.13E-03	1.21E-03	8.22E-06	1.13E-04	1.21E-04
ACETOPHENONE	NA	NA	0.00E+00	NA	NA	0.00E+00
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	NA	8.31E-04	8.31E-04	NA	8.31E-05	8.31E-05
ANTHRACENE	4.84E-05	3.87E-03	3.92E-03	4.84E-06	3.87E-04	3.92E-04
ANTIMONY	NA	NA	0.00E+00	NA	NA	0.00E+00
BARIUM	1.10E-01	6.15E-01	7.25E-01	5.51E-02	3.07E-01	3.62E-01
BENZALDEHYDE	NA	NA	0.00E+00	NA	NA	0.00E+00
BENZO(A)ANTHRACENE	NA	1.91E-02	1.91E-02	NA	NA	0.00E+00
BENZO(A)PYRENE	NA	6.11E-03	6.11E-03	NA	NA	0.00E+00
BENZO(B)FLUORANTHENE	NA	1.03E-02	1.03E-02	NA	NA	0.00E+00
BENZO(G,H,I)PERYLENE	NA	8.20E-04	8.20E-04	NA	NA	0.00E+00
BENZO(K)FLUORANTHENE	NA	6.41E-03	6.41E-03	NA	NA	0.00E+00
BENZYL BUTYL PHTHALATE	NA	NA	0.00E+00	NA	NA	0.00E+00
BERYLLIUM	NA	NA	0.00E+00	NA	NA	0.00E+00
BERYLLIUM	NA	NA	0.00E+00	NA	NA	0.00E+00
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	NA	1.64E-03	1.64E-03	NA	1.64E-04	1.64E-04
BIPHENYL (DIPHENYL)	NA	NA	0.00E+00	NA	NA	0.00E+00
BIS(2-ETHYLHEXYL) PHTHALATE	1.35E-01	4.68E-02	1.82E-01	NA	NA	0.00E+00
CAPROLACTAM	NA	NA	0.00E+00	NA	NA	0.00E+00
CARBAZOLE	NA	NA	0.00E+00	NA	NA	0.00E+00
CHRYSENE	NA	1.27E-02	1.27E-02	NA	NA	0.00E+00
COBALT	NA	3.33E-01	3.33E-01	NA	NA	0.00E+00
COPPER	7.41E-02	2.15E-01	2.90E-01	5.64E-02	1.64E-01	2.20E-01
CYANIDE	1.05E-01	NA	1.05E-01	1.05E-02	NA	1.05E-02
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	NA	1.64E-03	1.64E-03	NA	1.64E-04	1.64E-04
DIBENZOFURAN	NA	2.22E-03	2.22E-03	NA	2.22E-04	2.22E-04
FLUORANTHENE	NA	3.08E-02	3.08E-02	NA	NA	0.00E+00
FLUORENE	1.11E-01	3.20E+00	3.31E+00	1.11E-02	3.20E-01	3.31E-01
GAMMA BHC (LINDANE)	NA	1.66E-03	1.66E-03	NA	1.66E-04	1.66E-04
HEXACHLOROBUTADIENE	NA	1.00E-02	1.00E-02	NA	NA	0.00E+00
INDENO(1,2,3-C,D)PYRENE	NA	1.04E-03	1.04E-03	NA	NA	0.00E+00
IRON	NA	NA	0.00E+00	NA	NA	0.00E+00
LEAD	6.16E-01	2.68E-01	8.84E-01	3.80E-01	1.65E-01	5.45E-01
MANGANESE	7.65E-01	2.59E+00	3.36E+00	7.68E-02	2.60E-01	3.37E-01
MERCURY	2.02E-01	2.02E-01	4.04E-01	3.72E-02	3.72E-02	7.43E-02

Table 45
HQ Summary for the Spotted Sandpiper
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Contaminant of Potential Concern	Multi-Media NOAEL Hazard Quotients		Total Multi-Media NOAEL Hazard Quotient all Exposure Areas	Multi-Media LOAEL Hazard Quotients		Total Multi-Media LOAEL Hazard Quotient all Exposure Areas
	Lake Sabine - Intertidal	Lake Sabine - Near Shore		Lake Sabine - Intertidal	Lake Sabine - Near Shore	
NAPHTHALENE	8.22E-02	1.15E-02	9.37E-02	8.22E-03	1.15E-03	9.37E-03
NICKEL	1.61E-02	2.00E-02	3.61E-02	1.17E-02	1.45E-02	2.61E-02
NITROBENZENE	NA	NA	0.00E+00	NA	NA	0.00E+00
PENTACHLOROPHENOL	2.74E-03	NA	2.74E-03	1.65E-03	NA	1.65E-03
PHENANTHRENE	NA	1.79E+00	1.79E+00	NA	1.79E-01	1.79E-01
PYRENE	NA	4.68E-02	4.68E-02	NA	NA	0.00E+00
SELENIUM	4.25E-01	2.12E-01	6.37E-01	2.12E-01	1.06E-01	3.19E-01
THALLIUM	NA	2.05E+00	2.05E+00	NA	2.05E-01	2.05E-01
TRIBUTYL TIN	NA	NA	0.00E+00	NA	NA	0.00E+00
VANADIUM	NA	NA	0.00E+00	NA	NA	0.00E+00
ZINC	3.56E-01	3.69E-01	7.24E-01	3.94E-02	4.08E-02	8.02E-02
Hazard Index for LPAHs	NA	5.01E+00	5.01E+00	NA	5.01E-01	5.01E-01
Hazard Index for HPAHs	NA	1.35E-01	1.35E-01	NA	0.00E+00	0.00E+00

Table 46

HQs for the Kingfisher in Lake Sabine

Baseline Ecological Risk Assessment

State Marine Superfund Site, Port Arthur, TX

Assumptions used in Risk Calculation for the Belted Kingfisher

FIR - food ingestion rate (kg/kg bw/d) 1.14E-01
 AUF - area use factor (exposure area 2.05E-01
 PF - plant fraction 0.00E+00
 AIF - aquatic invertebrate fraction 0.00E+00
 FPF - fish prey fraction 1.00E+00
 ISF - incidental sediment ingestion 0.00E+00

Hazard Quotient Calculation Equations Equation

Hazard Quotient = Total Dose / TRV

Total Dose = Food Intake + Incidental Sediment Intake

Where

ConcSed = the estimated exposure concentration of the COC
 in sediment at the site (mg/kg)

Food Intake = FIR * AUF * ConcSed * (BSAF * FPF)

Where

BSAF = biota sediment accumulation factor

Contaminant of Potential Concern	Chemical Group	Sediment Exposure Point Concentration (mg/kg)	NOAEL RTVwild (mg/kg bw/d)	LOAEL RTVwild (mg/kg bw/d)	Chemical Intake from Fish (using BSAF) (mg/kg bw/d)	Food Medium Intake (mg/kg bw/d)	Total Dose (summary of media intake)	NOAEL Hazard Quotient	LOAEL Hazard Quotient
3,3'-DICHLOROBENZIDINE	SVOC	7.50E-02	NA	NA	1.74E-03	1.74E-03	1.74E-03	NA	NA
ACENAPHTHENE	LPAH	5.80E-01	3.25E+01	3.25E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ACETOPHENONE	SVOC	4.30E-02	NA	NA	1.00E-03	1.00E-03	1.00E-03	NA	NA
ANTHRACENE	LPAH	2.00E+00	3.25E+01	3.25E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ANTIMONY	MET	1.61E+01	NA	NA	1.17E+00	1.17E+00	1.17E+00	NA	NA
BARIUM	MET	1.15E+02	2.08E+01	4.17E+01	2.67E+00	2.67E+00	2.67E+00	1.28E-01	6.42E-02
BENZALDEHYDE	SVOC	1.10E-01	NA	NA	2.56E-03	2.56E-03	2.56E-03	NA	NA
BENZO(A)ANTHRACENE	HPAH	4.10E+00	1.96E+01	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA
BENZO(A)PYRENE	HPAH	2.30E+00	1.96E+01	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA
BENZO(B)FLUORANTHENE	HPAH	3.60E+00	1.96E+01	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA
BENZO(K)FLUORANTHENE	HPAH	1.90E+00	1.96E+01	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA
BENZYL BUTYL PHTHALATE	SVOC	1.70E-01	NA	NA	3.81E+00	3.81E+00	3.81E+00	NA	NA
BERYLLIUM	MET	2.70E+00	NA	NA	1.19E+00	1.19E+00	1.19E+00	NA	NA
BIS(2-ETHYLHEXYL) PHTHALATE	SVOC	2.00E-01	1.11E+00	NA	4.65E-03	4.65E-03	4.65E-03	4.19E-03	NA
CAPROLACTAM	SVOC	1.10E-01	NA	NA	2.56E-03	2.56E-03	2.56E-03	NA	NA
CARBAZOLE	SVOC	3.10E-01	NA	NA	7.21E-03	7.21E-03	7.21E-03	NA	NA
CHRYSENE	HPAH	3.90E+00	1.96E+01	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA
COBALT	MET	8.46E+00	1.30E+00	6.17E+00	1.97E-01	1.97E-01	1.97E-01	1.51E-01	3.19E-02
COPPER	MET	7.05E+01	4.70E+00	6.17E+00	1.85E+00	1.85E+00	1.85E+00	3.94E-01	3.00E-01
CYANIDE	MET	5.50E-01	4.00E-02	4.00E-01	1.28E-02	1.28E-02	1.28E-02	3.20E-01	3.20E-02
DIBENZOFURAN	LPAH	3.60E-01	3.25E+01	3.25E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FLUORANTHENE	HPAH	9.10E+00	1.96E+01	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA
FLUORENE	LPAH	7.90E-01	3.25E+01	3.25E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GAMMA BHC (LINDANE)	PEST	3.40E-03	2.00E+00	2.00E+01	5.78E-04	5.78E-04	5.78E-04	2.89E-04	2.89E-05
LEAD	MET	1.50E+02	3.85E+00	6.25E+00	3.48E+00	3.48E+00	3.48E+00	9.05E-01	5.57E-01
MERCURY	MET	1.80E-01	6.80E-02	3.70E-01	1.35E-02	1.35E-02	1.35E-02	1.99E-01	3.65E-02
NICKEL	MET	8.50E+01	7.74E+01	1.07E+02	9.88E-02	9.88E-02	9.88E-02	1.28E-03	9.23E-04

PHENANTHRENE	LPAH	7.10E+00	3.25E+01	3.25E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PYRENE	HPAH	8.80E+00	1.96E+01	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA
SELENIUM	MET	5.90E+00	4.00E-01	8.00E-01	1.69E-01	1.69E-01	1.69E-01	4.22E-01	2.11E-01
THALLIUM	MET	5.42E-01	5.30E-02	5.30E-01	1.26E-02	1.26E-02	1.26E-02	2.38E-01	2.38E-02
ZINC	MET	3.91E+03	1.45E+01	1.31E+02	1.04E+02	1.04E+02	1.04E+02	7.15E+00	7.91E-01
Hazard Index for LPAHs					0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hazard Index for HPAHs					0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Notes:

MET: metal

HPAH: high molecular weight (>200 atomic mass units) polycyclic aromatic hydrocarbon (PAH)

LPAH: low molecular weight (<200 atomic mass units) PAH

PEST = pesticide mg/kg-bw/d: r

SVOC = semivolatle organic carbon

Table 48
Summary of Chemicals of Potential Concern
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Assessment Endpoint	Guild (Food Web)	Representative Species	Measurement Endpoints	Exposure Routes	Null Hypotheses	Hypothesis Acceptation/ Rejection	COCs Identified
1. Impairment of growth, reproduction, or survival of populations of herbivorous birds that use the habitat on-site due to exposure to COCs attributable to the site	Herbivorous Bird (Terrestrial)	northern bobwhite quail	Comparison of exposure doses to NOAELs or LOAELs based on published values for survival, growth and reproduction	Direct exposure, ingestion	Exposure doses do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs	Accepted	
2. Impairment of growth, reproduction, or survival of populations of omnivorous mammals that use the habitat on-site due to exposure to COCs attributable to the site	Omnivorous Mammal (Terrestrial)	white-footed mouse	Comparison of exposure doses to NOAELs or LOAELs based on published values for survival, growth and reproduction	Direct exposure, ingestion	Exposure doses do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs	Rejected	DIELDRIN, ENDRIN ALDEHYDE, HEPTACHLOR EPOXIDE
3. Impairment of growth, reproduction, or survival of populations of carnivorous mammals that use the habitat on-site due to exposure to COCs attributable to the site	Carnivorous Mammal (Terrestrial)	coyote	Comparison of exposure doses to NOAELs or LOAELs based on published values for survival, growth and reproduction	Direct exposure, ingestion	Exposure doses do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs	Accepted	
4. Impairment of growth, reproduction, or survival of populations of benthic invertebrates that use the habitat on-site due to exposure to COCs attributable to the site	Benthic Invertebrates (Aquatic)	NA	Comparison of concentrations of chemicals in on-site surface sediment to literature-based screening levels	Direct exposure, ingestion	measured concentrations do not exceed literature-based screening levels	Rejected	LEAD
5. Impairment of growth, reproduction, or survival of populations of insectivorous shore birds that use the habitat on-site due to exposure to COCs attributable to the site	Insectivorous Shore Bird (Aquatic)	spotted sandpiper	Comparison of exposure doses to NOAELs or LOAELs based on published values for survival, growth and reproduction	Direct exposure, ingestion	Exposure doses do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs	Accepted	
6. Impairment of growth, reproduction, or survival of populations of carnivorous shore birds that use the habitat on-site due to exposure to COCs attributable to the site	Carnivorous Bird (Aquatic)	belted kingfisher	Comparison of exposure doses to NOAELs or LOAELs based on published values for survival, growth and reproduction	Direct exposure, ingestion	Exposure doses do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs	Accepted	

Notes:
NA = not applicable
NOAEL = no observed adverse effect level
LOAEL = lowest observed adverse effect level
95th UCL = 95th percent upper confidence level

Table 49
Preliminary Remediation Goals
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

Parameter	Medium	Derivation of Lower and Upper Range PRG	Lower Range PRG	Upper Range PRG	Final PRG
DIELDRIN	soil	white-footed mouse TRVs	5.90E-02	5.90E-01	3.25E-01
ENDRIN ALDEHYDE	soil	white-footed mouse TRVs	3.44E-02	3.44E-01	1.89E-01
HEPTACHLOR EPOXIDE	soil	white-footed mouse TRVs	1.39E-01	1.39E+00	7.66E-01
LEAD	sediment	ERLs and ERMs	4.67E+01	2.18E+02	1.32E+02

Table 50

Calculation of Groundwater to Sediment Screening Value for Lead
Baseline Ecological Risk Assessment
State Marine Superfund Site, Port Arthur, TX

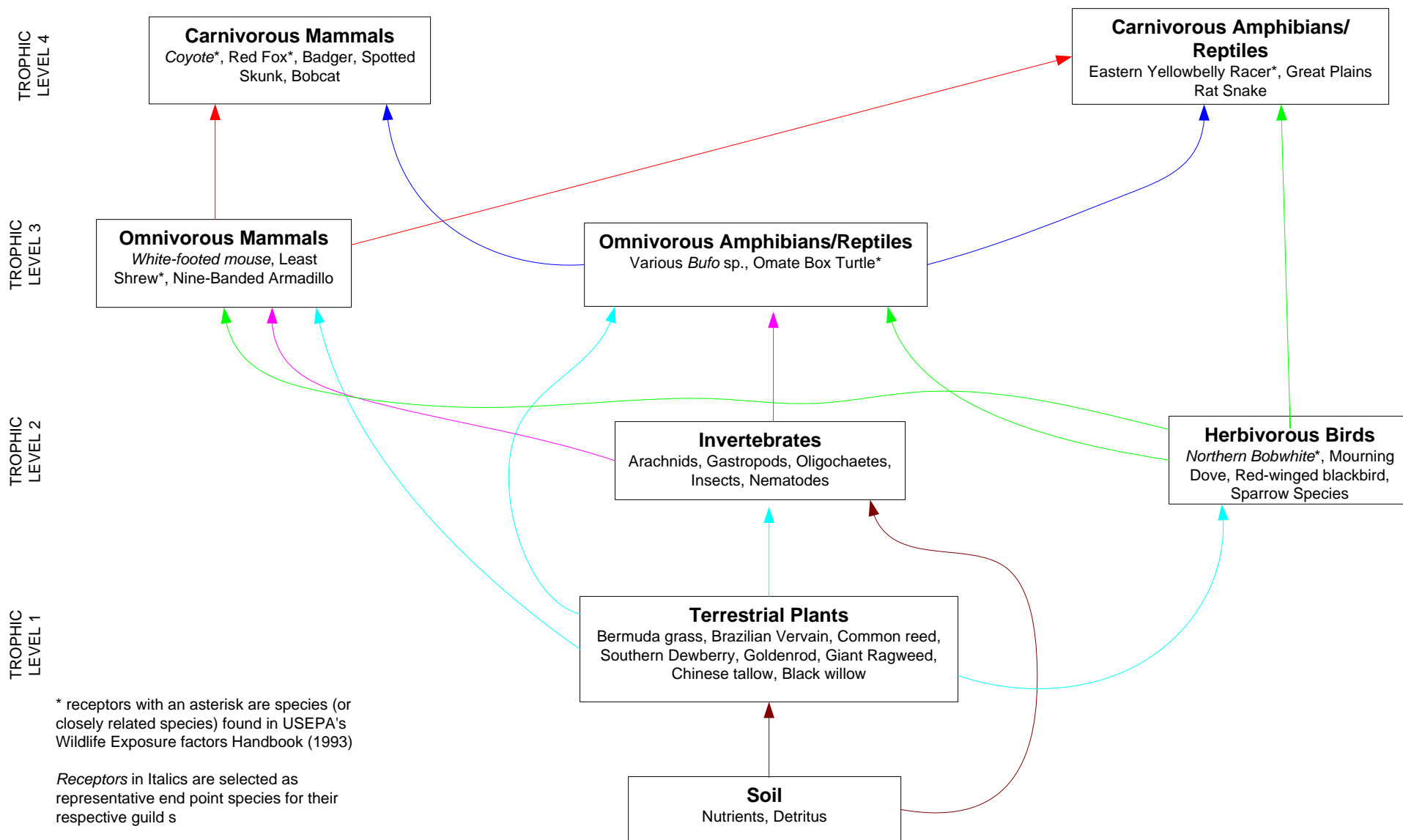
$^{Sed}GW = ^{Sed}RBEL * K_{sed-w} * SWMF$	
where:	
^{Sed}GW = Groundwater-sediment protection PCL (mg COC/L groundwater)	8.25E-04
$^{Sed}RBEL$ = Risk-based exposure limit for sediment (mg COC/kg sediment)	132
K_{sed-w} = Sediment-groundwater partition coefficient (mg/L-groundwater/mg/kg-sediment) = $\rho_{sed}/(\Theta + K_d \rho_{sed})$	4.17E-05
ρ_{sed} = Sediment bulk density (g-soil/cm ³ -sediment) as dry weight	1.67
Θ = Total Sediment Porosity (cm ³ -por space/cm ³ -sediment)	0.37
K_d = Sediment-water sorption coefficient (g-H ₂ O/g-sediment)	24000
SWMF = Surface water mixing factor (unitless)	0.15

Figures

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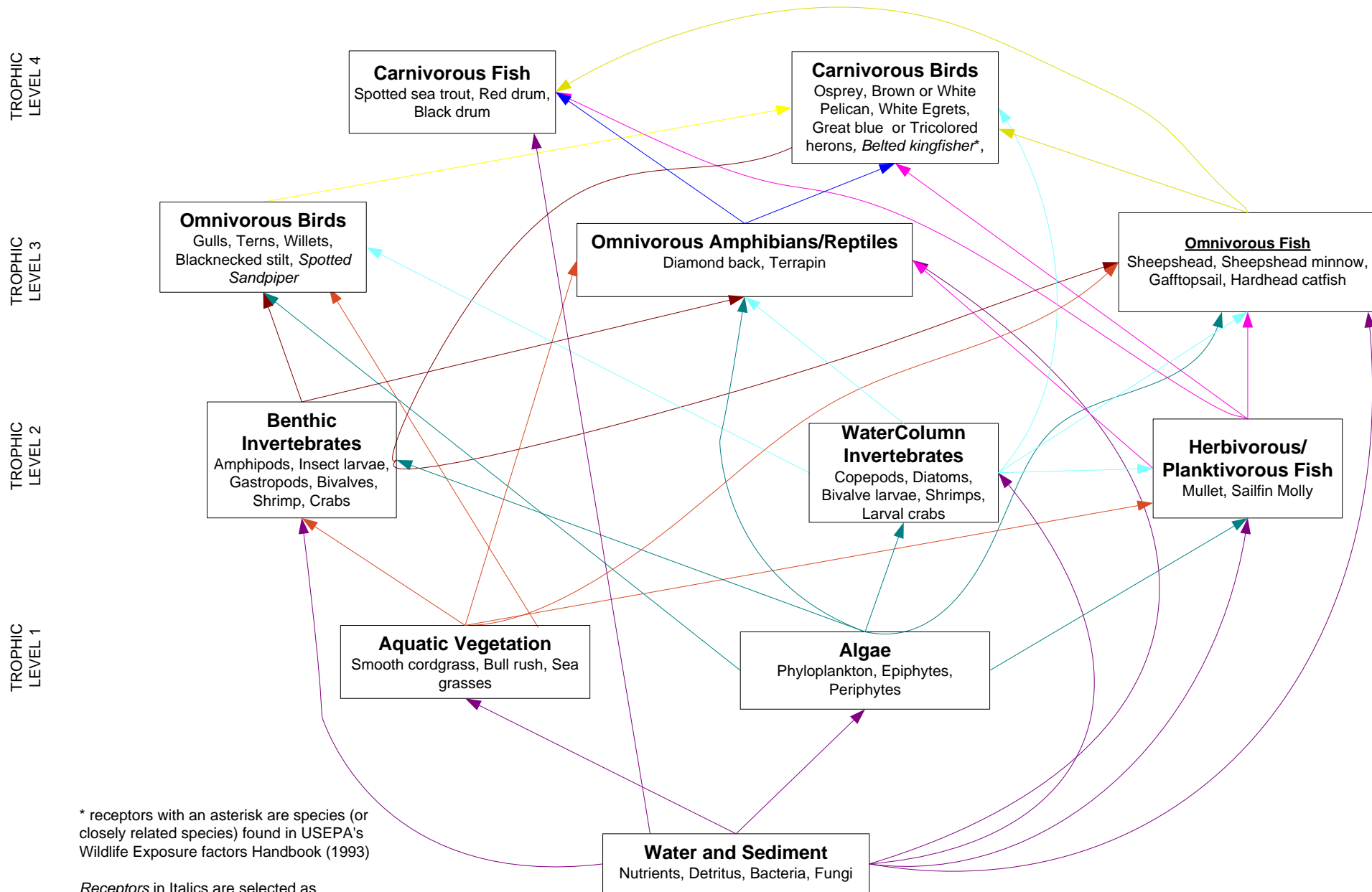
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Figure 2
Terrestrial Foodweb
State Marine Superfund Site



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Figure 3
Marine Aquatic Foodweb
State Marine Superfund Site

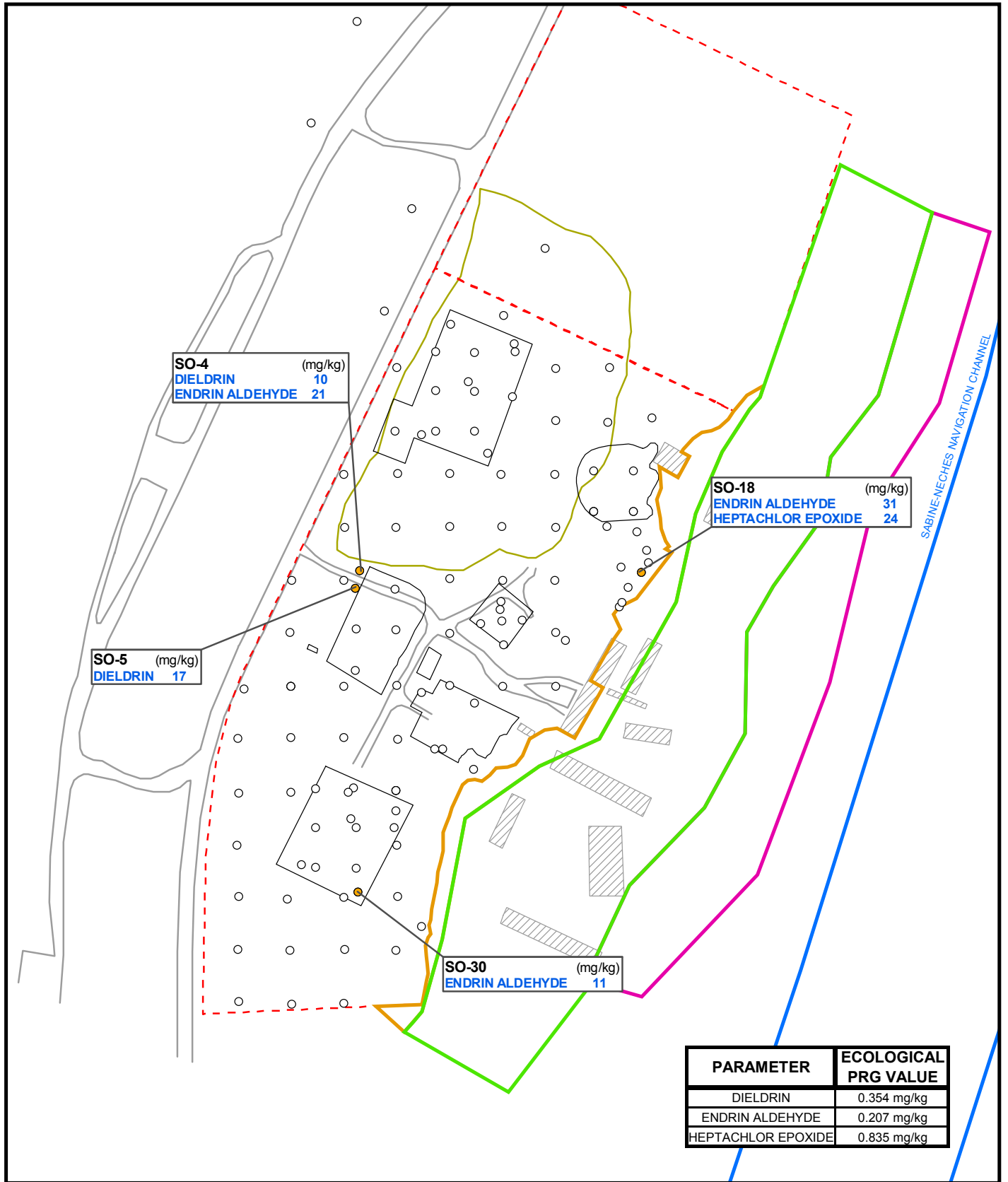


* receptors with an asterisk are species (or closely related species) found in USEPA's Wildlife Exposure factors Handbook (1993)

Receptors in *Italics* are selected as representative end point species for their respective guilds

005886

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LEGEND

- Area of Interest
- Landfill Area
- - - Property Boundary
- Road
- Navigation Channel
- ▨ Sunken Barge
- Soil Samples that Do Not Exceed any PRG Criteria
- Soil Samples that Exceed the Ecological PRG Criteria
- ▭ Intertidal Area
- ▭ Nearshore Area
- ▭ Offshore Area

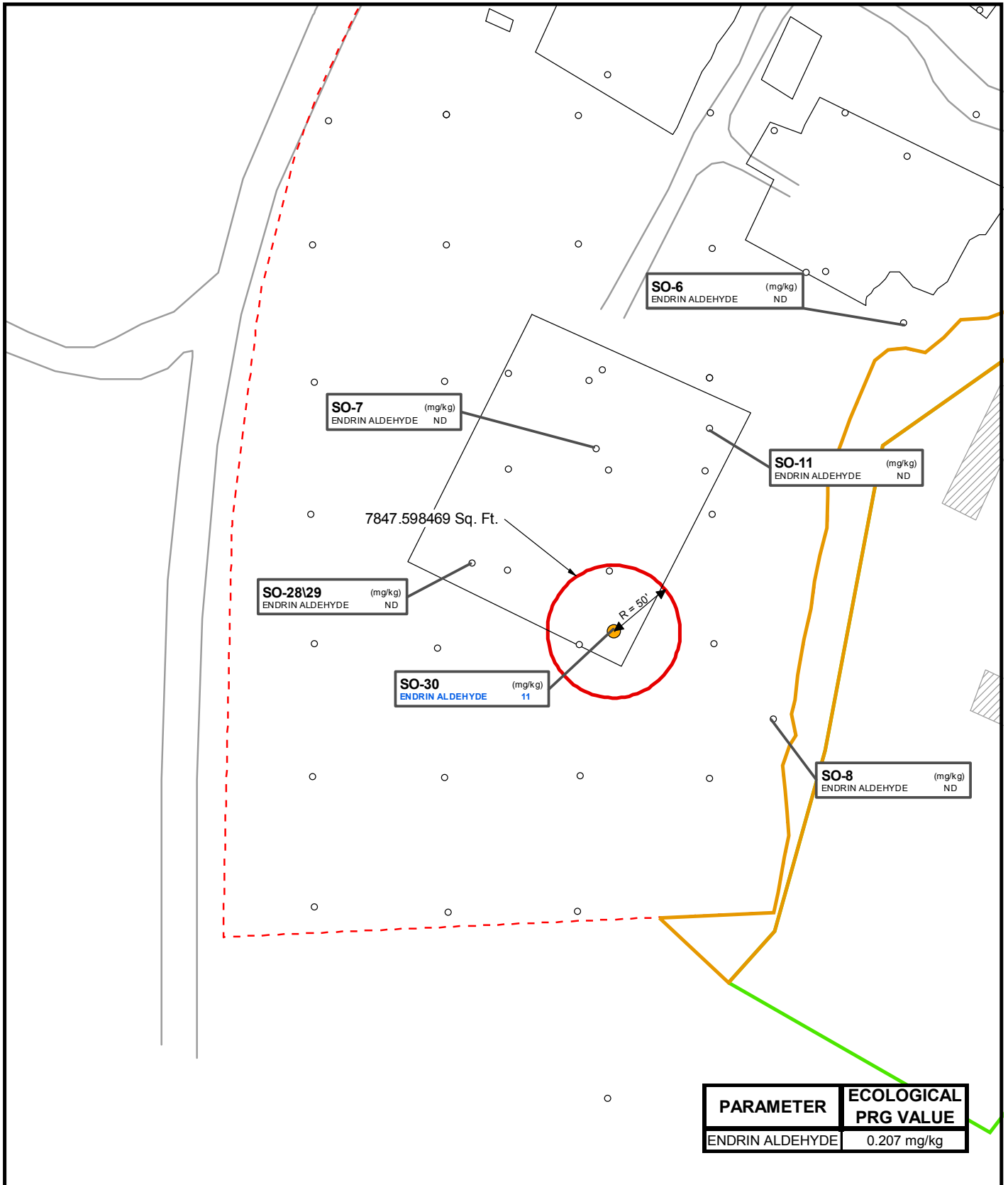
Note: Text within labels that is Blue Exceeds the PRG for that Criteria.

Figure 4
State Marine Superfund Site

CH2MHILL

300 150 0 300
SCALE IN FEET

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LEGEND

- Area of Interest
- Landfill Area
- Property Boundary
- Road
- Navigation Channel
- Sunken Barge
- Soil Samples that Do Not Exceed PRG Criteria
- Soil Samples that Exceed Ecological PRG Criteria
- Intertidal Area
- Nearshore Area
- Offshore Area
- Buffer Around Hot Spot Area

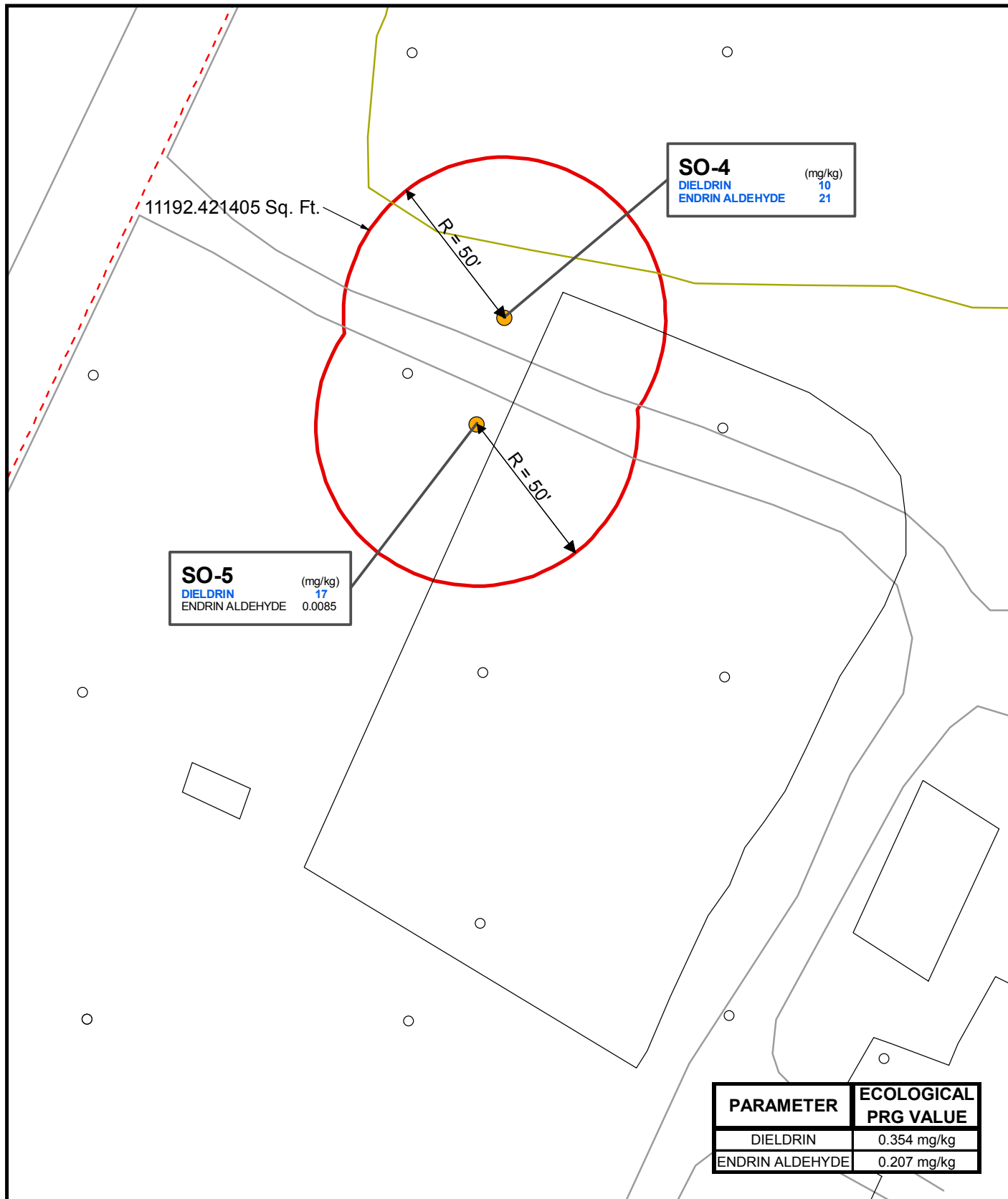
Note:
Text within labels that is **Blue** Exceeds the PRG for that Criteria.
ND = NON DETECT

100 50 0 100
SCALE IN FEET

Figure 5

State Marine Superfund Site





LEGEND

- Area of Interest
- Landfill Area
- - - Property Boundary
- Road
- Navigation Channel
- ▨ Sunken Barge
- Soil Samples that Do Not Exceed PRG Criteria
- Soil Samples that Exceed the Ecological PRG Criteria
- ▭ Buffer Around Hot Spot Area

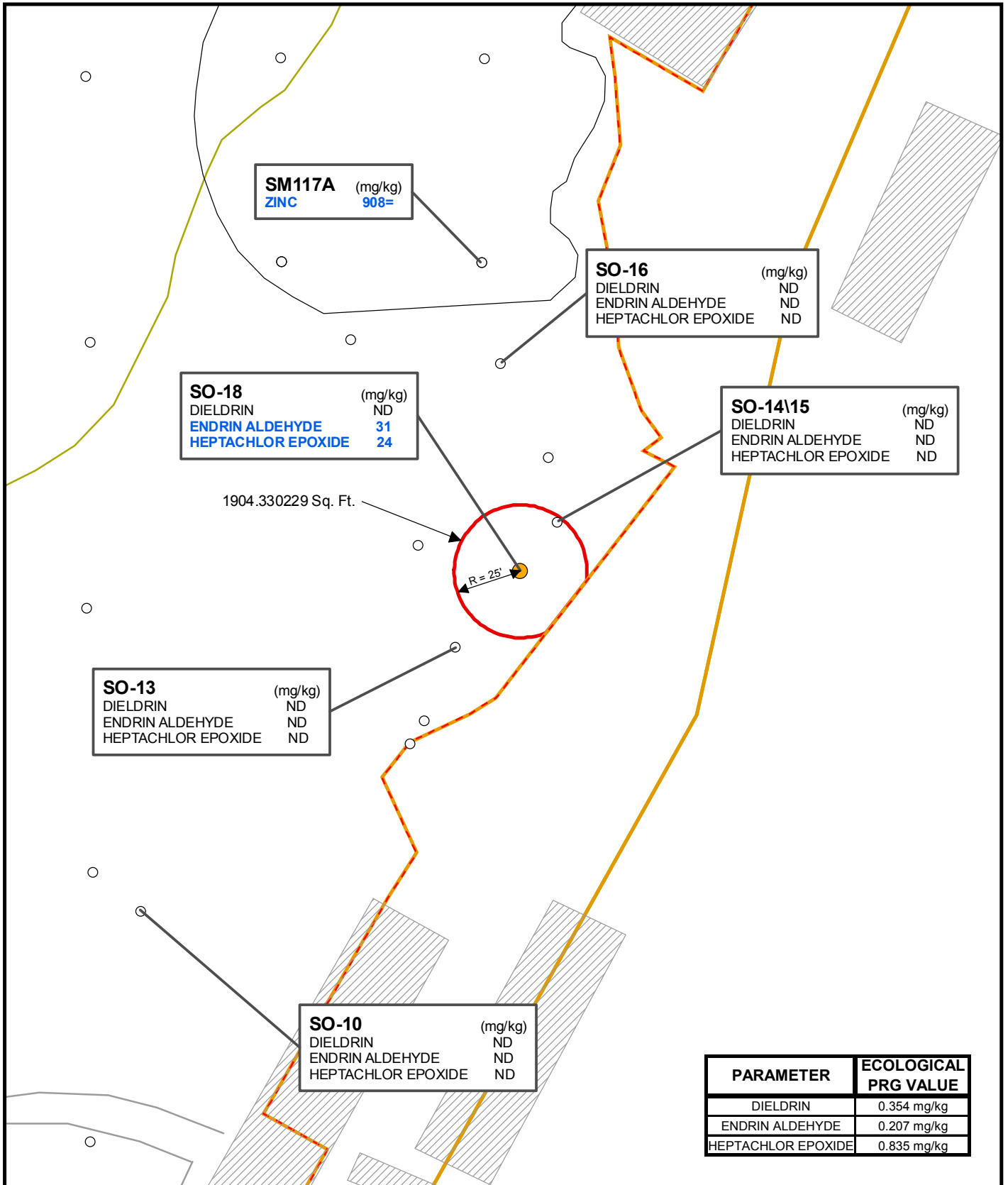
Note:
Text within labels that is **Blue** Exceeds the PRG for that Criteria.
ND = NON DETECT

Figure 6

State Marine Superfund Site

CH2MHILL

50 25 0 50
SCALE IN FEET



LEGEND

- Area of Interest
- Landfill Area
- Property Boundary
- Road
- Navigation Channel
- Sunken Barge
- Soil Samples that Do Not Exceed PRG Criteria
- Soil Samples that Exceed the Ecological PRG Criteria
- Nearshore Area
- Offshore Area
- Foot Buffer Around Hot Spot Area

Note:
Text within labels that is **Blue** Exceeds the PRG for that Criteria.
ND = NON DETECT

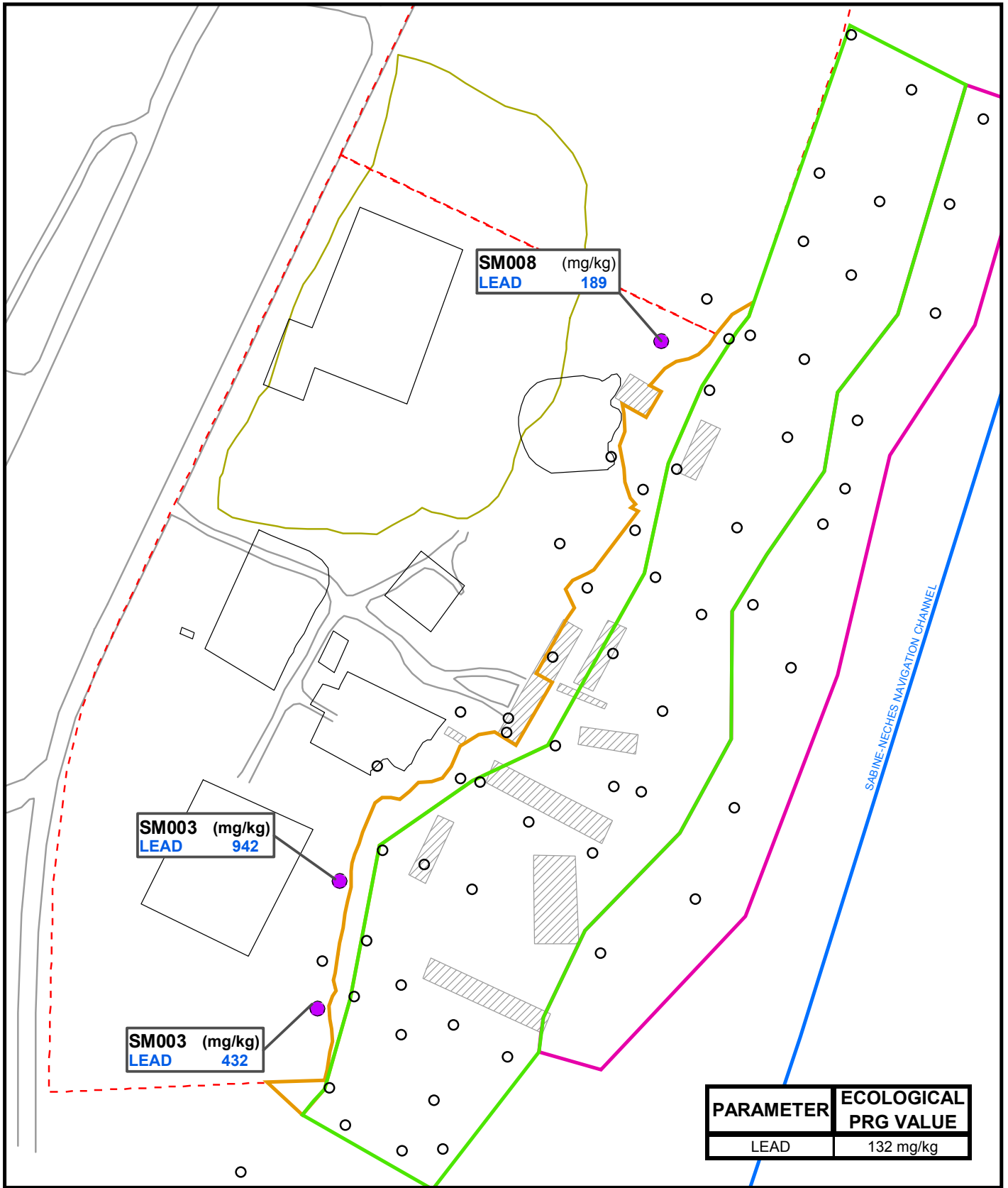
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SCALE IN FEET

Figure 7

State Marine Superfund Site



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LEGEND

- Area of Interest
- Landfill Area
- Property Boundary
- Road
- Navigation Channel
- Sunken Barge
- Sediment Samples that Do Not Exceed PRG Criteria
- Sediment Samples that Exceed the Ecological PRG Criteria
- Intertidal Area
- Nearshore Area
- Offshore Area

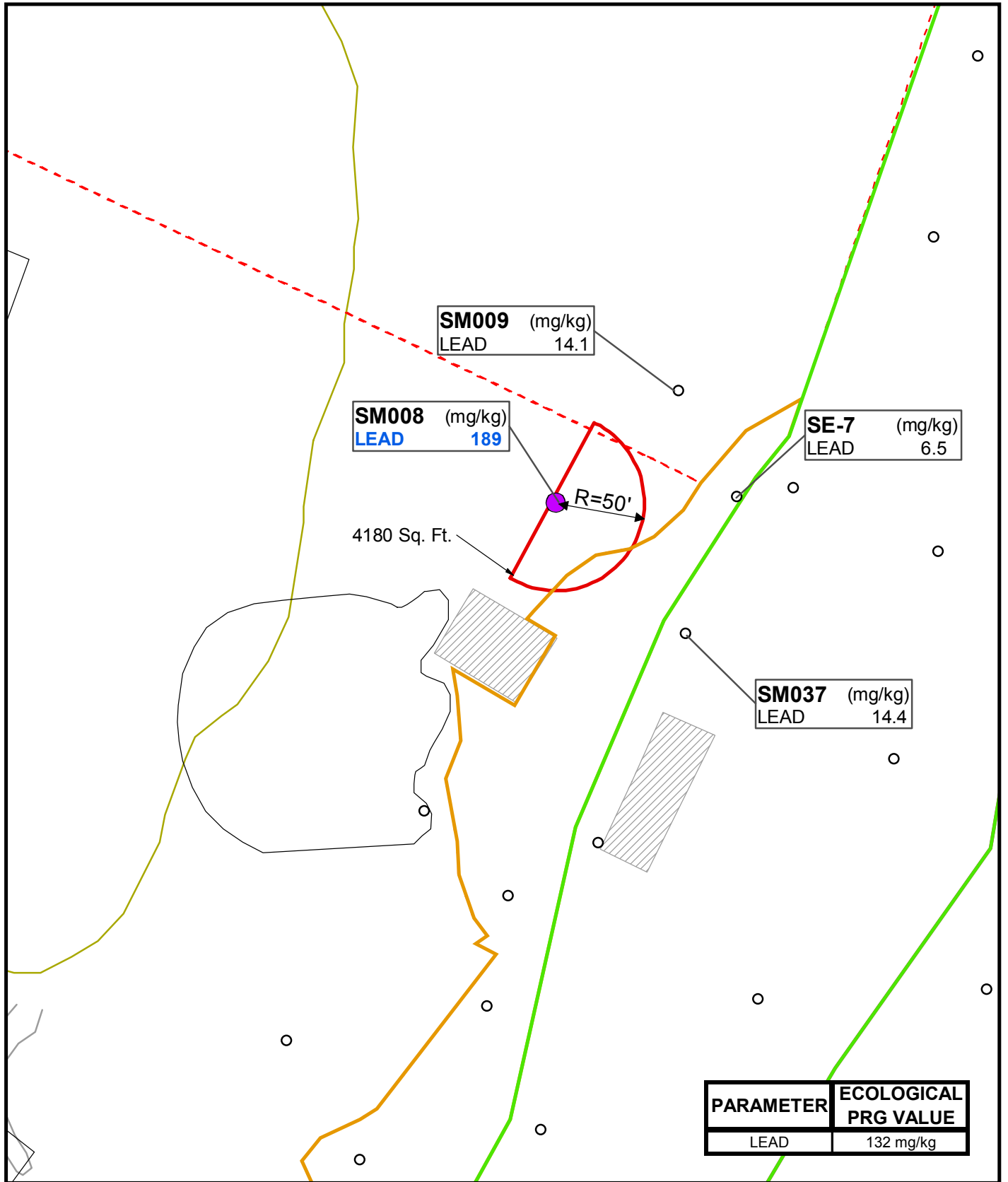
Note: Text within labels that is Blue Exceeds the PRG for that Criteria.

Figure 8
State Marine Superfund Site

CH2MHILL

SCALE IN FEET

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LEGEND

- Area of Interest
- Landfill Area
- - - Property Boundary
- Road
- Navigation Channel
- ▨ Sunken Barge
- Sediment Samples that Do Not Exceed PRG Criteria
- Sediment Samples that Exceed the Ecological PRG Criteria
- ▭ Buffer Around Hot Spot Area
- ▭ Intertidal Area
- ▭ Nearshore Area
- ▭ Offshore Area

Note:
Text within labels that is Blue Exceeds the PRG for that Criteria.

100 50 0 100
SCALE IN FEET

Figure 9

State Marine Superfund Site



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Attachment 1

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Introduction

Background data were available for both soil and sediment for the State Marine site. These included five soil and five sediment samples. The background data are summarized in **Table 1**. Both inorganic and organic parameter concentrations were available, with the organic data having a higher percentage of nondetects, as is typical. With this few samples, and the typically higher frequency of nondetects, decisions with background comparisons with the organic data are not recommended. However, statistics were carried out and reported for all parameters that were detected in both site and background populations.

This statistical analysis primarily focused on comparisons of central tendency using the nonparametric Wilcoxon Rank Sum test. These comparisons were reinforced with graphical comparisons of the background and site data via box and whisker plots. The comparison results with inorganics were used in consideration of which parameters would be included in risk calculations. Background threshold values were also calculated, as discussed later, but their use is not recommended for definitive decisions (with inorganic or organic data) since estimates of the upper tail of the background population carry considerable uncertainty with only five background samples.

Wilcoxon Rank Sum Comparisons

The Wilcoxon Rank Sum (WRS) test is a nonparametric test used for determining whether a difference exists between two populations. It can be used to test whether measurements from one population (such as the site population) tend to be shifted higher than those from another population (such as the background population). Acknowledged as a nonparametric test, it is suggested by EPA background guidance for cases when the sample size is less than 20 (EPA, 2002). As a nonparametric test based on ranks of the data, it is less influenced by spurious results in either data set than parametric tests, such as a t-test performed on the concentrations, which makes a distributional assumption about the data.

This test calculates the probability that the observed differences between the two populations are due merely to random variability in the data, as opposed to being due to an actual elevated shift in one. If this probability is less than a chosen significance level, in this case 0.20, then the decision is made that a significant difference does exist between the two populations. A significance level of 0.20 implies that one has 80% confidence ($[1 - 0.20] * 100\%$) that the two groups will be determined to be statistically equivalent when they actually are.

With a background data set of only five samples (five for soil and five for sediment) there is still considerable uncertainty in these background comparisons, but complemented with the box and whisker plots presented in **Figures 1, 2, and 3**, a useful understanding of how the background and site populations compare can be obtained. **Figure 1** presents plots for inorganics in soil, while **Figure 2** presents plots for organics in soil. Plots of sediment data appear in **Figure 3**. Box and whisker plots are explained in the following section.

The results of these comparisons are presented in **Tables 2 through 14** for each matrix-site combination. While each table needs to be reviewed individually, four soil metals are seen to be most likely to exceed background. These are copper, lead, silver, and zinc. Occasionally, these were not seen to exceed background and occasionally other soil metals were. For sediment, all metals except for antimony were found to significantly exceed background.

Box and Whisker Plots

Box and whisker plots are often very good at demonstrating how much overlap exists between two or more populations. These plots simultaneously present information on the central tendency, variability, and skewness for a sample data set by sketching the center 50 percent of the concentrations with a box, and then illustrating the typical tail regions of the distribution with whiskers (see EPA, 2000 for methodology and examples). For atypical concentrations that extend further from the center than the whiskers, individual data symbols are plotted. These plots often provide a better visual perspective on the comparison between populations than scatter plots, particularly when a large number of data points cause individual scatter plot symbols to overlap.

Specifically, these box and whisker plots are constructed as follows:

- The height of the box represents the interquartile range (IQR). The IQR is the distance between the 25th and the 75th percentiles.
- The horizontal line in the box interior represents the median.
- The vertical lines issuing from the box extend to the minimum and maximum measured values (as long as these minimum and maximum values do not extend further from the box than a distance of 1.5 times the IQR).
- Individual data symbols are used for concentrations that exceed the whiskers.

These principles are seen in the example box and whisker plots shown in **Figure 4**. The upper and lower edges of the box and the ends of the whiskers all represent actual measured concentrations in the sample data set. Specifically, for Data Group C, the 25th percentile, 75th percentile, and median are all labeled as part of the box. In this plot the overall minimum value serves as the end of the whisker since it is within a distance of $1.5 \times \text{IQR}$ from the box. The maximum values (and the next to the largest value), however, are further from the box than a distance of $1.5 \times \text{IQR}$. Thus, they are labeled as outliers. The third largest overall value, that represents the largest value within a distance of 1.5 risk based concentration IQR, serves as the end of the upper whisker.

Various interpretations are possible by examining these box and whisker plots. For example, if extensive overlap exists between the box plots from different data groups, such as between data groups B and C, then the measurements from each group, on average, are very similar. Conversely, little overlap, as seen between data group A and the other two, suggests that the measurements from the groups are, on average, quite different. The box and whisker plots presented in **Figures 1 through 3** offer a similar

opportunity to visualize the comparisons between site and background concentrations for inorganic soil, organic soil, and inorganic sediment, respectively.

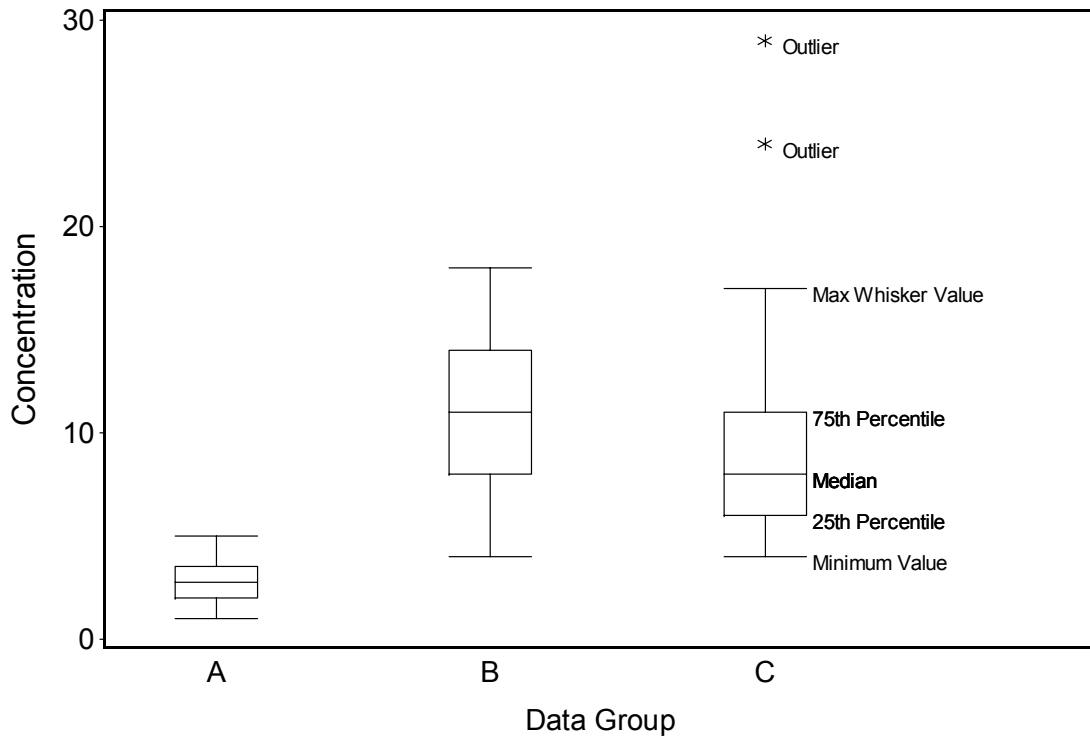


Figure 4: Example Box and Whisker Plots

Comparisons to a Background Threshold Value

A common feature in comparisons to background involves the calculation of a background threshold value to which individual site concentrations are compared. There are various threshold values that can be calculated and three are included here. These are the upper tolerance limit (UTL), the upper prediction limit (UPL), and the maximum of background sample concentrations. Although these are presented in **Table 1**, none of them were used definitively in determining whether a site should be considered to exceed background (the WRS test was used for this). The size of the background data set (5 samples) makes it difficult to estimate an appropriate elevated background value. Instead, they are presented as auxiliary information, particularly for those accustomed to considering these thresholds.

The UTL was calculated as a 95 percent/95 percent background UTL, that is, an upper bound (with 95 percent confidence) of the background 95th percentile. The calculation of UTLs depends on a distributional assumption. Given that the sample size (5 samples) did not lend itself to a good understanding of the distribution, all UTLs were calculated assuming normality. Some environmental data sets, including background, demonstrate more skewness than a normal distribution (positive skewness), but

assuming normality tends to offer a lower calculated upper bound than if an attempt is made to adjust for skewness, such as with a log transformation. Thus, the assumption of normality tended to offer values conservative for the environment.

Furthermore, the Shapiro-Wilk test for normality was performed on each parameter (see **Table 1**) with the results suggesting that normality was a typically good assumption (only a few p-values less than 0.05, the recommended threshold for this test of normality) although with only five samples one would typically not expect there to be sufficient evidence to reject normality (unless strong deviations from a normal distribution were indicated). The normal UTLs were calculated using the following equation:

$$UTL = \bar{x} + (K \times s),$$

where \bar{x} is the sample mean;
K is the tolerance factor; and
s is the sample standard deviation.

Since UTLs are an estimate of the 95th percentile of the background population, one understands that (with 95% confidence) as many as 5% of results equivalent to background may exceed this threshold.

Included in **Tables 2 through 14** are the number of exceedances of the UTL as well as the percentage of exceedances. Assuming the background populations for which the UTLs were calculated were normally distributed, one would expect this percentage to exceed 5% only about 5% of the time (1 in 20) if the upper tails of the site and background populations are equivalent. Of course, considerable uncertainty exists given the background sample size, so this comparison was not relied upon, even though it is reported.

Some consideration to using UPLs as a background threshold value has been voiced in the environmental community. It is an upper confidence limit on the next encountered site result. The UPLs were also calculated with a confidence level of 95% and an assumption of normality as follows:

$$UPL = \bar{x} + t_{0.95, n-1} \times s \times \sqrt{1 + \frac{1}{n}},$$

where \bar{x} is the sample mean;
t is the *Student's t* statistic;
n is the number of background samples; and
s is the sample standard deviation.

Adjustments to the equation are possible to expand the limit to include some future number of multiple results, but this is not typical of those proposing UPLs as a background threshold value. Because the UPL focuses on the next encountered result, it sometimes results in a large number of exceedances (of the UPL) when the number of site results to be compared is large (even more so than the UTL). Being closer to the

mean, it is often considered a more stable value than the UTL, but it also results in more exceedances by results equivalent to those in the background population (false indications of individual exceedances over background).

The number of exceedances are provided in **Tables 2 through 14**. Also include are the number of exceedances of the background sample maximum. The number of UPL exceedances are more than the number of exceedances of the UTL which is to be expected since it tends to estimate a lower percentile than the UTL. Even more exceedances are noted with the background sample maximum. The background sample maximum also estimates a value less than the 95th percentile with small data sets. (It would not estimate the 95th percentile, with 95% confidence, unless about 60 background samples were available.)

As would be expected, the number of exceedances of these background threshold values increases when the site population appears to exceed the background population (as indicated by the WRS test). With a small number of background samples, however, estimating an upper percentile of the background population carries a lot of uncertainty, and reliance on these values is not recommended.

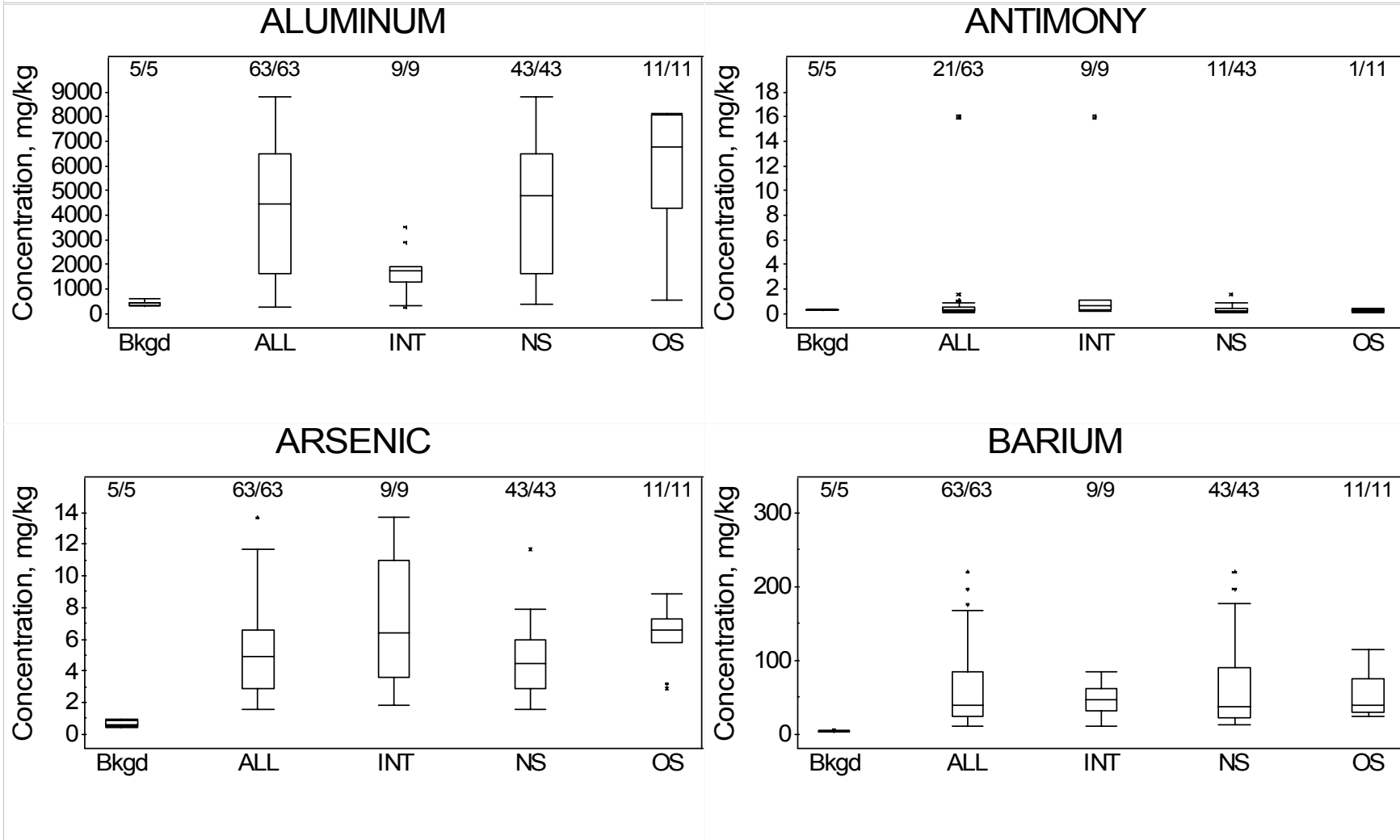
References

U.S. Environmental Protection Agency (EPA). 2000. *Guidance for Data Quality Assessment. Practical Methods for Data Analysis*. Office of Research and Development, Washington, D.C. 2000.

U.S. Environmental Protection Agency (EPA). 2002. *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites*, Office of Emergency and Remedial Response, 2002.

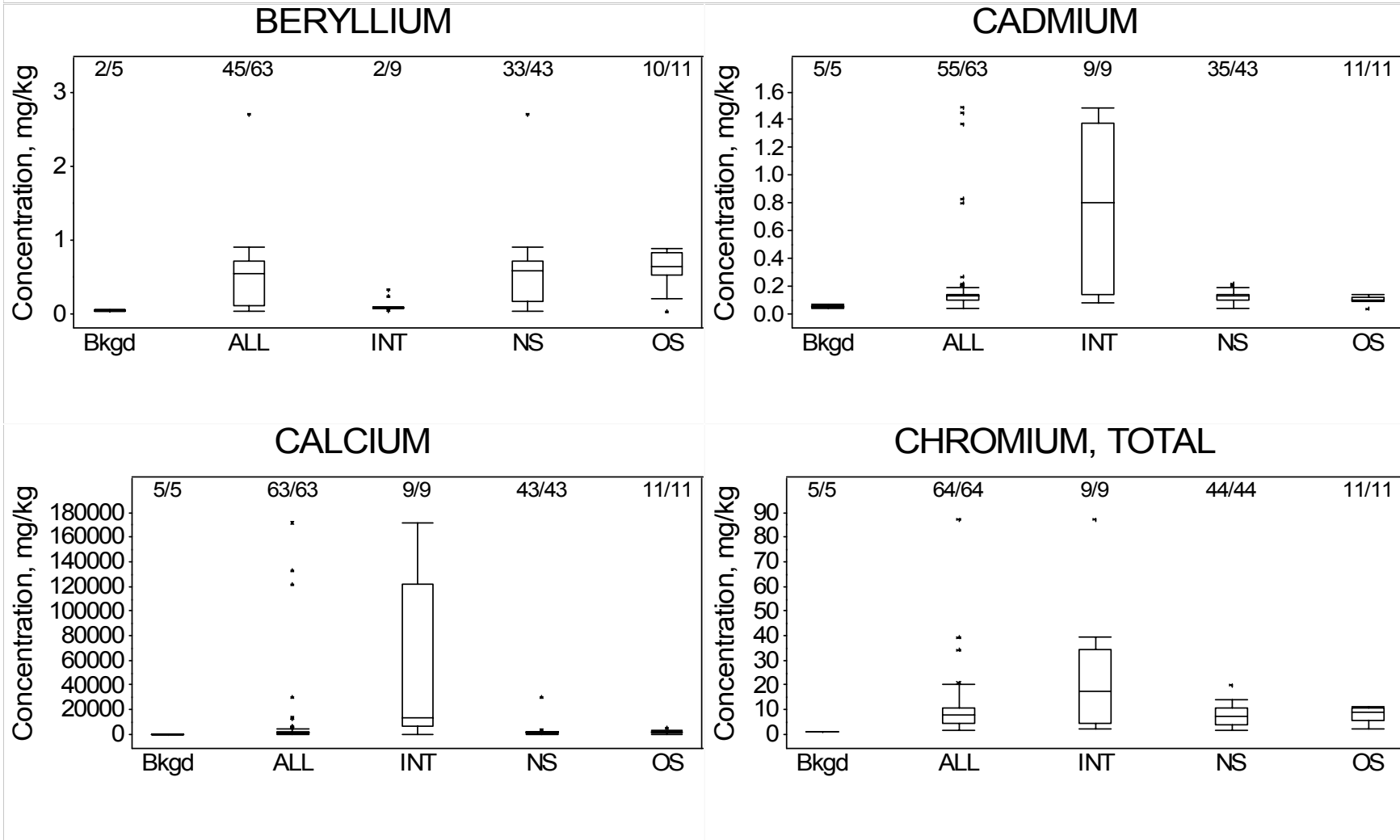
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Figure 3: Sediment Box and Whisker Plots for Detected Inorganics



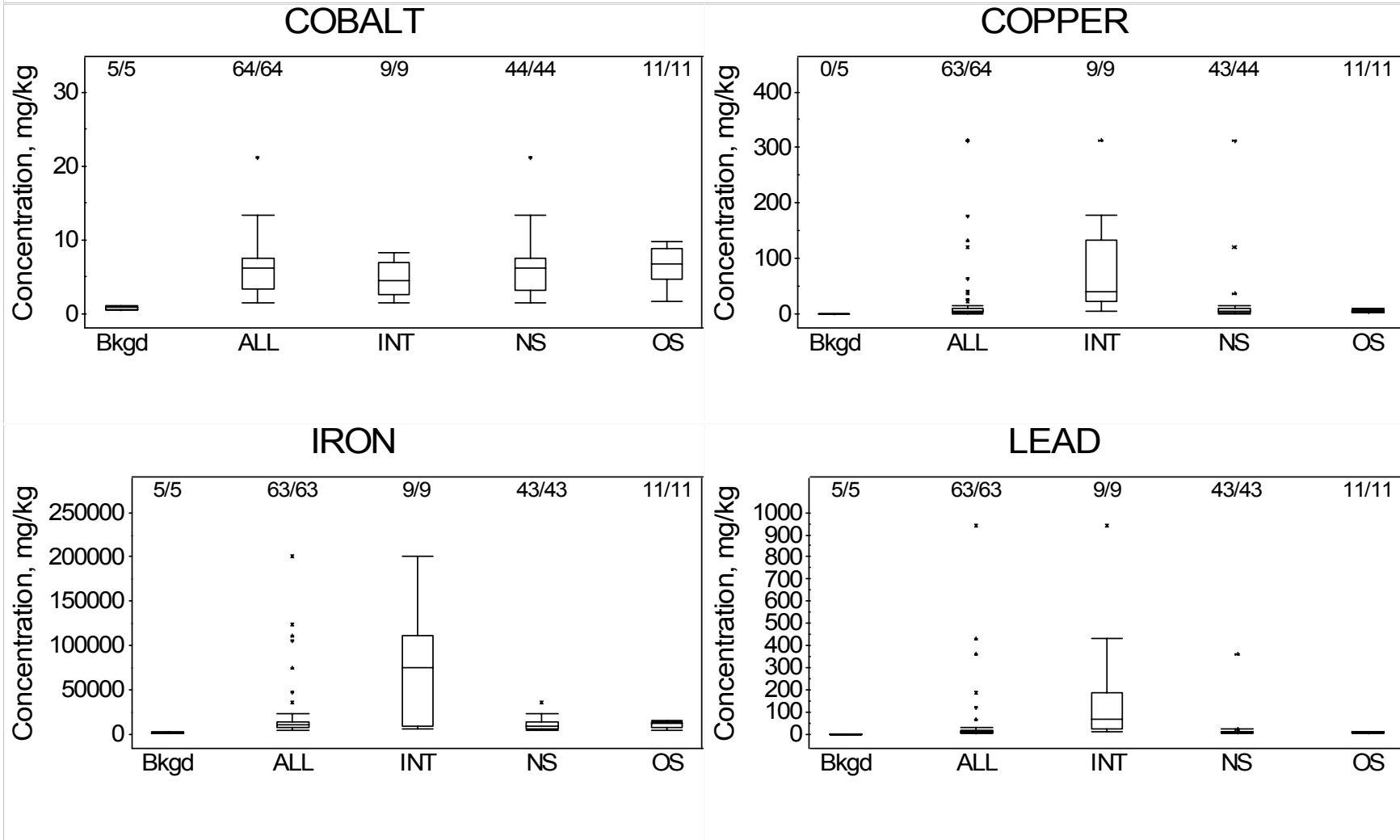
Bkgd=Background; ALL=All Sediment Data; INT=Intertidal Sediment (top of bank to mean lower water mark; NS=Near shore Sediment (shallow sed to potential upland; OS=Off shore Sediment (parallel to navigation channel, ship traffic

Figure 3: Sediment Box and Whisker Plots for Detected Inorganics



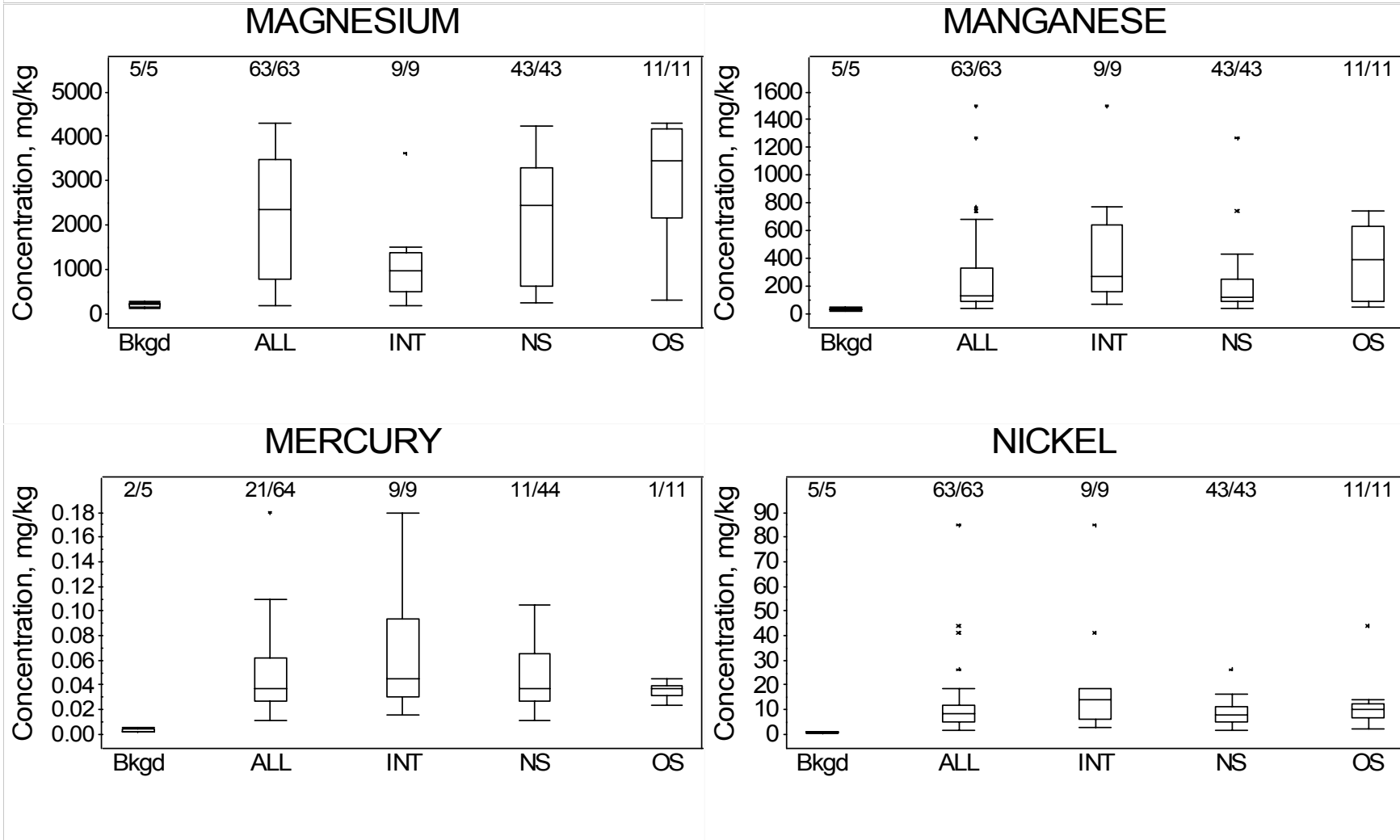
Bkgd=Background; ALL=All Sediment Data; INT=Intertidal Sediment (top of bank to mean lower water mark; NS=Near shore Sediment (shallow sed to potential upland; OS=Off shore Sediment (parallel to navigation channel, ship traffic

Figure 3: Sediment Box and Whisker Plots for Detected Inorganics



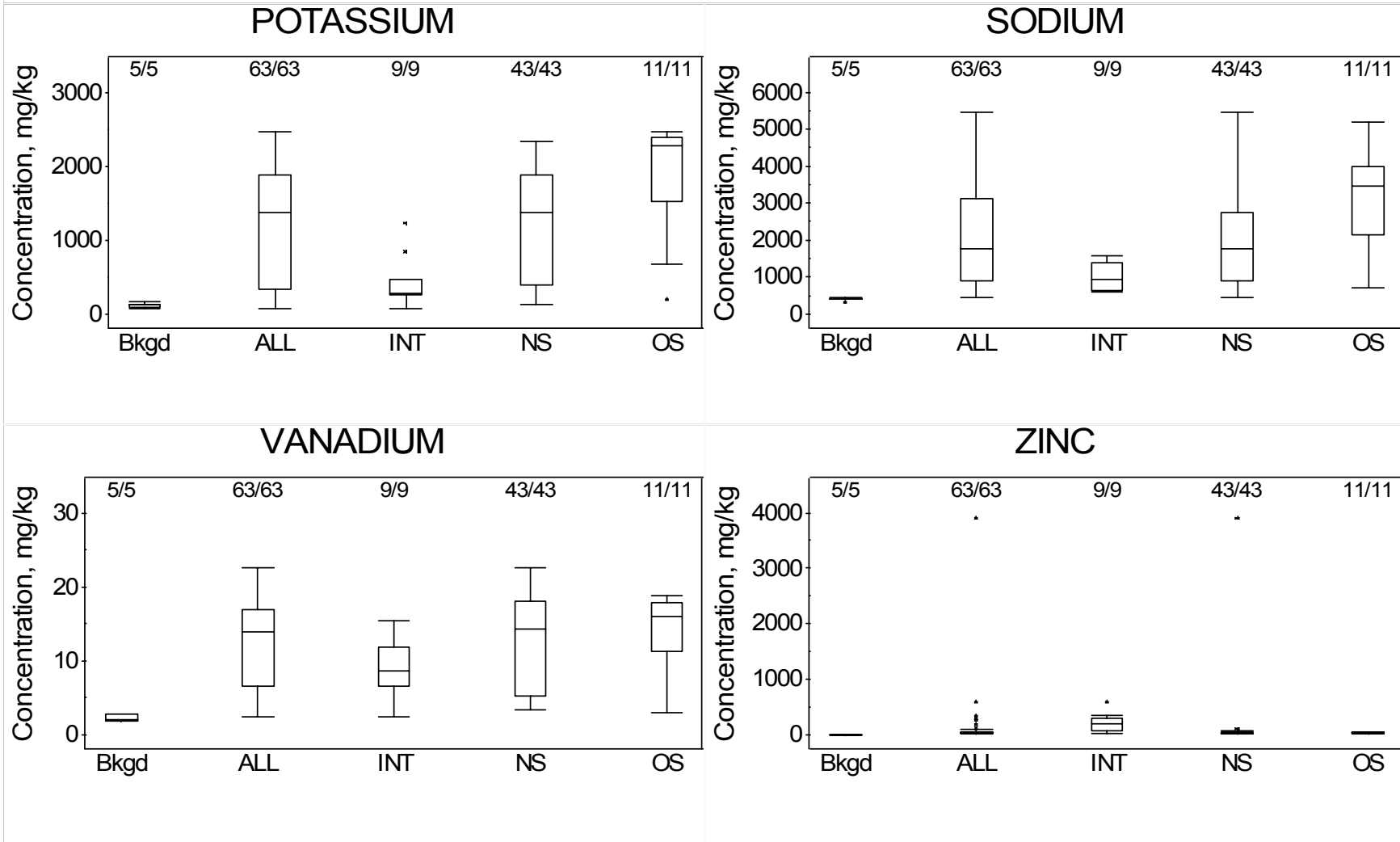
Bkgd=Background; ALL=All Sediment Data; INT=Intertidal Sediment (top of bank to mean lower water mark; NS=Near shore Sediment (shallow sed to potential upland; OS=Off shore Sediment (parallel to navigation channel, ship traffic

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Figure 3: Sediment Box and Whisker Plots for Detected Inorganics



Bkgd=Background; ALL=All Sediment Data; INT=Intertidal Sediment (top of bank to mean lower water mark); NS=Near shore Sediment (shallow sed to potential upland); OS=Off shore Sediment (parallel to navigation channel, ship traffic)

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