ENVIRON

May 26, 2011

Via Electronic Mail (in PDF)

Ms. Jill Tracy
Senior Environmental Counsel
San Diego Gas & Electric
101 Ash Street, HQ13
San Diego, CA 92101

Re: Technical Comments on Draft Technical Report for Tentative Cleanup and Abatement, Order No. R9-2011-0001, for the Shipyard Sediment Site San Diego Bay, San Diego, CA (CRWQCB, 2010) and Associated Administrative Record

Dear Ms. Tracy:

At the request of San Diego Gas & Electric (SDG&E), ENVIRON International Corporation (ENVIRON) has prepared this summary letter to present technical comments on the *Draft Technical Report for Tentative Cleanup and Abatement, Order No. R9-2005-0126, for the Shipyard Sediment Site San Diego Bay, San Diego, CA* (CRWQCB, 2010) and documents obtained from the Shipyard Sediment Site's ("Site") Administrative Record.

ENVIRON has four primary comments, which are detailed below:

1. DTR's Benthic Beneficial Use Impairment is Critically Flawed and Should be Replaced with a Causal Approach to Adequately Identify Risk;
2. DTR's Section 31 Economic Feasibility Analysis Fails to Consider Costs to Reduction in Benthic Risk Exposure and Should be Revised;
3. DTR's Assessment of Human Health Beneficial Use Impairment Fails to Follow Proscribed Regulatory Guidance and Should be Rejected; and
4. DTR's Assessment of Aquatic Dependent Wildlife Beneficial Use Impairment Fails to Follow Proscribed Regulatory Guidance and Should be Rejected.

1.0 DTR's Benthic Beneficial Use Impairment is Critically Flawed and Should be Replaced with a Causal Approach to Adequately Identify Risk

1.1 Introduction

CRWQCB evaluated impairment of Aquatic Life Beneficial Uses for Estuarine Habitat, Marine Habitat, and Migration of Aquatic Organisms by evaluating exposure and adverse effects to the benthic macroinvertebrate community and fish (Findings 14-15 in CRWQCB, 2010) using data from the 2001-2002 Site investigation by Exponent (2003). Adverse effects to fish from Site chemicals were not identified (Appendix for Finding 15 of CRWQCB, 2010). Adverse effects to the benthic macroinvertebrate community were evaluated by CRWQCB (2010) at each of the 66 sediment stations using one of two approaches, depending on the data collected at each of 66 sampling stations at the Site:

1. Triad Approach: The Triad Approach was based on a CRWQCB-derived Sediment Quality Triad approach (Findings 16 and 18 in CRWQCB, 2010) that integrated three lines of evidence: 1) concentrations of chemicals in Site surface sediment; 2) effects observed in laboratory toxicity tests conducted with Site surface sediment; and 3) enumeration of benthic macroinvertebrates collected from Site surface sediment. This approach was used to evaluate the likelihood of sediment chemical-derived effects on the benthic macroinvertebrate community at the 30 stations where data was collected for each of the three Triad lines of evidence. Six of the 30 Triad stations were classified as “Likely” for chemically-associated impairment (NA19, NA22, SW04, SW13, SW22, and SW23). A Triad Approach conclusion of “Likely” was equated with impairment of the benthic macroinvertebrate community at a level CRWQCB (2010) assumed to represent Aquatic Life BUI. The Triad approach did not provide evidence regarding the specific chemicals responsible for the BUI. Such an analysis would be problematic because TBT, a primary Site chemical of concern, was not included in the chemical screening step in this analysis.

2. Non-Triad Data Approach: The Non-Triad Data Approach was based on a CRWQCB-derived empirical approach (Finding 32 in CRWQCB, 2010) that used average quotients calculated from on dividing concentrations of PCBs (sum of 40 congeners), HPAHs, copper, mercury, and TBT by empirically-derived median values (SS-MEQ), as well as comparison of single values to 60% of the Lowest Adverse Effect Thresholds (LAETs) in Site surface sediment to predict the likelihood of sediment chemical-derived effects on the benthic macroinvertebrate community at the 36 stations for which only surface sediment chemistry was available. It should be noted that this analysis was used as a substitute for a full Sediment Quality Triad evaluation because sediment toxicity and benthic macroinvertebrate community census data were not collected at the Non-Triad stations. Seven of the 36 Non-Triad stations were classified as “Likely” for chemically-associated impairment (SW01, SW05, SW10, SW16, SW20, SW24, and SW28). A Non-Triad Data Approach conclusion of “Likely” for a station was equated with impairment of the benthic macroinvertebrate community at a level CRWQCB (2010) assumed to represent Aquatic Life BUI. SW01, SW05, SW16, and SW20 were identified based on an exceedance of the SS-MEQ threshold, for which chemical causality cannot be identified. SW10, SW24, and SW28 were identified based on an exceedance of 60% of the LAET value for HPAHs (and exceedance of SS-MEQ threshold), which suggests HPAHs may factor strongly in the BUI at these locations.

The sediment chemistry line of evidence approaches used in the CRWQCB (2010) do not represent a complete or accurate characterization of chemical risk potential to benthic invertebrates because they do not include all COCs and they are not based on cause-and-effect toxicity endpoints, as discussed by Conder (2011a). As a result, the current Triad and Non-Triad Data approaches set forth in the DTR are not scientifically valid or supportable, and should not be used to identify Aquatic Life Beneficial Use Impairment (BUI).

1.2 Triad Approach Flawed As it Lacks Scientifically Valid Consideration of COCs

The sediment chemistry line of evidence used in the CRWQCB (2010) Triad approach is critically flawed and is not valid to characterize risk potential to aquatic life. The approach relies on the SQGQ1 metric, as shown in Figure 18-1 of CRWQCB (2010). A primary flaw in this approach is that TBT is not considered by the SQGQ1 metric, despite the fact that TBT was selected by CRWQCB (2010) as a primary Site COC. TBT, an anti-fouling agent historically used on marine vessels and a known waste product of the shipyards industry, has been referred to as "the most toxic compound ever released into the environment" (Meador, 2010) and is a prevalent at many contaminated shipyard sediment sites undergoing investigation and remediation (USEPA, 1996; EVS, 1999; Antizar-Ladislao, 2008; Chen, 2010). TBT is toxic to aquatic invertebrate life, with effects noted in water at concentrations of 0.07 to 0.007 micrograms per liter (µg/L) and in sediment at concentrations less than 100 micrograms per kilogram (µg/kg) (Meador et al., 2002; Meador, 2011).

A second critical flaw in the CRWQCB (2010) Triad sediment chemistry line of evidence approach concerns the nature of the sediment quality guidelines (SQGs) used in the SQGQ1 metric. The SQGs used in the SQGQ1 approach are referred to as "empirical" SQGs because they are derived from studies that have measured concentrations of chemicals and laboratory toxicity in field-collected sediments containing a variety of chemicals and exhibiting a variety of physical properties. As these sediments contain a wide variety of unmeasured and measured physical and chemical properties that may adversely affect the laboratory toxicity test organisms, it is impossible from that approach alone to know which chemical, group of chemicals, or physical condition may be responsible for the presence of adverse effects (Batley et al., 2005). This leads to an absence of causality between concentrations of individual chemicals and adverse effects such that the SQGs are not useful in predicting toxicity from individual chemicals.

1.3 Non-Triad Approach Fails to Address Causal Connection Between COCs and Benthic Risk and 60% is Arbitrary and Without Scientific Support

The Non-Triad Data Approach used by CRWQCB (2010) to address benthic risk potential using sediment chemistry results is likewise critically flawed and cannot be used to quantify or understand the relative causal contribution of the five COCs to adverse toxic effects on macroinvertebrate communities (Conder, 2011a). The first part of the Non-Triad approach, a comparison of station chemistry results to 60% of the LAET values, is flawed because the use of the 60% value is arbitrary and is not supported by any technical or regulatory guidance. The DTR lacks any technical support or other scientific evidentiary record to validate the use of a 60% LAET. Additionally, the LAET does not establish causality between chemicals and adverse effects because it is developed using sediments containing an arbitrary mixture of chemicals. This deficiency equally applies to the second portion of the CRWQCB (2010) Non-Triad Data Approach, the SS-MEQ (Conder, 2011a). Neither the 60% LAET nor the SS-MEQ incorporates bioavailability considerations, such as normalization of concentrations of organic compounds in sediment by the amount of organic carbon (Conder, 2011a). The shortcoming regarding a lack of bioavailability in the CRWQCB (2010) benthic assessments was also noted by Allen (2011) in his analysis of chemical exposures to benthic invertebrates at the NASSCO portion of the Site. Allen (2011) arguments also apply to the BAE portion of the Site since a main criticism is that the CRWQCB (2010) primarily relied upon concentrations of total chemical in sediment (at both BAE and NASSCO) without regard to other conditions or factors that may influence bioavailability.

The Toxic Unit approach outlined in Conder (2011a) is a causal approach that is superior to an empirical evaluation in assessing benthic risk and should replace the CRWQCB (2010) sediment chemistry line of evidence used in the Triad, and should be used for understanding aquatic life risk potential where Triad data are unavailable, replacing the current Non-Triad Data Approach. The Toxic Unit approach explicitly evaluates causality between individual chemicals and Aquatic Life BUI in a manner that includes TBT, explicitly considers bioavailability of the five Site primary COCs and takes into account toxicity of individual COCs that are not addressed in the Triad or non-Triad approaches (Conder, 2011a). The Toxic Unit approach used in Conder (2011a) is similar to that used by Allen (2011) to evaluate the benthic risks associated with metals and PAHs at the NASSCO portion of the Site. However, Allen (2011) failed to incorporate a Toxic Unit analysis of PCBs or TBT despite the availability of exposure and effects data (Conder, 2011a). As such, the Allen (2011) analysis remains incomplete with regards to the effects of PCBs and TBT at the NASSCO portion of the Site.

1.4 Revised Remedial Footprint Based Upon Causal Approach to Benthic Risk Evaluation

For the existing Triad stations, a revised approach using the Toxic Unit in place of the current SQGQ1-based sediment chemistry line of evidence was used (Conder, 2011a). A sediment chemistry result of “Moderate/High” was assumed when any of the COCs exhibited a Toxic Unit greater than 1 and “Low” when all of the COCs exhibited Toxic Units less than or equal to 1 (Tables 1-19). The existing CRWQCB (2010) Triad framework (Table 18-14) was then used to interpret Triad results for each of the 30 Triad stations using these revised Toxic Unit-based sediment chemistry line of evidence results along with existing toxicity and benthic community lines of evidence. Results of the analysis (Table 19 for stations originally classified by CRWQCB (2010) as “Possible” or “Unlikely” and Table 19 of Conder (2011a) for stations originally classified by CRWQCB (2010) as “Likely”) indicate that the following Triad stations exhibit a Triad designation that includes “Likely”: NA11, NA19, SW04, SW13, and SW17.

For the Non-Triad stations, the Toxic Unit approach was used in place of the deficient SS-MEQ and 60% LAET evaluations. Benthic risk potential equivalent to a Triad result that includes “Likely” was assumed for stations in which any of the COCs exhibited a Toxic Unit greater than 1 (Tables 1-19). Non-Triad with this designation included: NA10, NA18, NA21, NA27, NA28, SW01, SW10, SW14, SW16, SW24, and SW34.

The results of the revised Likely and Non-Triad analyses (using the Toxic Unit approach) were used to revise the remedial footprint to address potential Aquatic Life BUI. Stations identified by the revised Toxic Unit-based Triad and Non-Triad Data approaches were assumed to represent polygons exhibiting Aquatic Life BUIs and should be considered for inclusion into the remedial footprint to address potential Aquatic Life BUI (Figure 1). This footprint should be fully evaluated on the basis of overall technical and economic feasibility in a manner consistent with the approaches discussed in CRWQCB (2010).

Alternate footprints to protect Aquatic Life BUIs have been proposed by others (MacDonald, 2009, 2011; Spadaro et al., 2011). The Toxic Unit approach used to derive the proposed footprint shown in Figure 1 is superior to the SQG-based evaluation used in part to identify polygons for remediation by MacDonald (2009,

2011) because the latter approach relies on empirical SQGs that suffer from the same weaknesses as the SQGQ1, SS-MEQ, and 60% LAET approaches (lack of chemical causality between concentrations and effects). The Toxic Unit approach is also a more scientifically-rigorous chemical line of evidence than the approach Spadaro et al. (2011) used to derive an alternate footprint to address Aquatic Life BUI in the BAE portion of the Site. Spadaro et al. (2011) relied heavily on a simple ranking of the total concentrations of COCs in sediment without regard to bioavailability or effects levels (Table 6 of Spadaro et al., 2011). This level of simplicity is the least technically-defensible approach to understanding chemical effects on benthic invertebrates of any approach used at the Site to date.

1.5 Conclusion

Although it is not recommended to fully characterize risk potential and/or designate remedial action to address benthic impacts by using sediment chemistry alone (e.g., for the Non-Triad Data Approach stations), the Toxic Unit approach detailed in Conder (2011a) is considered to be a more scientifically defensible sediment chemistry-only approach compared to the SS-MEQ and 60% LAET evaluation. It also includes all five relevant primary Site COCs, in contrast to the Triad sediment chemistry line of evidence, which omits TBT. The Toxic Unit approach should be adopted for use in sediment chemistry line of evidence approaches for the CRWQCB (2010) Triad and Non-Triad Data approaches, and thus should be used for deriving a remedial footprint in conjunction with other considerations regarding technical and economic feasibility in a manner consistent with the approaches discussed in CRWQCB (2010).

2.0 DTR's Section 31 Economic Feasibility Analysis Fails to Consider Costs to Reduction in Benthic Risk Exposure and Should be Revised

2.1 Introduction

Economic feasibility refers to the objective balancing of the incremental benefit of attaining more stringent cleanup levels compared with the incremental cost of achieving those levels. The CRWQCB (2010) is required by Resolution No. 92-49 (SWRCB, 1996) to evaluate economic feasibility such that the benefits of remediation in addressing the Site's BUIs are fully understood. The CRWQCB (2010) evaluated the benefits of remediation as the reduction in chemical exposure to human and aquatic-dependent wildlife receptors using surface-area weighted average concentrations (SWAC) of Site COCs. While this approach satisfies Resolution No. 92-49 with respect to Human Health and Aquatic-dependent Wildlife BUIs, it does not address Aquatic Life BUI.

Figure 31-1 of CRWQCB (2010) represents the final product of an economic feasibility analysis conducted to compare the incremental reduction in chemical exposure (y-axis of figure) to incremental remedial costs (x-axis of figure). In this figure, as explained on Page 31-2, exposure reduction is calculated on the basis of SWACs for the various remedial increments. The proposed remedial footprint set forth in Section 33 of the DTR was explicitly derived to address all three potential Site BUIs. SWACs were used to evaluate only two of the three BUIs found at the Site: Human Health and Aquatic-dependent Wildlife (Section 32.2 in CRWQCB (2010)). Aquatic Life BUI was evaluated on the basis of Triad and Non-Triad Data Approaches, not SWACs (Section 32.5 in CRWQCB (2010)). Although Page 31-2 states that "[t]his process used Triad data and site-specific median effects quotient (SS-MEQ)" (in reference to the economic feasibility analysis), the metric used to evaluate remedial success (exposure reduction) does not include a quantification of the exposure reduction gained from remediating polygons exhibiting Aquatic Life BUI. The areas of the polygons affected by aquatic life BUI are not included in the calculation of exposure reduction, as shown on Page 31-2 and in the Appendix 31 supporting material. The economic feasibility analysis by Spadaro et al. (2011, Table 15 therein) is also flawed because it only considers SWACs, which do not account for Aquatic Life BUI.

2.2 Revised Economic Feasibility Analysis

Because the CRWQCB is charged with addressing all three BUIs, and any supporting economic feasibility analysis, it is imperative to evaluate economic feasibility on the basis of all three BUIs. A revised economic feasibly analysis is shown in Figure 2, based on calculations shown in Tables 20 and 21. In this revised economic feasibility analysis, the percent exposure reduction for all three BUIs is considered via calculation of a composite percent exposure reduction based on SWACs for aquatic-dependent wildlife and human health (as in CRWQCB (2011)) and the area exhibiting aquatic life BUI, as based on a Toxic Unit approach for the sediment chemistry line of evidence (Figure 3; Conder, 2011a). The Toxic Unit approach is a causal chemical exposure modeling to account for bioavailability of chemicals to benthic invertebrates and predict potential chemical risk. It was used as a replacement approach for the flawed SQGQ1 approach used in the CRWQCB (2010) Triad sediment chemistry line of evidence in order to re-classify Triad stations. It was also used as a replacement approach for the flawed SS-MEQ and 60% of the LAET calculations used in the Non-Triad Data Approach. Both the revised Triad and Non-Triad Data approaches were used to identify polygons for Aquatic Life BUI (Figure 3).

Economic feasibility was also calculated using a footprint designated to address Aquatic Life BUI only (Figure 4). The approach ranked polygons exhibiting Aquatic Life BUI by the highest Toxic Unit result multiplied by the area of the polygon (Table 22). Remedial cost was estimated for five increments according to approximate cost rates suggested by Table A31-1 (Table 23). This approach is more technically-defensible because Aquatic Life BUI is the most likely BUI exhibited at the Site and modeling of human health and ecological risk to aquatic-dependent wildlife is flawed.

2.3 Conclusion

A revised economic feasibility approach should be adopted by CRWQCB to enable a complete and accurate evaluation of economic feasibility for any propose remedial footprint for the protection of BUIs at the Site.

3.0 DTR's Assessment of Human Health Beneficial Use Impairment Fails to Follow Proscribed Regulatory Guidance and Should be Rejected

3.1 Introduction

Human health BUI considerations as a remedial action driver should be withdrawn by the CRWQCB because there is a complete lack of evidence for human health risk at the Site as well as a failure by the CRWQCB to follow established state and federal guidelines for the assessment of human health risk at impacted sites. Critical deficiencies in the DTR's human health risk assessment include: (1) the assumption of a value of "1" for the Fractional Intake parameter (Page 28-5, Table 28-3 and Page 28-6, Table 28-4 in CRWQCB (2010) for angler exposure at the Site (i.e., a complete exposure pathway); and (2) the failure of the CRWQCB to properly apply site-specific exposure parameters in concluding there is a risk to human health at the Site.

3.2 Fractional Intake Assumptions

The CRWQCB (2010) Factional Intake assumption is technically flawed because anglers are not currently exposed to Site chemicals (Exponent, 2003; Finley, 2011). Current Site security measures prohibit fishing or collection of shellfish. The assumption that anglers derive 100% of their fish and shellfish diet from Site is untenable. CRWQCB (2010) supports their assumption at pages 27-4 to 27-5 of the DTR with the following hypotheses:

1. Shipyard workers fish at the Site;
2. Future angling opportunities may occur if the Site ceases to be used as a shipyard;
3. Chemicals may migrate to nearby public angling areas (i.e., Crosby Street Pier); and
4. CRWQCB is mandated to address Human Health BUI regardless of whether it is possible for human health exposure to chemicals to occur.

Regarding shipyard worker angling activity, there is no evidence for this occurrence, and such activity is prohibited by current Site security measures. Finley (2011), via a review of security camera footage, confirmed that no angling activity occurs at NASSCO. Because BAE has similar security measures, it can be concluded that shipyard workers are not angling at the Site. Mr. Tom Alo, the CRWQCB's Person Most Knowledgeable (PMK) stated in his February 16, 2011 deposition that CRWQCB has no evidence regarding angling at the Site (Alo, 2011). Mr. Alo further stated that the assumption that angling was taking place was unrealistic (Alo, 2011).

Regarding future exposure scenarios, the current human health risk assessment cannot be used to predict risk for a hypothetical future scenario in which Site access to anglers is granted because concentrations of chemicals in sediment may be decreasing and may continue to decrease during the 23 or more years remaining in the current BAE and NASSCO subleases (Conder, 2011b). Assuming a quantitative relationship between chemicals in Site sediment and chemicals in Site biota, the concentrations of chemicals in fish and shellfish, as measured in 2001-2002 and used in the current CRWQCB human health risk assessment, cannot be expected to equate with values in 2034 and/or 2040 (Conder, 2011c).

Regarding the migration of chemicals to nearby public angling areas (i.e., Crosby Street Pier), it is clear from Site sediment data that chemicals are not migrating from the Site in sufficient amounts to warrant concerns of human health risk (Conder, 2011c). Available studies on the migration ecology of fish and shellfish also indicate that resident Site fish and shellfish are unlikely to migrate to Crosby Street Pier (Conder, 2011c). If migration does occur, human health exposure parameters assumed by CRWQCB (2010), such as concentrations of chemicals in fish and shellfish caught at Crosby Street Pier, frequency of Site fish consumption, and consumption rate, cannot be applied to evaluate risk associated with any Site fish caught at Crosby Street Pier. Evaluating Site-derived risk at Crosby Street Pier would require estimation of the proportion of Site fish consumed by Crosby Street Pier anglers, because it is unreasonable to assume that 100% of animals consumed by anglers at Crosby Street Pier would originate from the Site. Additionally, it is uncertain whether the concentration of Site chemicals in any long-distance fish and lobster migrants caught at Crosby Street Pier would be a high as individuals that restrict their movements within the boundaries of the Site, because it is possible that these long-distance fish and lobster migrants may eliminate Site-derived chemicals from tissue in the time period between the departure from contaminated areas of the Site and capture at Crosby Street Pier.

Given the many critical deficiencies in the CRWQCB's human health risk assessment of the Site, it is clear that a human health risk determination is not supported by the evidence at the Site. Parameters used in CRWQCB (2010) to estimate the potential exposure of anglers to Site chemicals greatly overestimate human exposure and risk at the Site (Finley, 2011). For example, CRWQCB (2010) Site-specific human health risk assessment exposure assumptions estimate exposure for an angler deriving 100% of their fish or shellfish diet from prey items at the Site for a period of 30 years. Mr. Tom Alo, the CRWQCB's Person Most Knowledgeable (PMK) and lead CRWQCB human health risk assessor assigned to the Site, stated in his February 16, 2011 deposition that that he agreed that these exposure assumptions were unrealistic. Using more realistic Site-specific human health exposure assumptions, Finley (2011) calculated human health hazard and risk estimates that are below thresholds of concern (Hazard Index of 1, Excess Lifetime Cancer Risk of 1×10^{-5}, per OEHHA (2006, 2008)) for the NASSCO portion of the Site. Using the same approach and parameters detailed in Finley (2011), the highest risk potential for the inside BAE portion of the Site for the three human health chemicals of concern was found to be 1.7×10^{-6} for cancer risk and 0.33 for non-cancer hazard, as shown in Tables 24-26. Both of these risk estimates were associated with PCBs for ingestion of spotted sand bass by the "upper bound" angler. All risk and hazard estimates for the inside BAE portion of the Site (Table 26) are below OEHHA (2006, 2008) thresholds of concern and do not indicate human health BUI.

3.3 CRWQCB Tier 2 Risk Assessment

As noted above and by Finley (2011), the CRWQCB (2011) Tier 2 human health risk assessment fails to follow standard USEPA (1989) guidance because it did not accurately address realistic human health exposure conditions at the Site by accurately applying Site-specific exposure parameters and considerations. The assessment comprised an unrealistic, "worst case" scenario that appears to have been driven by non-technical, policy considerations. For example, Alo (2011) stated that all chemicals of concern were included in the Tier 2 analysis regardless of earlier screening analyses (Tier 1) that demonstrated an absence of risk. Alo (2011) stated that the Tier 2 analysis was favored a matter of policy such that the CRWQCB "erred on the conservative, more protective side". Thus, the overall framework of the Tier 1 and 2 human health risk assessments, described on page 26-1 of CRWQCB (2010), appears to be needlessly complicated and contrary to applicable regulatory guidance since Tier 1 results were ignored in preference for the unrealistic and non Site-specific Tier 2 assessment.

3.4 Conclusion

In conclusion, the CRWQCB (2010) determination of Human Health BUI is speculative, lacks scientific foundation, and fails to properly apply site-specific exposure parameters in accordance with applicable regulatory guidance to properly substantiate a finding of human health impairment at the Site. There is no evidence to support a conclusion that Site-derived chemicals impair Commercial and Sport Fishing and Shellfish Harvesting Beneficial Uses in San Diego Bay. Because there is no evidence of a Human Health BUI, consideration of human health should be withdrawn from Site decision-making algorithms (e.g., SWAC-based assessments of Findings 32-33 in CRWQCB (2010)) used to identify areas for potential remedial action.

4.0 DTR's Assessment of Aquatic Dependent Wildlife Beneficial Use Impairment Fails to Follow Proscribed Regulatory Guidance and Should be Rejected

4.1 Introduction

CRWQCB (2010) addressed Aquatic-dependent wildlife beneficial uses Wildlife Habitat (WILD), Preservation of Biological Habitats of Special Significance (BIOL), and Rare, Threatened, or Endangered Species (RARE) using ecological risk assessment to predict the likelihood of chemical effects in wildlife from exposure to chemicals originating from Site sediment. The CRWQCB (2010) analysis is based on modeling which predicts the exposure and effects to hypothetical wildlife species (Page 24-9 to 24-12 in CRWQCB (2010)). The model uses Site specific data such as concentrations of chemicals in sediment and prey items (e.g., fish, invertebrates) and specific-specific parameters (e.g., body weight, prey consumption rate). In cases where the model predicted potential risk for a particular chemical, the CRWQCB (2010) assumed Aquatic-dependent wildlife BUI was likely and identified that chemical as a COC. Primary COCs PCBs, HPAH, copper, and mercury were associated with Aquatic-dependent wildlife BUI and included in Spatially-Weighted Average Concentration (SWAC) calculations to derive a remedial footprint designed to address the presumed BUI.

4.2 DTR Ecological Risk Assessment Flawed and Should be Revised

Aquatic dependent wildlife BUI considerations set forth in the DTR should be withdrawn by CRWQCB, because there is an absence of any site-specific evidence for aquatic dependent wildlife risk at the Site. The critical flaw in the DTR's ecological risk assessment modeling is the assumption that aquatic dependent wildlife restricts their activity to the Site, thus deriving 100% of their diet (the primary source of exposure to chemicals) from the Site. This assumption is implicit in the assumption of a value of "1" for the Area Use Factor parameter (Page 24-10, Table 24-6 in CRWQCB, 2010) and as such represents the primary basis for the CRWQCB's conclusion of aquatic dependent wildlife risk at the Site.

The CRWQCB (2010) Area Use Factor assumption of 1 is technically flawed because this assumption fails to recognize all of the representative aquatic dependent wildlife species are expected to derive only a very small fraction of their diet from the Site. There is no reason to assume that the Site is attractive to wildlife such that it would result in this level of Site use because the Site is a heavily-industrialized shipyard and does not offer natural habitat (vegetated features, undeveloped beach areas, trees or nesting platforms, etc.) that would result in anything other than infrequent Site visits and/or foraging events. The lack of habitat is expected to continue until at least 2034 to 2040 (end of current NASSCO and BAE Systems leases (CRWQCB, 2010); therefore, the assumption that wildlife will only visit the Site very infrequently is expected to remain valid for at least another 23 years.

The frequency of wildlife foraging events is quantified in an ecological risk assessment by a quantitative comparison of the size of an organism's foraging range (home range) to the size of the Site, a value referred to as the Area Use Factor or Fractional Intake values by CRWQCB (2010). Standard ecological risk assessment guidances, both on a state (DTSC, 1996) and federal (USEPA, 1997) level, prescribe using this quantitative comparison in lieu of simply assuming 100% site use. This comparison is made by dividing an animal's foraging range by the size of the Site or contaminated area (DTSC, 1996; USEPA, 1997). The foraging range represents the area in which the animal forages on a daily basis. Estimates on foraging ranges are obtainable from scientific studies and agency-promulgated compilations (USEPA, 1993). The value that is obtained from dividing an animal's foraging range by the size of the Site can be considered to be equivalent to the proportion of the diet (the main route of wildlife exposure for most chemicals) that is derived from the Site. For example, the representative species with the smallest foraging range (East Pacific green turtle, 3,700 acres (Exponent, 2003)) would only be expected to derive 4% of its diet from the Site since the Site is only 140 acres (i.e., 140 ÷ 3,700 = 4%). The other representative aquatic dependent wildlife species exhibit larger foraging ranges than the East Pacific green turtle and would be expected to forage at the Site approximately 1% of the time based on their respective foraging ranges (Exponent, 2003). If these technically-supportable Area Use Factors of 0.01 to 0.04 (1 to 4%) are applied to Site chemical intake estimates (using the equation on page 24-9 of CRWQCB (2010)), all Hazard Quotients (as shown in Table 24-3 of CRWQCB (2010)), ecological risk potential would not be recognized. Contrary to the USEPA and DTSC approach, the CRWQCB (2010) assumption of an Area Use Factor of 1 grossly overestimates dietary intake of Site chemicals by a factor of 30 to 100.

The selection of an Area Use Factor of 1 by the CRWQCB (2010) appears to have been arbitrary and was made in absence of any applicable regulatory guidance or scientific evidence. Mr. Tom Alo, the CRWQCB's Person Most Knowledgeable (PMK) and lead CRWQCB ecological risk assessor assigned to the Site, stated in his February 17, 2011 deposition that the value of 1 was selected by Mr. David Barker, Chief, Surface Water Basins Branch, CRWQCB (Pages 117-121 in Alo, 2011). Alo stated that this decision was not supported by any technical guidance or scientific evidence, and agreed that it is probable that wildlife do not forage exclusively within the Site (Alo, 2011).

4.3 Conclusion

The CRWQCB (2010) assumption of a value of "1" (100%) for the Area Use Factor is not based upon any site-specific evidence, is not technically-supportable, and is contrary to state and federal ecological risk assessment guidance. Consideration of the Site-specific evidence of usage by wildlife in a manner consistent with USEPA and DTSC ecological risk assessment guidances demonstrates that ecological risk potential is absent from the Site. Because there is an absence of risk potential for aquatic-dependent wildlife, identification of COCs causing Aquatic-dependent Wildlife BUI is unnecessary, as is the derivation of a remedial footprint using the analysis of SWACs (Section 32, CRWQCB (2010)). Consideration of Aquatic-dependent wildlife BUI should be withdrawn from the DTR.

ENVIRON appreciates the opportunity to provide technical comments on the above-referenced issues.

Sincerely,

Jason Conder

Jason M. Conder, PhD
Manager

JC:gw

Attachments: References
Tables 1 through 26
Figures 1 through 4

References Cited

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Tables

Table 1. Non-Triad Stations and Triad Stations Identified by CRWQCB (2010) as Unlikely or Possible.

Non-Triad and CRWQCB (2010) Unlikely and Possible Stations	CRWQCB (2010) Triad Analysis			
	Sediment Chemistry	Toxicity	Benthic Community	Triad Conclusion
NA01	Moderate	Low	Low	Unlikely
NA02	Non-Triad Station			
NA03	Moderate	Low	Low	Unlikely
NA04	Moderate	Low	Low	Unlikely
NA05	Moderate	Low	Low	Unlikely
NA06	Moderate	Low	Low	Unlikely
NA07	Moderate	Low	Low	Unlikely
NA08	Non-Triad Station			
NA09	Moderate	Moderate	Low	Possible
NA10	Non-Triad Station			
NA11	Moderate	Moderate	Low	Possible
NA12	Moderate	Moderate	Low	Possible
NA13	Non-Triad Station			
NA14	Non-Triad Station			
NA15	Moderate	Low	Low	Unlikely
NA16	Moderate	Moderate	Low	Possible
NA17	High	Low	Low	Possible
NA18	Non-Triad Station			
NA20	Low	Low	Moderate	Unlikely
NA21	Non-Triad Station			
NA23	Non-Triad Station			
NA24	Non-Triad Station			
NA25	Non-Triad Station			
NA26	Non-Triad Station			
NA27	Non-Triad Station			
NA28	Non-Triad Station			
NA29	Non-Triad Station			
NA30	Non-Triad Station			
NA31	Non-Triad Station			
SW01	Non-Triad Station			
SW02	High	Low	Low	Possible
SW03	Moderate	Low	Low	Unlikely
SW05	Non-Triad Station			
SW06	Non-Triad Station			
SW07	Non-Triad Station			
SW08	High	Low	Low	Possible
SW09	High	Low	Low	Possible
SW10	Non-Triad Station			
SW11	Moderate	Low	Low	Unlikely
SW12	Non-Triad Station			
SW14	Non-Triad Station			
SW15	Moderate	Moderate	Low	Possible
SW16	Non-Triad Station			
SW17	Moderate	Moderate	Low	Possible
SW18	Moderate	Low	Low	Unlikely
SW19	Non-Triad Station			
SW20	Non-Triad Station			
SW21	High	Low	Low	Possible
SW24	Non-Triad Station			
SW25	Moderate	Moderate	Low	Possible
SW26	Non-Triad Station			
SW27	Moderate	Moderate	Low	Possible
SW28	Non-Triad Station			
SW29	Non-Triad Station			
SW30	Non-Triad Station			
SW31	Non-Triad Station			
SW32	Non-Triad Station			
SW33	Non-Triad Station			
SW34	Non-Triad Station			
SW36	Non-Triad Station			

Notes:

[1] Non-Triad Stations are referenced from Volume III 'Table 32-23 Site-Specific 60%LAET and SS-MEQ Threshold Exceedances SPI Successional Stage, and Remedial Designations at the Shipyard Sediment Site Non-Triad Stations' (CRWQRB, 2010).

[2] Triad Stations identified as Unlikely or Possible are referenced from Volume II 'Table 18-1 Results of the Sediment Quality Triad Lines-of-Evidence' (CRWQRB, 2010).

Table 2. Measured Concentration of PCB Homologs in Surface Sediment

Table 2.A. Raw Data (with field split and duplicate averaging)

Station	Sample Number	Date	Monochlorobiphenyl (µg/kg, dw)	Dichlorobiphenyl (µg/kg, dw)	Trichlorobiphenyl (µg/kg, dw)	Tetrachlorobiphenyl (µg/kg, dw)	Pentachlorobiphenyl (µg/kg, dw)	Hexachlorobiphenyl (µg/kg, dw)	Heptachlorobiphenyl (µg/kg, dw)	Octachlorobiphenyl (µg/kg, dw)	Nonachlorobiphenyl (µg/kg, dw)	Decachlorobiphenyl (µg/kg, dw)	Total PCB Homologs (µg/kg, dw)
NA01	SD0030	8/11/2001	0.2	1.4	7.4	49	170	190	89	23	7.1	4.7	530
NA01	SD0031	8/11/2001	0.25	1.3	5.9	47	160	180	89	25	6.8	3.5	520
NA01	--	--	0.23	1.35	6.65	48	165	185	89	24	6.95	4.1	525
NA01b	SD0136	9/14/2002	1.7	2.3	5.4	47	190	180	84	18	6.5	4.4	540
NA01	--	--	0.96	1.83	6.03	47.5	178	183	86.5	21	6.73	4.25	533
NA02	SD0033	8/11/2001	0.16	0.69	3	23	91	109	53	13	3.4	2.9	299
NA03	SD0032	8/11/2001	0.73	1.6	6.7	45	150	180	94	29	16	7.2	520
NA04	SD0035	8/11/2001	0.19	1.2	8.2	39	99	120	60	16	3.7	2.9	350
NA05	SD0044	8/13/2001	0.12	0.6	3.6	25	71	84	53	11	2.7	2.5	250
NA06	SD0020	8/9/2001	2.4	3.1	21	140	340	260	92	24	6.6	3.8	900
NA06b	SD0101	9/8/2002	0.36	2.1	20	130	380	310	100	19	6.9	2.9	970
NA06	--	--	1.38	2.6	20.5	135	360	285	96	21.5	6.75	3.35	935
NA07	SD0017	8/8/2001	0.21	1.6	18	100	210	210	92	23	4.7	2.7	660
NA07	SD0018	8/8/2001	0.3	1.6	19	100	260	240	110	29	5.7	3.4	760
NA07	--	--	0.26	1.6	18.5	100	235	225	101	26	5.2	3.05	710
NA08	SD0055	8/14/2001	0.17	0.98	6.5	45	140	150	73	17	3.8	3	430
NA09	SD0054	8/14/2001	0.14	1.1	7.2	42	130	140	67	16	3.8	3.4	410
NA10	SD0056	8/14/2001	0.21	0.66	3	22	67	78	41	10	2.7	2.4	230
NA11	SD0021	8/9/2001	0.14	0.73	4.5	28	77	91	47	13	3	2.3	270
NA12	SD0027	8/10/2001	0.08	0.59	3.1	31	63	70	37	10	2.3	2.1	220
NA13	SD0036	8/11/2001	0.13	0.52	3.1	19	73	91	47	11	3.2	3.3	250
NA13b	SD0120	9/11/2002	0.15	0.6	3.3	24	87	110	46	9.8	3.7	2.8	280
NA13	--	--	0.14	0.56	3.2	21.5	80	101	46.5	10.4	3.45	3.05	265
NA14	SD0051	8/14/2001	0.09	0.5	2	13	54	67	34	7.8	2.3	2.4	183
NA15	SD0037	8/12/2001	0.45	1.3	6.3	46	140	160	86	27	6	3.1	480
NA16	SD0038	8/12/2001	0.35	1.4	7.5	89	330	260	100	21	5.3	3.6	810
NA16b	SD0099	9/8/2002	0.16	1.1	8.3	53	190	200	87	17	5.3	3.3	560
NA16b	SD0100	9/8/2002	0.19	0.97	6.1	40	160	180	73	16	5.4	3.2	480
NA16	--	--	0.18	1.04	7.2	46.5	175	190	80	16.5	5.35	3.25	520
NA16	--	--	0.26	1.22	7.35	67.8	253	225	90	18.8	5.33	3.43	665
NA17	SD0039	8/12/2001	0.23	1.5	9	77	310	250	94	19	4.9	3.7	760
NA17b	SD0097	9/8/2002	0.16	1	-	48	170	180	72	13	4.5	2.9	480
NA17	--	--	0.2	1.25	9	62.5	240	215	83	16	4.7	3.3	620
NA18	SD0053	8/14/2001	0.19	1	6.2	50	180	170	66	15	3.8	3.2	490
NA20	SD0028	8/10/2001	0.04	0.61	4.2	22	50	55	28	6.2	1.2	0.96	170
NA21	SD0050	8/14/2001	0.16	0.69	3.7	23	76	89	48	11	2.9	2.5	257
NA24	SD0094	9/8/2002	0.16	0.78	4.9	34	110	150	83	16	4.6	2.7	410
NA25	SD0106	9/9/2002	0.06	0.35	1.4	9.1	31	43	23	5.1	2.1	1.8	120
NA26	SD0116	9/11/2002	0.06	0.45	2.6	24	99	85	31	6.3	2.4	1.8	250
NA27	SD0301	10/2/2002	0.18	0.92	4.7	25	76	110	60	12	4	3.3	290
NA28	SD0300	10/2/2002	0.16	0.83	4.1	23	66	92	50	12	3.8	5.1	260
NA29	SD0119	9/11/2002	0.16	0.59	3.1	23	84	90	46	9.5	3.6	2.6	260
NA30	SD0115	9/11/2002	0.13	0.66	5.5	11	40	51	28	8.1	3.1	2.3	150
NA31	SD0105	9/9/2002	***0.01***	0.22	1.1	7.9	27	34	18	4	1.8	1.6	96
SW01	SD0001	8/6/2001	3	12	210	640	740	490	200	65	11	1.7	2400
SW01b	SD0137	9/14/2002	0.56	4.8	110	450	910	660	210	41	8.6	2.3	2400
SW01	--	--	1.78	8.4	160	545	825	575	205	53	9.8	2	2400
SW02	SD0005	8/6/2001	4.3	22	370	1,800	3,300	2,000	550	150	32	5	8100
SW02	SD0006	8/6/2001	2.7	17	360	1900	2900	1800	510	150	46	8	7600
SW02	--	--	3.5	19.5	365	1850	3100	1900	530	150	39	6.5	7850
SW02b	SD0138	9/14/2002	1.6	23	580	2700	3300	1700	480	100	24	5.7	8800
SW02	--	--	2.55	21.3	473	2275	3200	1800	505	125	31.5	6.1	8325
SW03	SD0009	8/7/2001	0.35	1.2	12	82	230	170	68	13	3	2.6	580
SW05	SD0003	8/6/2001	0.79	5.8	88	400	640	450	140	54	14	2.6	1800
SW06	SD0002	8/6/2001	0.1	3	60	140	160	130	55	24	8.3	2.6	580
SW07	SD0004	8/6/2001	0.12	0.48	3.6	27	74	75	37	13	3.7	1.9	230
SW08	SD0016	8/8/2001	1.5	8.1	120	580	1100	780	300	69	12	4.1	3000
SW08b	SD0133	9/13/2002	5.1	9.4	87	410	910	710	250	46	13	4	2400
SW08	--	--	3.3	8.75	104	495	1005	745	275	57.5	12.5	4.05	2700
SW09	SD0007	8/6/2001	0.62	5.7	88	260	310	250	110	31	7.8	4.1	1100
SW10	SD0008	8/6/2001	0.47	10	120	240	290	180	64	19	4.5	1.6	930
SW11	SD0048	8/13/2001	0.1	0.7	5.9	29	82	94	49	13	3.2	2.5	280
SW12	SD0010	8/7/2001	0.11	0.6	3	21	74	77	34	8.5	2.2	1.9	222
SW12b	SD0111	9/10/2002	0.07	0.66	3.2	22	83	85	33	7.2	2.7	1.8	240
SW12	--	--	0.09	0.63	3.1	21.5	78.5	81	33.5	7.85	2.45	1.85	231
SW14	SD0024	8/10/2001	0.39	1.1	9.1	58	160	200	110	27	4.8	2.7	570
SW15	SD0023	8/10/2001	0.17	1.3	23	85	160	160	81	21	4.6	3.1	540
SW16	SD0025	8/10/2001	0.24	1.2	9.8	70	180	210	110	26	5	2.9	610
SW17	SD0047	8/13/2001	0.25	1.2	13	98	220	320	180	43	7.3	3.9	880
SW18	SD0046	8/13/2001	0.24	1.6	13	63	190	220	130	28	6.8	6.2	660
SW19	SD0011	8/7/2001	0.03	0.34	1.9	13	37	48	25	6.3	1.8	1.8	135
SW20	SD0059	8/15/2001	0.31	1.2	21	250	430	930	750	170	13	2.6	2600
SW21	SD0019	8/9/2001	0.24	1.6	26	310	610	1,400	1,000	250	22	4.1	3600
SW24	SD0015	8/8/2001	0.17	1	13	140	300	510	360	87	8.3	2.9	1400
SW24b	SD0113	9/10/2002	0.18	1.4	13	130	300	600	430	77	11	3	1600
SW24	--	--	0.18	1.2	13	135	300	555	395	82	9.65	2.95	1500
SW25	SD0057	8/15/2001	0.57	1.3	9.3	54	130	170	110	28	6.2	3	510
SW25b	SD0114	9/10/2002	0.55	1.3	7.9	52	120	180	95	19	5.9	3.7	490
SW25	--	--	0.56	1.3	8.6	53	125	175	103	23.5	6.05	3.35	500
SW26	SD0014	8/8/2001	0.14	0.75	3.7	48	180	134	40	8.1	2	1.7	418
SW27	SD0045	8/13/2001	0.14	0.63	4.2	27	90	110	66	14	2.9	2.6	320
SW28	SD0029	8/11/2001	0.38	1.5	10	100	420	1,200	980	200	13	2.7	3000
SW28b	SD0121	9/11/2002	0.24	1.5	9.9	88	370	890	670	120	14	3.9	2200
SW28	--	--	0.31	1.5	9.95	94	395	1045	825	160	13.5	3.3	2600
SW29	SD0110	9/9/2002	1.8	3.1	21	170	460	360	110	20	6.9	2.1	1200
SW30	SD0135	9/14/2002	0.27	1.4	7.7	55	190	180	65	17	17	9.3	540
SW31	SD0122	9/11/2002	***0.01***	0.23	1.3	8.3	33	31	14	3.1	1.1	0.68	93
SW32	SD0108	9/9/2002	0.21	0.62	2	18	71	84	35	7.9	3.4	3.1	230
SW33	SD0118	9/11/2002	0.12	0.49	1.6	8.2	36	55	32	7.3	3	2.5	150
SW34	SD0117	9/11/2002	0.1	0.46	2.2	14	55	62	31	6.9	2.7	2.2	180
SW36	SD0180	11/7/2002	0.16	0.74	4.2	28	73	100	53	13	3.8	3.9	282

Table 2.B. Data Summarized By Station

Station	Monochlorobiphenyl (µg/kg, dw)	Dichlorobiphenyl (µg/kg, dw)	Trichlorobiphenyl (µg/kg, dw)	Tetrachlorobiphenyl (µg/kg, dw)	Pentachlorobiphenyl (µg/kg, dw)	Hexachlorobiphenyl (µg/kg, dw)	Heptachlorobiphenyl (µg/kg, dw)	Octachlorobiphenyl (µg/kg, dw)	Nonachlorobiphenyl (µg/kg, dw)	Decachlorobiphenyl (µg/kg, dw)	Total PCB Homologs (µg/kg, dw)
NA01	0.96	1.83	6.03	47.5	178	183	86.5	21	6.73	4.25	533
NA02	0.16	0.69	3	23	91	109	53	13	3.4	2.9	299
NA03	0.73	1.6	6.7	45	150	180	94	29	16	7.2	520
NA04	0.19	1.2	8.2	39	99	120	60	16	3.7	2.9	350
NA05	0.12	0.6	3.6	25	71	84	53	11	2.7	2.5	250
NA06	1.38	2.6	20.5	135	360	285	96	21.5	6.75	3.35	935
NA07	0.26	1.6	18.5	100	235	225	101	26	5.2	3.05	710
NA08	0.17	0.98	6.5	45	140	150	73	17	3.8	3	430
NA09	0.14	1.1	7.2	42	130	140	67	16	3.8	3.4	410
NA10	0.21	0.66	3	22	67	78	41	10	2.7	2.4	230
NA11	0.14	0.73	4.5	28	77	91	47	13	3	2.3	270
NA12	0.08	0.59	3.1	31	63	70	37	10	2.3	2.1	220
NA13	0.14	0.56	3.2	21.5	80	101	46.5	10.4	3.45	3.05	265
NA14	0.09	0.5	2	13	54	67	34	7.8	2.3	2.4	183
NA15	0.45	1.3	6.3	46	140	160	86	27	6	3.1	480
NA16	0.26	1.22	7.35	67.8	253	225	90	18.8	5.33	3.43	665
NA17	0.2	1.25	9	62.5	240	215	83	16	4.7	3.3	620
NA18	0.19	1	6.2	50	180	170	66	15	3.8	3.2	490
NA20	0.04	0.61	4.2	22	50	55	28	6.2	1.2	0.96	170
NA21	0.16	0.69	3.7	23	76	89	48	11	2.9	2.5	257
NA23	0.28	1.4	12	54	190	210	100	21	7.7	3.4	600
NA24	0.16	0.78	4.9	34	110	150	83	16	4.6	2.7	410
NA25	0.06	0.35	1.4	9.1	31	43	23	5.1	2.1	1.8	120
NA26	0.06	0.45	2.6	24	99	85	31	6.3	2.4	1.8	250
NA27	0.18	0.92	4.7	25	76	110	60	12	4	3.3	290
NA28	0.16	0.83	4.1	23	66	92	50	12	3.8	5.1	260
NA29	0.16	0.59	3.1	23	84	90	46	9.5	3.6	2.6	260
NA30	0.13	0.66	5.5	11	40	51	28	8.1	3.1	2.3	150
NA31	0.01	0.22	1.1	7.9	27	34	18	4	1.8	1.6	96
SW01	1.78	8.4	160	545	825	575	205	53	9.8	2	2,400
SW02	2.55	21.3	473	2275	3200	1800	505	125	31.5	6.1	8,325
SW03	0.35	1.2	12	82	230	170	68	13	3	2.6	580
SW05	0.79	5.8	88	400	640	450	140	54	14	2.6	1,800
SW06	0.1	3	60	140	160	130	55	24	8.3	2.6	580
SW07	0.12	0.48	3.6	27	74	75	37	13	3.7	1.9	230
SW08	3.3	8.75	104	495	1005	745	275	57.5	12.5	4.05	2,700
SW09	0.62	5.7	88	260	310	250	110	31	7.8	4.1	1,100
SW10	0.47	10	120	240	290	180	64	19	4.5	1.6	930
SW11	0.1	0.7	5.9	29	82	94	49	13	3.2	2.5	280
SW12	0.09	0.63	3.1	21.5	78.5	81	33.5	7.85	2.45	1.85	231
SW14	0.39	1.1	9.1	58	160	200	110	27	4.8	2.7	570
SW15	0.17	1.3	23	85	160	160	81	21	4.6	3.1	540
SW16	0.24	1.2	9.8	70	180	210	110	26	5	2.9	610
SW17	0.25	1.2	13	98	220	320	180	43	7.3	3.9	880
SW18	0.24	1.6	13	63	190	220	130	28	6.8	6.2	660
SW19	0.03	0.34	1.9	13	37	48	25	6.3	1.8	1.8	135
SW20	0.31	1.2	21	250	430	930	750	170	13	2.6	2,600
SW21	0.24	1.6	26	310	610	1400	1000	250	22	4.1	3,600
SW24	0.18	1.2	13	135	300	555	395	82	9.65	2.95	1,500
SW25	0.56	1.3	8.6	53	125	175	103	23.5	6.05	3.35	500
SW26	0.14	0.75	3.7	48	180	134	40	8.1	2	1.7	418
SW27	0.14	0.63	4.2	27	90	110	66	14	2.9	2.6	320
SW28	0.31	1.5	9.95	94	395	1045	825	160	13.5	3.3	2,600
SW29	1.8	3.1	21	170	460	360	110	20	6.9	2.1	1,200
SW30	0.27	1.4	7.7	55	190	180	65	17	17	9.3	540
SW31	0.01	0.23	1.3	8.3	33	31	14	3.1	1.1	0.68	93
SW32	0.21	0.62	2	18	71	84	35	7.9	3.4	3.1	230
SW33	0.12	0.49	1.6	8.2	36	55	32	7.3	3	2.5	150
SW34	0.1	0.46	2.2	14	55	62	31	6.9	2.7	2.2	180
SW36	0.16	0.74	4.2	28	73	100	53	13	3.8	3.9	282

Notes:

[1] Raw data in Table 2.A. is referenced from 'Table B1-8 PCB congener and homolog results for surface sediment samples' in Exponent, 2003.

[2] All surface sediment samples were collected from a depth interval of 0–2 cm.

[3] Field splits and duplicates are averaged.

[4] Stations ending with the letter b indicate the sample was collected for the porewater study and was analyzed for PCB homologs only.

[5] Bold and italicized values indicate concentrations are below detection. Non-detect concentrations are represented as half of the detection limit.

[6] In Table 2.B. the data is summarized by station.

[7] Station NA23 had no PCB homolog results for the surface sediment sampling; therefore, the PCB homolog results for the core sediment sampling for station NA23 sample number SD0091 dated 09/04/2002 for core depths 0 feet to 2 feet as referenced from Table B2-7 of Exponent (2003) was used to represent PCB homologues in sediment.

[8] PCB = polychlorinated biphenyl.

[9] µg/kg, dw = micrograms per kilogram, dry weight.

[10] NR = Not Reported.

Table 3. Measured Concentration of HPAHs in Surface Sediment

Table 3.A. Raw Data (with field split and duplicate averaging)

Station	Sample Number	Date	Fluoranthene (µg/kg, dw)	Pyrene (µg/kg, dw)	Benz[a]-anthracene (µg/kg, dw)	Chrysene (µg/kg, dw)	Benzo[b]-fluoranthene (µg/kg, dw)	Benzo[k]-fluoranthene (µg/kg, dw)	Benzo[a]-pyrene (µg/kg, dw)	Indeno-[1,2,3-cd]-pyrene (µg/kg, dw)	Dibenz[a,h]-anthracene (µg/kg, dw)	Benzo[ghi]-perylene (µg/kg, dw)	Total HPAH (to two significant figures) (µg/kg, dw)
NA01	SD0030	8/11/2001	570	550	630	1,200	1,200	980	1,300	960	190	700	8,300
NA01	SD0031	8/11/2001	470	490	490	960	1,000	740	1,000	830	160	630	6,800
NA01	--	--	520	520	560	1,080	1,100	860	1,150	895	175	665	7,550
NA01	SD0179	11/7/2002	340	390	440	840	880	610	910	610	120	420	5,600
NA01	--	--	430	455	500	960	990	735	1,030	753	148	543	6,575
NA02	SD0033	8/11/2001	240	250	230	390	340	310	440	310	61	220	2,800
NA03	SD0032	8/11/2001	470	480	470	820	850	730	910	700	130	530	6,100
NA04	SD0035	8/11/2001	210	210	220	470	560	390	510	450	82	360	3,500
NA05	SD0044	8/13/2001	200	210	190	370	360	340	400	340	70	320	2,800
NA06	SD0020	8/9/2001	330	370	330	690	590	520	610	470	99	410	4,400
NA06	SD0181	11/7/2002	260	330	200	330	620	330	480	340	63	240	3,200
NA06	--	--	295	350	265	510	605	425	545	405	81	325	3,800
NA07	SD0017	8/8/2001	490	500	370	550	630	500	670	490	110	370	4,700
NA07	SD0018	8/8/2001	4,300	4,200	2,100	2,400	3,700	2,300	3,500	2,200	510	1,600	27,000
NA07	--	--	2,395	2,350	1,235	1,475	2,165	1,400	2,085	1,345	310	985	15,850
NA08	SD0055	8/14/2001	250	380	220	440	520	390	470	410	78	360	3,500
NA09	SD0054	8/14/2001	200	260	180	320	400	310	380	360	64	320	2,800
NA10	SD0056	8/14/2001	110	160	96	190	250	220	270	240	43	220	1,800
NA11	SD0021	8/9/2001	240	260	200	370	360	310	400	300	56	260	2,800
NA12	SD0027	8/10/2001	180	180	150	270	250	220	260	210	44	190	2,000
NA13	SD0036	8/11/2001	140	160	110	220	180	170	180	150	28	130	1,500
NA13	SD0183	11/8/2002	160	200	140	250	370	210	320	250	42	200	2,100
NA13	--	--	150	180	125	235	275	190	250	200	35	165	1,800
NA14	SD0051	8/14/2001	110	110	86	190	130	120	140	120	20	100	1,100
NA15	SD0037	8/12/2001	220	260	210	390	500	380	500	420	80	370	3,300
NA16	SD0038	8/12/2001	340	350	240	390	540	390	540	470	87	400	3,700
NA16	SD0182	11/7/2002	160	220	150	250	470	300	430	360	64	280	2,700
NA16	--	--	250	285	195	320	505	345	485	415	76	340	3,200
NA17	SD0039	8/12/2001	370	680	220	390	510	420	480	410	85	370	3,900
NA17	SD0184	11/8/2002	140	180	110	160	350	250	320	230	43	170	2,000
NA17	--	--	255	430	165	275	430	335	400	320	64	270	2,950
NA18	SD0053	8/14/2001	170	190	150	280	350	280	360	300	59	270	2,400
NA20	SD0028	8/10/2001	310	420	210	320	420	330	390	260	57	230	2,900
NA21	SD0050	8/14/2001	230	270	160	270	260	250	260	190	33	170	2,100
NA23	SD0095	9/8/2002	280	330	240	450	480	390	540	370	65	300	3,400
NA24	SD0094	9/8/2002	150	160	130	270	330	280	330	240	41	200	2,100
NA25	SD0106	9/9/2002	86	120	73	130	140	120	150	110	17	110	1,100
NA26	SD0116	9/11/2002	65	86	51	110	150	72	120	97	14	88	850
NA27	SD0301	10/2/2002	240	280	200	350	410	300	430	290	47	230	2,800
NA28	SD0300	10/2/2002	290	360	240	400	490	370	530	360	61	290	3,400
NA29	SD0119	9/11/2002	130	170	110	250	350	170	280	220	38	190	1,900
NA30	SD0115	9/11/2002	81	110	50	120	190	86	140	130	18	110	1,000
NA31	SD0105	9/9/2002	44	66	35	54	71	58	75	62	***5***	58	530
SW01	SD0001	8/6/2001	1,100	1,400	760	1,300	1,400	1,100	1,500	980	190	760	10,000
SW01	SD0169	11/6/2002	470	830	340	600	920	470	680	410	84	300	5,100
SW01	SD0171	11/6/2002	480	800	360	490	780	500	750	440	81	330	5,000
SW01	--	--	475	815	350	545	850	485	715	425	83	315	5,050
SW01	--	--	788	1,108	555	923	1,125	793	1,108	703	136	538	7,525
SW02	SD0005	8/6/2001	2,100	3,300	970	1,600	2,000	1,500	1,900	1,100	260	800	16,000
SW02	SD0006	8/6/2001	1,200	2,500	1,000	1,900	1,500	1,300	1,500	790	210	580	12,000
SW02	--	--	1,650	2,900	985	1,750	1,750	1,400	1,700	945	235	690	14,000
SW02	SD0172	11/6/2002	3,900	3,500	1,200	1,200	1,200	760	1,300	750	130	610	15,000
SW02	--	--	2,775	3,200	1,093	1,475	1,475	1,080	1,500	848	183	650	14,500
SW03	SD0009	8/7/2001	620	590	510	830	1,000	780	1,100	680	140	540	6,800
SW05	SD0003	8/6/2001	2,300	2,200	910	1,500	1,500	1,200	1,500	790	200	580	13,000
SW06	SD0002	8/6/2001	2,800	1,700	1,300	1,800	1,100	790	1,000	560	130	420	12,000
SW07	SD0004	8/6/2001	400	340	350	600	530	420	510	340	73	250	3,800
SW08	SD0016	8/8/2001	3,500	2,600	2,300	4,900	3,500	2,400	2,900	1,800	450	1,300	26,000
SW08	SD0178	11/7/2002	2,400	2,300	2,400	4,800	3,900	2,200	3,300	1,900	390	1,200	25,000
SW08	--	--	2,950	2,450	2,350	4,850	3,700	2,300	3,100	1,850	420	1,250	25,500
SW09	SD0007	8/6/2001	2,000	1,800	1,600	3,800	2,200	1,500	2,100	1,100	290	750	17,000
SW10	SD0008	8/6/2001	4,000	3,500	1,200	1,500	1,600	1,200	1,600	790	200	590	16,000
SW11	SD0048	8/13/2001	780	750	570	1,100	1,200	940	1,100	770	150	600	8,000
SW12	SD0010	8/7/2001	320	290	240	520	380	370	380	260	47	210	3,000
SW14	SD0024	8/10/2001	560	790	630	1,300	1,200	1,100	1,300	760	150	570	8,400
SW15	SD0023	8/10/2001	980	800	730	1,200	1,000	770	980	620	120	500	7,700
SW16	SD0025	8/10/2001	260	720	210	400	1,100	790	1,000	600	130	500	5,700
SW17	SD0047	8/13/2001	920	960	840	1,600	1,400	1,200	1,500	1,000	180	730	10,000
SW18	SD0046	8/13/2001	880	790	640	1,300	1,100	980	1,100	670	130	550	8,100
SW19	SD0011	8/7/2001	94	110	85	170	140	130	140	120	21	110	1,100
SW20	SD0059	8/15/2001	930	1,200	760	1,800	1,500	1,200	1,400	970	200	770	11,000
SW21	SD0019	8/9/2001	580	850	650	1,400	1,600	1,100	1,500	990	210	780	9,700
SW24	SD0015	8/8/2001	7,100	3,100	6,300	11,000	7,000	7,300	8,800	3,700	1,100	2,800	58,000
SW24	SD0173	11/6/2002	3,600	9,800	2,700	4,700	7,300	5,500	7,200	2,800	750	1,700	46,000
SW24	--	--	5,350	6,450	4,500	7,850	7,150	6,400	8,000	3,250	925	2,250	52,000
SW25	SD0057	8/15/2001	750	940	710	1,300	2,000	1,600	2,000	1,100	240	800	11,000
SW25	SD0174	11/6/2002	400	460	410	720	970	670	850	430	84	290	5,300
SW25	--	--	575	700	560	1,010	1,485	1,135	1,425	765	162	545	8,150
SW26	SD0014	8/8/2001	120	120	120	270	200	200	210	150	30	130	1,600
SW27	SD0045	8/13/2001	1,700	1,400	1,100	2,000	1,300	1,200	1,400	850	160	650	12,000
SW28	SD0029	8/11/2001	1,300	1,400	1,900	4,300	2,900	2,100	3,100	1,700	330	1,100	20,000
SW28	SD0177	11/7/2002	1,400	1,600	970	2,000	2,300	1,500	2,000	1,200	230	740	14,000
SW28	--	--	1,350	1,500	1,435	3,150	2,600	1,800	2,550	1,450	280	920	17,000
SW29	SD0110	9/9/2002	460	510	360	580	660	510	690	400	75	310	4,600
SW30	SD0135	9/14/2002	410	430	380	820	880	420	700	430	80	350	4,900
SW31	SD0122	9/11/2002	78	72	69	170	250	120	200	120	20	95	1,200
SW32	SD0108	9/9/2002	76	99	66	110	100	85	110	86	***7.5***	82	820
SW33	SD0118	9/11/2002	88	110	62	140	150	75	130	120	18	110	1,000
SW34	SD0117	9/11/2002	110	150	87	190	240	110	190	150	25	140	1,400
SW36	SD0180	11/7/2002	390	380	340	560	640	410	560	380	65	280	4,000

Table 3.B. Data Summarized By Station (to two significant figures)

Station	Fluoranthene (µg/kg, dw)	Pyrene (µg/kg, dw)	Benz[a]-anthracene (µg/kg, dw)	Chrysene (µg/kg, dw)	Benzo[b]-fluoranthene (µg/kg, dw)	Benzo[k]-fluoranthene (µg/kg, dw)	Benzo[a]-pyrene (µg/kg, dw)	Indeno-[1,2,3-cd]-pyrene (µg/kg, dw)	Dibenz[a,h]-anthracene (µg/kg, dw)	Benzo[ghi]-perylene (µg/kg, dw)	Total HPAH (µg/kg, dw)
NA01	430	460	500	960	990	740	1,000	750	150	540	6,600
NA02	240	250	230	390	340	310	440	310	61	220	2,800
NA03	470	480	470	820	850	730	910	700	130	530	6,100
NA04	210	210	220	470	560	390	510	450	82	360	3,500
NA05	200	210	190	370	360	340	400	340	70	320	2,800
NA06	300	350	270	510	610	430	550	410	81	330	3,800
NA07	2,400	2,400	1,200	1,500	2,200	1,400	2,100	1,300	310	990	16,000
NA08	250	380	220	440	520	390	470	410	78	360	3,500
NA09	200	260	180	320	400	310	380	360	64	320	2,800
NA10	110	160	96	190	250	220	270	240	43	220	1,800
NA11	240	260	200	370	360	310	400	300	56	260	2,800
NA12	180	180	150	270	250	220	260	210	44	190	2,000
NA13	150	180	130	240	280	190	250	200	35	170	1,800
NA14	110	110	86	190	130	120	140	120	20	100	1,100
NA15	220	260	210	390	500	380	500	420	80	370	3,300
NA16	250	290	200	320	510	350	490	420	76	340	3,200
NA17	260	430	170	280	430	340	400	320	64	270	3,000
NA18	170	190	150	280	350	280	360	300	59	270	2,400
NA20	310	420	210	320	420	330	390	260	57	230	2,900
NA21	230	270	160	270	260	250	260	190	33	170	2,100
NA23	280	330	240	450	480	390	540	370	65	300	3,400
NA24	150	160	130	270	330	280	330	240	41	200	2,100
NA25	86	120	73	130	140	120	150	110	17	110	1,100
NA26	65	86	51	110	150	72	120	97	14	88	850
NA27	240	280	200	350	410	300	430	290	47	230	2,800
NA28	290	360	240	400	490	370	530	360	61	290	3,400
NA29	130	170	110	250	350	170	280	220	38	190	1,900
NA30	81	110	50	120	190	86	140	130	18	110	1,000
NA31	44	66	35	54	71	58	75	62	5	58	530
SW01	790	1,100	560	920	1,100	790	1,100	700	140	540	7,500
SW02	2,800	3,200	1,100	1,500	1,500	1,100	1,500	850	180	650	15,000
SW03	620	590	510	830	1,000	780	1,100	680	140	540	6,800
SW05	2,300	2,200	910	1,500	1,500	1,200	1,500	790	200	580	13,000
SW06	2,800	1,700	1,300	1,800	1,100	790	1,000	560	130	420	12,000
SW07	400	340	350	600	530	420	510	340	73	250	3,800
SW08	3,000	2,500	2,400	4,900	3,700	2,300	3,100	1,900	420	1,300	26,000
SW09	2,000	1,800	1,600	3,800	2,200	1,500	2,100	1,100	290	750	17,000
SW10	4,000	3,500	1,200	1,500	1,600	1,200	1,600	790	200	590	16,000
SW11	780	750	570	1,100	1,200	940	1,100	770	150	600	8,000
SW12	320	290	240	520	380	370	380	260	47	210	3,000
SW14	560	790	630	1,300	1,200	1,100	1,300	760	150	570	8,400
SW15	980	800	730	1,200	1,000	770	980	620	120	500	7,700
SW16	260	720	210	400	1,100	790	1,000	600	130	500	5,700
SW17	920	960	840	1,600	1,400	1,200	1,500	1,000	180	730	10,000
SW18	880	790	640	1,300	1,100	980	1,100	670	130	550	8,100
SW19	94	110	85	170	140	130	140	120	21	110	1,100
SW20	930	1,200	760	1,800	1,500	1,200	1,400	970	200	770	11,000
SW21	580	850	650	1,400	1,600	1,100	1,500	990	210	780	9,700
SW24	5,400	6,500	4,500	7,900	7,200	6,400	8,000	3,300	930	2,300	52,000
SW25	580	700	560	1,000	1,500	1,100	1,400	770	160	550	8,200
SW26	120	120	120	270	200	200	210	150	30	130	1,600
SW27	1,700	1,400	1,100	2,000	1,300	1,200	1,400	850	160	650	12,000
SW28	1,400	1,500	1,400	3,200	2,600	1,800	2,600	1,500	280	920	17,000
SW29	460	510	360	580	660	510	690	400	75	310	4,600
SW30	410	430	380	820	880	420	700	430	80	350	4,900
SW31	78	72	69	170	250	120	200	120	20	95	1,200
SW32	76	99	66	110	100	85	110	86	8	82	820
SW33	88	110	62	140	150	75	130	120	18	110	1,000
SW34	110	150	87	190	240	110	190	150	25	140	1,400
SW36	390	380	340	560	640	410	560	380	65	280	4,000

Notes:

[1] Raw data in Table 3.A. is referenced from 'Table B1-5 Polycyclic aromatic hydrocarbon results for surface sediment samples' and 'Table B1-6 Alkylated polycyclic aromatic hydrocarbon results for surface sediment samples' in Exponent, 2003.

[2] All surface sediment samples were collected from a depth interval of 0–2 cm.

[3] Field splits and duplicates are averaged. If field splits are taken from a duplicate sample, the field split is averaged, then the duplicates are averaged.

[4] Non-detect concentrations are represented as half of the detection limit.

[5] In Table 3.B. the data is summarized by station and represented to two significant figures.

[6] HPAH = High Molecular Weight Polycyclic Aromatic Hydrocarbon.

[7] Total HPAH is computed as the sum of the concentrations of fluoranthene, pyrene, benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenz[a,h]anthracene, and benzo[ghi]perylene. Total HPAH is calculated to two significant figures. The field splits and duplicate averages are calculated based on values with two significant figures.

[8] µg/kg, dw = micrograms per kilogram, dry weight.

Table 4. Measured and Estimated Concentration of AVS and SEM for Copper in Surface Sediment

Table 4.A. Raw Data (with field split and duplicate averaging)

Station	Sample Number	Date	AVS	SEM for Copper
NA01	SD0030	8/11/2001	93	220
NA01	SD0031	8/11/2001	89	210
NA01	--	--	91	215
NA02	SD0033	8/11/2001	24	160
NA03	SD0032	8/11/2001	120	220
NA04	SD0035	8/11/2001	23	240
NA05	SD0044	8/13/2001	4.5	150
NA06	SD0020	8/9/2001	210	320
NA07	SD0017	8/8/2001	110	260
NA07	SD0018	8/8/2001	83	250
NA07	--	--	97	255
NA08	SD0055	8/14/2001	54	260
NA09	SD0054	8/14/2001	620	260
NA10	SD0056	8/14/2001	10	130
NA11	SD0021	8/9/2001	18	180
NA12	SD0027	8/10/2001	18	150
NA13	SD0036	8/11/2001	98	170
NA14	SD0051	8/14/2001	59	110
NA15	SD0037	8/12/2001	27	260
NA16	SD0038	8/12/2001	120	250
NA17	SD0039	8/12/2001	280	530
NA18	SD0053	8/14/2001	27	230
NA20	SD0028	8/10/2001	120	90
NA21	SD0050	8/14/2001	96	140
SW01	SD0001	8/6/2001	57	350
SW02	SD0005	8/6/2001	320	340
SW02	SD0006	8/6/2001	140	380
SW02	--	--	230	360
SW03	SD0009	8/7/2001	150	94
SW05	SD0003	8/6/2001	190	200
SW06	SD0002	8/6/2001	160	150
SW07	SD0004	8/6/2001	100	150
SW08	SD0016	8/8/2001	1,600	870
SW09	SD0007	8/6/2001	160	430
SW10	SD0008	8/6/2001	610	140
SW11	SD0048	8/13/2001	210	180
SW12	SD0010	8/7/2001	18	120
SW14	SD0024	8/10/2001	470	310
SW15	SD0023	8/10/2001	480	230
SW16	SD0025	8/10/2001	280	500
SW17	SD0047	8/13/2001	42	330
SW18	SD0046	8/13/2001	23	230
SW19	SD0011	8/7/2001	50	91
SW20	SD0059	8/15/2001	370	260
SW21	SD0019	8/9/2001	18	250
SW24	SD0015	8/8/2001	60	240
SW25	SD0057	8/15/2001	95	250
SW26	SD0014	8/8/2001	2.6	110
SW27	SD0045	8/13/2001	190	210
SW28	SD0029	8/11/2001	450	270

Table 4.B. Data Summarized By Station

Station	Measured AVS (mg/kg, dw)	Measured SEM for Copper (mg/kg, dw)	Estimated AVS (mg/kg, dw)	Estimation Methodology
NA01	91	215	-	Not applicable
NA02	24	160	-	Not applicable
NA03	120	220	-	Not applicable
NA04	23	240	-	Not applicable
NA05	4.5	150	-	Not applicable
NA06	210	320	-	Not applicable
NA07	96.5	255	-	Not applicable
NA08	54	260	-	Not applicable
NA09	620	260	-	Not applicable
NA10	10	130	-	Not applicable
NA11	18	180	-	Not applicable
NA12	18	150	-	Not applicable
NA13	98	170	-	Not applicable
NA14	59	110	-	Not applicable
NA15	27	260	-	Not applicable
NA16	120	250	-	Not applicable
NA17	280	530	-	Not applicable
NA18	27	230	-	Not applicable
NA20	120	90	-	Not applicable
NA21	96	140	-	Not applicable
NA23	NR	NR	116.5	Value represents average of adjacent polygons NA04 and NA06
NA24	NR	NR	71.5	Value represents average of adjacent polygons NA03 and NA04
NA25	NR	NR	84.3	Value represents average of adjacent polygons NA13, NA14, and NA21
NA26	NR	NR	24.0	Value represents average of adjacent polygons NA02
NA27	NR	NR	78.7	Value represents average of adjacent polygons NA04, NA06, NA07, NA08, and NA10
NA28	NR	NR	14.7	Value represents average of adjacent polygons NA04, NA05, NA10, NA11, and NA12
NA29	NR	NR	52.9	Value represents average of adjacent polygons NA02, NA03, NA05, NA12, and NA13
NA30	NR	NR	78.5	Value represents average of adjacent polygons NA13 and NA14
NA31	NR	NR	96.0	Value represents average of adjacent polygons NA21
SW01	57	350	-	Not applicable
SW02	230	360	-	Not applicable
SW03	150	94	-	Not applicable
SW05	190	200	-	Not applicable
SW06	160	150	-	Not applicable
SW07	100	150	-	Not applicable
SW08	1600	870	-	Not applicable
SW09	160	430	-	Not applicable
SW10	610	140	-	Not applicable
SW11	210	180	-	Not applicable
SW12	18	120	-	Not applicable
SW14	470	310	-	Not applicable
SW15	480	230	-	Not applicable
SW16	280	500	-	Not applicable
SW17	42	330	-	Not applicable
SW18	23	230	-	Not applicable
SW19	50	91	-	Not applicable
SW20	370	260	-	Not applicable
SW21	18	250	-	Not applicable
SW24	60	240	-	Not applicable
SW25	95	250	-	Not applicable
SW26	2.6	110	-	Not applicable
SW27	190	210	-	Not applicable
SW28	450	270	-	Not applicable
SW29	NR	NR	145.7	Value represents average of adjacent polygons SW01, SW02, and SW03
SW30	NR	NR	89.3	Value represents average of adjacent polygons SW03, SW07, and SW12
SW31	NR	NR	80.3	Value represents average of adjacent polygons NA01, SW18, SW25, SW26, and SW27
SW32	NR	NR	59.0	Value represents average of adjacent polygons SW07 and SW12
SW33	NR	NR	34.0	Value represents average of adjacent polygons SW12 and SW19
SW34	NR	NR	41.9	Value represents average of adjacent polygons NA01, NA02, SW19, and SW26
SW36	NR	NR	130.6	Value represents average of adjacent polygons SW11, SW12, SW15, SW18, SW19, and SW26

Notes:

[1] Raw data in Table 4.A. is referenced from 'Table B1-4 Acid-volatile sulfide and simultaneously extracted metal results for surface sediment samples' in Exponent, 2003.

[2] All surface sediment samples were collected from a depth interval of 0–2 cm.

[3] Field splits and duplicates are averaged. If field splits are taken from a duplicate sample, the field split is averaged, then the duplicates are averaged.

[4] In Table 4.B. the data is summarized by station and represented to two significant figures.

[5] AVS = Acid-Volatile Sulfide.

[6] SEM = Simultaneously Extracted Metals.

[7] mg/kg, dw = milligrams per kilogram, dry weight.

[8] NR = Not Reported.

Table 5. Measured TOC Content in Surface Sediment

Table 5.A. Raw Data (with field split and duplicate averaging)			
Station	Sample Number	Date	TOC (%, dw)
NA01	SD0030	8/11/2001	2.1
NA01	SD0031	8/11/2001	2.15
NA01	--	--	2.125
NA01	SD0136	9/14/2002	2.24
NA01	SD0179	11/7/2002	2.2
NA01	--	--	2.19
NA02	SD0033	8/11/2001	2
NA03	SD0032	8/11/2001	2.33
NA04	SD0035	8/11/2001	2.04
NA04	SD0096	9/8/2002	NR
NA04	--	--	2.04
NA05	SD0044	8/13/2001	1.6
NA06	SD0020	8/9/2001	2.31
NA06	SD0101	9/8/2002	2.06
NA06	SD0181	11/7/2002	2.04
NA06	--	--	2.14
NA07	SD0017	8/8/2001	1.98
NA07	SD0018	8/8/2001	2.05
NA07	--	--	2.015
NA08	SD0055	8/14/2001	2.18
NA09	SD0054	8/14/2001	2.26
NA10	SD0056	8/14/2001	1.18
NA11	SD0021	8/9/2001	1.69
NA11	SD0098	9/8/2002	NR
NA11	--	--	1.69
NA12	SD0027	8/10/2001	1.48
NA13	SD0036	8/11/2001	2.1
NA13	SD0120	9/11/2002	1.87
NA13	SD0183	11/8/2002	1.8
NA13	--	--	1.9
NA14	SD0051	8/14/2001	1.82
NA15	SD0037	8/12/2001	1.95
NA16	SD0038	8/12/2001	1.88
NA16	SD0099	9/8/2002	2.04
NA16	SD0100	9/8/2002	1.96
NA16	--	--	2
NA16	SD0182	11/7/2002	2.13
NA16	--	--	2.00
NA17	SD0039	8/12/2001	2.33
NA17	SD0097	9/8/2002	2.24
NA17	SD0184	11/8/2002	1.52
NA17	--	--	2.03
NA18	SD0053	8/14/2001	2.04
NA20	SD0028	8/10/2001	1.42
NA21	SD0050	8/14/2001	2.15
NA23	SD0095	9/8/2002	2.21
NA24	SD0094	9/8/2002	2.12
NA25	SD0106	9/9/2002	1.24
NA26	SD0116	9/11/2002	1.22
NA27	SD0301	10/2/2002	2.01
NA28	SD0300	10/2/2002	1.87
NA29	SD0119	9/11/2002	1.7
NA30	SD0115	9/11/2002	1.38
NA31	SD0105	9/9/2002	0.92
SW01	SD0001	8/6/2001	2.25
SW01	SD0137	9/14/2002	2.31
SW01	SD0169	11/6/2002	2.18
SW01	SD0171	11/6/2002	2.14
SW01	--	--	2.16
SW01	--	--	2.24
SW02	SD0005	8/6/2001	4.27
SW02	SD0006	8/6/2001	3.9
SW02	--	--	4.085
SW02	SD0138	9/14/2002	6.42
SW02	SD0172	11/6/2002	7.43
SW02	--	--	6.925
SW03	SD0009	8/7/2001	3.11
SW05	SD0003	8/6/2001	1.55
SW06	SD0002	8/6/2001	1.82
SW07	SD0004	8/6/2001	1.73
SW08	SD0016	8/8/2001	3.35
SW08	SD0133	9/13/2002	3.77
SW08	SD0178	11/7/2002	4.29
SW08	--	--	3.80
SW09	SD0007	8/6/2001	1.94
SW10	SD0008	8/6/2001	1.21
SW11	SD0048	8/13/2001	1.81
SW12	SD0010	8/7/2001	1.58
SW12	SD0111	9/10/2002	1.35
SW12	--	--	1.47
SW14	SD0024	8/10/2001	2.13
SW15	SD0023	8/10/2001	2.31
SW16	SD0025	8/10/2001	2.24
SW17	SD0047	8/13/2001	2.53
SW18	SD0046	8/13/2001	2.19
SW19	SD0011	8/7/2001	1.15
SW20	SD0059	8/15/2001	2.14
SW21	SD0019	8/9/2001	2.1
SW24	SD0015	8/8/2001	1.61
SW24	SD0113	9/10/2002	2.06
SW24	SD0173	11/6/2002	1.59
SW24	--	--	1.75
SW25	SD0057	8/15/2001	2.03
SW25	SD0114	9/10/2002	2.36
SW25	SD0174	11/6/2002	2.06
SW25	--	--	2.15
SW26	SD0014	8/8/2001	1.31
SW27	SD0045	8/13/2001	2.08
SW28	SD0029	8/11/2001	2.53
SW28	SD0121	9/11/2002	2.6
SW28	SD0177	11/7/2002	2.42
SW28	--	--	2.52
SW29	SD0110	9/9/2002	1.34
SW30	SD0135	9/14/2002	2.05
SW31	SD0122	9/11/2002	0.66
SW32	SD0108	9/9/2002	1.56
SW33	SD0118	9/11/2002	2.09
SW34	SD0117	9/11/2002	1.68
SW36	SD0180	11/7/2002	2.23

Table 5.B. Data Summarized By Station	
Station	TOC (%, dw)
NA01	2.19
NA02	2
NA03	2.33
NA04	2.04
NA05	1.6
NA06	2.14
NA07	2.015
NA08	2.18
NA09	2.26
NA10	1.18
NA11	1.69
NA12	1.48
NA13	1.92
NA14	1.82
NA15	1.95
NA16	2.00
NA17	2.03
NA18	2.04
NA20	1.42
NA21	2.15
NA23	2.21
NA24	2.12
NA25	1.24
NA26	1.22
NA27	2.01
NA28	1.87
NA29	1.7
NA30	1.38
NA31	0.92
SW01	2.24
SW02	4.085
SW03	3.11
SW05	1.55
SW06	1.82
SW07	1.73
SW08	3.80
SW09	1.94
SW10	1.21
SW11	1.81
SW12	1.465
SW14	2.13
SW15	2.31
SW16	2.24
SW17	2.53
SW18	2.19
SW19	1.15
SW20	2.14
SW21	2.1
SW24	1.75
SW25	2.15
SW26	1.31
SW27	2.08
SW28	2.52
SW29	1.34
SW30	2.05
SW31	0.66
SW32	1.56
SW33	2.09
SW34	1.68
SW36	2.23

Notes:

[1] Raw data in Table 5.A. is referenced from 'Table B1-1. Conventional results for surface sediment samples' in Exponent, 2003.

[2] All surface sediment samples were collected from a depth interval of 0–2 cm.

[3] Field splits and duplicates are averaged. If field splits are taken from a duplicate sample, the field split is averaged, then the duplicates are averaged.

[4] In Table 5.B. the data is summarized by station.

[5] TOC = Total Organic Carbon.

[6] %, dw = percent, dry weight.

Table 6. Measured Concentration of Copper, Mercury, and Tributyltin in Surface Sediment

Table 6.A. Raw Data (with field split and duplicate averaging)

Station	Sample Number	Date	Copper (mg/kg, dw)	Mercury (mg/kg, dw)	Tributyltin (µg/kg, dw)
NA01	SD0030	8/11/2001	210	0.95	210
NA01	SD0031	8/11/2001	220	1.1	220
NA01	--	--	215	1.025	215
NA01	SD0136	9/14/2002	290	1.1	99
NA01	--	--	252.5	1.0625	157
NA02	SD0033	8/11/2001	170	0.7	82
NA03	SD0032	8/11/2001	220	1.1	180
NA04	SD0035	8/11/2001	260	1.100	300
NA05	SD0044	8/13/2001	170	0.61	110
NA06	SD0020	8/9/2001	410	3.2	180
NA06	SD0101	9/8/2002	380	1.5	270
NA06	--	--	395	2.35	225
NA07	SD0017	8/8/2001	210	1.5	130
NA07	SD0018	8/8/2001	240	1.4	91
NA07	--	--	225	1.45	110.5
NA08	SD0055	8/14/2001	270	0.82	110
NA09	SD0054	8/14/2001	260	1.2	120
NA10	SD0056	8/14/2001	160	0.58	91
NA11	SD0021	8/9/2001	180	0.85	38
NA12	SD0027	8/10/2001	150	0.62	80
NA13	SD0036	8/11/2001	170	0.69	69
NA13	SD0120	9/11/2002	200	0.6	67
NA13	--	--	185	0.645	68
NA14	SD0051	8/14/2001	130	0.55	45
NA15	SD0037	8/12/2001	250	0.98	670
NA16	SD0038	8/12/2001	260	1.1	190
NA16	SD0099	9/8/2002	250	0.97	170
NA16	SD0100	9/8/2002	240	1.2	150
NA16	--	--	245	1.085	160
NA16	--	--	252.5	1.0925	175
NA17	SD0039	8/12/2001	660	0.93	1000
NA17	SD0097	9/8/2002	360	0.76	1700
NA17	--	--	510	0.845	1350
NA18	SD0053	8/14/2001	230	0.79	210
NA20	SD0028	8/10/2001	96	0.24	280
NA21	SD0050	8/14/2001	150	0.51	410
NA23	SD0095	9/8/2002	350	1.1	120
NA24	SD0094	9/8/2002	200	0.9	59
NA25	SD0106	9/9/2002	85	0.42	25
NA26	SD0116	9/11/2002	80	0.48	37
NA27	SD0301	10/2/2002	390	1.2	100
NA28	SD0300	10/2/2002	290	0.89	90
NA29	SD0119	9/11/2002	110	0.55	58
NA30	SD0115	9/11/2002	140	0.71	22
NA31	SD0105	9/9/2002	71	0.35	20
SW01	SD0001	8/6/2001	620	1.4	520
SW01	SD0137	9/14/2002	500	1.5	380
SW01	--	--	560	1.45	450
SW02	SD0005	37109	570	3.9	220
SW02	SD0006	8/6/2001	530	3.1	310
SW02	--	--	550	3.5	265
SW02	SD0138	9/14/2002	610	5.4	69
SW02	--	--	580	4.45	167
SW03	SD0009	8/7/2001	190	1.2	53
SW05	SD0003	8/6/2001	230	0.96	170
SW06	SD0002	8/6/2001	170	0.75	100
SW07	SD0004	8/6/2001	150	0.52	44
SW08	SD0016	8/8/2001	1,000	2.5	1900
SW08	SD0133	9/13/2002	840	2	1,800
SW08	--	--	920	2.25	1850
SW09	SD0007	8/6/2001	660	0.96	910
SW10	SD0008	8/6/2001	160	0.58	250
SW11	SD0048	8/13/2001	170	0.75	140
SW12	SD0010	8/7/2001	140	0.55	31
SW12	SD0111	9/10/2002	99	0.5	41
SW12	--	--	119.5	0.525	36
SW14	SD0024	8/10/2001	280	1	450
SW15	SD0023	8/10/2001	230	0.9	170
SW16	SD0025	8/10/2001	430	1	1100
SW17	SD0047	8/13/2001	270	0.98	440
SW18	SD0046	8/13/2001	220	0.75	130
SW19	SD0011	8/7/2001	110	2.1	37
SW20	SD0059	8/15/2001	290	0.99	130
SW21	SD0019	8/9/2001	260	1.4	170
SW24	SD0015	8/8/2001	260	1.6	170
SW24	SD0113	9/10/2002	340	2.2	160
SW24	--	--	300	1.9	165
SW25	SD0057	8/15/2001	230	0.8	370
SW25	SD0114	9/10/2002	230	0.75	91
SW25	--	--	230	0.775	230.5
SW26	SD0014	8/8/2001	120	0.43	49
SW27	SD0045	8/13/2001	210	0.68	250
SW28	SD0029	8/11/2001	270	0.98	180
SW28	SD0121	9/11/2002	260	0.77	120
SW28	--	--	265	0.875	150
SW29	SD0110	9/9/2002	220	0.93	190
SW30	SD0135	9/14/2002	240	1.1	200
SW31	SD0122	9/11/2002	54	0.23	36
SW32	SD0108	9/9/2002	92	0.51	30
SW33	SD0118	9/11/2002	100	0.53	19
SW34	SD0117	9/11/2002	320	0.75	38
SW36	SD0180	11/7/2002	240	0.75	49

Table 6.B. Data Summarized By Station

Station	Copper (mg/kg, dw)	Mercury (mg/kg, dw)	Tributyltin (µg/kg, dw)
NA01	252.5	1.06	157
NA02	170	0.70	82
NA03	220	1.10	180
NA04	260	1.10	300
NA05	170	0.61	110
NA06	395	2.35	225
NA07	225	1.45	110.5
NA08	270	0.82	110
NA09	260	1.20	120
NA10	160	0.58	91
NA11	180	0.85	38
NA12	150	0.62	80
NA13	185	0.65	68
NA14	130	0.55	45
NA15	250	0.98	670
NA16	252.5	1.09	175
NA17	510	0.85	1350
NA18	230	0.79	210
NA20	96	0.24	280
NA21	150	0.51	410
NA23	350	1.10	120
NA24	200	0.90	59
NA25	85	0.42	25
NA26	80	0.48	37
NA27	390	1.20	100
NA28	290	0.89	90
NA29	110	0.55	58
NA30	140	0.71	22
NA31	71	0.35	20
SW01	560	1.45	450
SW02	580	4.45	167
SW03	190	1.20	53
SW05	230	0.96	170
SW06	170	0.75	100
SW07	150	0.52	44
SW08	920	2.25	1850
SW09	660	0.96	910
SW10	160	0.58	250
SW11	170	0.75	140
SW12	119.5	0.53	36
SW14	280	1.00	450
SW15	230	0.90	170
SW16	430	1.00	1100
SW17	270	0.98	440
SW18	220	0.75	130
SW19	110	2.10	37
SW20	290	0.99	130
SW21	260	1.40	170
SW24	300	1.90	165
SW25	230	0.78	230.5
SW26	120	0.43	49
SW27	210	0.68	250
SW28	265	0.88	150
SW29	220	0.93	190
SW30	240	1.10	200
SW31	54	0.23	36
SW32	92	0.51	30
SW33	100	0.53	19
SW34	320	0.75	38
SW36	240	0.75	49

Notes:

[1] Raw data in Table 6.A. is referenced from 'Table B1-3. Metal and butyltin results for surface sediment samples' in Exponent, 2003.

[2] All surface sediment samples were collected from a depth interval of 0–2 cm.

[3] Field splits and duplicates are averaged.

[4] In Table 6.B. the data is summarized by station.

[5] mg/kg, dw = milligrams per kilogram, dry weight.

[6] µg/kg, dw = micrograms per kilogram, dry weight.

Table 7. Measured Concentration of Copper and Tributyltin in Porewater

Table 7.A. Raw Data (with field split and duplicate averaging)

Station	Sample Number	Date	Copper (µg/L)	Tributyltin (µg/L)
NA01	PW0017W	9/14/2002	14	***0.005***
NA06	PW0004W	9/8/2002	33	0.1
NA13	PW0009W	9/11/2002	14	0.022
NA16	PW0002W	9/8/2002	22	0.06
NA16	PW0003W	9/8/2002	22	0.049
NA16	--	--	22	0.05
NA17	PW0001W	9/8/2002	23	0.077
SW01	PW0018W	9/14/2002	17	0.037
SW02	PW0019W	9/14/2002	390	0.059
SW08	PW0015W	9/13/2002	33	0.49
SW12	PW0005W	9/10/2002	17	0.022
SW24	PW0007W	9/10/2002	25	0.074
SW25	PW0008W	9/10/2002	28	0.063
SW28	PW0010W	9/11/2002	19	***0.016***

Table 7.B. Data Summarized By Station

Station	Copper (µg/L)	Tributyltin (µg/L)
NA01	14	0.005
NA02	NR	NR
NA03	NR	NR
NA04	NR	NR
NA05	NR	NR
NA06	33	0.1
NA07	NR	NR
NA08	NR	NR
NA09	NR	NR
NA10	NR	NR
NA11	NR	NR
NA12	NR	NR
NA13	14	0.022
NA14	NR	NR
NA15	NR	NR
NA16	22	0.05
NA17	23	0.077
NA18	NR	NR
NA20	NR	NR
NA21	NR	NR
NA23	NR	NR
NA24	NR	NR
NA25	NR	NR
NA26	NR	NR
NA27	NR	NR
NA28	NR	NR
NA29	NR	NR
NA30	NR	NR
NA31	NR	NR
SW01	17	0.037
SW02	390	0.059
SW03	NR	NR
SW05	NR	NR
SW06	NR	NR
SW07	NR	NR
SW08	33	0.49
SW09	NR	NR
SW10	NR	NR
SW11	NR	NR
SW12	17	0.022
SW14	NR	NR
SW15	NR	NR
SW16	NR	NR
SW17	NR	NR
SW18	NR	NR
SW19	NR	NR
SW20	NR	NR
SW21	NR	NR
SW24	25	0.074
SW25	28	0.063
SW26	NR	NR
SW27	NR	NR
SW28	19	0.016
SW29	NR	NR
SW30	NR	NR
SW31	NR	NR
SW32	NR	NR
SW33	NR	NR
SW34	NR	NR
SW36	NR	NR

Notes:

[1] Data is referenced from 'Table D-1. Metal and butyltin results for porewater samples' in Exponent, 2003.

[2] Sediment for porewater extraction was collected from a depth interval of 0–2 cm.

[3] Field splits and duplicates are averaged.

[4] Bold and italicized values indicate concentrations are below detection. Non-detect concentrations are represented as half of the detection limit.

[5] µg/L = micrograms per liter.

[6] NR = Not Reported.

Table 8. Measured Concentration of HPAHs in Porewater

Table 8.A. Raw Data (with field split and duplicate averaging)													
Station	Sample Number	Date	Fluoranthene (µg/L)	Pyrene (µg/L)	Benz[a]-anthracene (µg/L)	Chrysene (µg/L)	Benzo[b]-fluoranthene (µg/L)	Benzo[k]-fluoranthene (µg/L)	Benzo[a]-pyrene (µg/L)	Indeno-[1,2,3-cd]-pyrene (µg/L)	Dibenz[a,h]-anthracene (µg/L)	Benzo[ghi]-perylene (µg/L)	Total HPAH (µg/L)
NA01	PW0033W	11/7/2002	0.048	0.068	0.021	0.026	0.065	0.049	0.039	***0.010***	***0.010***	***0.010***	0.35
NA06	PW0034W	11/7/2002	0.028	0.033	***0.011***	***0.011***	0.035	0.031	0.023	***0.011***	***0.011***	***0.011***	0.20
NA13	PW0036W	11/8/2002	0.048	0.052	***0.010***	***0.010***	***0.010***	**0.010**	***0.010***	***0.010***	***0.010***	***0.010***	0.18
NA16	PW0035W	11/7/2002	***0.011***	***0.011***	***0.011***	***0.011***	0.031	**0.011**	***0.011***	***0.011***	***0.011***	***0.011***	0.13
NA17	PW0037W	11/8/2002	0.023	0.025	***0.010***	***0.010***	0.038	0.030	0.021	***0.010***	***0.010***	***0.010***	0.19
SW01	PW0023W	11/6/2002	0.037	0.130	0.023	0.026	0.089	0.070	0.070	0.042	***0.011***	0.032	0.53
SW02	PW0025W	11/6/2002	25.000	21.000	5.900	4.900	4.400	3.000	4.200	1.900	0.350	1.400	72
SW08	PW0032W	11/7/2002	0.260	0.270	0.069	0.100	0.130	0.099	0.090	0.046	***0.010***	0.030	1.1
SW24	PW0027W	11/6/2002	0.069	0.180	0.040	0.066	0.270	0.200	0.250	0.090	***0.011***	0.059	1.2
SW25	PW0028W	11/6/2002	0.066	0.078	0.032	0.031	0.056	0.052	0.043	***0.010***	***0.010***	***0.010***	0.39
SW28	PW0031W	11/7/2002	0.044	0.090	***0.010***	***0.010***	0.052	0.029	0.033	***0.010***	***0.010***	***0.010***	0.30

Table 8.B. Data Summarized By Station											
Station	Fluoranthene (µg/L)	Pyrene (µg/L)	Benz[a]-anthracene (µg/L)	Chrysene (µg/L)	Benzo[b]-fluoranthene (µg/L)	Benzo[k]-fluoranthene (µg/L)	Benzo[a]-pyrene (µg/L)	Indeno-[1,2,3-cd]-pyrene (µg/L)	Dibenz[a,h]-anthracene (µg/L)	Benzo[ghi]-perylene (µg/L)	Total HPAH (µg/L)
NA01	0.048	0.068	0.021	0.026	0.065	0.049	0.039	0.010	0.010	0.010	0.350
NA02	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA03	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA04	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA05	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA06	0.028	0.033	0.011	0.011	0.035	0.031	0.023	0.011	0.011	0.011	0.200
NA07	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA08	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA09	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA10	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA11	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA12	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA13	0.048	0.052	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.180
NA14	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA15	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA16	0.011	0.011	0.011	0.011	0.031	0.011	0.011	0.011	0.011	0.011	0.130
NA17	0.023	0.025	0.010	0.010	0.038	0.030	0.021	0.010	0.010	0.010	0.190
NA18	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA20	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA21	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA23	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA24	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA25	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA26	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA27	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA28	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA29	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA30	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA31	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW01	0.037	0.130	0.023	0.026	0.089	0.070	0.070	0.042	0.011	0.032	0.530
SW02	25.00	21.00	5.900	4.900	4.400	3.000	4.200	1.900	0.350	1.400	72.00
SW03	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW05	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW06	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW07	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW08	0.260	0.270	0.069	0.100	0.130	0.099	0.090	0.046	0.010	0.030	1.100
SW09	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW10	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW11	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW12	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW14	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW15	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW16	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW17	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW18	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW19	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW20	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW21	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW24	0.069	0.180	0.040	0.066	0.270	0.200	0.250	0.090	0.011	0.059	1.200
SW25	0.066	0.078	0.032	0.031	0.056	0.052	0.043	0.010	0.010	0.010	0.390
SW26	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW27	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW28	0.044	0.090	0.010	0.010	0.052	0.029	0.033	0.010	0.010	0.010	0.300
SW29	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW30	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW31	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW32	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW33	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW34	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW36	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Notes:

1 Data is referenced from 'Table D-2. Polycyclic aromatic hydrocarbon and total organic carbon results for porewater samples' in Exponent, 2003.

2 Sediment for porewater extraction was collected from a depth interval of 0–2 cm.

3 HPAH = High Molecular Weight Polycyclic Aromatic Hydrocarbon.

4 Total HPAH is computed as the sum of the concentrations of fluoranthene, pyrene, benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenz[a,h]anthracene, and benzo[ghi]perylene.

5 Bold and italicized values indicate concentrations are below detection. Non-detect concentrations are represented as half of the detection limit.

6 Field splits and duplicates are averaged.

7 NR = Not Reported.

8 µg/L = micrograms per liter.

Table 9. Measured Concentration of PCB Homologs in Porewater

Table 9.A. Raw Data (with field split and duplicate averaging)

Station	Sample Number	Date	Monochlorobiphenyl (ng/L)	Dichlorobiphenyl (ng/L)	Trichlorobiphenyl (ng/L)	Tetrachlorobiphenyl (ng/L)	Pentachlorobiphenyl (ng/L)	Hexachlorobiphenyl (ng/L)	Heptachlorobiphenyl (ng/L)	Octachlorobiphenyl (ng/L)	Nonachlorobiphenyl (ng/L)	Decachlorobiphenyl (ng/L)	Total PCB Homologs (ng/L)
NA01	PW0017W	9/14/2002	***0.315***	***0.315***	***0.315***	4.6	21	26	12	2.5	***0.315***	***0.315***	68
NA06	PW0004W	9/8/2002	***0.355***	***0.355***	4.1	40	73	55	20	4.2	1.2	0.85	200
NA13	PW0009W	9/11/2002	***0.395***	***0.395***	***0.395***	1.6	18	21	11	1.6	***0.395***	***0.395***	56
NA16	PW0002W	9/8/2002	***0.305***	***0.305***	***0.305***	9.2	31	35	16	3.7	0.89	0.65	97
NA16	PW0003W	9/8/2002	***0.265***	***0.265***	***0.265***	8.5	29	34	14	3	0.79	0.82	91
NA16	--	--	0.285	0.285	0.285	8.85	30	34.5	15	3.35	0.84	0.735	94
NA17	PW0001W	9/8/2002	***0.44***	***0.44***	***0.44***	13	29	28	10	1.8	***0.44***	***0.44***	84
SW01	PW0018W	9/14/2002	***0.405***	***0.405***	26	160	160	100	40	7.2	1.4	***0.405***	500
SW02	PW0019W	9/14/2002	***0.34***	24	1300	6100	4900	2400	820	170	27	7.6	16000
SW08	PW0015W	9/13/2002	***0.475***	***0.475***	18	110	180	130	56	12	2.2	1	520
SW12	PW0005W	9/10/2002	***0.195***	***0.195***	***0.195***	8	24	29	11	2.4	0.7	0.7	80
SW24	PW0007W	9/10/2002	***0.495***	***0.495***	1.7	80	140	260	150	29	2.4	0.99	670
SW25	PW0008W	9/10/2002	***0.37***	***0.37***	***0.37***	19	48	66	33	5.8	1.4	1.1	180
SW28	PW0010W	9/11/2002	***0.43***	***0.43***	5.5	18	57	130	71	10	1.2	***0.43***	290

Table 9.B. Data Summarized By Station

Station	Monochlorobiphenyl (µg/L)	Dichlorobiphenyl (µg/L)	Trichlorobiphenyl (µg/L)	Tetrachlorobiphenyl (µg/L)	Pentachlorobiphenyl (µg/L)	Hexachlorobiphenyl (µg/L)	Heptachlorobiphenyl (µg/L)	Octachlorobiphenyl (µg/L)	Nonachlorobiphenyl (µg/L)	Decachlorobiphenyl (µg/L)	Total PCB Homologs (µg/L)
NA01	0.0003	0.0003	0.0003	0.0046	0.0210	0.0260	0.0120	0.0025	0.0003	0.0003	0.0680
NA02	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA03	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA04	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA05	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA06	0.0004	0.0004	0.0041	0.0400	0.0730	0.0550	0.0200	0.0042	0.0012	0.0009	0.2000
NA07	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA08	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA09	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA10	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA11	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA12	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA13	0.0004	0.0004	0.0004	0.0016	0.0180	0.0210	0.0110	0.0016	0.0004	0.0004	0.0560
NA14	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA15	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA16	0.0003	0.0003	0.0003	0.0089	0.0300	0.0345	0.0150	0.0034	0.0008	0.0007	0.0940
NA17	0.0004	0.0004	0.0004	0.0130	0.0290	0.0280	0.0100	0.0018	0.0004	0.0004	0.0840
NA18	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA20	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA21	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA23	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA24	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA25	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA26	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA27	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA28	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA29	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA30	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA31	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW01	0.0004	0.0004	0.0260	0.1600	0.1600	0.1000	0.0400	0.0072	0.0014	0.0004	0.5000
SW02	0.0003	0.0240	1.3000	6.1000	4.9000	2.4000	0.8200	0.1700	0.0270	0.0076	16.0000
SW03	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW05	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW06	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW07	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW08	0.0005	0.0005	0.0180	0.1100	0.1800	0.1300	0.0560	0.0120	0.0022	0.0010	0.5200
SW09	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW10	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW11	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW12	0.0002	0.0002	0.0002	0.0080	0.0240	0.0290	0.0110	0.0024	0.0007	0.0007	0.0800
SW14	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW15	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW16	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW17	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW18	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW19	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW20	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW21	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW24	0.0005	0.0005	0.0017	0.0800	0.1400	0.2600	0.1500	0.0290	0.0024	0.0010	0.6700
SW25	0.0004	0.0004	0.0004	0.0190	0.0480	0.0660	0.0330	0.0058	0.0014	0.0011	0.1800
SW26	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW27	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW28	0.0004	0.0004	0.0055	0.0180	0.0570	0.1300	0.0710	0.0100	0.0012	0.0004	0.2900
SW29	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW30	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW31	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW32	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW33	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW34	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW36	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Notes:

[1] Data is referenced from 'Table D-3. PCB homolog results for porewater samples' in Exponent, 2003.

[2] Sediment for porewater extraction was collected from a depth interval of 0–2 cm.

[3] PCB = polychlorinated biphenyl.

[4] Field splits and duplicates are averaged.

[5] Bold and italicized values indicate concentrations that are below the detection limit. Non-detect concentrations are represented as half of the detection limit. These values are used to calculate Total PCB Homologs.

[6] µg/L = micrograms per liter.

[7] NR = Not Reported.

Table 10. Derivation of the Bioaccumulation Factor for Mercury

Notes	1	2	3
Station	Measured Concentration in Tissue (mg/kg, ww)	Pre-remedy SWAC (mg/kg, dw)	BAF ($kg_{sediment, dw}/kg_{tissue, ww}$)
NA19	0.024	0.75	0.032
NA24	0.020		0.027
SW18	0.017		0.023
SW27	0.018		0.024
		Average	0.026

Notes:

[1] Measured concentration in mussel (soft tissue) is referenced from 'Table E-1. Lipid, solids, metal, and butyltin results for tissue samples' in Exponent (2003). Composite samples of benthic mussel tissues with shell removed (*Musculista senhousei*) were collected at two stations inside each shipyard, NASSCO and Southwest Marine.

[2] The pre-remedy surface-area weighted average concentration (SWAC) is referenced from 'Table 32-5 Current and Post-Remedial SWACs' of CRWQCB (2010).

[3] Bioaccumulation Factor (BAF) is calculated as the measured total mercury concentration in tissue divided by the pre-remedy SWAC, as in CRWQCB (2010).

[4] mg/kg, ww = milligrams per kilogram, wet weight.

[5] mg/kg, dw = milligrams per kilogram, dry weight.

[6] $kg_{sediment, dw}/kg_{tissue, ww}$ = kilogram of sediment, dry weight per kilogram of tissue, wet weight.

Table 11. Octanol-water Partition Coefficient for the PCB Homologue Mixture in Surface Sediment

Table 11.A. Measured Concentration of PCB Homologs in Surface Sedimen											
Station	Monochlorobiphenyl (µg/kg, dw)	Dichlorobiphenyl (µg/kg, dw)	Trichlorobiphenyl (µg/kg, dw)	Tetrachlorobiphenyl (µg/kg, dw)	Pentachlorobiphenyl (µg/kg, dw)	Hexachlorobiphenyl (µg/kg, dw)	Heptachlorobiphenyl (µg/kg, dw)	Octachlorobiphenyl (µg/kg, dw)	Nonachlorobiphenyl (µg/kg, dw)	Decachlorobiphenyl (µg/kg, dw)	Total PCB Homologs (µg/kg, dw)
NA01	0.963	1.825	6.025	47.5	177.5	182.5	86.5	21	6.725	4.25	533
NA02	0.16	0.69	3	23	91	109	53	13	3.4	2.9	299
NA03	0.73	1.6	6.7	45	150	180	94	29	16	7.2	520
NA04	0.19	1.2	8.2	39	99	120	60	16	3.7	2.9	350
NA05	0.12	0.6	3.6	25	71	84	53	11	2.7	2.5	250
NA06	1.38	2.6	20.5	135	360	285	96	21.5	6.75	3.35	935
NA07	0.255	1.6	18.5	100	235	225	101	26	5.2	3.05	710
NA08	0.17	0.98	6.5	45	140	150	73	17	3.8	3	430
NA09	0.14	1.1	7.2	42	130	140	67	16	3.8	3.4	410
NA10	0.21	0.66	3	22	67	78	41	10	2.7	2.4	230
NA11	0.14	0.73	4.5	28	77	91	47	13	3	2.3	270
NA12	0.08	0.59	3.1	31	63	70	37	10	2.3	2.1	220
NA13	0.14	0.56	3.2	21.5	80	100.5	46.5	10.4	3.45	3.05	265
NA14	0.086	0.5	2	13	54	67	34	7.8	2.3	2.4	183
NA15	0.45	1.3	6.3	46	140	160	86	27	6	3.1	480
NA16	0.263	1.218	7.35	67.75	252.5	225	90	18.75	5.325	3.425	665
NA17	0.195	1.25	9	62.5	240	215	83	16	4.7	3.3	620
NA18	0.19	1	6.2	50	180	170	66	15	3.8	3.2	490
NA20	0.036	0.61	4.2	22	50	55	28	6.2	1.2	0.96	170
NA21	0.16	0.69	3.7	23	76	89	48	11	2.9	2.5	257
NA23	0.28	1.4	12	54	190	210	100	21	7.7	3.4	600
NA24	0.16	0.78	4.9	34	110	150	83	16	4.6	2.7	410
NA25	0.06	0.35	1.4	9.1	31	43	23	5.1	2.1	1.8	120
NA26	0.063	0.45	2.6	24	99	85	31	6.3	2.4	1.8	250
NA27	0.18	0.92	4.7	25	76	110	60	12	4	3.3	290
NA28	0.16	0.83	4.1	23	66	92	50	12	3.8	5.1	260
NA29	0.16	0.59	3.1	23	84	90	46	9.5	3.6	2.6	260
NA30	0.13	0.66	5.5	11	40	51	28	8.1	3.1	2.3	150
NA31	0.013	0.22	1.1	7.9	27	34	18	4	1.8	1.6	96
SW01	1.78	8.4	160	545	825	575	205	53	9.8	2	2,400
SW02	2.55	21.25	472.5	2275	3200	1800	505	125	31.5	6.1	8,325
SW03	0.35	1.2	12	82	230	170	68	13	3	2.6	580
SW05	0.79	5.8	88	400	640	450	140	54	14	2.6	1,800
SW06	0.099	3	60	140	160	130	55	24	8.3	2.6	580
SW07	0.12	0.48	3.6	27	74	75	37	13	3.7	1.9	230
SW08	3.3	8.75	103.5	495	1005	745	275	57.5	12.5	4.05	2,700
SW09	0.62	5.7	88	260	310	250	110	31	7.8	4.1	1,100
SW10	0.47	10	120	240	290	180	64	19	4.5	1.6	930
SW11	0.099	0.7	5.9	29	82	94	49	13	3.2	2.5	280
SW12	0.088	0.63	3.1	21.5	78.5	81	33.5	7.85	2.45	1.85	231
SW14	0.39	1.1	9.1	58	160	200	110	27	4.8	2.7	570
SW15	0.17	1.3	23	85	160	160	81	21	4.6	3.1	540
SW16	0.24	1.2	9.8	70	180	210	110	26	5	2.9	610
SW17	0.25	1.2	13	98	220	320	180	43	7.3	3.9	880
SW18	0.24	1.6	13	63	190	220	130	28	6.8	6.2	660
SW19	0.03	0.34	1.9	13	37	48	25	6.3	1.8	1.8	135
SW20	0.31	1.2	21	250	430	930	750	170	13	2.6	2,600
SW21	0.24	1.6	26	310	610	1400	1000	250	22	4.1	3,600
SW24	0.175	1.2	13	135	300	555	395	82	9.65	2.95	1,500
SW25	0.56	1.3	8.6	53	125	175	102.5	23.5	6.05	3.35	500
SW26	0.14	0.75	3.7	48	180	134	40	8.1	2	1.7	418
SW27	0.14	0.63	4.2	27	90	110	66	14	2.9	2.6	320
SW28	0.31	1.5	9.95	94	395	1045	825	160	13.5	3.3	2,600
SW29	1.8	3.1	21	170	460	360	110	20	6.9	2.1	1,200
SW30	0.27	1.4	7.7	55	190	180	65	17	17	9.3	540
SW31	0.013	0.23	1.3	8.3	33	31	14	3.1	1.1	0.68	93
SW32	0.21	0.62	2	18	71	84	35	7.9	3.4	3.1	230
SW33	0.12	0.49	1.6	8.2	36	55	32	7.3	3	2.5	150
SW34	0.1	0.46	2.2	14	55	62	31	6.9	2.7	2.2	180
SW36	0.16	0.74	4.2	28	73	100	53	13	3.8	3.9	282

Table 11.B. Fraction of PCB Mixture Consisting of Each Homolog										
Station	Monochlorobiphenyl (µg/µg$_{Total\ PCB\ Homologs}$)	Dichlorobiphenyl (µg/µg$_{Total\ PCB\ Homologs}$)	Trichlorobiphenyl (µg/µg$_{Total\ PCB\ Homologs}$)	Tetrachlorobiphenyl (µg/µg$_{Total\ PCB\ Homologs}$)	Pentachlorobiphenyl (µg/µg$_{Total\ PCB\ Homologs}$)	Hexachlorobiphenyl (µg/µg$_{Total\ PCB\ Homologs}$)	Heptachlorobiphenyl (µg/µg$_{Total\ PCB\ Homologs}$)	Octachlorobiphenyl (µg/µg$_{Total\ PCB\ Homologs}$)	Nonachlorobiphenyl (µg/µg$_{Total\ PCB\ Homologs}$)	Decachlorobiphenyl (µg/µg$_{Total\ PCB\ Homologs}$)
NA01	0.0018	0.0034	0.0113	0.0888	0.3319	0.3413	0.1617	0.0393	0.0126	0.0079
NA02	0.0005	0.0023	0.0100	0.0769	0.3042	0.3644	0.1772	0.0435	0.0114	0.0097
NA03	0.0014	0.0030	0.0126	0.0849	0.2829	0.3395	0.1773	0.0547	0.0302	0.0136
NA04	0.0005	0.0034	0.0234	0.1114	0.2827	0.3427	0.1713	0.0457	0.0106	0.0083
NA05	0.0005	0.0024	0.0142	0.0986	0.2801	0.3313	0.2091	0.0434	0.0107	0.0099
NA06	0.0015	0.0028	0.0220	0.1448	0.3862	0.3058	0.1030	0.0231	0.0072	0.0036
NA07	0.0004	0.0022	0.0259	0.1397	0.3284	0.3144	0.1411	0.0363	0.0073	0.0043
NA08	0.0004	0.0022	0.0148	0.1024	0.3186	0.3413	0.1661	0.0387	0.0086	0.0068
NA09	0.0003	0.0027	0.0175	0.1023	0.3166	0.3409	0.1632	0.0390	0.0093	0.0083
NA10	0.0009	0.0029	0.0132	0.0969	0.2952	0.3437	0.1806	0.0441	0.0119	0.0106
NA11	0.0005	0.0027	0.0169	0.1050	0.2887	0.3412	0.1762	0.0487	0.0112	0.0086
NA12	0.0004	0.0027	0.0141	0.1414	0.2874	0.3194	0.1688	0.0456	0.0105	0.0096
NA13	0.0005	0.0021	0.0119	0.0798	0.2971	0.3732	0.1727	0.0386	0.0128	0.0113
NA14	0.0005	0.0027	0.0109	0.0710	0.2949	0.3659	0.1857	0.0426	0.0126	0.0131
NA15	0.0009	0.0027	0.0132	0.0966	0.2940	0.3360	0.1806	0.0567	0.0126	0.0065
NA16	0.0004	0.0018	0.0109	0.1009	0.3760	0.3350	0.1340	0.0279	0.0079	0.0051
NA17	0.0003	0.0020	0.0142	0.0984	0.3780	0.3386	0.1307	0.0252	0.0074	0.0052
NA18	0.0004	0.0020	0.0125	0.1009	0.3634	0.3432	0.1332	0.0303	0.0077	0.0065
NA20	0.0002	0.0036	0.0250	0.1308	0.2973	0.3270	0.1665	0.0369	0.0071	0.0057
NA21	0.0006	0.0027	0.0144	0.0895	0.2958	0.3464	0.1868	0.0428	0.0113	0.0097
NA23	0.0005	0.0023	0.0200	0.0900	0.3168	0.3501	0.1667	0.0350	0.0128	0.0057
NA24	0.0004	0.0019	0.0121	0.0837	0.2708	0.3693	0.2044	0.0394	0.0113	0.0066
NA25	0.0005	0.0030	0.0120	0.0778	0.2652	0.3678	0.1967	0.0436	0.0180	0.0154
NA26	0.0002	0.0018	0.0103	0.0950	0.3919	0.3365	0.1227	0.0249	0.0095	0.0071
NA27	0.0006	0.0031	0.0159	0.0844	0.2567	0.3715	0.2026	0.0405	0.0135	0.0111
NA28	0.0006	0.0032	0.0160	0.0895	0.2568	0.3580	0.1946	0.0467	0.0148	0.0198
NA29	0.0006	0.0022	0.0118	0.0876	0.3199	0.3428	0.1752	0.0362	0.0137	0.0099
NA30	0.0009	0.0044	0.0367	0.0734	0.2670	0.3405	0.1869	0.0541	0.0207	0.0154
NA31	0.0001	0.0023	0.0115	0.0826	0.2823	0.3555	0.1882	0.0418	0.0188	0.0167
SW01	0.0007	0.0035	0.0671	0.2285	0.3459	0.2411	0.0860	0.0222	0.0041	0.0008
SW02	0.0003	0.0025	0.0560	0.2696	0.3792	0.2133	0.0598	0.0148	0.0037	0.0007
SW03	0.0006	0.0021	0.0206	0.1409	0.3951	0.2920	0.1168	0.0223	0.0052	0.0045
SW05	0.0004	0.0032	0.0490	0.2228	0.3565	0.2507	0.0780	0.0301	0.0078	0.0014
SW06	0.0002	0.0051	0.1029	0.2401	0.2744	0.2230	0.0943	0.0412	0.0142	0.0045
SW07	0.0005	0.0020	0.0153	0.1145	0.3138	0.3181	0.1569	0.0551	0.0157	0.0081
SW08	0.0012	0.0032	0.0382	0.1827	0.3709	0.2749	0.1015	0.0212	0.0046	0.0015
SW09	0.0006	0.0053	0.0825	0.2436	0.2905	0.2343	0.1031	0.0290	0.0073	0.0038
SW10	0.0005	0.0108	0.1291	0.2582	0.3120	0.1936	0.0688	0.0204	0.0048	0.0017
SW11	0.0004	0.0025	0.0211	0.1038	0.2935	0.3364	0.1754	0.0465	0.0115	0.0089
SW12	0.0004	0.0027	0.0135	0.0933	0.3406	0.3515	0.1454	0.0341	0.0106	0.0080
SW14	0.0007	0.0019	0.0159	0.1012	0.2792	0.3490	0.1919	0.0471	0.0084	0.0047
SW15	0.0003	0.0024	0.0427	0.1576	0.2968	0.2968	0.1502	0.0389	0.0085	0.0057
SW16	0.0004	0.0020	0.0159	0.1138	0.2926	0.3414	0.1788	0.0423	0.0081	0.0047
SW17	0.0003	0.0014	0.0147	0.1105	0.2481	0.3609	0.2030	0.0485	0.0082	0.0044
SW18	0.0004	0.0024	0.0197	0.0956	0.2884	0.3339	0.1973	0.0425	0.0103	0.0094
SW19	0.0002	0.0025	0.0141	0.0962	0.2737	0.3551	0.1850	0.0466	0.0133	0.0133
SW20	0.0001	0.0005	0.0082	0.0973	0.1674	0.3621	0.2920	0.0662	0.0051	0.0010
SW21	0.0001	0.0004	0.0072	0.0855	0.1683	0.3863	0.2759	0.0690	0.0061	0.0011
SW24	0.0001	0.0008	0.0087	0.0904	0.2008	0.3715	0.2644	0.0549	0.0065	0.0020
SW25	0.0011	0.0026	0.0172	0.1062	0.2506	0.3508	0.2055	0.0471	0.0121	0.0067
SW26	0.0003	0.0018	0.0088	0.1147	0.4302	0.3203	0.0956	0.0194	0.0048	0.0041
SW27	0.0004	0.0020	0.0132	0.0850	0.2835	0.3465	0.2079	0.0441	0.0091	0.0082
SW28	0.0001	0.0006	0.0039	0.0369	0.1551	0.4102	0.3238	0.0628	0.0053	0.0013
SW29	0.0016	0.0027	0.0182	0.1472	0.3983	0.3117	0.0952	0.0173	0.0060	0.0018
SW30	0.0005	0.0026	0.0142	0.1014	0.3501	0.3317	0.1198	0.0313	0.0313	0.0171
SW31	0.0001	0.0025	0.0140	0.0895	0.3559	0.3343	0.1510	0.0334	0.0119	0.0073
SW32	0.0009	0.0028	0.0089	0.0799	0.3152	0.3730	0.1554	0.0351	0.0151	0.0138
SW33	0.0008	0.0034	0.0109	0.0561	0.2462	0.3762	0.2189	0.0499	0.0205	0.0171
SW34	0.0006	0.0026	0.0125	0.0793	0.3115	0.3512	0.1756	0.0391	0.0153	0.0125
SW36	0.0006	0.0026	0.0150	0.1001	0.2609	0.3574	0.1894	0.0465	0.0136	0.0139

Notes:

1 Measured Concentration of PCB Homologs in Surface Sediment are referenced from Table 2.B of this document.

2 PCB = polychlorinated biphenyl.

3 The fraction of PCB mixture consisting of each homolog is calculated in Table 11.B. by dividing the individual PCB homolog concentration by the sum of the PCB homologs concentrations.

4 The octanol-water partition coefficient (K_{OW}) for homolog *i* is shown in Table 11.C. This data is calculated as 10 to the power of the Log K_{OW} as referenced from 'Table 3. Percentage homologue composition and chronic sediment-quality benchmarks for selected U.S. commercial and environmental polychlorinated biphenyl (PCB) mixtures' in Fuchsman et al. 2006.

5 The overall log K_{OW} for the PCB Mixture (Log $K_{OW\text{-}Total\ PCB}$) is calculated in Table 11.D. as the logarithm base 10 of the inverse of the sum of the ratio of the fraction of PCB mixture consisting of homolog *i* ($f_{homolog\ i}$) to the Log K_{OW} for homolog *i* (Log $K_{OW\text{-}homolog\ i}$).

6 µg/kg, dw = micrograms per kilogram, dry weight.

7 µg/µg$_{Total\ PCB\ Homologs}$ = microgram individual PCB homolog per microgram total PCB homologs.

8 $L_{water}/L_{octanol}$ = liter water per liter octanol.

9 µg•$L_{octanol}$/µg$_{Total\ PCB\ Homologs}$•L_{water} = microgram individual PCB homolog times liters of octanol per microgram total PCB homolog times liters of water.

Table 11.C. K_{OW} for homolog *i*

Monochlorobiphenyl ($L_{water}/L_{octanol}$)	Dichlorobiphenyl ($L_{water}/L_{octanol}$)	Trichlorobiphenyl ($L_{water}/L_{octanol}$)	Tetrachlorobiphenyl ($L_{water}/L_{octanol}$)	Pentachlorobiphenyl ($L_{water}/L_{octanol}$)	Hexachlorobiphenyl ($L_{water}/L_{octanol}$)	Heptachlorobiphenyl ($L_{water}/L_{octanol}$)	Octachlorobiphenyl ($L_{water}/L_{octanol}$)	Nonachlorobiphenyl ($L_{water}/L_{octanol}$)	Decachlorobiphenyl ($L_{water}/L_{octanol}$)
4.37E+04	1.32E+05	4.17E+05	1.10E+06	3.09E+06	6.92E+06	9.55E+06	5.25E+07	1.74E+08	1.82E+08

Table 11.D. Overall Log K_{OW} for the PCB Mixture (Log $K_{OW\text{-}Total\ PCB}$)

Station	$f_{homolog\ i} \div K_{OW\text{-}homolog\ i}$											
	Monochlorobiphenyl ($\mu g \cdot L_{octanol}/\mu g_{Total\ PCB\ Homologs} \cdot L_{water}$)	Dichlorobiphenyl ($\mu g \cdot L_{octanol}/\mu g_{Total\ PCB\ Homologs} \cdot L_{water}$)	Trichlorobiphenyl ($\mu g \cdot L_{octanol}/\mu g_{Total\ PCB\ Homologs} \cdot L_{water}$)	Tetrachlorobiphenyl ($\mu g \cdot L_{octanol}/\mu g_{Total\ PCB\ Homologs} \cdot L_{water}$)	Pentachlorobiphenyl ($\mu g \cdot L_{octanol}/\mu g_{Total\ PCB\ Homologs} \cdot L_{water}$)	Hexachlorobiphenyl ($\mu g \cdot L_{octanol}/\mu g_{Total\ PCB\ Homologs} \cdot L_{water}$)	Heptachlorobiphenyl ($\mu g \cdot L_{octanol}/\mu g_{Total\ PCB\ Homologs} \cdot L_{water}$)	Octachlorobiphenyl ($\mu g \cdot L_{octanol}/\mu g_{Total\ PCB\ Homologs} \cdot L_{water}$)	Nonachlorobiphenyl ($\mu g \cdot L_{octanol}/\mu g_{Total\ PCB\ Homologs} \cdot L_{water}$)	Decachlorobiphenyl ($\mu g \cdot L_{octanol}/\mu g_{Total\ PCB\ Homologs} \cdot L_{water}$)	$\Sigma(f_{homolog\ i} \div K_{OW\text{-}homolog\ i})$ ($\mu g \cdot L_{octanol}/\mu g_{Total\ PCB\ Homologs} \cdot L_{water}$)	Log $K_{OW\text{-}Total\ PCB}$ ($L_{water}/L_{octanol}$)
NA01	4.12E-08	2.59E-08	2.70E-08	8.10E-08	1.07E-07	4.93E-08	1.69E-08	7.48E-10	7.24E-11	4.37E-11	3.50E-07	6.46
NA02	1.23E-08	1.75E-08	2.41E-08	7.01E-08	9.84E-08	5.27E-08	1.86E-08	8.28E-10	6.54E-11	5.33E-11	2.95E-07	6.53
NA03	3.15E-08	2.29E-08	3.03E-08	7.74E-08	9.15E-08	4.91E-08	1.86E-08	1.04E-09	1.74E-10	7.46E-11	3.23E-07	6.49
NA04	1.24E-08	2.60E-08	5.62E-08	1.02E-07	9.15E-08	4.95E-08	1.79E-08	8.71E-10	6.08E-11	4.55E-11	3.56E-07	6.45
NA05	1.08E-08	1.80E-08	3.41E-08	8.99E-08	9.06E-08	4.79E-08	2.19E-08	8.27E-10	6.13E-11	5.42E-11	3.14E-07	6.50
NA06	3.39E-08	2.12E-08	5.28E-08	1.32E-07	1.25E-07	4.42E-08	1.08E-08	4.40E-10	4.17E-11	1.98E-11	4.20E-07	6.38
NA07	8.16E-09	1.70E-08	6.20E-08	1.27E-07	1.06E-07	4.54E-08	1.48E-08	6.92E-10	4.18E-11	2.34E-11	3.82E-07	6.42
NA08	8.86E-09	1.69E-08	3.55E-08	9.34E-08	1.03E-07	4.93E-08	1.74E-08	7.37E-10	4.98E-11	3.75E-11	3.25E-07	6.49
NA09	7.81E-09	2.03E-08	4.21E-08	9.33E-08	1.02E-07	4.93E-08	1.71E-08	7.42E-10	5.33E-11	4.55E-11	3.33E-07	6.48
NA10	2.12E-08	2.21E-08	3.17E-08	8.84E-08	9.55E-08	4.97E-08	1.89E-08	8.40E-10	6.85E-11	5.81E-11	3.28E-07	6.48
NA11	1.20E-08	2.08E-08	4.05E-08	9.58E-08	9.34E-08	4.93E-08	1.85E-08	9.29E-10	6.47E-11	4.74E-11	3.31E-07	6.48
NA12	8.36E-09	2.04E-08	3.39E-08	1.29E-07	9.30E-08	4.62E-08	1.77E-08	8.69E-10	6.04E-11	5.27E-11	3.50E-07	6.46
NA13	1.19E-08	1.58E-08	2.85E-08	7.28E-08	9.61E-08	5.39E-08	1.81E-08	7.36E-10	7.37E-11	6.22E-11	2.98E-07	6.53
NA14	1.08E-08	2.07E-08	2.62E-08	6.48E-08	9.54E-08	5.29E-08	1.94E-08	8.12E-10	7.23E-11	7.20E-11	2.91E-07	6.54
NA15	2.17E-08	2.07E-08	3.17E-08	8.81E-08	9.51E-08	4.86E-08	1.89E-08	1.08E-09	7.25E-11	3.58E-11	3.26E-07	6.49
NA16	8.95E-09	1.38E-08	2.63E-08	9.20E-08	1.22E-07	4.84E-08	1.40E-08	5.32E-10	4.56E-11	2.80E-11	3.26E-07	6.49
NA17	7.04E-09	1.49E-08	3.40E-08	8.98E-08	1.22E-07	4.89E-08	1.37E-08	4.80E-10	4.26E-11	2.86E-11	3.31E-07	6.48
NA18	8.79E-09	1.53E-08	3.00E-08	9.20E-08	1.18E-07	4.96E-08	1.40E-08	5.77E-10	4.41E-11	3.55E-11	3.28E-07	6.48
NA20	4.90E-09	2.75E-08	5.99E-08	1.19E-07	9.62E-08	4.73E-08	1.74E-08	7.02E-10	4.11E-11	3.14E-11	3.73E-07	6.43
NA21	1.43E-08	2.04E-08	3.45E-08	8.16E-08	9.57E-08	5.01E-08	1.96E-08	8.16E-10	6.49E-11	5.35E-11	3.17E-07	6.50
NA23	1.07E-08	1.77E-08	4.80E-08	8.21E-08	1.03E-07	5.06E-08	1.75E-08	6.67E-10	7.39E-11	3.12E-11	3.30E-07	6.48
NA24	9.02E-09	1.46E-08	2.89E-08	7.63E-08	8.76E-08	5.34E-08	2.14E-08	7.51E-10	6.52E-11	3.65E-11	2.92E-07	6.53
NA25	1.18E-08	2.27E-08	2.87E-08	7.10E-08	8.58E-08	5.32E-08	2.06E-08	8.31E-10	1.03E-10	8.46E-11	2.95E-07	6.53
NA26	5.71E-09	1.35E-08	2.47E-08	8.66E-08	1.27E-07	4.86E-08	1.29E-08	4.75E-10	5.47E-11	3.92E-11	3.19E-07	6.50
NA27	1.39E-08	2.36E-08	3.81E-08	7.70E-08	8.31E-08	5.37E-08	2.12E-08	7.72E-10	7.77E-11	6.12E-11	3.11E-07	6.51
NA28	1.43E-08	2.45E-08	3.83E-08	8.16E-08	8.31E-08	5.17E-08	2.04E-08	8.90E-10	8.51E-11	1.09E-10	3.15E-07	6.50
NA29	1.40E-08	1.70E-08	2.83E-08	7.99E-08	1.04E-07	4.95E-08	1.83E-08	6.89E-10	7.89E-11	5.44E-11	3.11E-07	6.51
NA30	1.99E-08	3.34E-08	8.81E-08	6.70E-08	8.64E-08	4.92E-08	1.96E-08	1.03E-09	1.19E-10	8.44E-11	3.65E-07	6.44
NA31	2.99E-09	1.75E-08	2.76E-08	7.53E-08	9.14E-08	5.14E-08	1.97E-08	7.97E-10	1.08E-10	9.19E-11	2.87E-07	6.54
SW01	1.71E-08	2.67E-08	1.61E-07	2.08E-07	1.12E-07	3.48E-08	9.00E-09	4.23E-10	2.36E-11	4.61E-12	5.69E-07	6.24
SW02	6.92E-09	1.91E-08	1.34E-07	2.46E-07	1.23E-07	3.08E-08	6.27E-09	2.82E-10	2.15E-11	3.97E-12	5.66E-07	6.25
SW03	1.38E-08	1.56E-08	4.94E-08	1.28E-07	1.28E-07	4.22E-08	1.22E-08	4.26E-10	2.97E-11	2.45E-11	3.90E-07	6.41
SW05	1.01E-08	2.45E-08	1.18E-07	2.03E-07	1.15E-07	3.62E-08	8.17E-09	5.73E-10	4.49E-11	7.96E-12	5.16E-07	6.29
SW06	3.89E-09	3.90E-08	2.47E-07	2.19E-07	8.88E-08	3.22E-08	9.88E-09	7.84E-10	8.19E-11	2.45E-11	6.41E-07	6.19
SW07	1.17E-08	1.54E-08	3.66E-08	1.04E-07	1.02E-07	4.60E-08	1.64E-08	1.05E-09	9.03E-11	4.43E-11	3.33E-07	6.48
SW08	2.79E-08	2.45E-08	9.16E-08	1.67E-07	1.20E-07	3.97E-08	1.06E-08	4.04E-10	2.65E-11	8.21E-12	4.81E-07	6.32
SW09	1.33E-08	4.05E-08	1.98E-07	2.22E-07	9.40E-08	3.39E-08	1.08E-08	5.53E-10	4.21E-11	2.11E-11	6.13E-07	6.21
SW10	1.16E-08	8.16E-08	3.10E-07	2.35E-07	1.01E-07	2.80E-08	7.21E-09	3.89E-10	2.79E-11	9.46E-12	7.75E-07	6.11
SW11	8.12E-09	1.90E-08	5.07E-08	9.47E-08	9.50E-08	4.86E-08	1.84E-08	8.87E-10	6.59E-11	4.92E-11	3.35E-07	6.47
SW12	8.75E-09	2.07E-08	3.23E-08	8.51E-08	1.10E-07	5.08E-08	1.52E-08	6.49E-10	6.12E-11	4.41E-11	3.24E-07	6.49
SW14	1.56E-08	1.46E-08	3.81E-08	9.23E-08	9.03E-08	5.04E-08	2.01E-08	8.98E-10	4.82E-11	2.59E-11	3.22E-07	6.49
SW15	7.22E-09	1.83E-08	1.02E-07	1.44E-07	9.60E-08	4.29E-08	1.57E-08	7.42E-10	4.91E-11	3.16E-11	4.27E-07	6.37
SW16	8.94E-09	1.48E-08	3.82E-08	1.04E-07	9.47E-08	4.93E-08	1.87E-08	8.05E-10	4.68E-11	2.59E-11	3.29E-07	6.48
SW17	6.46E-09	1.03E-08	3.52E-08	1.01E-07	8.03E-08	5.22E-08	2.13E-08	9.24E-10	4.74E-11	2.42E-11	3.07E-07	6.51
SW18	8.35E-09	1.84E-08	4.73E-08	8.72E-08	9.33E-08	4.83E-08	2.07E-08	8.10E-10	5.94E-11	5.17E-11	3.24E-07	6.49
SW19	5.08E-09	1.91E-08	3.37E-08	8.77E-08	8.86E-08	5.13E-08	1.94E-08	8.88E-10	7.66E-11	7.32E-11	3.06E-07	6.51
SW20	2.77E-09	3.54E-09	1.96E-08	8.88E-08	5.42E-08	5.23E-08	3.06E-08	1.26E-09	2.91E-11	5.56E-12	2.53E-07	6.60
SW21	1.52E-09	3.35E-09	1.72E-08	7.80E-08	5.45E-08	5.58E-08	2.89E-08	1.31E-09	3.49E-11	6.22E-12	2.41E-07	6.62
SW24	2.68E-09	6.09E-09	2.09E-08	8.24E-08	6.50E-08	5.37E-08	2.77E-08	1.05E-09	3.72E-11	1.09E-11	2.60E-07	6.59
SW25	2.57E-08	1.98E-08	4.14E-08	9.69E-08	8.11E-08	5.07E-08	2.15E-08	8.98E-10	6.98E-11	3.69E-11	3.38E-07	6.47
SW26	7.67E-09	1.36E-08	2.12E-08	1.05E-07	1.39E-07	4.63E-08	1.00E-08	3.69E-10	2.75E-11	2.23E-11	3.43E-07	6.46
SW27	1.01E-08	1.51E-08	3.17E-08	7.76E-08	9.17E-08	5.01E-08	2.18E-08	8.40E-10	5.26E-11	4.50E-11	2.99E-07	6.52
SW28	2.79E-09	4.47E-09	9.37E-09	3.37E-08	5.02E-08	5.93E-08	3.39E-08	1.20E-09	3.05E-11	7.12E-12	1.95E-07	6.71
SW29	3.57E-08	2.04E-08	4.36E-08	1.34E-07	1.29E-07	4.51E-08	9.97E-09	3.30E-10	3.44E-11	9.99E-12	4.18E-07	6.38
SW30	1.14E-08	1.96E-08	3.40E-08	9.24E-08	1.13E-07	4.79E-08	1.25E-08	5.97E-10	1.80E-10	9.42E-11	3.32E-07	6.48
SW31	3.09E-09	1.88E-08	3.36E-08	8.16E-08	1.15E-07	4.83E-08	1.58E-08	6.37E-10	6.83E-11	4.03E-11	3.17E-07	6.50
SW32	2.14E-08	2.09E-08	2.13E-08	7.29E-08	1.02E-07	5.39E-08	1.63E-08	6.68E-10	8.69E-11	7.56E-11	3.09E-07	6.51
SW33	1.88E-08	2.54E-08	2.63E-08	5.11E-08	7.97E-08	5.44E-08	2.29E-08	9.51E-10	1.18E-10	9.40E-11	2.80E-07	6.55
SW34	1.30E-08	1.98E-08	2.99E-08	7.23E-08	1.01E-07	5.08E-08	1.84E-08	7.45E-10	8.80E-11	6.85E-11	3.06E-07	6.51
SW36	1.31E-08	2.01E-08	3.60E-08	9.13E-08	8.44E-08	5.17E-08	1.98E-08	8.85E-10	7.82E-11	7.66E-11	3.17E-07	6.50

Table 12. Summary of Studies Used to Derive a Mercury Effects Benchmark in Invertebrate Tissue

Media	Taxa	Class	Tissue Effect Concentration (mg/kg, ww)	Tissue(s) Analyzed	Effect	End Point	Reference
Freshwater	*Chironomus riparius*	Arthropoda	40	Whole Body	Mortality	NOED	Rossaro et al. (1986)
Freshwater	*Carcinus maenas*	Crustacea	39	Digestive Tract, Exoskeleton, Gill, Other	Mortality	LD50 (Average of Tissues Analyzed)	Mount and Stephan (1967)
Freshwater	*Perna perna*	Mollusca	17	Soft Tissue	Physiological (filtration rate)	NOED	Gregory et al. (2002)
Freshwater	*Crepidula fornicata*	Mollusca	8	Whole Body	Development	LOED	Thain (1984)
Freshwater	*Viviparus georgianus*	Mollusca	6	Soft Tissue	Mortality	NOED	Tessier et al. (1996)
Saltwater	*Hexagenia rigida*	Arthropoda	2	Whole Body	Growth, Mortality	NOED	Odin et al. (1994)
Saltwater	*Palaemonetes pugio*	Crustacea	1.6	Whole Body	Behavior, Mortality	LOED, NOED	Barthalmus (1977)
Saltwater	*Hexagenia*	Arthropoda	1.1	Whole Body	Growth	NOED	Naimo et al. (2000)
Saltwater	*Elliptio complanata*	Mollusca	0.19	Whole Body	Growth	NOED	Beckvar et al. (2000)

Notes:

[1] Data referenced from the Environmental Residue-Effects Database (ERED).

[2] Concentrations of mercury in tissue residue are assumed to be total mercury.

[3] Endpoints were selected from the ERED based on the following preference: LOED > % Effect Concentration (e.g., EC50, LC50, etc.) > NOED.

[4] NOED = No Observed Effect Dose.

[5] LD50 = Median Lethal Dose.

[6] LOED = Lowest Observed Effect Dose.

[7] mg/kg, ww = milligrams per kilogram, wet weight.

Table 13. Summary of Effects Benchmarks

COC	Individual Chemical, *if applicable*	Effects Benchmark				
		Value	UOM	Type	Basis for Effects Benchmark	Reference
Copper	--	130	µmol/g_{OC}	ESB; Acute and Chronic Toxicity	10 and 14 day mortality to various freshwater and aquatic organisms; Chronic toxicity possible when value exceeded (Pg 3-22 of USEPA (2005a))	USEPA (2005a)
	--	3.1	µg/L	FCV	Chronic toxicity for various aquatic organisms	USEPA (2005a)
Mercury	--	0.19	mg/kg	Tissue effect benchmark	Sublethal tissue benchmark for a variety of benthic organisms (Table 12)	Table 12
HPAH	Fluoranthene	7.109	µg/L	FCV	Chronic toxicity for various aquatic organisms	USEPA (2003b)
	Pyrene	10.11				
	Benz[a]-anthracene	2.227				
	Chrysene	2.042				
	Benzo[b]-fluoranthene	0.6774				
	Benzo[k]-fluoranthene	0.6415				
	Benzo[a]-pyrene	0.9573				
	Indeno-[1,2,3-cd]-pyrene	0.275				
	Dibenz[a,h]-anthracene	0.2825				
	Benzo[ghi]-perylene	0.4391				
PCB	--	0.54	µg/L	FCV	Chronic toxicity for various aquatic organisms	Fuchsman et al. (2006)
TBT	--	0.0658	µg/L	FCV	Chronic toxicity for various aquatic organisms	USEPA (2003a)

Notes:

1 COC = Contaminant of Concern.

2 HPAH = High Molecular Weight Polycyclic Aromatic Hydrocarbons.

3 PCB = polychlorinated biphenyl.

4 TBT = Tributyltin.

5 UOM = Unit of Measure

6 µmol/g_{OC} = micromoles per gram organic carbon.

7 mg/kg = milligram per kilogram.

8 µg/L = microgram per liter.

9 ESB = Equilibrium Partitioning Sediment Benchmark

10 FCV = Final Chronic Value

Table 14. Benthic Risk for Total PCB Homologs

Notes	1	2	3	4	5	6	7	8	9	10
Station	Measured Concentration in Surface Sediment (µg/kg$_{sediment}$)	Log $K_{OW\text{-Total PCB}}$ ($L_{water}/L_{octanol}$)	$K_{OC\text{-Total PCB}}$ ($L_{porewater}/kg_{OC}$)	TOC Content (%)	Concentration in Surface Sediment on an Organic Carbon Basis (µg/kg$_{OC}$)	Estimated Concentration in Porewater [EqP model approach] (µg/L)	Estimated Concentration in Porewater [Prediction equation approach] (µg/L)	Measured Concentration in Porewater (µg/L)	Effects Benchmark (µg/L)	Toxic Units
NA01	533	6.46	2,859,763	2.19	24,334	0.01	0.13	0.07		0.02
NA02	299	6.53	3,395,279	2.00	14,950	0.00	0.08	NR		0.01
NA03	520	6.49	3,099,719	2.33	22,318	0.01	0.12	NR		0.01
NA04	350	6.45	2,808,252	2.04	17,157	0.01	0.09	NR		0.01
NA05	250	6.50	3,183,242	1.60	15,625	0.00	0.07	NR		0.01
NA06	935	6.38	2,378,710	2.14	43,760	0.02	0.20	0.20		0.03
NA07	710	6.42	2,618,928	2.02	35,236	0.01	0.16	NR		0.02
NA08	430	6.49	3,074,099	2.18	19,725	0.01	0.11	NR		0.01
NA09	410	6.48	3,001,927	2.26	18,142	0.01	0.10	NR		0.01
NA10	230	6.48	3,044,702	1.18	19,492	0.01	0.07	NR		0.01
NA11	270	6.48	3,018,500	1.69	15,976	0.01	0.08	NR		0.01
NA12	220	6.46	2,860,809	1.48	14,865	0.01	0.07	NR		0.01
NA13	265	6.53	3,355,435	1.92	13,778	0.00	0.08	0.06		0.01
NA14	183	6.54	3,434,324	1.82	10,055	0.00	0.06	NR		0.01
NA15	480	6.49	3,067,245	1.95	24,615	0.01	0.12	NR		0.01
NA16	665	6.49	3,070,360	2.00	33,195	0.01	0.15	0.09		0.02
NA17	620	6.48	3,018,944	2.03	30,542	0.01	0.14	0.08		0.02
NA18	490	6.48	3,049,166	2.04	24,020	0.01	0.12	NR		0.01
NA20	170	6.43	2,679,154	1.42	11,972	0.00	0.06	NR		0.01
NA21	257	6.50	3,153,717	2.15	11,953	0.00	0.07	NR		0.01
NA23	600	6.48	3,031,633	2.21	27,149	0.01	0.14	NR		0.02
NA24	410	6.53	3,422,744	2.12	19,340	0.01	0.10	NR		0.01
NA25	120	6.53	3,392,476	1.24	9,677	0.00	0.05	NR		0.01
NA26	250	6.50	3,130,508	1.22	20,492	0.01	0.07	NR		0.01
NA27	290	6.51	3,210,703	2.01	14,428	0.00	0.08	NR		0.01
NA28	260	6.50	3,174,971	1.87	13,904	0.00	0.08	NR		0.01
NA29	260	6.51	3,210,550	1.70	15,294	0.00	0.08	NR		0.01
NA30	150	6.44	2,741,262	1.38	10,870	0.00	0.05	NR		0.01
NA31	96	6.54	3,486,349	0.92	10,435	0.00	0.04	NR		0.01
SW01	2,400	6.24	1,756,273	2.24	107,143	0.06	0.44	0.50	0.54	0.11
SW02	8,325	6.25	1,765,814	4.09	203,794	0.12	1.35	16.00		0.21
SW03	580	6.41	2,563,514	3.11	18,650	0.01	0.14	NR		0.01
SW05	1,800	6.29	1,938,806	1.55	116,129	0.06	0.34	NR		0.11
SW06	580	6.19	1,560,987	1.82	31,868	0.02	0.14	NR		0.04
SW07	230	6.48	3,000,349	1.73	13,295	0.00	0.07	NR		0.01
SW08	2,700	6.32	2,076,988	3.80	70,990	0.03	0.49	0.52		0.06
SW09	1,100	6.21	1,631,114	1.94	56,701	0.03	0.23	NR		0.06
SW10	930	6.11	1,290,485	1.21	76,860	0.06	0.20	NR		0.11
SW11	280	6.47	2,981,463	1.81	15,470	0.01	0.08	NR		0.01
SW12	231	6.49	3,088,079	1.47	15,768	0.01	0.07	0.08		0.01
SW14	570	6.49	3,101,743	2.13	26,761	0.01	0.13	NR		0.02
SW15	540	6.37	2,341,393	2.31	23,377	0.01	0.13	NR		0.02
SW16	610	6.48	3,036,080	2.24	27,232	0.01	0.14	NR		0.02
SW17	880	6.51	3,252,952	2.53	34,783	0.01	0.19	NR		0.02
SW18	660	6.49	3,081,879	2.19	30,137	0.01	0.15	NR		0.02
SW19	135	6.51	3,268,960	1.15	11,739	0.00	0.05	NR		0.01
SW20	2,600	6.60	3,950,835	2.14	121,495	0.03	0.47	NR		0.06
SW21	3,600	6.62	4,155,381	2.10	171,429	0.04	0.63	NR		0.08
SW24	1,500	6.59	3,853,291	1.75	85,551	0.02	0.29	0.67		0.04
SW25	500	6.47	2,958,217	2.15	23,256	0.01	0.12	0.18		0.01
SW26	418	6.46	2,915,037	1.31	31,908	0.01	0.11	NR		0.02
SW27	320	6.52	3,344,687	2.08	15,385	0.00	0.09	NR		0.01
SW28	2,600	6.71	5,131,261	2.52	103,311	0.02	0.47	0.29		0.04
SW29	1,200	6.38	2,391,055	1.34	89,552	0.04	0.24	NR		0.07
SW30	540	6.48	3,011,204	2.05	26,341	0.01	0.13	NR		0.02
SW31	93	6.50	3,152,344	0.66	14,091	0.00	0.04	NR		0.01
SW32	230	6.51	3,231,569	1.56	14,744	0.00	0.07	NR		0.01
SW33	150	6.55	3,574,564	2.09	7,177	0.00	0.05	NR		0.00
SW34	180	6.51	3,270,206	1.68	10,714	0.00	0.06	NR		0.01
SW36	282	6.50	3,150,625	2.23	12,646	0.00	0.08	NR		0.01

Notes:

1 Measured Concentration in Surface Sediment is referenced from Table 2.B of this document.

2 Overall logarithm of octanol-water partition coefficient (Log K_{OW}) for the PCB Mixture (Log $K_{OW\text{-Total PCB}}$) is referenced from Table 11.

3 $K_{OW\text{-Total PCB}}$ is calculated as 10 to the power of Log $K_{OW\text{-Total PCB}}$. The Organic Carbon-Water Partition Coefficient (K_{OC}) for nonionic organic chemicals is assumed to be equal to the K_{OW} (Fuchsman et al., 2006; Bucheli and Gustafsson, 2001).

4 Total organic carbon (TOC) content is referenced from Table 5.B.

5 Concentration in Surface Sediment on an Organic Carbon Basis is calculated as the Measured Concentration in Surface Sediment ÷ (TOC Content ÷ 100%).

6 Estimated Concentration in Porewater is calculated using the Equilibrium Partitioning (EqP) model approach (Di Toro et al., 1992). Estimated Porewater Concentration = Concentration in Surface Sediment on an Organic Carbon Basis ÷ K_{OC}.

7 Estimated Concentration in Porewater is calculated using the prediction equation as referenced from 'Table 5-2 Relationships between porewater and sediment' (Exponent, 2003). For PCB homologs, the prediction equation is pw = [2.65 + 0.374 × (Measured Concentration of Contaminant in the Surface Sediment)$^{1/2}$)]^2. Porewater units from this equation are provided in ng/L, this value is converted to µg/L.

8 Measured Concentration in Porewater is referenced from Table 9.

9 Effects Benchmark and reference are provided in Table 13.

10 Toxic Units are calculated as the Porewater Concentration divided by the Effects Benchmark. If the Measured Concentration in Porewater is reported, then the lower value of the Measured Concentration in Porewater or the Estimated Concentration in Porewater [EqP model approach] is used to calculate the Toxic Units. Otherwise, the lower value of the Estimated Concentration in Porewater [EqP model approach] or Estimated Concentration in Porewater [Prediction equation approach] is used to calculate the Toxic Units.

11 Values indicating risk potential (Toxic Unit > 1) are shown in shaded cells with bold text.

12 PCB = polychlorinated biphenyl. µg/kg = micrograms per kilogram. Lwater/Loctanol = liter water per liter octanol. µg/L = micrograms per liter. NR = Not Reported.

Table 15. Benthic Risk for HPAHs

Notes	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3
	Measured Concentration in Surface Sediment (µg/kg)										Log K_{OC} ($L_{porewater}/kg_{oc}$)										K_{OC} ($L_{porewater}/kg_{OC}$)									
Station	Fluoranthene	Pyrene	Benz[a]-anthracene	Chrysene	Benzo[b]-fluoranthene	Benzo[k]-fluoranthene	Benzo[a]-pyrene	Indeno-[1,2,3-cd]-pyrene	Dibenz[a,h]-anthracene	Benzo[ghi]-perylene	Fluoranthene	Pyrene	Benz[a]-anthracene	Chrysene	Benzo[b]-fluoranthene	Benzo[k]-fluoranthene	Benzo[a]-pyrene	Indeno-[1,2,3-cd]-pyrene	Dibenz[a,h]-anthracene	Benzo[ghi]-perylene	Fluoranthene	Pyrene	Benz[a]-anthracene	Chrysene	Benzo[b]-fluoranthene	Benzo[k]-fluoranthene	Benzo[a]-pyrene	Indeno-[1,2,3-cd]-pyrene	Dibenz[a,h]-anthracene	Benzo[ghi]-perylene
NA01	430	460	500	960	990	740	1,000	750	150	540																				
NA02	240	250	230	390	340	310	440	310	61	220																				
NA03	470	480	470	820	850	730	910	700	130	530																				
NA04	210	210	220	470	560	390	510	450	82	360																				
NA05	200	210	190	370	360	340	400	340	70	320																				
NA06	300	350	270	510	610	430	550	410	81	330																				
NA07	2,400	2,400	1,200	1,500	2,200	1,400	2,100	1,300	310	990																				
NA08	250	380	220	440	520	390	470	410	78	360																				
NA09	200	260	180	320	400	310	380	360	64	320																				
NA10	110	160	96	190	250	220	270	240	43	220																				
NA11	240	260	200	370	360	310	400	300	56	260																				
NA12	180	180	150	270	250	220	260	210	44	190																				
NA13	150	180	130	240	280	190	250	200	35	170																				
NA14	110	110	86	190	130	120	140	120	20	100																				
NA15	220	260	210	390	500	380	500	420	80	370																				
NA16	250	290	200	320	510	350	490	420	76	340																				
NA17	260	430	170	280	430	340	400	320	64	270																				
NA18	170	190	150	280	350	280	360	300	59	270																				
NA20	310	420	210	320	420	330	390	260	57	230																				
NA21	230	270	160	270	260	250	260	190	33	170																				
NA23	280	330	240	450	480	390	540	370	65	300																				
NA24	150	160	130	270	330	280	330	240	41	200																				
NA25	86	120	73	130	140	120	150	110	17	110																				
NA26	65	86	51	110	150	72	120	97	14	88																				
NA27	240	280	200	350	410	300	430	290	47	230																				
NA28	290	360	240	400	490	370	530	360	61	290																				
NA29	130	170	110	250	350	170	280	220	38	190																				
NA30	81	110	50	120	190	86	140	130	18	110																				
NA31	44	66	35	54	71	58	75	62	5	58																				
SW01	790	1,100	560	920	1,100	790	1,100	700	140	540	4.998	4.839	5.577	5.616	6.16	6.184	6.003	6.608	6.599	6.397	99,541	69,024	377,572	413,048	1,445,440	1,527,566	1,006,932	4,055,085	3,971,915	2,494,595
SW02	2,800	3,200	1,100	1,500	1,500	1,100	1,500	850	180	650																				
SW03	620	590	510	830	1,000	780	1,100	680	140	540																				
SW05	2,300	2,200	910	1,500	1,500	1,200	1,500	790	200	580																				
SW06	2,800	1,700	1,300	1,800	1,100	790	1,000	560	130	420																				
SW07	400	340	350	600	530	420	510	340	73	250																				
SW08	3,000	2,500	2,400	4,900	3,700	2,300	3,100	1,900	420	1,300																				
SW09	2,000	1,800	1,600	3,800	2,200	1,500	2,100	1,100	290	750																				
SW10	4,000	3,500	1,200	1,500	1,600	1,200	1,600	790	200	590																				
SW11	780	750	570	1,100	1,200	940	1,100	770	150	600																				
SW12	320	290	240	520	380	370	380	260	47	210																				
SW14	560	790	630	1,300	1,200	1,100	1,300	760	150	570																				
SW15	980	800	730	1,200	1,000	770	980	620	120	500																				
SW16	260	720	210	400	1,100	790	1,000	600	130	500																				
SW17	920	960	840	1,600	1,400	1,200	1,500	1,000	180	730																				
SW18	880	790	640	1,300	1,100	980	1,100	670	130	550																				
SW19	94	110	85	170	140	130	140	120	21	110																				
SW20	930	1,200	760	1,800	1,500	1,200	1,400	970	200	770																				
SW21	580	850	650	1,400	1,600	1,100	1,500	990	210	780																				
SW24	5,400	6,500	4,500	7,900	7,200	6,400	8,000	3,300	930	2,300																				
SW25	580	700	560	1,000	1,500	1,100	1,400	770	160	550																				
SW26	120	120	120	270	200	200	210	150	30	130																				
SW27	1,700	1,400	1,100	2,000	1,300	1,200	1,400	850	160	650																				
SW28	1,400	1,500	1,400	3,200	2,600	1,800	2,600	1,500	280	920																				
SW29	460	510	360	580	660	510	690	400	75	310																				
SW30	410	430	380	820	880	420	700	430	80	350																				
SW31	78	72	69	170	250	120	200	120	20	95																				
SW32	76	99	66	110	100	85	110	86	8	82																				
SW33	88	110	62	140	150	75	130	120	18	110																				
SW34	110	150	87	190	240	110	190	150	25	140																				
SW36	390	380	340	560	640	410	560	380	65	280																				

Notes:

[1] Measured Concentration in Surface Sediment is referenced from Table 3 of this document.

[2] Logarithm of $HPAH_i$ organic carbon-water partition coefficients (Log K_{OC}) are referenced from 'Table 3-4. $C_{OC,PAHi,FCVi}$ concentrations and properties required for their derivation' USEPA (2003b). Log K_{OC} (L/kg_{OC}) in Table 3-4 has been calculated in from the SPARC $log_{10}K_{OW}$ value (Hilal et al., 1994) using the following equation from Di Toro (1985) $log_{10}K_{OC} = 0.00028+0.983\ log_{10}K_{OW}$ (USEPA, 2003).

[3] $HPAH_i$ organic carbon-water partition coefficients (K_{OC}) are calculated as 10 to the power of Log K_{OC}.

[4] Total organic carbon (TOC) content is referenced from Table 5 of this document.

[5] Concentration in Surface Sediment on an Organic Carbon Basis is calculated as the Measured Concentration in Surface Sediment ÷ (TOC Content ÷ 100%).

[6] Estimated Concentration in Porewater is calculated using the Equilibrium Partitioning (EqP) model approach (Di Toro et al., 1992). Estimated Porewater Concentration = Concentration in Surface Sediment on an Organic Carbon Basis ÷ KOC.

[7] Measured Concentration in Porewater is referenced from Table 8 of this document.

[8] Effects Benchmark and reference are provided in Table 13 of this document.

[9] $HPAH_i$ Toxic Units are calculated as the Porewater Concentration divided by the Effects Benchmark. The lower value of the Estimated or Measured Porewater Concentration is used to calculate the Toxic Units.

[10] Total HPAH Toxic Units are calculated as the sum of the $HPAH_i$ Toxic Units.

[11] Values indicating risk potential (Toxic Unit > 1) are shown in shaded cells with bold text.

[12] NR = Not Reported

[13] HPAH = High Molecular Weight Polycyclic Aromatic Hydrocarbons

[14] µg/kg = micrograms per kilogram.

[15] L_{water}/kg_{oc} = liter water per kilogram organic carbon.

[16] µg/L = micrograms per liter.

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Table 15. Benthic Risk for HPAHs, continued

Notes	4	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7
		Concentration in Surface Sediment on an Organic Carbon Basis (µg/kg$_{OC}$)										Estimated Concentration in Porewater (µg/L)										Measured Concentration in Porewater (µg/L)									
Station	TOC Content (%)	Fluoranthene	Pyrene	Benz[a]-anthracene	Chrysene	Benzo[b]-fluoranthene	Benzo[k]-fluoranthene	Benzo[a]-pyrene	Indeno-[1,2,3-cd]-pyrene	Dibenz[a,h]-anthracene	Benzo[ghi]-perylene	Fluoranthene	Pyrene	Benz[a]-anthracene	Chrysene	Benzo[b]-fluoranthene	Benzo[k]-fluoranthene	Benzo[a]-pyrene	Indeno-[1,2,3-cd]-pyrene	Dibenz[a,h]-anthracene	Benzo[ghi]-perylene	Fluoranthene	Pyrene	Benz[a]-anthracene	Chrysene	Benzo[b]-fluoranthene	Benzo[k]-fluoranthene	Benzo[a]-pyrene	Indeno-[1,2,3-cd]-pyrene	Dibenz[a,h]-anthracene	Benzo[ghi]-perylene
NA01	2.1883	19,650	21,021	22,848	43,869	45,240	33,816	45,697	34,273	6,855	24,676	0.20	0.30	0.06	0.11	0.03	0.02	0.05	0.01	0.00	0.01	0.05	0.07	0.02	0.03	0.07	0.05	0.04	0.01	0.01	0.01
NA02	2	12,000	12,500	11,500	19,500	17,000	15,500	22,000	15,500	3,050	11,000	0.12	0.18	0.03	0.05	0.01	0.01	0.02	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA03	2.33	20,172	20,601	20,172	35,193	36,481	31,330	39,056	30,043	5,579	22,747	0.20	0.30	0.05	0.09	0.03	0.02	0.04	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA04	2.04	10,294	10,294	10,784	23,039	27,451	19,118	25,000	22,059	4,020	17,647	0.10	0.15	0.03	0.06	0.02	0.01	0.02	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA05	1.6	12,500	13,125	11,875	23,125	22,500	21,250	25,000	21,250	4,375	20,000	0.13	0.19	0.03	0.06	0.02	0.01	0.02	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA06	2.1367	14,041	16,381	12,637	23,869	28,549	20,125	25,741	19,189	3,791	15,445	0.14	0.24	0.03	0.06	0.02	0.01	0.03	0.00	0.00	0.01	0.03	0.03	0.01	0.01	0.04	0.03	0.02	0.01	0.01	0.01
NA07	2.015	119,107	119,107	59,553	74,442	109,181	69,479	104,218	64,516	15,385	49,132	1.20	1.73	0.16	0.18	0.08	0.05	0.10	0.02	0.00	0.02	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA08	2.18	11,468	17,431	10,092	20,183	23,853	17,890	21,560	18,807	3,578	16,514	0.12	0.25	0.03	0.05	0.02	0.01	0.02	0.00	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA09	2.26	8,850	11,504	7,965	14,159	17,699	13,717	16,814	15,929	2,832	14,159	0.09	0.17	0.02	0.03	0.01	0.01	0.02	0.00	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA10	1.18	9,322	13,559	8,136	16,102	21,186	18,644	22,881	20,339	3,644	18,644	0.09	0.20	0.02	0.04	0.01	0.01	0.02	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA11	1.69	14,201	15,385	11,834	21,893	21,302	18,343	23,669	17,751	3,314	15,385	0.14	0.22	0.03	0.05	0.01	0.01	0.02	0.00	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA12	1.48	12,162	12,162	10,135	18,243	16,892	14,865	17,568	14,189	2,973	12,838	0.12	0.18	0.03	0.04	0.01	0.01	0.02	0.00	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA13	1.9233	7,799	9,359	6,759	12,478	14,558	9,879	12,998	10,399	1,820	8,839	0.08	0.14	0.02	0.03	0.01	0.01	0.01	0.00	0.00	0.00	0.05	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
NA14	1.82	6,044	6,044	4,725	10,440	7,143	6,593	7,692	6,593	1,099	5,495	0.06	0.09	0.01	0.03	0.00	0.00	0.01	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA15	1.95	11,282	13,333	10,769	20,000	25,641	19,487	25,641	21,538	4,103	18,974	0.11	0.19	0.03	0.05	0.02	0.01	0.03	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA16	2.0033	12,479	14,476	9,983	15,973	25,458	17,471	24,459	20,965	3,794	16,972	0.13	0.21	0.03	0.04	0.02	0.01	0.02	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.01
NA17	2.03	12,808	21,182	8,374	13,793	21,182	16,749	19,704	15,764	3,153	13,300	0.13	0.31	0.02	0.03	0.01	0.01	0.02	0.00	0.00	0.01	0.02	0.03	0.01	0.01	0.04	0.03	0.02	0.01	0.01	0.01
NA18	2.04	8,333	9,314	7,353	13,725	17,157	13,725	17,647	14,706	2,892	13,235	0.08	0.13	0.02	0.03	0.01	0.01	0.02	0.00	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA20	1.42	21,831	29,577	14,789	22,535	29,577	23,239	27,465	18,310	4,014	16,197	0.22	0.43	0.04	0.05	0.02	0.02	0.03	0.00	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA21	2.15	10,698	12,558	7,442	12,558	12,093	11,628	12,093	8,837	1,535	7,907	0.11	0.18	0.02	0.03	0.01	0.01	0.01	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA23	2.21	12,670	14,932	10,860	20,362	21,719	17,647	24,434	16,742	2,941	13,575	0.13	0.22	0.03	0.05	0.02	0.01	0.02	0.00	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA24	2.12	7,075	7,547	6,132	12,736	15,566	13,208	15,566	11,321	1,934	9,434	0.07	0.11	0.02	0.03	0.01	0.01	0.02	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA25	1.24	6,935	9,677	5,887	10,484	11,290	9,677	12,097	8,871	1,371	8,871	0.07	0.14	0.02	0.03	0.01	0.01	0.01	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA26	1.22	5,328	7,049	4,180	9,016	12,295	5,902	9,836	7,951	1,148	7,213	0.05	0.10	0.01	0.02	0.01	0.00	0.01	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA27	2.01	11,940	13,930	9,950	17,413	20,398	14,925	21,393	14,428	2,338	11,443	0.12	0.20	0.03	0.04	0.01	0.01	0.02	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA28	1.87	15,508	19,251	12,834	21,390	26,203	19,786	28,342	19,251	3,262	15,508	0.16	0.28	0.03	0.05	0.02	0.01	0.03	0.00	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA29	1.7	7,647	10,000	6,471	14,706	20,588	10,000	16,471	12,941	2,235	11,176	0.08	0.14	0.02	0.04	0.01	0.01	0.02	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA30	1.38	5,870	7,971	3,623	8,696	13,768	6,232	10,145	9,420	1,304	7,971	0.06	0.12	0.01	0.02	0.01	0.00	0.01	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
NA31	0.92	4,783	7,174	3,804	5,870	7,717	6,304	8,152	6,739	543	6,304	0.05	0.10	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW01	2.24	35,268	49,107	25,000	41,071	49,107	35,268	49,107	31,250	6,250	24,107	0.35	0.71	0.07	0.10	0.03	0.02	0.05	0.01	0.00	0.01	0.04	0.13	0.02	0.03	0.09	0.07	0.07	0.04	0.01	0.03
SW02	4.085	68,543	78,335	26,928	36,720	36,720	26,928	36,720	20,808	4,406	15,912	0.69	1.13	0.07	0.09	0.03	0.02	0.04	0.01	0.00	0.01	25.00	21.00	5.90	4.90	4.40	3.00	4.20	1.90	0.35	1.40
SW03	3.11	19,936	18,971	16,399	26,688	32,154	25,080	35,370	21,865	4,502	17,363	0.20	0.27	0.04	0.06	0.02	0.02	0.04	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW05	1.55	148,387	141,935	58,710	96,774	96,774	77,419	96,774	50,968	12,903	37,419	1.49	2.06	0.16	0.23	0.07	0.05	0.10	0.01	0.00	0.02	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW06	1.82	153,846	93,407	71,429	98,901	60,440	43,407	54,945	30,769	7,143	23,077	1.55	1.35	0.19	0.24	0.04	0.03	0.05	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW07	1.73	23,121	19,653	20,231	34,682	30,636	24,277	29,480	19,653	4,220	14,451	0.23	0.28	0.05	0.08	0.02	0.02	0.03	0.00	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW08	3.8033	78,878	65,732	63,103	128,834	97,283	60,473	81,507	49,956	11,043	34,181	0.79	0.95	0.17	0.31	0.07	0.04	0.08	0.01	0.00	0.01	0.26	0.27	0.07	0.10	0.13	0.10	0.09	0.05	0.01	0.03
SW09	1.94	103,093	92,784	82,474	195,876	113,402	77,320	108,247	56,701	14,948	38,660	1.04	1.34	0.22	0.47	0.08	0.05	0.11	0.01	0.00	0.02	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW10	1.21	330,579	289,256	99,174	123,967	132,231	99,174	132,231	65,289	16,529	48,760	3.32	4.19	0.26	0.30	0.09	0.06	0.13	0.02	0.00	0.02	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW11	1.81	43,094	41,436	31,492	60,773	66,298	51,934	60,773	42,541	8,287	33,149	0.43	0.60	0.08	0.15	0.05	0.03	0.06	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW12	1.465	21,843	19,795	16,382	35,495	25,939	25,256	25,939	17,747	3,208	14,334	0.22	0.29	0.04	0.09	0.02	0.02	0.03	0.00	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW14	2.13	26,291	37,089	29,577	61,033	56,338	51,643	61,033	35,681	7,042	26,761	0.26	0.54	0.08	0.15	0.04	0.03	0.06	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW15	2.31	42,424	34,632	31,602	51,948	43,290	33,333	42,424	26,840	5,195	21,645	0.43	0.50	0.08	0.13	0.03	0.02	0.04	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW16	2.24	11,607	32,143	9,375	17,857	49,107	35,268	44,643	26,786	5,804	22,321	0.12	0.47	0.02	0.04	0.03	0.02	0.04	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW17	2.53	36,364	37,945	33,202	63,241	55,336	47,431	59,289	39,526	7,115	28,854	0.37	0.55	0.09	0.15	0.04	0.03	0.06	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW18	2.19	40,183	36,073	29,224	59,361	50,228	44,749	50,228	30,594	5,936	25,114	0.40	0.52	0.08	0.14	0.03	0.03	0.05	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW19	1.15	8,174	9,565	7,391	14,783	12,174	11,304	12,174	10,435	1,826	9,565	0.08	0.14	0.02	0.04	0.01	0.01	0.01	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW20	2.14	43,458	56,075	35,514	84,112	70,093	56,075	65,421	45,327	9,346	35,981	0.44	0.81	0.09	0.20	0.05	0.04	0.06	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW21	2.1	27,619	40,476	30,952	66,667	76,190	52,381	71,429	47,143	10,000	37,143	0.28	0.59	0.08	0.16	0.05	0.03	0.07	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW24	1.7533	307,985	370,722	256,654	450,570	410,646	365,019	456,274	188,213	53,042	131,179	3.09	5.37	0.68	1.09	0.28	0.24	0.45	0.05	0.01	0.05	0.07	0.18	0.04	0.07	0.27	0.20	0.25	0.09	0.01	0.06
SW25	2.15	26,977	32,558	26,047	46,512	69,767	51,163	65,116	35,814	7,442	25,581	0.27	0.47	0.07	0.11	0.05	0.03	0.06	0.01	0.00	0.01	0.07	0.08	0.03	0.03	0.06	0.05	0.04	0.01	0.01	0.01
SW26	1.31	9,160	9,160	9,160	20,611	15,267	15,267	16,031	11,450	2,290	9,924	0.09	0.13	0.02	0.05	0.01	0.01	0.02	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW27	2.08	81,731	67,308	52,885	96,154	62,500	57,692	67,308	40,865	7,692	31,250	0.82	0.98	0.14	0.23	0.04	0.04	0.07	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW28	2.5167	55,629	59,603	55,629	127,152	103,311	71,523	103,311	59,603	11,126	36,556	0.56	0.86	0.15	0.31	0.07	0.05	0.10	0.01	0.00	0.01	0.04	0.09	0.01	0.01	0.05	0.03	0.03	0.01	0.01	0.01
SW29	1.34	34,328	38,060	26,866	43,284	49,254	38,060	51,493	29,851	5,597	23,134	0.34	0.55	0.07	0.10	0.03	0.02	0.05	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW30	2.05	20,000	20,976	18,537	40,000	42,927	20,488	34,146	20,976	3,902	17,073	0.20	0.30	0.05	0.10	0.03	0.01	0.03	0.01	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW31	0.66	11,818	10,909	10,455	25,758	37,879	18,182	30,303	18,182	3,030	14,394	0.12	0.16	0.03	0.06	0.03	0.01	0.03	0.00	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW32	1.56	4,872	6,346	4,231	7,051	6,410	5,449	7,051	5,513	481	5,256	0.05	0.09	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW33	2.09	4,211	5,263	2,967	6,699	7,177	3,589	6,220	5,742	861	5,263	0.04	0.08	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW34	1.68	6,548	8,929	5,179	11,310	14,286	6,548	11,310	8,929	1,488	8,333	0.07	0.13	0.01	0.03	0.01	0.00	0.01	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW36	2.23	17,489	17,040	15,247	25,112	28,700	18,386	25,112	17,040	2,915	12,556	0.18	0.25	0.04	0.06	0.02	0.01	0.02	0.00	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Table 15. Benthic Risk for HPAHs, continued

Notes	8	8	8	8	8	8	8	8	8	8	9	9	9	9	9	9	9	9	9	9	10
	Effects Benchmark (µg/L)										HPAH$_i$ Toxic Units										
Station	Fluoranthene	Pyrene	Benz[a]-anthracene	Chrysene	Benzo[b]-fluoranthene	Benzo[k]-fluoranthene	Benzo[a]-pyrene	Indeno-[1,2,3-cd]-pyrene	Dibenz[a,h]-anthracene	Benzo[ghi]-perylene	Fluoranthene	Pyrene	Benz[a]-anthracene	Chrysene	Benzo[b]-fluoranthene	Benzo[k]-fluoranthene	Benzo[a]-pyrene	Indeno-[1,2,3-cd]-pyrene	Dibenz[a,h]-anthracene	Benzo[ghi]-perylene	Total HPAH Toxic Units
NA01											0.01	0.01	0.01	0.01	0.05	0.03	0.04	0.03	0.01	0.02	0.22
NA02											0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.01	0.00	0.01	0.15
NA03											0.03	0.03	0.02	0.04	0.04	0.03	0.04	0.03	0.00	0.02	0.29
NA04											0.01	0.01	0.01	0.03	0.03	0.02	0.03	0.02	0.00	0.02	0.18
NA05											0.02	0.02	0.01	0.03	0.02	0.02	0.03	0.02	0.00	0.02	0.19
NA06											0.00	0.00	0.00	0.01	0.03	0.02	0.02	0.02	0.00	0.01	0.13
NA07											0.17	0.17	0.07	0.09	0.11	0.07	0.11	0.06	0.01	0.04	0.91
NA08											0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.00	0.02	0.18
NA09											0.01	0.02	0.01	0.02	0.02	0.01	0.02	0.01	0.00	0.01	0.13
NA10											0.01	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.00	0.02	0.16
NA11											0.02	0.02	0.01	0.03	0.02	0.02	0.02	0.02	0.00	0.01	0.18
NA12											0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.01	0.00	0.01	0.15
NA13											0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.08
NA14											0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.07
NA15											0.02	0.02	0.01	0.02	0.03	0.02	0.03	0.02	0.00	0.02	0.18
NA16											0.00	0.00	0.00	0.01	0.03	0.02	0.01	0.02	0.00	0.02	0.11
NA17											0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.01	0.00	0.01	0.10
NA18											0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.01	0.00	0.01	0.13
NA20											0.03	0.04	0.02	0.03	0.03	0.02	0.03	0.02	0.00	0.01	0.23
NA21											0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.11
NA23											0.02	0.02	0.01	0.02	0.02	0.02	0.03	0.02	0.00	0.01	0.17
NA24											0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.01	0.00	0.01	0.11
NA25											0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.09
NA26											0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.08
NA27											0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.01	0.00	0.01	0.15
NA28											0.02	0.03	0.02	0.03	0.03	0.02	0.03	0.02	0.00	0.01	0.20
NA29											0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.01	0.00	0.01	0.12
NA30											0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.08
NA31											0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.06
SW01	7.109	10.11	2.227	2.042	0.6774	0.6415	0.9573	0.275	0.2825	0.4391	0.01	0.01	0.01	0.01	0.05	0.04	0.05	0.03	0.01	0.02	0.23
SW02											0.10	0.11	0.03	0.04	0.04	0.03	0.04	0.02	0.00	0.01	0.42
SW03											0.03	0.03	0.02	0.03	0.03	0.03	0.04	0.02	0.00	0.02	0.24
SW05											0.21	0.20	0.07	0.11	0.10	0.08	0.10	0.05	0.01	0.03	0.97
SW06											0.22	0.13	0.08	0.12	0.06	0.04	0.06	0.03	0.01	0.02	0.77
SW07											0.03	0.03	0.02	0.04	0.03	0.02	0.03	0.02	0.00	0.01	0.25
SW08											0.04	0.03	0.03	0.05	0.10	0.06	0.08	0.04	0.01	0.03	0.47
SW09											0.15	0.13	0.10	0.23	0.12	0.08	0.11	0.05	0.01	0.04	**1.02**
SW10											0.47	0.41	0.12	0.15	0.14	0.10	0.14	0.06	0.01	0.04	**1.64**
SW11											0.06	0.06	0.04	0.07	0.07	0.05	0.06	0.04	0.01	0.03	0.49
SW12											0.03	0.03	0.02	0.04	0.03	0.03	0.03	0.02	0.00	0.01	0.23
SW14											0.04	0.05	0.04	0.07	0.06	0.05	0.06	0.03	0.01	0.02	0.43
SW15											0.06	0.05	0.04	0.06	0.04	0.03	0.04	0.02	0.00	0.02	0.38
SW16											0.02	0.05	0.01	0.02	0.05	0.04	0.05	0.02	0.01	0.02	0.28
SW17											0.05	0.05	0.04	0.07	0.06	0.05	0.06	0.04	0.01	0.03	0.45
SW18											0.06	0.05	0.03	0.07	0.05	0.05	0.05	0.03	0.01	0.02	0.42
SW19											0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.11
SW20											0.06	0.08	0.04	0.10	0.07	0.06	0.07	0.04	0.01	0.03	0.56
SW21											0.04	0.06	0.04	0.08	0.08	0.05	0.07	0.04	0.01	0.03	0.50
SW24											0.01	0.02	0.02	0.03	0.40	0.31	0.26	0.17	0.04	0.12	**1.37**
SW25											0.01	0.01	0.01	0.02	0.07	0.05	0.04	0.03	0.01	0.02	0.28
SW26											0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.01	0.00	0.01	0.13
SW27											0.12	0.10	0.06	0.11	0.06	0.06	0.07	0.04	0.01	0.03	0.65
SW28											0.01	0.01	0.00	0.00	0.08	0.05	0.03	0.04	0.01	0.02	0.25
SW29											0.05	0.05	0.03	0.05	0.05	0.04	0.05	0.03	0.00	0.02	0.38
SW30											0.03	0.03	0.02	0.05	0.04	0.02	0.04	0.02	0.00	0.02	0.27
SW31											0.02	0.02	0.01	0.03	0.04	0.02	0.03	0.02	0.00	0.01	0.20
SW32											0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.06
SW33											0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.05
SW34											0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.09
SW36											0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.02	0.00	0.01	0.20

Table 16. Benthic Risk for Copper

Notes	1	2	2	3	4	5	6	7	8	9	10	11	12	13	14	8	15	16
Station	TOC Content (%)	AVS Concentration in Surface Sediment (mg/kg)	SEM for Copper Concentration in Surface Sediment (mg/kg)	Copper Concentration in Surface Sediment (mg/kg)	AVS Concentration in Surface Sediment (mmol/kg)	SEM for Copper Concentration in Surface Sediment (mmol/kg)	Copper Concentration in Surface Sediment (mmol/kg)	OC Normalized Excess SEM Concentration in Surface Sediment (mmol/kg, OC)	Effects Benchmark [Sediment Approach] (mmol/kg, OC)	Toxic Units [SEM-AVS Sediment Approach]	Measured Copper Concentration in Surface Sediment (mg/kg)	K_d ($L_{porewater}/kg_{sediment}$)	Estimated Concentration in Porewater [EqP model approach] (µg/L)	Estimated Concentration in Porewater [Prediction equation approach] (µg/L)	Measured Concentration in Porewater (µg/L)	Effects Benchmark [Porewater Approach] (µg/L, OC)	Toxic Units [Porewater Approach]	Toxic Units
NA01	2.188	91.0	215.0	NA	2.8	3.4	NA	25		0.19	253		20	20	14		**4.52**	0.19
NA02	2	24.0	160.0	NA	0.7	2.5	NA	88		0.68	170		14	17	NR		**4.36**	0.68
NA03	2.33	120.0	220.0	NA	3.7	3.5	NA	-12		0.00	220		17	18	NR		**5.64**	0.00
NA04	2.04	23.0	240.0	NA	0.7	3.8	NA	150		**1.15**	260		21	20	NR		**6.39**	**1.15**
NA05	1.6	4.5	150.0	NA	0.1	2.4	NA	139		**1.07**	170		14	17	NR		**4.36**	**1.07**
NA06	2.137	210.0	320.0	NA	6.5	5.0	NA	-71		0.00	395		31	24	33		**10.12**	0.00
NA07	2.015	96.5	255.0	NA	3.0	4.0	NA	50		0.38	225		18	19	NR		**5.77**	0.38
NA08	2.18	54.0	260.0	NA	1.7	4.1	NA	110		0.85	270		21	20	NR		**6.50**	0.85
NA09	2.26	620.0	260.0	NA	19.3	4.1	NA	-675		0.00	260		21	20	NR		**6.39**	0.00
NA10	1.18	10.0	130.0	NA	0.3	2.0	NA	147		**1.13**	160		13	16	NR		**4.10**	**1.13**
NA11	1.69	18.0	180.0	NA	0.6	2.8	NA	134		**1.03**	180		14	17	NR		**4.61**	**1.03**
NA12	1.48	18.0	150.0	NA	0.6	2.4	NA	122		0.94	150		12	16	NR		**3.84**	0.94
NA13	1.923	98.0	170.0	NA	3.1	2.7	NA	-20		0.00	185		15	17	14		**4.52**	0.00
NA14	1.82	59.0	110.0	NA	1.8	1.7	NA	-6		0.00	130		10	15	NR		**3.33**	0.00
NA15	1.95	27.0	260.0	NA	0.8	4.1	NA	167		**1.28**	250		20	19	NR		**6.28**	**1.28**
NA16	2.003	120.0	250.0	NA	3.7	3.9	NA	10		0.07	253		20	20	22		**6.47**	0.07
NA17	2.03	280.0	530.0	NA	8.7	8.3	NA	-19		0.00	510		41	28	23		**7.42**	0.00
NA18	2.04	27.0	230.0	NA	0.8	3.6	NA	136		**1.05**	230		18	19	NR		**5.89**	**1.05**
NA20	1.42	120.0	90.0	NA	3.7	1.4	NA	-164		0.00	96		8	14	NR		**2.46**	0.00
NA21	2.15	96.0	140.0	NA	3.0	2.2	NA	-37		0.00	150		12	16	NR		**3.84**	0.00
NA23	2.21	116.5	NR	350.0	3.6	NA	5.5	85		0.65	350		28	23	NR		**7.39**	0.65
NA24	2.12	71.5	NR	200.0	2.2	NA	3.1	43		0.33	200		16	18	NR		**5.12**	0.33
NA25	1.24	84.3	NR	85.0	2.6	NA	1.3	-104		0.00	85		7	14	NR		**2.18**	0.00
NA26	1.22	24.0	NR	80.0	0.7	NA	1.3	42		0.32	80		6	14	NR		**2.05**	0.32
NA27	2.01	78.7	NR	390.0	2.5	NA	6.1	183		**1.41**	390		31	24	NR		**7.83**	**1.41**
NA28	1.87	14.7	NR	290.0	0.5	NA	4.6	220		**1.69**	290		23	21	NR		**6.72**	**1.69**
NA29	1.7	52.9	NR	110.0	1.6	NA	1.7	5		0.04	110		9	15	NR		**2.82**	0.04
NA30	1.38	78.5	NR	140.0	2.4	NA	2.2	-18		0.00	140		11	16	NR		**3.59**	0.00
NA31	0.92	96.0	NR	71.0	3.0	NA	1.1	-204		0.00	71		6	13	NR		**1.82**	0.00
SW01	2.24	57.0	350.0	NA	1.8	5.5	NA	167	130	**1.28**	560	12,589	44	30	17	3.1	**5.48**	**1.28**
SW02	4.085	230.0	360.0	NA	7.2	5.7	NA	-37		0.00	580		46	31	390		**14.86**	0.00
SW03	3.11	150.0	94.0	NA	4.7	1.5	NA	-103		0.00	190		15	17	NR		**4.87**	0.00
SW05	1.55	190.0	200.0	NA	5.9	3.1	NA	-179		0.00	230		18	19	NR		**5.89**	0.00
SW06	1.82	160.0	150.0	NA	5.0	2.4	NA	-144		0.00	170		14	17	NR		**4.36**	0.00
SW07	1.73	100.0	150.0	NA	3.1	2.4	NA	-44		0.00	150		12	16	NR		**3.84**	0.00
SW08	3.803	1600.0	870.0	NA	49.9	13.7	NA	-952		0.00	920		73	42	33		**10.65**	0.00
SW09	1.94	160.0	430.0	NA	5.0	6.8	NA	92		0.70	660		52	34	NR		**10.82**	0.70
SW10	1.21	610.0	140.0	NA	19.0	2.2	NA	-1390		0.00	160		13	16	NR		**4.10**	0.00
SW11	1.81	210.0	180.0	NA	6.5	2.8	NA	-205		0.00	170		14	17	NR		**4.36**	0.00
SW12	1.465	18.0	120.0	NA	0.6	1.9	NA	91		0.70	120		9	15	17		**3.06**	0.70
SW14	2.13	470.0	310.0	NA	14.7	4.9	NA	-459		0.00	280		22	21	NR		**6.61**	0.00
SW15	2.31	480.0	230.0	NA	15.0	3.6	NA	-491		0.00	230		18	19	NR		**5.89**	0.00
SW16	2.24	280.0	500.0	NA	8.7	7.9	NA	-39		0.00	430		34	26	NR		**8.27**	0.00
SW17	2.53	42.0	330.0	NA	1.3	5.2	NA	153		**1.18**	270		21	20	NR		**6.50**	**1.18**
SW18	2.19	23.0	230.0	NA	0.7	3.6	NA	133		**1.02**	220		17	18	NR		**5.64**	**1.02**
SW19	1.15	50.0	91.0	NA	1.6	1.4	NA	-11		0.00	110		9	15	NR		**2.82**	0.00
SW20	2.14	370.0	260.0	NA	11.5	4.1	NA	-348		0.00	290		23	21	NR		**6.72**	0.00
SW21	2.1	18.0	250.0	NA	0.6	3.9	NA	161		**1.24**	260		21	20	NR		**6.39**	**1.24**
SW24	1.753	60.0	240.0	NA	1.9	3.8	NA	109		0.84	300		24	21	25		**7.69**	0.84
SW25	2.15	95.0	250.0	NA	3.0	3.9	NA	45		0.35	230		18	19	28		**5.89**	0.35
SW26	1.31	2.6	110.0	NA	0.1	1.7	NA	126		0.97	120		10	15	NR		**3.07**	0.97
SW27	2.08	190.0	210.0	NA	5.9	3.3	NA	-126		0.00	210		17	18	NR		**5.38**	0.00
SW28	2.517	450.0	270.0	NA	14.0	4.2	NA	-389		0.00	265		21	20	19		**6.13**	0.00
SW29	1.34	145.7	NR	220.0	4.5	NA	3.5	-81		0.00	220		17	18	NR		**5.64**	0.00
SW30	2.05	89.3	NR	240.0	2.8	NA	3.8	48		0.37	240		19	19	NR		**6.15**	0.37
SW31	0.66	80.3	NR	54.0	2.5	NA	0.8	-251		0.00	54		4	13	NR		**1.38**	0.00
SW32	1.56	59.0	NR	92.0	1.8	NA	1.4	-25		0.00	92		7	14	NR		**2.36**	0.00
SW33	2.09	34.0	NR	100.0	1.1	NA	1.6	25		0.19	100		8	14	NR		**2.56**	0.19
SW34	1.68	41.9	NR	320.0	1.3	NA	5.0	222		**1.71**	320		25	22	NR		**7.06**	**1.71**
SW36	2.23	130.6	NR	240.0	4.1	NA	3.8	-13		0.00	240		19	19	NR		**6.15**	0.00

Notes:

[1] Total Organic Carbon (TOC) content is referenced from Table 5 of this document.

[2] Concentrations of Acid Volatile Sulfide (AVS) and Simultaneously Extracted Metal (SEM) for Copper in Surface Sediment are referenced from Table 4 of this document.

[3] Concentrations of Copper in Surface Sediment are referenced from Table 6 of this document.

[4] Molar mass of sulfur is 32.065 mg/mmol. AVS Concentration in Surface Sediment (mg/kg) is converted to mg/kg to mmol/kg by dividing the AVS Concentration in Surface Sediment (mg/kg) by the molar mass of sulfur.

[5] Molar mass of copper is 63.546 mg/mmol. SEM for Copper Concentration in Surface Sediment (mg/kg) is converted to mg/kg to mmol/kg by dividing the SEM for Copper Concentration in Surface Sediment (mg/kg) by the mola

[6] Molar mass of copper is 63.546 mg/mmol. Copper Concentration in Surface Sediment (mg/kg) is converted to mg/kg to mmol/kg by dividing the Copper Concentration in Surface Sediment (mg/kg) by the molar mass of copper

[7] Organic Carbon (OC) Normalized Excess SEM for Copper Concentration in Surface Sediment is calculated as (SEM - AVS) ÷ TOC. The SEM-AVS ÷ TOC methodology was referenced from USEPA (2005a). If the SEM is not

[8] Effects Benchmark and reference are provided in Table 13 of this document.

[9] Toxic Units are calculated as the OC Normalized Excess SEM for Copper Concentration (mmol/kg) divided by the Effects Benchmark. If the OC Normalized Excess SEM for Copper Concentration is negative, then the Toxic Ur

[10] Measured Copper Concentration in Surface Sediment is referenced from Table 6 of this document.

[11] The sediment-porewater partition coefficient (K_d) was calculated as 10 to the power Log K_d as referenced from 'Table 4. Metal partition coefficients (log Kd) in kg/L for sediment/porewater' (USEPA, 2005b).

[12] Estimated Concentration in Porewater is calculated using the copper sediment-porewater partition coefficient (K_d) which is defined as the ratio of sorbed concentration to the dissolved concentration at equilibrium. K_d = Sorbed

[13] Estimated Concentration in Porewater is calculated using the prediction equation as referenced from 'Table 5-2 Relationships between porewater and sediment' (Exponent, 2003). For Copper, the prediction equation is pw = 1(

[14] Measured Concentration in Porewater is referenced from Table 7 of this document.

[15] Toxic Units are calculated as the Porewater Concentration divided by the Effects Benchmark. If the Measured Concentration in Porewater is reported, then the lower value of the Measured Concentration in Porewater or the Estimated Concentration in Porewater [EqP model approach] is used to calculate the Toxic Units. Otherwise, the lower value of the Estimated Concentration in Porewater [EqP model approach] or Estimated Concentration in Porewater [Prediction equation approach] is used to calculate the Toxic Units.

[16] Toxic Units are the lesser value of the Toxic Units [SEM-AVS Sediment approach] and Toxic Units [Porewater approach].

[17] Values indicating risk potential (Toxic Unit > 1) are shown in shaded cells with bold text.

[18] mg/kg = milligrams per kilogram.

[19] mmol/kg = millimoles per kilogram.

[20] NA = Not Applicable

Table 17. Benthic Risk for TBT

Notes	1	2	3	4	5	6	7	8	9	10
Station	Measured Concentration in Surface Sediment (µg/kg)	Log K_{OW} ($L_{water}/L_{octanol}$)	K_{OC} ($L_{porewater}/kg_{OC}$)	TOC Content ($kg_{OC}/kg_{sediment}$)	Concentration in Surface Sediment on an Organic Carbon Basis (µg/kg_{OC})	Estimated Concentration in Porewater [EqP model approach] (µg/L)	Estimated Concentration in Porewater [Prediction equation approach] (µg/L)	Measured Concentration in Porewater (µg/L)	Effects Benchmark (µg/L)	Toxic Units
NA01	157			2.19	7,174	0.34	0.04	0.01		0.08
NA02	82			2.00	4,100	0.19	0.03	NR		0.41
NA03	180			2.33	7,725	0.37	0.04	NR		0.68
NA04	300			2.04	14,706	0.70	0.06	NR		0.97
NA05	110			1.60	6,875	0.32	0.03	NR		0.49
NA06	225			2.14	10,530	0.50	0.05	0.10		**1.52**
NA07	111			2.02	5,484	0.26	0.03	NR		0.49
NA08	110			2.18	5,046	0.24	0.03	NR		0.49
NA09	120			2.26	5,310	0.25	0.03	NR		0.52
NA10	91			1.18	7,712	0.36	0.03	NR		0.44
NA11	38			1.69	2,249	0.11	0.02	NR		0.27
NA12	80			1.48	5,405	0.26	0.03	NR		0.41
NA13	68			1.92	3,536	0.17	0.02	0.02		0.33
NA14	45			1.82	2,473	0.12	0.02	NR		0.30
NA15	670			1.95	34,359	1.62	0.12	NR		**1.80**
NA16	175			2.00	8,735	0.41	0.04	0.05		0.83
NA17	1,350			2.03	66,502	3.14	0.21	0.08		**1.17**
NA18	210			2.04	10,294	0.49	0.05	NR		0.75
NA20	280			1.42	19,718	0.93	0.06	NR		0.92
NA21	410			2.15	19,070	0.90	0.08	NR		**1.23**
NA23	120			2.21	5,430	0.26	0.03	NR		0.52
NA24	59			2.12	2,783	0.13	0.02	NR		0.34
NA25	25			1.24	2,016	0.10	0.01	NR		0.22
NA26	37			1.22	3,033	0.14	0.02	NR		0.27
NA27	100			2.01	4,975	0.24	0.03	NR		0.46
NA28	90			1.87	4,813	0.23	0.03	NR		0.43
NA29	58			1.70	3,412	0.16	0.02	NR		0.34
NA30	22			1.38	1,594	0.08	0.01	NR		0.21
NA31	20			0.92	2,174	0.10	0.01	NR		0.20
SW01	450	4.4	21,158	2.24	20,089	0.95	0.09	0.04	0.0658	0.56
SW02	167			4.09	4,088	0.19	0.04	0.06		0.90
SW03	53			3.11	1,704	0.08	0.02	NR		0.32
SW05	170			1.55	10,968	0.52	0.04	NR		0.65
SW06	100			1.82	5,495	0.26	0.03	NR		0.46
SW07	44			1.73	2,543	0.12	0.02	NR		0.29
SW08	1,850			3.80	48,642	2.30	0.28	0.49		**7.45**
SW09	910			1.94	46,907	2.22	0.15	NR		**2.32**
SW10	250			1.21	20,661	0.98	0.06	NR		0.85
SW11	140			1.81	7,735	0.37	0.04	NR		0.57
SW12	36			1.47	2,457	0.12	0.02	0.02		0.33
SW14	450			2.13	21,127	1.00	0.09	NR		**1.32**
SW15	170			2.31	7,359	0.35	0.04	NR		0.65
SW16	1,100			2.24	49,107	2.32	0.18	NR		**2.71**
SW17	440			2.53	17,391	0.82	0.09	NR		**1.30**
SW18	130			2.19	5,936	0.28	0.04	NR		0.55
SW19	37			1.15	3,217	0.15	0.02	NR		0.27
SW20	130			2.14	6,075	0.29	0.04	NR		0.55
SW21	170			2.10	8,095	0.38	0.04	NR		0.65
SW24	165			1.75	9,411	0.44	0.04	0.07		**1.12**
SW25	231			2.15	10,721	0.51	0.05	0.06		0.96
SW26	49			1.31	3,740	0.18	0.02	NR		0.31
SW27	250			2.08	12,019	0.57	0.06	NR		0.85
SW28	150			2.52	5,960	0.28	0.04	0.02		0.24
SW29	190			1.34	14,179	0.67	0.05	NR		0.70
SW30	200			2.05	9,756	0.46	0.05	NR		0.73
SW31	36			0.66	5,455	0.26	0.02	NR		0.26
SW32	30			1.56	1,923	0.09	0.02	NR		0.24
SW33	19			2.09	909	0.04	0.01	NR		0.20
SW34	38			1.68	2,262	0.11	0.02	NR		0.27
SW36	49			2.23	2,197	0.10	0.02	NR		0.31

Notes:

1 Measured Concentration in Surface Sediment is referenced from Table 6 of this document.

2 Logarithm of the octanol-water partition coefficient (K_{OW}) is referenced from Meador (2011)

3 The Organic Carbon-Water Partition Coefficient (K_{OC}) (L/kg_{OC}) is calculated as 10 to the power of Log K_{OC}. Log K_{OC} is calculated using the following equation from Di Toro (1985) $\log_{10}K_{OC} = 0.00028+0.983 \log_{10}K_{OW}$ (USEPA, 2003b).

4 Total organic carbon (TOC) content is referenced from Table 5 of this document.

5 Concentration in Surface Sediment on an Organic Carbon Basis is calculated as the Measured Concentration in Surface Sediment ÷ (TOC Content ÷ 100%).

6 Estimated Concentration in Porewater is calculated using the Equilibrium Partitioning (EqP) model approach (Di Toro et al., 1992). Estimated Porewater Concentration = Concentration in Surface Sediment on an Organic Carbon Basis ÷ K_{OC}.

7 Estimated Concentration in Porewater is calculated using the prediction equation as referenced from 'Table 5-2 Relationships between porewater and sediment' (Exponent, 2003). For TBT, the prediction equation is $pw = [\,0.0676 + 0.0107 \times (\text{Measured Concentration of Contaminant in the Surface Sediment})^{1/2}\,]^2$.

8 Measured Concentration in Porewater is referenced from Table 7 of this document.

9 Effects Benchmark and reference are provided in Table 13 of this document.

10 Toxic Units are calculated as the Porewater Concentration divided by the Effects Benchmark. If the Measured Concentration in Porewater is reported, then the lower value of the Measured Concentration in Porewater or the Estimated Concentration in Porewater [EqP model approach] is used to calculate the Toxic Units. Otherwise, the lower value of the Estimated Concentration in Porewater [EqP model approach] or Estimated Concentration in Porewater [Prediction equation approach] is used to calculate the Toxic Units.

11 Values indicating risk potential (Toxic Unit > 1) are shown in shaded cells with bold text.

12 NR = Not Reported

13 TBT = Tributyltin

14 µg/kg = micrograms per kilogram.

15 $L_{water}/L_{octanol}$ = liter water per liter octanol.

16 L_{water}/kg_{oc} = liter water per kilogram organic carbon.

17 $kg_{OC}/kg_{sediment}$ = kilograms of organic carbon per kilograms of sediment.

18 µg/kg_{OC} = micrograms per kilogram of organic carbon.

19 µg/L = micrograms per liter.

Table 18. Benthic Risk for Mercury

Notes	1	2	3	4	5	6
Station	Measured Concentration in Surface Sediment (mg/kg, dw)	BAF ($kg_{sediment, dw}/kg_{tissue, ww}$)	Estimated Concentration in Invertebrate Tissue (mg/kg, ww)	Measured Concentration in Invertebrate Tissue (mg/kg, ww)	Effects Benchmark (mg/kg, ww)	Toxic Units
NA01	1.1	0.026	0.03	NR	0.19	0.15
NA02	0.7		0.02	NR		0.10
NA03	1.1		0.03	NR		0.15
NA04	1.1		0.03	NR		0.15
NA05	0.6		0.02	NR		0.08
NA06	2.4		0.06	NR		0.33
NA07	1.5		0.04	NR		0.20
NA08	0.8		0.02	NR		0.11
NA09	1.2		0.03	NR		0.17
NA10	0.6		0.02	NR		0.08
NA11	0.9		0.02	NR		0.12
NA12	0.6		0.02	NR		0.09
NA13	0.6		0.02	NR		0.09
NA14	0.6		0.01	NR		0.08
NA15	1.0		0.03	NR		0.14
NA16	1.1		0.03	NR		0.15
NA17	0.8		0.02	NR		0.12
NA18	0.8		0.02	NR		0.11
NA20	0.2		0.01	NR		0.03
NA21	0.5		0.01	NR		0.07
NA23	1.1		0.03	NR		0.15
NA24	0.9		0.02	0.02		0.11
NA25	0.4		0.01	NR		0.06
NA26	0.5		0.01	NR		0.07
NA27	1.2		0.03	NR		0.17
NA28	0.9		0.02	NR		0.12
NA29	0.6		0.01	NR		0.08
NA30	0.7		0.02	NR		0.10
NA31	0.4		0.01	NR		0.05
SW01	1.5		0.04	NR		0.20
SW02	4.5		0.12	NR		0.62
SW03	1.2		0.03	NR		0.17
SW05	1.0		0.03	NR		0.13
SW06	0.8		0.02	NR		0.10
SW07	0.5		0.01	NR		0.07
SW08	2.3		0.06	NR		0.31
SW09	1.0		0.03	NR		0.13
SW10	0.6		0.02	NR		0.08
SW11	0.8		0.02	NR		0.10
SW12	0.5		0.01	NR		0.07
SW14	1.0		0.03	NR		0.14
SW15	0.9		0.02	NR		0.12
SW16	1.0		0.03	NR		0.14
SW17	1.0		0.03	NR		0.14
SW18	0.8		0.02	0.02		0.09
SW19	2.1		0.06	NR		0.29
SW20	1.0		0.03	NR		0.14
SW21	1.4		0.04	NR		0.19
SW24	1.9		0.05	NR		0.26
SW25	0.8		0.02	NR		0.11
SW26	0.4		0.01	NR		0.06
SW27	0.7		0.02	0.02		0.09
SW28	0.9		0.02	NR		0.12
SW29	0.9		0.02	NR		0.13
SW30	1.1		0.03	NR		0.15
SW31	0.2		0.01	NR		0.03
SW32	0.5		0.01	NR		0.07
SW33	0.5		0.01	NR		0.07
SW34	0.8		0.02	NR		0.10
SW36	0.8		0.02	NR		0.10

Notes:

[1] Concentration in Surface Sediment is referenced from Table 6 of this document.

[2] Bioaccumulation Factor (BAF) is calculated in Table 10 of this document.

[3] Estimated Concentration in Invertebrate Tissue is calculated as the Surface Sediment Concentration multiplied by the BAF.

[4] Measured concentration in mussel (soft tissue) is referenced from 'Table E-1. Lipid, solids, metal, and butyltin results for tissue samples' in Exponent, 2003. Composite samples of benthic mussel tissues with shell removed (*Musculista senhousei*) were collected at two stations inside each shipyard, NASSCO and Southwest Marine.

[5] Effects Benchmark and reference are provided in Table 13 of this document.

[6] Toxic Units are calculated as the Measured Concentration in Invertebrate Tissue divided by the Effects Benchmark. If the Measured Concentration in Invertebrate Tissue is not reported, then the Estimated Concentration in Invertebrate Tissue is used.

[7] Values indicating risk potential (Toxic Unit > 1) are shown in shaded cells with bold text.

[8] NR = Not Reported

[9] mg/kg, ww = milligrams per kilogram, wet weight.

[10] mg/kg, dw = milligrams per kilogram, dry weight.

[11] $kg_{sediment, dw}/kg_{tissue, ww}$ = kilogram of sediment, dry weight per kilogram of tissue, wet weight.

Table 19. Summary of Benthic Risk for the Five Primary Site Chemicals of Concern and Selection of Polygons for Consideration for Footprint Inclusion

Notes	1	2	3	4	5	6	7				8	9
							Revised Triad Analysis					
Station	**Toxic Unit for PCB Homolog**	**Toxic Unit for Total HPAH**	**Toxic Unit for Copper**	**Toxic Unit for TBT**	**Toxic Unit for Mercury**	**Chemicals Posing Risk**	**Sediment Chemistry (Toxic Unit Approach)**	**Toxicity (Table 1)**	**Benthic Community (Table 1)**	**Triad Conclusion**	**Evidence of Benthic Risk Potential**	**Consideration for Footprint Inclusion**
NA01	0.02	0.22	0.19	0.08	0.15		Low	Low	Low	Unlikely		
NA02	0.01	0.15	0.68	0.41	0.10		Non-Triad Station					
NA03	0.01	0.29	0.00	0.68	0.15		Low	Low	Low	Unlikely		
NA04	0.01	0.18	**1.15**	0.97	0.15	Copper	Moderate/High	Low	Low	Unlikely/Possible		
NA05	0.01	0.19	**1.07**	0.49	0.08	Copper	Moderate/High	Low	Low	Unlikely/Possible		
NA06	0.03	0.13	0.00	**1.52**	0.33	TBT	Moderate/High	Low	Low	Unlikely/Possible		
NA07	0.02	0.91	0.38	0.49	0.20		Low	Low	Low	Unlikely		
NA08	0.01	0.18	0.85	0.49	0.11		Non-Triad Station					
NA09	0.01	0.13	0.00	0.52	0.17		Low	Moderate	Low	Unlikely		
NA10	0.01	0.16	**1.13**	0.44	0.08	Copper	Non-Triad Station				Non-Triad Toxic Unit > 1	**Yes**
NA11	0.01	0.18	**1.03**	0.27	0.12	Copper	Moderate/High	Moderate	Low	Possible/Likely	Revised Triad Possible/Likely	**Yes**
NA12	0.01	0.15	0.94	0.41	0.09		Low	Moderate	Low	Unlikely		
NA13	0.01	0.08	0.00	0.33	0.09		Non-Triad Station					
NA14	0.01	0.07	0.00	0.30	0.08		Non-Triad Station					
NA15	0.01	0.18	**1.28**	**1.80**	0.14	Copper, TBT	Moderate/High	Low	Low	Unlikely/Possible		
NA16	0.02	0.11	0.07	0.83	0.15		Low	Moderate	Low	Unlikely		
NA17	0.02	0.10	0.00	**1.17**	0.12	TBT	Moderate/High	Low	Low	Unlikely/Possible		
NA18	0.01	0.13	**1.05**	0.75	0.11	Copper	Non-Triad Station				Non-Triad Toxic Unit > 1	**Yes**
NA20	0.01	0.23	0.00	0.92	0.03		Low	Low	Moderate	Unlikely		
NA21	0.01	0.11	0.00	**1.23**	0.07	TBT	Non-Triad Station				Non-Triad Toxic Unit > 1	**Yes**
NA23	0.02	0.17	0.65	0.52	0.15		Non-Triad Station					
NA24	0.01	0.11	0.33	0.34	0.11		Non-Triad Station					
NA25	0.01	0.09	0.00	0.22	0.06		Non-Triad Station					
NA26	0.01	0.08	0.32	0.27	0.07		Non-Triad Station					
NA27	0.01	0.15	**1.41**	0.46	0.17	Copper	Non-Triad Station				Non-Triad Toxic Unit > 1	**Yes**
NA28	0.01	0.20	**1.69**	0.43	0.12	Copper	Non-Triad Station				Non-Triad Toxic Unit > 1	**Yes**
NA29	0.01	0.12	0.04	0.34	0.08		Non-Triad Station					
NA30	0.01	0.08	0.00	0.21	0.10		Non-Triad Station					
NA31	0.01	0.06	0.00	0.20	0.05		Non-Triad Station					
SW01	0.11	0.23	**1.28**	0.56	0.20	Copper	Non-Triad Station				Non-Triad Toxic Unit > 1	**Yes**
SW02	0.21	0.42	0.00	0.90	0.62		Low	Low	Low	Unlikely		
SW03	0.01	0.24	0.00	0.32	0.17		Low	Low	Low	Unlikely		
SW05	0.11	0.97	0.00	0.65	0.13		Non-Triad Station					
SW06	0.04	0.77	0.00	0.46	0.10		Non-Triad Station					
SW07	0.01	0.25	0.00	0.29	0.07		Non-Triad Station					
SW08	0.06	0.47	0.00	**7.45**	0.31	TBT	Moderate/High	Low	Low	Unlikely/Possible		
SW09	0.06	**1.02**	0.70	**2.32**	0.13	HPAH, TBT	Moderate/High	Low	Low	Unlikely/Possible		
SW10	0.11	**1.64**	0.00	0.85	0.08	HPAH	Non-Triad Station				Non-Triad Toxic Unit > 1	**Yes**
SW11	0.01	0.49	0.00	0.57	0.10		Low	Low	Low	Unlikely		
SW12	0.01	0.23	0.70	0.33	0.07		Non-Triad Station					
SW14	0.02	0.43	0.00	**1.32**	0.14	TBT	Non-Triad Station				Non-Triad Toxic Unit > 1	**Yes**
SW15	0.02	0.38	0.00	0.65	0.12		Low	Moderate	Low	Unlikely		
SW16	0.02	0.28	0.00	**2.71**	0.14	TBT	Non-Triad Station				Non-Triad Toxic Unit > 1	**Yes**
SW17	0.02	0.45	**1.18**	**1.30**	0.14	Copper, TBT	Moderate/High	Moderate	Low	Possible/Likely	Revised Triad Possible/Likely	**Yes**
SW18	0.02	0.42	**1.02**	0.55	0.09	Copper	Moderate/High	Low	Low	Unlikely/Possible		
SW19	0.01	0.11	0.00	0.27	0.29		Non-Triad Station					
SW20	0.06	0.56	0.00	0.55	0.14		Non-Triad Station					
SW21	0.08	0.50	**1.24**	0.65	0.19	Copper	Moderate/High	Low	Low	Unlikely/Possible		
SW24	0.04	**1.37**	0.84	**1.12**	0.26	HPAH, TBT	Non-Triad Station				Non-Triad Toxic Unit > 1	**Yes**
SW25	0.01	0.28	0.35	0.96	0.11		Low	Moderate	Low	Unlikely		
SW26	0.02	0.13	0.97	0.31	0.06		Non-Triad Station					
SW27	0.01	0.65	0.00	0.85	0.09		Low	Moderate	Low	Unlikely		
SW28	0.04	0.25	0.00	0.24	0.12		Non-Triad Station					
SW29	0.07	0.38	0.00	0.70	0.13		Non-Triad Station					
SW30	0.02	0.27	0.37	0.73	0.15		Non-Triad Station					
SW31	0.01	0.20	0.00	0.26	0.03		Non-Triad Station					
SW32	0.01	0.06	0.00	0.24	0.07		Non-Triad Station					
SW33	0.00	0.05	0.19	0.20	0.07		Non-Triad Station					
SW34	0.01	0.09	**1.71**	0.27	0.10	Copper	Non-Triad Station				Non-Triad Toxic Unit > 1	**Yes**
SW36	0.01	0.20	0.00	0.31	0.10		Non-Triad Station					

Notes:

[1] The Toxic Unit for PCB Homologs is referenced from Table 14 of this document.

[2] The Toxic Unit for Total HPAH is referenced from Table 15 of this document.

[3] The Toxic Unit for Copper is referenced from Table 16 of this document.

[4] The Toxic Unit for TBT is referenced from Table 17 of this document.

[5] The Toxic Unit for Mercury is referenced from Table 18 of this document.

[6] Toxic units greater than 1 pose potential risk to the benthic community.

[7] For Triad stations, a revised Triad analysis was performed, assuming a "Moderate/High" result for the sediment chemistry line of evidence when one or more COCs exhibited a Toxic Unit > 1, and a "Low" result when all COCs exhibited Toxic Units ≤ 1. Following the reclassification of the sediment chemistry line of evidence, the Triad analysis was reinterpreted per CRWQCB (2010) Triad decision rules (Table 18-4).

[8] For Non-Triad stations, evidence of benthic risk potential is indicated by one or more COCs with a Toxic Unit > 1 . For Triad stations, evidence of benthic risk potential is indicated by a Triad result of "Possible/Likely".

[9] Stations should be considered for inclusion into the Site remedial footprint to address Aquatic Life Beneficial Use Impairment where evidence of benthic risk potential is indicated.

[10] HPAH = High Molecular Weight Polycyclic Aromatic Hydrocarbons.

[11] PCB = polychlorinated biphenyl.

[12] TBT = Tributyltin.

Table 20. Exposure reduction for Aquatic Life for CRWQCB (2010) Polygon Increments Included in the Economic Feasibility Analysis.

Remedial Analysis Increment (CRWQCB, 2010)	Increment Area (acres) (CRWQCB, 2010)	Polygons Included in Increment	Aquatic Life BUI Evidence (Toxic Unit Approach as Sediment Chemistry Line of Evidence, Conder (2011))	Polygon Area (acres) (CRWQCB, 2010)	Polygon Aquatic Life Exposure Reduction [1] (%)	Increment Aquatic Life Exposure Reduction (%)
1	372,595	SW04	Revised Triad Likely	22,921	2%	11%
		SW08		15,421		
		SW02		37,018		
		SW24	Toxic Unit Non-Triad Approach (TU > 1)	25,940	2%	
		SW09		24,389		
		SW13	Revised Triad Likely	37,141	3%	
		NA17		29,690		
		SW01	Toxic Unit Non-Triad Approach (TU > 1)	33,247	3%	
		SW16	Toxic Unit Non-Triad Approach (TU > 1)	18,273	1%	
		SW21		13,641		
		SW28		50,535		
		NA06		64,379		
2	173,104	SW20		27,601		7%
		SW05		25,402		
		SW23		26,842		
		SW22		4,440		
		SW17	Revised Triad Likely	56,117	4%	
		NA19	Revised Triad Likely	32,701	3%	
3	255,365	NA07		32,593		3%
		SW14	Toxic Unit Non-Triad Approach (TU > 1)	16,747	1%	
		NA15		51,282		
		SW10	Toxic Unit Non-Triad Approach (TU > 1)	21,626	2%	
		NA23		67,024		
		SW29		66,095		
4	3,151,014	NA04		81,308		80%
		NA01		100,720		
		NA27	Toxic Unit Non-Triad Approach (TU > 1)	57,956	4%	
		NA16		36,736		
		SW30		76,779		
		SW27		77,527		
		NA03		120,986		
		SW25		70,172		
		SW15		57,423		
		SW03		47,090		
		SW06		26,105		
		SW18		61,364		
		NA09		28,922		
		SW19		210,320		
		NA18	Toxic Unit Non-Triad Approach (TU > 1)	45,370	3%	
		NA08		19,632		
		NA28	Toxic Unit Non-Triad Approach (TU > 1)	56,241	4%	
		SW11		37,417		
		NA21	Toxic Unit Non-Triad Approach (TU > 1)	514,183	39%	
		SW36		101,104		
		NA24		60,391		
		SW34	Toxic Unit Non-Triad Approach (TU > 1)	302,142	23%	
		NA11	Revised Triad Likely	38,392	3%	
		NA02		160,570		
		NA05		113,895		
		NA13		255,537		
		NA22		235,799		
		NA10	Toxic Unit Non-Triad Approach (TU > 1)	29,008	2%	
		NA12		90,903		
		SW07		37,022		
5	2,529,080	NA20		322,869		0%
		NA30		239,380		
		SW12		106,435		
		NA29		203,451		
		SW26		87,094		
		NA14		211,512		
		SW32		70,925		
		SW33		150,157		
		NA26		299,493		
		NA25		513,303		
		NA31		239,878		
		SW31		84,584		
			Sum of Polygons Exhibiting Aquatic Life BUI	**1,308,004**		

Notes:

[1] Percent exposure reduction for remediation to address Aquatic Life BUI is calculated by dividing the area for polygons exhibiting Aquatic Life BUI Evidence by the total area exhibiting Aquatic Life BUI.

Table 21. Incoproration of All Three Beneficial Use Impairments in the Economic Feasbility Analysis.

Increment	Total (Cumulative) Number of Polygons Remediated	Incremental Exposure Reduction				Incremental Cost	Composite Exposure Reduction per $10 million
		Aquatic-dependent Wildlife (CRWQCB, 2010)	Human Health (CRWQCB, 2010)	Aquatic Life (Table 1)	Composite[1]		
1	12	30%	30%	11%	24%	$ 24,300,000	9.7%
2	18	10%	10%	7%	9%	$ 8,600,000	10.6%
3	24	8%	8%	3%	6%	$ 12,000,000	5.2%
4	54	53%	53%	80%	62%	$ 139,900,000	4.4%
5	66	0%	0%	0%	0%	$ 50,300,000	0.0%

Notes:

1 Composite exposure reduction calculated by the average of the incremental exposure reductions for Aquatic-dependent wildlife, human health, and aquatic life BUIs.

Table 22. Exposure reduction for Aquatic Life Only Economic Feasibility Analysis.

Remedial Analysis Increment (CRWQCB, 2010)	Increment Area (acres) (CRWQCB, 2010)	Polygons Included in Increment	Aquatic Life BUI Evidence (Toxic Unit Approach as Sediment Chemistry Line of Evidence, Conder (2011))	Highest Toxic Unit (Where > 1)	Polygon Area (acres) (CRWQCB, 2010)	Highest Toxic Unit × Polygon Area	Polygon Aquatic Life Exposure Reduction [1] (%)	Increment Aquatic Life Exposure Reduction (%)
1	932,628	NA21	Toxic Unit Non-Triad Approach (TU > 1)	1.23	514,183	631,420	40%	73%
		SW34	Toxic Unit Non-Triad Approach (TU > 1)	1.71	302,142	515,883	24%	
		SW04	Revised Triad Likely	8.36	22,921	191,590	2%	
		SW13	Revised Triad Likely	3.97	37,141	147,421	3%	
		NA28	Toxic Unit Non-Triad Approach (TU > 1)	1.69	56,241	94,973	4%	
2	210,418	NA27	Toxic Unit Non-Triad Approach (TU > 1)	1.41	57,956	81,686	5%	16%
		SW17	Revised Triad Likely	1.30	56,117	72,740	4%	
		NA19	Revised Triad Likely	1.59	32,701	51,868	3%	
		SW16	Toxic Unit Non-Triad Approach (TU > 1)	2.71	18,273	49,568	1%	
		NA18	Toxic Unit Non-Triad Approach (TU > 1)	1.05	45,370	47,515	4%	
3	148,212	SW01	Toxic Unit Non-Triad Approach (TU > 1)	1.28	33,247	42,588	3%	12%
		NA11	Revised Triad Likely	1.03	38,392	39,689	3%	
		SW24	Toxic Unit Non-Triad Approach (TU > 1)	1.37	25,940	35,667	2%	
		SW10	Toxic Unit Non-Triad Approach (TU > 1)	1.64	21,626	35,419	2%	
		NA10	Toxic Unit Non-Triad Approach (TU > 1)	1.13	29,008	32,788	2%	
4	123,264	SW14	Toxic Unit Non-Triad Approach (TU > 1)	1.32	16,747	22,086	1%	1%
		SW08			15,421		0%	
		SW02			37,018		0%	
		SW09			24,389		0%	
		NA17			29,690		0%	
5	5,066,636	SW21			13,641		0%	0%
		SW28			50,535		0%	
		NA06			64,379		0%	
		SW20			27,601		0%	
		SW05			25,402		0%	
		SW23			26,842		0%	
		SW22			4,440		0%	
		NA07			32,593		0%	
		NA15			51,282		0%	
		NA23			67,024		0%	
		SW29			66,095		0%	
		NA04			81,308		0%	
		NA01			100,720		0%	
		NA16			36,736		0%	
		SW30			76,779		0%	
		SW27			77,527		0%	
		NA03			120,986		0%	
		SW25			70,172		0%	
		SW15			57,423		0%	
		SW03			47,090		0%	
		SW06			26,105		0%	
		SW18			61,364		0%	
		NA09			28,922		0%	
		SW19			210,320		0%	
		NA08			19,632		0%	
		SW11			37,417		0%	
		SW36			101,104		0%	
		NA24			60,391		0%	
		NA02			160,570		0%	
		NA05			113,895		0%	
		NA13			255,537		0%	
		NA22			235,799		0%	
		NA12			90,903		0%	
		SW07			37,022		0%	
		NA20			322,869		0%	
		NA30			239,380		0%	
		SW12			106,435		0%	
		NA29			203,451		0%	
		SW26			87,094		0%	
		NA14			211,512		0%	
		SW32			70,925		0%	
		SW33			150,157		0%	
		NA26			299,493		0%	
		NA25			513,303		0%	
		NA31			239,878		0%	
		SW31			84,584		0%	
			Sum of Polygons Exhibiting Aquatic Life BUI		**1,284,127**			

Notes:

[1] Percent exposure reduction for remediation to address Aquatic Life BUI is calculated by dividing the area for polygons exhibiting Aquatic Life BUI Evidence by the total area exhibiting Aquatic Life BUI.

Table 23. Incoproration of Aquatic Life Beneficial Use Impairment in an Economic Feasbility Analysis.

Increment	Total (Cumulative) Number of Polygons Remediated	Incremental Exposure Reduction Aquatic Life (Table 1)	Incremental Cost [1]	Composite Exposure Reduction per $10 million
1	5	73%	$ 32,641,969	22.2%
2	10	16%	$ 7,364,628	22.2%
3	15	12%	$ 5,187,420	22.2%
4	20	1%	$ 4,314,256	3.0%
5	66	0%	$ 177,332,254	0.0%

Notes:

[1] Assumes a cost of approximately $35 per acre based on CRWQCB (2010).

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Table 24. Metal Concentrations in Tissue of Spotted Sand Bass and Spiny Lobster Located Inside BAE Systems

Species	Portion	Station	Sample Number	Date	Field Replicate	Copper (mg/kg, ww)	Mercury, total (mg/kg, ww)
Spotted sand bass	Fillet	SWFI01	BI0014	09/25/2002	1	0.12	0.18
Spotted sand bass	Fillet	SWFI01	BI0015	09/25/2002	2	0.11	0.22
Spotted sand bass	Fillet	SWFI01	BI0016	09/25/2002	3	0.12	0.17
Spotted sand bass	Fillet	SWFI01	BI0017	09/25/2002	4	0.13	0.13
Spotted sand bass	Fillet	SWFI01	BI0018	09/25/2002	5	0.16	0.19
Spotted sand bass	**Fillet**	**Mean**				**0.13**	**0.18**
		Maximum				**0.16**	**0.22**
Spiny Lobster	Edible	SWM-Lob	BI0001	8/27/2002	1	16	0.068
Spiny Lobster	Edible	SWM-Lob	BI0002	8/27/2002	2	17	0.044
Spiny Lobster	Edible	SWM-Lob	BI0003	8/27/2002	3	18	0.065
Spiny Lobster	Edible	SWM-Lob	BI0073	9/29/2002	4	18	0.11
Spiny Lobster	Edible	SWM-Lob	BI0074	9/29/2002	5	14	0.084
Spiny Lobster	**Edible**	**Mean**				**17**	**0.07**
		Maximum				**18**	**0.11**

Notes:
[1] Tissue Concentrations are referenced from Table E-1 of Exponent (2003).
[2] Units are milligram per kilogram, wet weight basis (mg/kg, ww).

Table 25. Total Polychlorinated Biphenyl (PCB) Concentrations in Tissue of Spotted Sand Bass and Spiny Lobster Located Inside BAE Systems.

Species	Portion	Station	Sample Number	Date	Field Replicate	Total PCBs (µg/kg, ww)
Spotted sand bass	Fillet	SWFI01	BI0014	09/25/2002	1	27
Spotted sand bass	Fillet	SWFI01	BI0015	09/25/2002	2	190
Spotted sand bass	Fillet	SWFI01	BI0016	09/25/2002	3	69
Spotted sand bass	Fillet	SWFI01	BI0017	09/25/2002	4	400
Spotted sand bass	Fillet	SWFI01	BI0018	09/25/2002	5	140
Spotted sand bass	**Fillet**	**Mean**				**165**
		Maximum				**400**
Lobster	Edible	SWM-Lob	BI0001	8/27/2002	1	***20***
Lobster	Edible	SWM-Lob	BI0002	8/27/2002	2	12
Lobster	Edible	SWM-Lob	BI0003	8/27/2002	3	***20***
Lobster	Edible	SWM-Lob	BI0073	9/29/2002	4	21
Lobster	Edible	SWM-Lob	BI0074	9/29/2002	5	10
Spiny Lobster	**Edible**	**Mean**				**17**
		Maximum				**21**

Notes:

1 Tissue Concentrations are referenced from Table E-5 of Exponent (2003).

2 Units are microgram per kilogram, wet weight basis (µg/kg, ww).

3 Total PCB is calculated as the sum of Aroclors according to the following rules: 1) if any Aroclor is detected, all detected Aroclors are summed; 2) if no Aroclor is detected, the highest detection limit for any Aroclor is used.

4 Non-detect values are bold and italicized. Half of the detection limit is used in mean concentration calculations.

Table 26. Revised Human Health Risk Assessment for Inside BAE Systems.

		Notes:	1	2	3	2	2	2	4	2	5
			Consumption Rate	Body Weight	Exposure Duration	Exposure Frequency	Fraction Ingested	Averaging Time for Carcinogens	Averaging Time for Non-carcinogens	Conversion Factor	Cooking Loss, Median
Exposure Scenario			CR	BW	ED	EF	FI	AT_c	AT_n	CF	CL
Angler	Species	Portion	kg/day	kg	years	days/year	unitless	days	days	µg/mg	unitless
Recreational	Spotted Sand Bass	Fillet	0.00042	70	9	365	1	25,550	3,285	1,000	0.359
Upper Bound	Spotted Sand Bass	Fillet	0.0018	70	9	365	1	25,550	3,285	1,000	0.359
Recreational	Spiny Lobster	Edible	0.00042	70	9	365	1	25,550	3,285	1,000	0.309
Upper Bound	Spiny Lobster	Edible	0.0018	70	9	365	1	25,550	3,285	1,000	0.309

			Notes:	6	8	11	12	6	8	11	12	7	9	11	12	7	10	11	13
				Mercury, total				Copper				Total PCBs (Non-carcinogen)				Total PCBs (Carcinogen)			
				Tissue Concentration	Intake	Reference Dose	Hazard Index	Tissue Concentration	Intake	Reference Dose	Hazard Index	Tissue Concentration	Intake, Non-carcinogen	Reference Dose	Hazard Index	Tissue Concentration	Intake, Carcinogen	Cancer Slope Factor	Risk
	Exposure Scenario			C	I	RfD	HI	C	I	RfD	HI	C	I	RfD	HI	C	I	CSF	R
Location	Angler	Species	Portion	mg/kg, ww	mg/kg-day	mg/kg-day	Unitless	mg/kg, ww	mg/kg-day	mg/kg-day	Unitless	µg/kg, ww	mg/kg-day	mg/kg-day	Unitless	µg/kg, ww	mg/kg-day	$(mg/kg\text{-}day)^{-1}$	Unitless
Inside BAE Systems	Recreational	Spotted Sand Bass	Fillet	0.22	0.0000013	0.0001	0.01	0.16	0.0000010	0.037	0.00003	400	0.00000154	0.00002	0.08	400	0.000000198	2	4.0E-07
	Upper Bound	Spotted Sand Bass	Fillet	0.22	0.0000057	0.0001	0.06	0.16	0.0000041	0.037	0.0001	400	0.00000659	0.00002	0.33	400	0.000000848	2	1.7E-06
	Recreational	Spiny Lobster	Edible	0.11	0.0000007	0.0001	0.007	18	0.0001080	0.037	0.003	21	0.00000009	0.00002	0.004	21	0.000000011	2	2.2E-08
	Upper Bound	Spiny Lobster	Edible	0.11	0.0000028	0.0001	0.03	18	0.0004629	0.037	0.01	21	0.00000037	0.00002	0.02	21	0.000000048	2	9.6E-08

Notes:

1 CR is referenced from Finley (2011). The CR value in the DTR is 0.021 kg/day for recreational angler as referenced from OEHHA (2001) and 0.161 kg/day for subsistence angler as referenced from SCCWRP and MBC (1994) .

2 The values for BW, EF, FI, CF, and AT_c are used in both the DTR and Finley (2011).

3 ED is referenced from Finely (2011). The ED value in the DTR is 30 years.

4 ATn is calculated as the exposure duration multiplied by 365 days per year. Please note, both Finley (2011) and DTR used 30 years as the exposure duration for this calculation, despite Finley (2011) use of 9 years as the exposure duration for the parameter ED.

5 CL is referenced from Finely (2011). The DTR applied a 50 percent reduction factor for PCBs in spotted sand bass fillets for recreational anglers.

6 Maximum metal concentrations in tissue are referenced from Table E-1 of Exponent (2003), as summarized in Table 1.

7 Maximum PCB concentrations in tissue are referenced from Table E-6 of Exponent (2003), as summarized in Table 2.

8 Intake for Mercury, total and Copper are calculated as $I = (C \times CR \times FI \times ED \times EF) \div (BW \times AT_n)$.

9 Intake for Total PCBs (Non-carcinogen) is calculated as $I = (C \times CR \times FI \times ED \times EF \times (1\text{-}CL)) \div (BW \times AT_n \times CF)$.

10 Intake for Total PCBs (Carcinogen) is calculated as $I = (C \times CR \times FI \times ED \times EF \times (1\text{-}CL)) \div (BW \times AT_c \times CF)$.

11 The values for RfD and CSF are used in both the DTR and Finley (2011) (USEPA 2003).

12 $HI = I \div RfD$. If the value of HI is greater than 1.0, then there is the potential for unacceptable exposures and non-cancer health effects as referenced from DTR. HI values that exceed 1.0 are formatted bold and italicized.

13 $R = I \times CSF$. If the value of R is greater than the target cancer risk level of 1×10^{-5}, then there is the potential for beneficial use impairment (OEHHA 2006). R values that exceed the target cancer risk level are formatted bold and italicized.

14 Units are milligram per kilogram, wet weight basis (mg/kg, ww).

15 Units are microgram per kilogram, wet weight basis (µg/kg, ww).

Figures

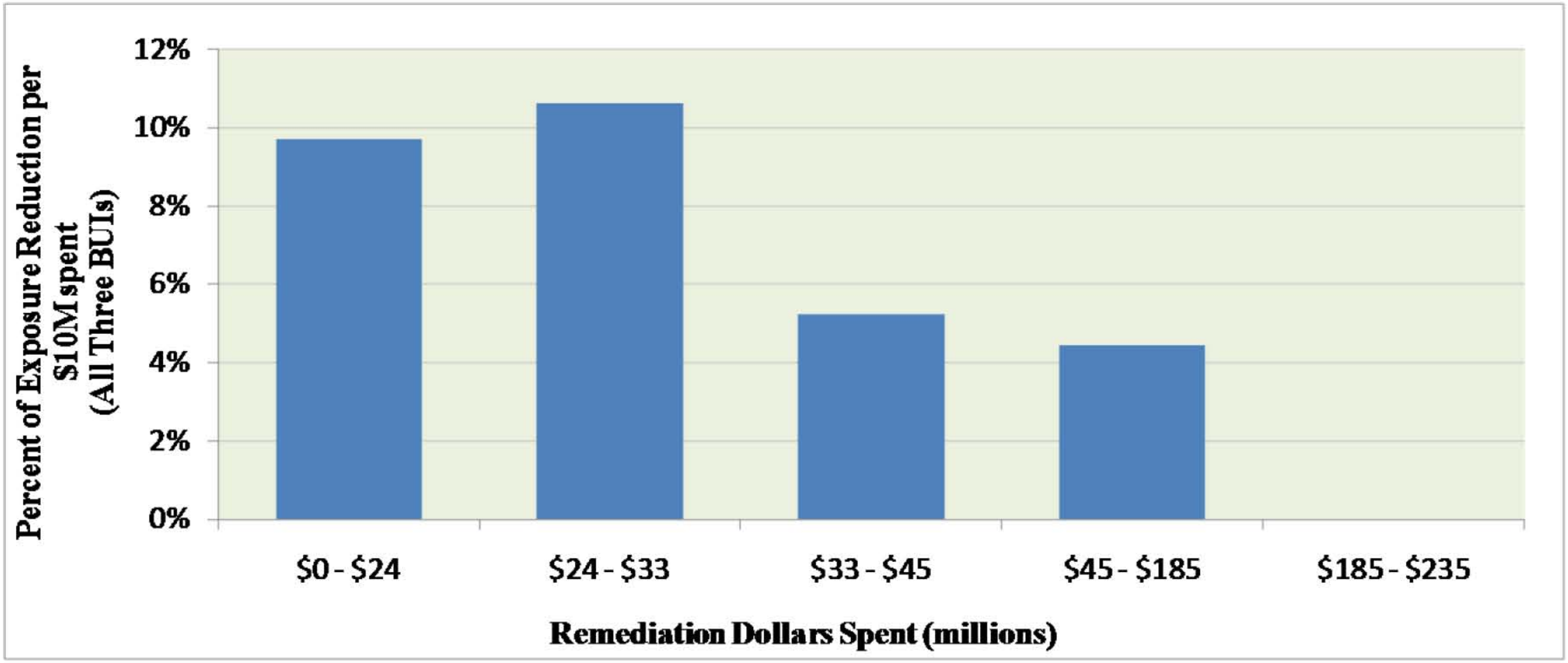
ENVIRON

Remedial Footprint to Protect Aquatic Life Beneficial Uses

San Diego Shipyard Sediment Site
San Diego, California

Figure 1

DRAFTED BY: SShin | DATE: 5/12/2011 | PROJECT: 03-19562A



ENVIRON

Percent Exposure Reduction for all Three Beneficial Use Impairment Endpoints versus Remediation Dollars Spent

San Diego Shipyard Sediment Site
San Diego Bay, San Diego, CA

Figure 2

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Path: Z:\01_Projects\SEMPRA\03_GIS\MXD\San Diego Alternate Footprint Figs\Figure_2_Remedial Footprint to Protect Aquatic Life, Human Health, and Aquatic-dependent Wildlife Beneficial Uses.

ENVIRON

Remedial Footprint to Protect Aquatic Life, Human Health, and Aquatic-dependent Wildlife Beneficial Uses

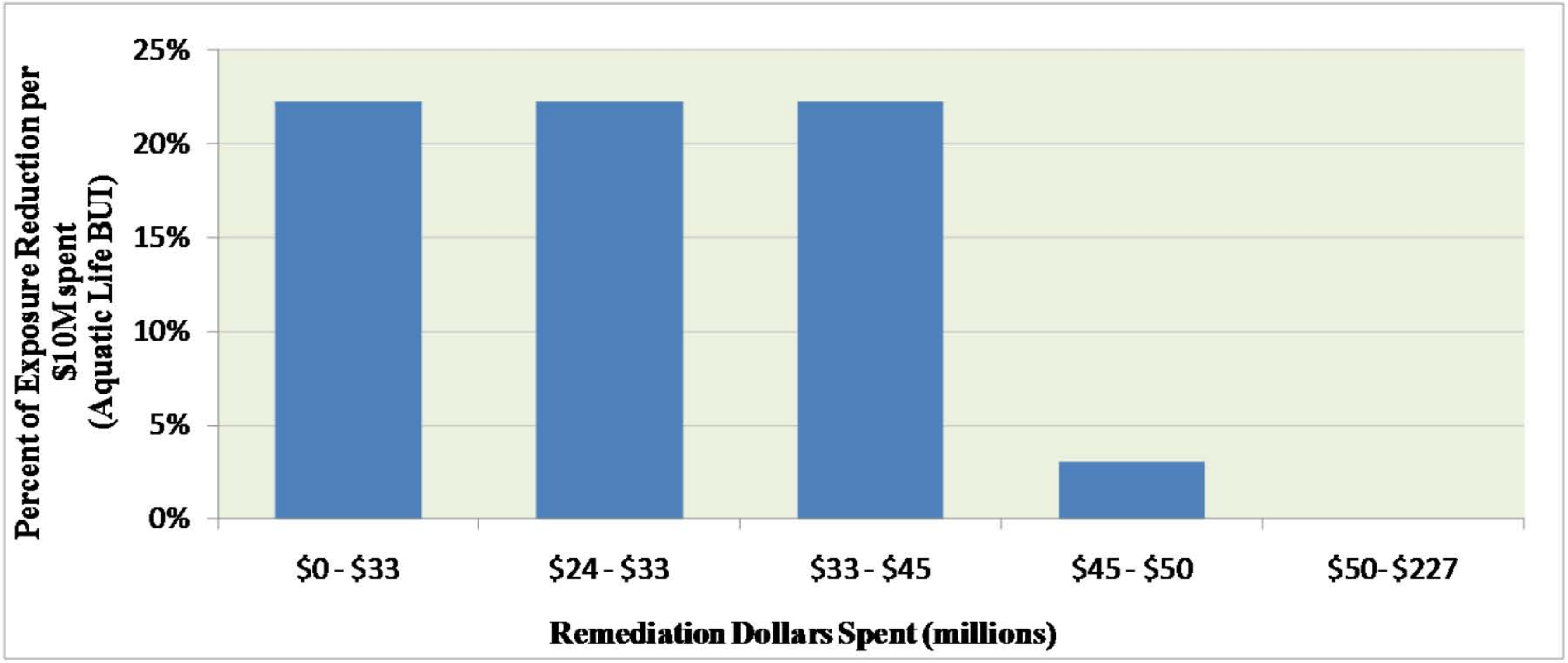
San Diego Shipyard Sediment Site
San Diego, California

Figure 3

DRAFTED BY: SShin

DATE: 5/12/2011

PROJECT: 03-19562A



ENVIRON

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Percent Exposure Reduction for the Aquatic Life Beneficial Use Impairment Endpoint versus Remediation Dollars Spent

San Diego Shipyard Sediment Site
San Diego Bay, San Diego, CA

Figure 4

PROJECT: 03-19562A