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Mr. Cecil Felix
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San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
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Subject: Response to Comments on Human Health and Ecological Risk Evaluation, UC Berkeley Richmond Field Station, Richmond, California (November 2001)

Dear Mr. Felix:

The purpose of this letter is to provide the RWQCB with responses to the comments written by Roger Brewer (May 3, 2002) and Naomi Feger (May 31, 2002) on the Human Health and Ecological Risk Evaluation for the UC Berkeley Richmond Field Station (URS 2001). Both sets of comments are presented below, as well as the response to each comment.

Responses to Comments from Roger Brewer on the Human Health Portion of the Risk Evaluation

1. ***Comment: Section 3.2, Table 3-11, Soil Background Concentrations - reevaluate background concentrations of arsenic in soils at the site.*** *Reference was made to a 1995 LBNL document that calculated background concentrations of metals in Bay area soils based on a relatively extensive database. Methods used in the LBNL document to calculate UCL-based background concentrations of metals in soil have recently been found to be incorrect, however. For the subject site, this is primarily a concern for arsenic. In our office's December 2001 RBSL document, background concentrations of arsenic in Bay area soils is recalculated to be approximately 8.0 mg/kg based on the LBNL database. LBNL is currently working to revise their document.*

   Response: On the basis of the technical discussion presented below, we recommend that the representative background concentration for arsenic in soil be retained as 19.1 mg/kg and that the newly proposed value of 8.0 mg/kg be used as a reference criterion for the preliminary screening. Based on recent conversations with Roger Brewer, it appears that the RWQCB-recommended background concentration of 8.0 mg/kg was calculated as the 95% upper confidence limit on the mean (UCL) concentration of the background dataset. The UCL is a conservative estimator of the average concentration, and it is used to represent the source term in the exposure assessment. The former threshold for arsenic in soil was, however, calculated as a conservative estimate of the data instead of the mean. As is presented in the attachment provided in this letter (Appendix A), this estimator is called the upper

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tolerance limit (UTL) of the dataset. The UTL comprises the results of the laboratory analyses for the background soil population and is interpreted as an established limit below which a high percentage of all site concentrations lie. According to URS statisticians, the appropriate criterion for evaluating exceedances of soil background conditions is the UTL, and not the UCL. Operationally, the UTL and exceedances of the UTL should be further evaluated in more detail to assess if they represent a significant concern in terms of protection of human health.

The referenced attachment (Appendix A), titled "Development of Background Limits for Comparison with Site Contamination Data," provides a discussion of the UTL. Additionally, the attachment includes the procedure for calculating the UTL and example calculations.

The goal of the human health site-specific target levels (H-SSTLs) is to provide criteria designed to protect human health while avoiding unnecessary remediation. Background arsenic concentrations are quite variable and site-specific, and in the San Francisco (SF) Bay area at similar industrial sites along SF Bay, the RWQCB recently allowed >20 milligrams per kilogram (mg/kg) of arsenic in soil. Because of the variability and uncertainty in estimating background, the risk manager's challenge is to avoid unnecessary remediation while protecting human health. We believe that the recommended level for arsenic of 19.1 mg/kg is a balanced criterion that takes into account both goals for the risk assessment.

In addition, based on further site-specific evaluation of the data results in the upland area for arsenic, we identified the presence of two populations of arsenic sample results. One population, where most of the results pertain, is in the low range of concentrations (below 20 mg/kg) and represents background concentrations. The rest of the data points show higher concentrations and are clustered in small areas representing probable hot spots.

2. ***Comment: Section 3.2, Tier 1 Screening - Include a brief discussion of the nature, extent and magnitude of PCB impacts identified at the site to date and a note that PCB-impact issues are to be discussed separately.*** *This should discussed and highlighted early in the risk assessment. For example, include a map that denotes the location of the former PG&E facility, the storm sewer that contains PCB-impacted sediments and a summary of PCB data collected to date. Include Tier 1 human health and ecological screening levels for PCBs for reference.*

   Response: The location of the PG&E facility, storm drain line, and PCB impacted sediment have been discussed on several occasions with Mr. Cecil Felix. Based on the discussions, we will be submitting a separate package to Cecil to assist us with identifying the offsite source of PCBs. This report will be submitted by the end of the year

3. ***Comment: Section 3.3.2.1, Figure 3-2, Human Receptors - Consider the exposure pathway for office workers to be potentially complete.*** *Potential exposure of office*

workers is assumed to be incomplete or insignificant (Figure 3-2). Office workers at the site could potentially be exposed to impacted soils in open areas during breaks, movement between buildings, etc. This is a standard assumption in human health risk assessments and should be included. Exposure assumptions for commercial/industrial workers are presented in Table 3-11, however, and were apparently used to develop screening levels for the "maintenance worker" scenario noted in Figure 3-2. The exposure assumptions in the table (and resulting screening levels) are adequate for both types of workers and both exposure scenarios could simply be combined.

Response: Figure 3-2 has been revised. The incidental ingestion and dermal contact with soil is considered complete for the office workers. The developed commercial/industrial worker receptors H-SSTLs are believed to cover this receptor and were therefore not modified.

4. ***Comment: Section 3.3.2.2, Table 3-11, Human Exposure Assessment - Adjust recreational exposure time with respect to an 8 hour day spent outdoors (vs a 24 hour day).*** *The referenced soil ingestion rates for exposure of adults and children to outdoor soils (100 mg/day and 200 mg/day, respectively) are intended reflect typical daytime exposure during time spent outside (e.g., 8 hours), rather than exposure over a full 24 hour period. This will effectively reduce the Tier 2 H-SSTLs by a factor of three.*

   Response: We agree, but the soil ingestion rate was already time adjusted to account for daytime exposure in the calculations. This is reflected in Table 3-11 where an exposure frequency of 12.5 day/year was used that represents an exposure of three days per week, 50 weeks per year, with an exposure time of 2 hours per recreational day. Therefore, no revision of the Tier 2 H-SSTLs is needed.

5. ***Comment: Section 3.3.2.3, Toxicity Assessment - Use a target cancer risk of 10^{-6} for all classes of carcinogens (including Class C).*** *A target cancer risk of 10^{-5} was used to develop human health screening levels for Class C carcinogens. The USEPA National Contingency Plan guidance states: "The 10^{-6} level shall be used as the point of departure for determining remediation goals..." (USEPA 1994). The NCP guidance does not state that remediation is "...generally not warranted for protection of human health" at sites where the estimated cancer risk does not exceed 10^{-4}, as suggested in the subject report. Remediation or risk management is almost always warranted at sites where the estimated cancer risk exceeds 10^{-4}. Remediation or risk management is rarely warranted at sites where the estimated cancer risk does not exceed 10^{-6}. For sites where the estimated risk is between 10^{-4} and 10^{-6}, the need for remediation or risk management is evaluated on a site-specific basis. Less stringent target risks are often acceptable for commercial/industrial areas where children and other sensitive populations are not likely to be present on a regular basis.*

   Response: The target risk levels used were 1 x 10-6 for residential and recreational scenarios. The target risk level was 1 x 10-5 for maintenance workers,

construction/excavation workers and anglers. No distinction was made between Class A, B or C carcinogens. The target risk levels are consistent with federal and state guidance for risk evaluation and remedial goals development and are more stringent for the scenarios that are associated with higher exposures and sensitive receptors (e.g., residents, children).

In addition to comparisons against individual chemical-specific H-SSTLs, cumulative risks were also evaluated for each receptor and exposure scenario in the Risk Reconciliation section of the human health risk assessment (HHRA). Therefore, the use of target risk levels based on 1 x 10-5 risk level does not overlook the potential for cumulative risks that may exceed 1x 10-5.

6. ***Comment:*** *Section 3.4.2, Figure 3-7, Results and Discussion - Clarify boundaries of impacted areas of concern identified in Figure 3-7; collect additional samples as needed and extend anticipated remedial measures as appropriate. Areas of Concern based on human health in the marsh areas identified in Figure 3-7 are not adequately defined based on the data presented. These areas should be more fully defined through additional sampling. The boundaries of the AOCs to be targeted for risk management or remedial action should be adjusted accordingly.*

   Response: We concur that the areas of concern (AOCs) need further refinement. Additional sampling has been performed, and the results will be screened and AOCs adjusted accordingly. The results will be presented in the 10/31/02 (upland) and 12/1/02 (marsh) submittals as required under the order.

7. ***Comment: Section 3.4.1.2, General - "Explosive Maintenance Area" should presumably be "Explosive Storage Area".***

   Response: Tables are correct but text should read "Explosives Manufacturing Area" instead of "Explosive Storage Area" at sections 3.2.2.2, 3.4.1.2, and 3.5

8. ***Comment: Section 3.4.1.2, General - Provide a map similar to Figure 3-5 that denotes point-by-point exceedances of commercial/industrial soil screening levels.*** *This map will be useful in identifying upland hotspot areas where additional investigation may be needed with respect to potential commercial/industrial exposure, even though area-wide 95% UCLs based on existing data may be below soil screening levels. For example, concentrations of arsenic and lead in the former Shell Manufacturing Area exceed commercial/industrial screening levels.*

   Response: Upland exposure units were identified based on former site use. The exposure point concentration for the risk evaluations was based on the 95% UCL. Special attention was paid to the selection of the areas that can be considered as sources of chemicals, in order to keep them separated from the rest of the site and avoid dilution of the concentration. In addition, "hotspots" were also identified for all sample locations where the chemical of concerns (COCs) exceed the H-SSTL by

greater than 5x times. We believe that we have adequately addressed the hotspot issue.

9. ***Comment: Section 3.4.1.2, Table 3-15, Figure 3-5, South Pyrite Cinder Area - Risks summarized for this area in Table 3-15 do not match risks stated in the text; maximum metal concentrations presented in Table 3-14 do not correlate with data on Figure 3-5.***

   Response: Table 3.14i and D2-9 were revised. Maximum Detected concentrations where corrected for the Pyrite Cinder Area in both tables. Change in outcome in Table 3.14I is as follows. Arsenic concentrations in the South Pyrite Cinder Area exceeds the residential, commercial, and construction/excavation H-SSTLs. Lead concentrations exceed the residential H-SSTLs. Table 3-15 was also revised to reflect correct risk and hazard quotient calculations.

10. ***Comment: Section 3.4.1.2, Northern Pyrite Cinder Area - Evaluate adequacy of data for this area.*** *Only one sample was collected in this area. Based on the name of the area, impacts similar to other identified cinder areas would be anticipated (e.g., elevated arsenic).*

    Response: The Northern Pyrite Cinder Area, or fill area, was subsequently sampled. Test pits were excavated and visual observations revealed that there is only one limited area of cinders (approximately 5' x 5' area). Additional aerial photo and historical review indicate that this area was filled with soil and not cinders, as was previously suspected.

11. ***Comment: Section 3.4.1.3, Evaluation of Groundwater - Summarize groundwater data on a map(s) of the site.***

    Response: The groundwater data was summarized in the December 2000 report previously submitted to the RWQCB. The new data collected to delineate the uplands will be mapped and submitted to the RWQCB in the 10/31/02 report.

12. ***Comment: Section 3.4.1.3, Evaluation of Groundwater - General: Do not assume a DAF of ten for potential impacts to benthic organisms.*** *The assumption of a ten-fold dilution of groundwater upon discharge to surface water may be appropriate for estimating concentrations of chemicals in surface water and uptake in fish but should not be used to evaluate potential ecological impacts to benthic organisms. I did not review the ecological risk assessment portion of the document to see if this assumption was carried through. Actual surface water data would be preferable*

    Response: We did not apply the dilution factor of ten to the benthic organisms. This ten-fold factor was used to conservatively estimate the dilution of chemicals from the sediment pore water into the surface-water into the over-lying surface water.

13. ***Comment:*** *Table 3-13, Summary of RBCs - Use risk-based screening levels for non-liquid chemicals instead of saturation levels. Use of a chemicals theoretical soil saturation limit as an upper limit on screening levels is generally only required for chemicals that are liquids under ambient conditions (refer to USEPA PRG guidance, November 2000).*

    Response: Saturation ceiling was replaced by risk-based concentrations for chemicals not liquid at ambient conditions in Tables 3.14, 3.16, 3.17, and 3.24 to 3.27. This did not result in changes in the outcome of the assessment.

14. ***Comment: Table 3-13, Risk-Based Concentrations - Use a risk-based concentration of lead of 255 mg/kg for Tier 1 residential screening.*** *DTSC recently published a draft residential/school-based soil screening level for lead of 255 mg/kg based on a residential exposure scenario. This screening level is lower than the 400 mg/kg USEPA screening level referenced in Table 3-13. Reference:*

    DTSC, 2001, Interim Guidance for Evaluating Lead-Based Paint and Asbestos Containing Materials at Proposed School Sites: California Environmental Protection Agency, Department of Toxic Substances Control, July 23, 2001, www.dtsc.ca.gov/Schools/Schools.html.

    Response: Tier 2 H-SSTL for lead has been changed from 400 mg/kg to 255 mg/kg for the residential receptor. See Table 3-13 and 3-14 and series for revision. No change in outcome resulted from this comment.

15. ***Comment: Figure 3-3, Residential Tier 2 H-SSTLs - Include sample points in marsh area that exceeded Residential Tier 2 H-SSTLs for general reference.*** *This will assist in evaluating future land uses for the site and potential exposure concerns for nearby residents.*

    Response: The future land use of the marsh is not expected to be residential. The marsh is currently being used for research and teaching purposes, and is the home of the endangered Clapper Rail. Therefore, we believe that it is not necessary to apply residential levels to the marsh.

16. ***Comment: General - Evaluate the need to post caution signs in highly-impacted areas that could potentially be accessed by the general public, both under current conditions and anticipated conditions following remedial actions.*** *Levels of arsenic are significantly elevated in some marsh areas adjacent to footpaths and trails that pass through the property. Caution/advisory signs should be posted in highly impacted areas (e.g., > ten or one-hundred times the risk-based residential soil screening levels) that are potentially accessible to the general public and/or access to these areas should be restricted through fences. Caution/advisory signs for "No Fishing or Hunting" may also be warranted.*

Response: The site is currently fenced and is undergoing remedial actions for Sub-Unit 2A. Signs are also posted. In addition, signs and fencing will be installed around the PCB hot spot in Sub-Unit 2B.

17. ***Comment: General - The proposed deed restriction for the site should include a restriction against residential use of the property as well as use for schools, day-care centers, medical facilities, etc.***

    Response: Although the site is presently a designated commercial area, portions of the site may be considered for faculty housing or other residential purposes in the future. If residential landuse is proposed in the future, potential risks that may originate from the remaining COC concentrations in site media will be re-evaluated to ensure the protection of future onsite residents. Furthermore, once the current remedial activities are complete, the residual risks will be quantified as part of the confirmation sampling activities, and appropriate deed restriction will be negotiated with RWQCB Staff as required under Task 8A of Board Order 01-102.

Responses to Comments from Naomi Feger on the Human Health and Ecological Risk Evaluations

Human Health Risk Assessment

1. *Comment: In terms of the Human Health Risk Assessment, there are two critical areas of potential risk that have yet to be property characterized, the sanitary/storm drain system (source of PCBs to the Marsh) and the PCE/TCE plume which is allegedly moving from Zeneca on to the UCB property. Well location PB12B along the boundary between the two properties (Upland subunit 2A) indicates 6,500 ug/L PCE and 120 ug/L TCE. The report mentions the need for further characterization of the PCBs. Discussion of the TCE/PCE plume is absent from the document.*

   Response: The PCBs and the PCE/TCE-related issues are independent and separate issues for this site. The PCBs were addressed in the report and further characterization was recommended and has recently been performed. As discussed under several comments, the results will be provided in the 12/1/02 submittal to the RWQCB. Concerning the PCE/TCE plume, we agree that it must be addressed in terms of characterization and assessment. However, this plume originates off-site and it is the responsibility of the source site owner to evaluate it and/or remediate it, if necessary.

2. *Comment: Why was TBT considered as an explosive? Table 3.1 refers to TBT as an explosive. Was TNT sampled for?*

   Response: TBT was misplaced. Tables 3-1 to 3-5 and Table 3-20 to 3-23 were revised placing TBT in the pesticide group.

3. ***Comment: Re Table 3-4:*** *in some instances the outcome for the Tier 1 evaluation states that the COPC was not detected so no further consideration was given to that COPC. However, there were no samples collected so the comment should read "never sampled."*

   Response: Table 3-4 was revised to show as a comment "never sampled" when no sample was taken for a chemical.

4. ***Comment:*** *Was Hexachlorobenzene (HCB) ever sampled for? HCB was detected during sampling conducted as part of the BPTC program.*

   Response: Based on a review of historical activities conducted at the site, HCB was not identified as a chemical of potential concern (COPC) and, therefore, was not evaluated in the risk assessment. Furthermore, based on information provided in the Bay Protection and Toxic Cleanup Program (BPTCP) report (RWQCB 1998), it appears that HCB was detected in the Zeneca marsh (i.e., Eastern Stege Marsh [ESM]). Given the past site usage of the Zeneca property as a pesticide manufacturing facility, it is likely that the HCB was detected in ESM. Therefore, an investigation of Western Stege Marsh (WSM) by UC Berkeley, based on the HCB detected under the BPTCP, does not seem appropriate.

   Reference

   RWQCB. 1998. Sediment Quality and Biological Effects in San Francisco Bay, Bay Protection and Toxic Cleanup Program, Final Technical Report. August 1998.

5. ***Comment: Table 3-5*** *states that the detection limit for aroclors are generally 170 ppm in the sloughs, mudflats and ponds in Stege Marsh. These detection limits are too high.*

   Response: Some of the detection limits in the Stege Marsh samples were elevated due to the high concentrations of PCBs in the samples. We do not believe that this causes a problem in the assessment since there is plenty of information about the magnitude and extent of PCBs in the area and the non-detected results do not significantly affect the quality of such information. A more detailed discussion of the elevated reporting limits for PCBs is provided in the response to Comment #19 for the Ecological Risk Assessment.

6. ***Comment: Re groundwater data – Table 3-6:*** *why were the wells not sampled for VOCs or semivolatiles?*

   Response: Based on extensive historic site reviews, it was concluded that VOCs are not suspected based on past site operations and therefore were not considered COPC for this site. It should be noted that an offsite source of VOCs is migrating onto the property and should be addressed by the offsite party.

7. ***Comment: For tables 3-7 et seq.*** *It would be helpful to bold the COPCs where the 95%UCL exceeds the background level.*

   Response: Although we agree with this comment, we prefer not to implement it because it could be interpreted as if the UCL was used as a tool for background evaluation. Exceedance of background should be evaluated based on comparison of each individual sample result with the threshold. The threshold background concentration is calculated as the UTL of the background sample data set, and it should not be compared with the UCL. The UCL is a conservative estimator of the mean, and it is used to represent the source term for exposure assessment. On the other end, the UTL is a statistics related to the analytical results (instead of the average as in the UCL), and it is used to estimate a concentration high enough to avoid false positive results in testing for exceedance of background. This comparison is done for each individual measurement with the purpose of making sure that locations that exhibit relatively high concentrations but are still within background range are not misinterpreted and possibly unnecessarily remediated. The fact that the UCL is not exceeding background is not sufficient to draw conclusions. It is possible that even in cases where the UCL is below the background threshold, a significant fraction of the individual samples may still exceed significantly the benchmark, and may indicate a potential concern.

8. ***Comment: Table 3-8:*** *the table states that the dermal contact with surface soil is based on maximum detected groundwater concentrations. Please explain this further.*

   Response: This was a mistake. Table 3-8 has been revised to read that the dermal contact with surface soil is based on representative surface soil concentrations.

9. ***Comment:*** *Cancer risk level is 1 in 100,000 for construction workers and recreational anglers rather than 1 in 1,000,000. This is a risk management issue. I agree with Roger that screening should be done with 10^{-6}. Cleanup might be to a lower standard.*

   Response: Please see the response to the above Comment #5 from Mr. Brewer.

10. ***Comment: Table 3-11:*** *Averaging time of 24 years for adults and 6 for children is applicable for carcinogens if combine adult and childhood exposures. For non-carcinogens the exposure duration should be 30 years for adults (no change in outcome though because this terms cancels out).*

    Response: We agree with this comment and recognize that the terms cancel out and the results do not change.

11. ***Comment: Fish ingestion rates:*** *Should base fish consumption rates on the San Francisco Bay Seafood Consumption Survey (SFEI, 2000) rather than EPA study*

cited. Board Staff is recommending selection of the 90th percentile ingestion rate for all consumers surveyed which is 32 grams per day.

Response: We believe that either of the consumption rates could be used for this assessment and the difference between the value is so small that a recalculation of risk is not deemed necessary. We'll use the Board recommended rate for future risk estimations.

12. ***Comment:*** *Should apply the same reference dose for DDT to DDE and DDD. The DDT metabolites should be summed in order to evaluate fish consumption.*

    Response: We concur and Table 3-12 was revised, however this does not alter the results because the additivity of cancer effects, which are driving the risk, was already accounted for.

13. ***Comment: Re Table 3-17****: some of the angler based SSTLs are high, e.g., mercury at 17 ppm in sediments. Sediment numbers protective of recreational anglers that are being considered under the mercury TMDL are more in the range of less than a ppm. Also the oral reference dose used is for mercury compounds in general. Since the concern is consumption of fish the Rfd should be the one for methylmercury.*

    Response: In order to assess the differences between the H-SSTLs developed for the fish consumption pathway at the RFS and target levels in sediment being considered under the mercury TMDL, the exposure factors used to develop target levels for the mercury TMDL would have to be evaluated. Since the target levels for fish consumption have not yet been established for the mercury TMDL, exposure factors that may have been used in these calculations are not readily available, nor is it known whether a risk-based approach was employed to develop the target levels. In addition, target levels specific to a particular site in SF Bay that facilitate remedial decisions, i.e., H-SSTLs based on site-specific bioaccumulation factors and other site-specific data, are expected to serve a different purpose than target levels that are based on Bay-wide exposure to fish.

    The reference dose (RfD) for methyl mercury (10-4) was used for the H-SSTL calculations. This modification resulted in a decrease in the original mercury H-SSTL for angler of 17 mg/kg to a new H-SSTL of 5.82 mg/kg. The attached Table 3-12, 3-13, and 3-14 series were revised to account for this change.

14. ***Comment: Re Figure 5-1 combined areas of elevated risk:*** *It would be helpful to shade human health vs ecological risk differently so can distinguish between them.*

    Response: Comment noted. This will be done for future submittals.

15. ***Comment:*** *The* ***site conceptual model*** *should be revised to show how the residential exposure scenario was evaluated.*

Response: Figure 3-1 and 3-2 were revised to show potential exposure pathways for the residential scenario.

Ecological Risk Assessment

16. ***Comment: Re assessment endpoints:*** *was the American Robin considered as an assessment endpoint for the upland sites. Fish in general should be the assessment endpoint rather than topsmelt. The topsmelt bioassay in one line of evidence for evaluating effects in fish. The clapper rail is a good assessment endpoint for the tidal marsh and adjacent slough channels. A piscivorous bird species, such as a heron, would be a good assessment endpoint for the shallow bay and channel habitat or some secondary consumer e.g., a species of shorebird that feeds in the channel at low tide.*

    Response: The selected receptors for the ecological risk assessment (ERA) were verbally agreed upon on two separate occasions: 1) during the initial site walk with Elizabeth Christian of the RWQCB (1999), 2) during a teleconference with Ned Black of the USEPA (2000). In the beginning stages of the project, Ms. Christian was the assigned contact person at the RWQCB for the ecological evaluation. The ecological receptors selected for the site were verbally approved by Ms. Christian. Once the ERA was initiated, the RWQCB (Cecil Felix – Case Manager) informed URS on behalf of UC Berkeley that Mr. Black would be reviewing the ERA upon submittal to the RWQCB. Subsequent to receiving this notice, URS arranged a conference call with Mr. Black to verify that the exposure pathways, receptors, and general ERA approach was acceptable to the USEPA. Therefore, adding the robin or a piscivorous bird to the list of ecological receptors is beyond the original scope of the ERA that was originally approved by the RWQCB and USEPA staff.

    We concur with the second comment that fish in general are an assessment endpoint, and topsmelt are included in that category. The selected measurement endpoints for assessing potential effects to aquatic plants, aquatic invertebrates, and fish are represented by AWQC. Therefore, fish as a general category is more appropriate for designation and topsmelt should be clarified as being representative of the general fish category.

17. ***Comment:*** *AVS was sampled at three sites closest to the Zeneca sites. AVS-SEM is useful for providing insight into the causes of sediment toxicity in field sediments with mixtures of contaminants. EPA's point of view is that it cannot by itself predict toxicity in sediments. In terms of predicting toxicity, Di Toro proposed that if the SEM to AVS ratio < 1 (or .9 as a safety factor) then < 50% mortality occurs; if > 1 then > 50% mortality occurs. In addition, AVS is not useful for predicting bioavailability.*

    Response: Acid volatile sulfide (AVS) was measured in five samples from four locations in the Tidal Salt Marsh habitat (TSM) and three samples from three locations in the Shallow Bay and Channel habitat (SBC). To estimate the capacity of

sediments that contain divalent metals to exert toxicity, the AVS data was used to supplement other parameters used such as measurements of pH, total organic carbon (TOC), and grain size; exceedances of sediment quality criteria (SQC; including Effects Range – Median quotients [ER-Mqs] and mean ERMqs); toxicity and bioaccumulation tests; and food chain models (hazard quotients [HQs] and hazard indices [HIs]). Because AVS-simultaneously extracted metals (SEM) data were not available for most sediment samples collected in WSM, and the available data are highly variable, the measured AVS concentrations were used in conjunction with other parameters to assist in the explanation of the observed toxicity. No sample locations were eliminated from the evaluation simply based on AVS concentrations, given the presence of other metals that are not known to be affected by AVS binding. Furthermore, most locations for which AVS-SEM data were collected revealed metal concentrations in exceedance of the binding capacity of the reported AVS concentrations.

18. ***Comment:*** *There were 3 elevated hits of chromium – but on average they were below the RBSL so they were eliminated as a COPC in surface water and sediment. Screening should be done based on max. nos. The 3 elevated hits may warrant further scrutiny.*

Response: Please clarify the basis of this comment. In review of the screening tables (Tables 4-3 through 4-15), the maximum concentration of chromium in sediment of the SBC at the 1 to 3 foot depth is below the ambient level for San Francisco (SF) Bay (Table 4-8). Therefore, chromium was eliminated from further consideration as a COPC for this habitat/medium/sample depth. In the Tier 1 Evaluation, the maximum concentration of chromium in surface water and sediment was screened against ambient water quality criteria (AWQC) and ER-Ms, respectively. Chromium was eliminated from further consideration as a COPC in surface water of the SBC habitat because the maximum detected concentration is below the criterion maximum concentration (CMC) and the criterion continuous concentration (CCC; Table 4-11). It was also eliminated as a COPC in sediment of the TSM (0 to 1 foot and 1 to 3 feet) because the maximum concentration is below the ER-M (Tables 4-12 and 4-13). Finally, chromium was eliminated from further consideration in sediment of the SBC (0 to 1 foot) because the maximum concentration is below the ER-M (Tables 4-14).

Chromium was carried through as a Tier 2 COPC in surface water of the TSM with a maximum concentration of 0.61 mg/L (and a 95% UCL concentration of 0.088 milligrams per liter [mg/L]). It appears that chromium was mistakenly omitted from the Tier 2 screening table for surface water of the TSM (Table 4-41). However, the Tier 2 toxicity reference value (TRV) identified for chromium of 10.3 mg/L, based on a 96-hour lethal concentration – 50 (LC50) for the American oyster (USEPA 1980; described on Page 4-50 of the ERA), is substantially higher than the maximum detected concentration in the TSM. Table 4-41 has been corrected to include chromium in the Tier 2 screening and is provided as an attachment.

19. ***Comment:*** *PCBs should be screened based on total Aroclors since congener data wasn't collected. Congener data are preferred. Aroclor-1260 should not be screened out of the risk assessment. Please note that the detection limits for Aroclor 1260 wasn't low enough in the marsh (170 to 250 ppb) to evaluate potential ecological risks.*

Response:

Total PCBs (as Aroclors)

To address the first part of this comment, an evaluation of Total PCBs (as Aroclors) was conducted in addition to the work already completed for the individual Aroclors. Calculations for Total PCBs were performed according to the direction provided by the RWQCB during the meeting held on September 5, 2002. Detected Aroclor concentrations were added for each sample to derive the Total PCBs concentration specific to each location. For samples characterized by elevated Aroclor detection limits, half of the detection limit was the assumed concentration of each Aroclor and these assumed concentrations were used to estimate the Total PCBs concentration for that sample.

No elevated detection limits were reported for the upland habitat. In the marsh (TSM and SBC), detection limits generally ranged between 10 ug/kg to 20 or 50 ug/kg. However, samples collected from the two main PCB hot-spot areas in the marsh have elevated detection limits for all Aroclors analyzed. The laboratory had to calibrate their equipment to accommodate the very high concentrations of PCBs in these hot-spots, which resulted in elevated detection limits for non-detected Aroclors.

Since ecological SSTLs (E-SSTLs) are independent of chemical concentrations in media and the same TRV (applicable to Total PCBs) was used for each Aroclor, the E-SSTL for Total PCBs was selected from the Aroclor E-SSTLs previously generated for each habitat. In the TSM, the E-SSTL for Aroclor 1248 was also used to assess Total PCBs. Although Aroclors 1248 and 1254 were both detected in the TSM (sediments 0 to 1 feet bgs), site-specific bioaccumulation factors (i.e., PUFs and BSAFs) for Aroclor 1248 are more stringent than those estimated for Aroclor 1254. Additionally, Aroclor 1248 had a higher detection frequency in the TSM than Aroclor 1254. In the SBC, Aroclors 1016, 1248, and 1254 were detected at high levels (HQ>1.0) and E-SSTLs were generated for these Aroclors. The lowest E-SSTL is associated with Aroclor 1016; however, the E-SSTL for Aroclor 1248 was used to assess Total PCBs. This decision was made because Aroclor 1248 was detected much more frequently (10 of 16 samples at the 0 to 1 foot depth; 6 of 10 samples at the 1 to 3 foot depth) than Aroclor 1016 (1 of 16 samples at the 0 to 1 foot depth; 0 of 10 at the 1 to 3 foot depth). Little confidence is placed in the reported concentration of Aroclor 1016, given that it was only detected once at the site. Additionally, the E-SSTL for Aroclor 1248 of 5.9 mg/kg is very similar to the E-SSTL for Aroclor 1016 of 4.2 mg/kg.

The evaluation of Total PCBs did not modify the results of the Tier 1 or Tier 2 assessments, and did not influence the conclusions of the ERA. No additional

locations were identified that warrant remediation. The following tables in the ERA were modified to include Total PCBs and are included as attachments: 4-2 through 4-9, 4-12 through 4-15, 4-22, 4-23, 4-28 through 4-35, 4-38 through 4-41, 4-46, 4-47, 4-53, 4-54, 4-56, 4-58, and 4-59.

Aroclor Versus Congener Data

The second part of this comment presents the issue of using congener data in preference over Aroclor data. Please see the response to Comment # 20 (below), which provides a brief discussion on this issue.

Elevated Detection Limits for Aroclor 1260

In response to the third part of this comment, we agree that PCB and Aroclor reporting limits were elevated in several samples. However, all these samples were collected in areas that are proposed for further investigation and/or remediation. Therefore, the high reporting limits do not affect (in particular, do not underestimate) potential ecological risks since the areas have been identified as AOCs and are subject to remedial action.

The following table was developed upon a review of detection limits for Aroclor 1260 reported for all soil and sediment samples collected at the site. The table presents a list of the sample locations with elevated (<170 ppb) detection limits (see Figure 4-10):

Sample Location	Elevated Detection Limit – Aroclor 1260 (ug/kg)
SM-103-TOX	200
SM-104-B-0	5,000
SM-104-B-2	170,000
SM-104-BIO	58,000
SM-105-TOX	700
SM-108-B-2	250
SM-109-BIO	180

As previously slated, further investigation or remediation will be conducted at these locations.

20. ***Comment:*** *Hazard assessments based on Aroclor mixtures may underestimate risk by five-fold.*

Response: Comment noted. Congener-based toxicity data are not always available for the variety of receptors evaluated in ecological risk assessments. The TRVs for PCBs that are recommended by the Department of Toxic Substances Control (DTSC) and Biological Technical Assistance Group (BTAG) are themselves based on studies that evaluated toxicity from exposure to Aroclors, which were used to develop a TRV for total PCBs. Since additional investigation and remediation of PCB containing

areas are ongoing at the site, lack of a congener-based assessment is not expected to underestimate the risks associated with the decisions or actions at the site.

21. ***Comment: Re Table 3-6, elevated levels of PCBs in groundwater:*** *please identify the location of the sample exceeding the Tier 1 screening level.*

    Response: This will be done for the 10/31/02 submittal. However, only two groundwater samples detected PCBs and does not warrant a separate exceedance figure.

22. ***Comment: Table 3-4*** *states that 2 samples were analyzed for TBTs and that it was not detected. Please provide the detection limits as the table reports na. The comment for PCP on this table should read "never sampled."*

    Response: Table 3-4 was revised to reflect the detection limit for the two samples analyzed.

23. ***Comment: E-SSTLs:*** *the High TRV does not represent a LOAEL (lowest observed adverse effect level) or the lowest LOAEL derived from a literature review. Instead it represents a level at of mid-range effects to birds and mammals. For example, the high TRV for mercury is based on neurological effects and increased mortality in the offspring of mammals. Board Staff agrees with the Richmond Field Station that those areas that exceed the E-SSTLs based on the High TRVs should be identified as hot spots and AOCs. Board Staff would also like to see those additional areas that exceed the low TRV-derived SSTLs defined on Figure 4-10.*

    Response: The methodology used to develop the high TRV was reviewed and its basis as the mid-range level of effects is recognized.

    As discussed during the meeting held on September 5, 2002 (RWQCB and URS staff), Figure 4-10 will be updated and revised to illustrate new site characterization data and the results of the associated risk evaluation. The risk evaluation will include a comparison of the site data with high TRV-based E-SSTLs, and will be consistent with the approach used in the ERA. Residual risks will be re-calculated based on no-observable-adverse-effects-levels (NOAEL)-based TRVs (TRV_{NOAELs}) to ensure the protection of individuals of endangered species. If it becomes apparent that acceptable levels of residual risk can not be achieved based on TRV_{NOAELs}, then a Tier 3 analysis will be considered.

    The purpose of the Tier 3 analysis would be to conduct a more site-specific exposure assessment in which the COCs that were identified as risk-drivers, based on residual risk calculations, would be further evaluated. This may involve an analysis of the actual bioavailability potential of these COCs or identification of appropriate absorption-elimination factors to apply to the exposure dose equations. Another possibility may be to identify the actual chemical form of the COC present in site sediments and compare this form with the form of the COC used in the study upon

which the TRV is based. TRV studies may also be reviewed to determine the manner in which the chemical was administered to the test species to ensure that this method is directly applicable to the exposure routes assessed for site receptors. Finally, risk reduction strategies may be evaluated to minimize risks in areas with the highest potential exposure (i.e., sloughs within the TSM and other critical foraging areas).

24. ***Comment:*** *Figure 4-10 should be revised to reflect the additional data collected and to reflect exceedances of the Low TRV-based SSTLs.*

Response: The additional data that were collected subsequent to the submittal of the risk assessment will be subject to a risk-based screening consistent with the approach exercised in the ERA when the results of the additional characterization are submitted on December 1, 2002 as part of the Conceptual Remedial Action Plan (RAP), as requested in the Board Order. Please see the response to Comment #23 (above) for a discussion of the proposed approach to the risk-based screening process for future submittals.

25. ***Comment:*** *Board Staff does not agree with the approach used in the ERA whereby sample locations selected for removal are replaced with ambient concentrations in the dataset to calculate residual risk. This approach might be useful if applied post-removal to ensure that the cleanup actions taken are environmentally protective. In this approach, confirmation sampling would be used to calculate residual risk.*

Response: Sample locations within the AOCs that were recommended for remediation will be replaced with at least 3 feet of clean fill that meets the criteria presented in the beneficial reuse guidance (draft) document for wetland environments ("*Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines, Draft*," SFRWQCB 2000). For wetland surface material, the guidance identifies SF Bay ambient levels in sediment as the proper screening criteria. Instead of conducting a post-remediation residual risk assessment, these ambient concentrations were used in a pre-remediation residual risk assessment in order to facilitate a more efficient remedial design plan. Under this approach, it is appropriate to assume that sample locations within AOCs will be replaced with fill material that is characterized by ambient levels.

Exposure doses associated with post-remediation concentrations of chemicals were estimated, under the assumption of replacement with clean fill subsequent to soil or sediment removal, and the residual risk to ecological receptors was characterized. As discussed in Section 4.5 of the ERA, guidance from USEPA and DTSC (2000) regarding the use of the TRV_{NOAELs} and $TRV_{Effects}$ was used in the development of residual estimates of risk. Chemicals whose effects-based HQs exceed 1.0 warranted remedial action and chemicals whose NOAEL-based HQs are less than 1.0 were eliminated from consideration. Chemicals whose NOAEL-based HQs are greater than 1.0 but whose effects-based HQs are less than 1.0 were identified as being in a "gray area" (i.e., a potential risk) for which further risk reduction measures were considered.

26. ***Comment:*** *Compliance with Ambient Water Quality Criteria (AWQC) in the marsh: Screening surface water against 10 X AWQC is not appropriate for the marsh. Marsh surface waters should meet AWQC.*

    Response: Please clarify the basis of this comment. Surface water data from the SBC and surface water data from the TSM (supplemented by groundwater data within 100 feet of the mean tide level) were screened against AWQC in the Tier 1 Evaluation of the ERA. Chemicals for which the maximum detected concentration exceeded the AWQC were retained for the more site-specific evaluation (i.e., Tier 2). Screening benchmarks for surface water were not defined as 10 times the AWQC in the ERA.

27. ***Comment:*** *Sediments were analyzed for total mercury. It would be important to know the levels of methylmercury in the sediments.*

    Response: The ratio of methyl mercury to total mercury increases with increasing trophic level, so nearly all mercury found in fish and wildlife is methyl mercury (MeHg). Therefore, only the tissue samples (plants and benthic invertebrates) were analyzed for MeHg. This is based on previous experience and research conducted at two other locations. Methyl mercury is often not detectable in estuarine sediments due to the low level of methylation that usually occurs in these environments. Some supporting studies of this occurrence include: 1) the average MeHg percentage (0.77%) of total mercury found by Kannan et al. (1998) in south Florida estuarine sediments, and 2) the average percentage observed by Bartlett and Craig (1981) in British estuarine sediments (0.46%). This percentage is much higher in freshwater sediments (up to 37%) (Beckvar et al. 1996). In fact, mercury methylation appears to decrease as salinity increases in estuarine environments (Compeau and Bartha 1984, Gilmour and Capone 1987). This may be due the bicarbonate component of seawater slowing methylation (Compeau and Bartha 1984) and the increased chloride ions binding with mercury to decrease the amount of reactive mercury (Craig and Moreton 1986).

    References

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    Compeau, G. and R. Bartha. 1984. Methylation and Demethylation of Mercury Under Controlled Redox, pH, and Salinity Conditions. *Applied and Environmental Microbiology*, 48(6): 1203-1207.

Craig, P.J., and P.A. Moreton. 1986. Total methyl mercury and sulfide levels in British estuarine sediments-III. *Water Res.* 20: 1111-1118.

Gilmour, C.G., and D.G. Capone. 1987. Relationship between Hg methylation and the sulfur cycle in estuarine sediments. *EOS Trans Am Geophys Union*, 68: 1718-1725.

Kannan, K., Smith, R.G., Lee, R.F., Windom, H.L., Heitmuller, P.T., Macauley, J.M., and J.K. Summers. 1998. Distribution of Total Mercury and Methyl Mercury in Water, Sediment, and Fish from South Florida Estuaries. *Arch. of Environ. Contam. and Toxicol.* 34: 109-118.

28. ***Comment: Section 4.2.4.4:*** *The Tier 1 screening develops direct toxicity-based target levels for mercury and selenium based on extrapolation from toxicity tests. Since both of the contaminants bioaccumulate in the environment they would naturally screen through a Tier 1 assessment and be evaluated in the Tier 2 assessment. Development of target cleanup levels for these contaminants based on toxicity to benthic invertebrates is therefore not an acceptable approach. Please eliminate screening out sample locations in the Tier 1 assessment based on the EC25 presented in this section.*

    Response: We apologize for referring to the Tier 1 screening values that were developed from site-specific toxicity tests as "Target Cleanup Levels" (TCLs) and for not adequately explaining the application of these TCLs is in the ERA. These site-specific values are actually intended to be revised ER-Ms, and were applied in lieu of the generic sediment benchmarks, i.e., ER-Ms. Subsequent to the initial Tier 1 screening, where sediment concentrations were compared to ER-Ms and mERMqs were generated, toxicity test data for mercury and selenium were used to estimate more realistic concentrations that are associated with direct toxicity to benthic invertebrates at the site. Sample locations exceeding the revised (site-specific) ER-Ms for mercury and selenium are provided on Figure 4-8, and these locations could potentially pose a risk to the benthic community. Due to the highly bioaccumulative nature of mercury and selenium, these chemicals were retained for the Tier 2 assessment. No sample locations were eliminated from the ERA solely because concentrations were below the revised ER-Ms. The revised ER-Ms were used in conjunction with toxicity results for specific sample locations and with E-SSTLs to identify areas of concern at the site.

29. ***Comment:*** *Assessment endpoints should reflect the ecosystems, communities and/or species potentially present at a site. Section 4.3.1.5 presents the assessment endpoints in terms of analyte concentrations in contaminated media. Contaminant concentrations are measurement endpoints that reflect a measure of exposure. The linkage between the assessment and measurement endpoints should be provided in the discussion of the conceptual site model rather than in the presentation of the assessment endpoints.*

Response: We agree with the RWQCB's perception of assessment and measurement endpoints. Assessment endpoints are explicit expressions of the actual environmental value to be protected and, if found to be significantly affected, can trigger further action. The recommended assessment endpoints for ecological receptors at the site have been revised as follows:

Upland Habitat

- Protection of terrestrial plant community and soil-dwelling invertebrate populations that may be exposed to COPCs in soil to maintain species diversity, abundance, and nutrient cycling.
- Protection of terrestrial small mammals, represented by the California ground squirrel, with no unacceptable effects on reproduction, growth, or development on a population level due to COPCs in soil and terrestrial plants.
- Protection of carnivorous birds, represented by the red-tailed hawk, with no unacceptable effects on reproduction, growth, or development on a population level due to COPCs in soil and small mammals.

TSM Habitat

- Protection of wetland plant community and benthic community that may be exposed to COPCs in sediment and porewater to maintain species diversity, abundance, and nutrient cycling.
- Protection of aquatic invertebrate and fish populations that may be exposed to COPCs in surface water (and groundwater that could potentially discharge into surface water from the adjacent upland habitat) to ensure survival, reproduction, and development.
- Protection of special-status wildlife species, represented by the salt marsh harvest mouse and California clapper rail, with no unacceptable effects on reproduction, growth, or development on an organism level due to COPCs in sediment, surface water, and dietary elements (i.e., wetland plants for mouse and benthic invertebrates for rail).

SBC Habitat

- Maintain diversity and abundance of aquatic plant and benthic communities that may be exposed to COPCs in surface water and sediment/porewater, respectively, to maintain species diversity, abundance, and nutrient cycling.
- Protection of aquatic invertebrate and fish populations that may be exposed to COPCs in surface water to ensure survival, reproduction, and development.
- Protection of special-status wildlife species, represented by the California clapper rail, with no unacceptable effects on reproduction, growth, or development on an organism level due to COPCs in sediment, surface water, and benthic invertebrates.

30. ***Comment:*** *The conceptual site model, Figure 4-4 should include the selected assessment endpoints.*

Response: Figure 4-4 has been revised to include the assessment endpoints selected for the ecological risk assessment and is provided as an attachment.

31. ***Comment:*** *The conceptual site model could also consider secondary release mechanisms, e.g., surface water runoff and erosion, tidal exchange (resuspension and dissolution) and groundwater discharge and transport. Certain COCs may contribute to the 303(d) impairment listing for the San Francisco Bay, specifically PCBs and Hg. An analysis of the fate and transport of these contaminants and relationship to contamination of offshore sediments and biota should be included in the ERA.*

Response: The revised conceptual site model (CSM; Figure 4-4) includes secondary release mechanisms, such as overland runoff and groundwater discharge to Stege Marsh, and is provided as an attachment. The RWQCB limited the non-terrestrial area of the RFS that warrants concern to inner Stege Marsh. This decision was made because the inner marsh is highly contaminated, it has a limited hydrologic connection with the outer marsh and SF Bay, and the levee (i.e., walking trail owned by the East Bay Regional Park District) divides the marsh into two distinct parts: inner marsh and bay-side marsh. Therefore, the current RWQCB Order (No. 01-102) identifies the inner marsh only as the focus of the site investigation and remedial activities.

To assess the potential transport of COPCs in surface water WSM/Meeker Slough to SF Bay, sampling was conducted during a winter storm event (March 6, 2002). The results of this investigation support the conclusion that transport of chemicals in surface water to SF Bay is limited under current site conditions. These results will be formally submitted to the RWQCB in the Conceptual RAP that is due on December 1, 2002. Furthermore, surface water monitoring is required under the RWQCB Order (No. 01-102) subsequent to the remediation.

32. ***Comment:*** *The ERA should include the results of any site-specific surveys that have been conducted. This would include vegetation, endangered species, fish surveys. Inclusion of a vegetation map as part of the ERA would be a helpful addition.*

Response: The risk assessment report included the following site-specific ecological information:

- Natural diversity map of special status species and habitats present or potentially present at the site (California Natural Diversity Database [CNDDB]; Figure 2-3);
- Detailed descriptions of vegetation, benthic invertebrates, fish, birds and mammals observed at the site, those that could be present due to suitable habitat conditions, or those for which evidence of presence was noted, i.e., *Macoma balthica* shells (Ecological Setting, Section 2.4);

- Map depicting pickleweed, benthic invertebrate, and fish sample locations (based on sample ID; Figure 1-2); and
- Identification and description of fish and crabs caught in traps during the fish sampling event.

The Ecological Setting section was developed from observances made during the site reconnaissance conducted by URS in 2000 and from historical investigations conducted by URS and other consultants. A benthic survey was attempted for five of the samples collected for purposes of toxicity/bioaccumulation testing, but the laboratory (Pacific EcoRisk) reported no macroinvertebrates present in any of the samples collected. The information listed above represents all known site-specific ecological evaluations that were available when the ERA was submitted. The only formal vegetation survey that had been conducted for the site upon submittal of the ERA was fairly old and primarily focused on the upland habitat. Brady and Associates, Inc. provided this vegetation map in their report titled, "*Richmond Research Center Master Plan Environmental Impact Report, Existing Opportunities and Constraints Report*" (1994). A copy of this map is included as an attachment (with the revised figures). In addition, a more recent vegetation survey that focused on Stege Marsh was presented in a report submitted by URS on behalf of UC Berkeley to the U.S. Fish and Wildlife Service in 2002. A copy of this report was provided to Cecil Felix, the RWQCB project case officer. This map is also included as an attachment (with the revised figures).

33. ***Comment:*** *Additional spatial analyses needs to be provided on a contaminant-specific basis. Contaminant levels of COCs in soil/sediment that constitute the major risk drivers at the site should be mapped separately and presented in the ERA. Select COCs may also warrant mapping of surface water concentration data.*

Response: The objective of Figures 4-5 and 4-10 are to illustrate the COPCs that are present in soil and sediment at concentrations above the selected Tier 1 and Tier 2 screening benchmarks, respectively. Figure 4-10 presents the driver COCs that were carried through the Tier 2 evaluation and represent the primary sources of risk to ecological receptors at the site. The sample locations characterized by elevated concentrations of these driver COCs were provided on one concise figure in an effort to facilitate a more comprehensive overview of potential risk within each habitat. Spatial trends of all COCs present can be identified upon review of Figure 4-10. Figures that present results for individual chemicals detected at the site were provided in the site characterization report that was submitted prior to the risk assessment ("*Field Sampling and Analysis Results*," URS 2000).

The results of the additional data currently being collected and analyzed for purposes of site characterization will be presented to the RWQCB in two reports. The upland data will be submitted on October 31, 2002 and the marsh data on December 1, 2002. As required under the Board Order, the marsh report will include a chemical-specific spatial analysis for the major risk drivers at the site (arsenic, mercury, zinc, and PCBs), and a separate figure will be created for each chemical.

Editorial comments

34. ***Comment:*** *Figures 4-1 a and 4-1 b have inaccurate reference to figure 2-1.*

Response: Figures 4-1a and 4-1b have been corrected and are provided as attachments.

In addition, Table 4-25 had editorial errors that were corrected and the table is provided as an attachment.

Please contact me at 510.874.3284 or Usha Vedagiri at 510.874.3269 if there are any questions regarding the responses to comments provided in this letter.

Sincerely,
URS Corporation

Diane K. Mims
Project Manager

Usha K. Vedagiri
Senior Risk Assessor

cc: Naomi Feger – RWQCB-SF Bay Region
Roger Brewer – RWQCB-SF Bay Region
Anna Moore – UC Berkeley, Environmental Health and Safety
Karl Hans – UC Berkeley, Environmental Health and Safety
Michael Hryciw – UC Berkeley, Capital Projects

TABLES

HUMAN HEALTH RISK ASSESSMENT

TABLE 3.1. SUMMARY OF ANALYTICAL RESULTS IN SOILS AND TIER 1 EVALUATION - ENTIRE UPLAND - 0 TO 10 FEET
UC-BERKELEY RICHMOND FIELD STATION

REVISED

Analyte	Number Analyzed	Number Detected	Detection Frequency [%]	Max Detection Limit in ND Samples	Max Detected [mg/kg]	Background Conc. (1) [mg/kg]	Does Max Exceed Bkgd Conc. YES/no	Tier 1 RBSL [mg/kg] Residential	Tier 1 RBSL [mg/kg] Industrial	Does Max Detected Conc. Exceed RBSL Residential YES/no	Number of samples exceeding RBSL Residential	Does Max Detected Conc. Exceed RBSL Industrial YES/no	Number of samples exceeding RBSL Industrial	Outcome of Tier 1 Evaluation
METALS														
Antimony	88	8	9%	180	16	5.5	YES	6.3	40	YES	4	no	1	Tier 1 residential RBSL exceeded, GO TO TIER 2
Arsenic	153	148	97%	8.8	1,600	19.1	YES	0.39	2.7	YES	152	YES	125	Tier 1 residential RBSL exceeded, GO TO TIER 2
Beryllium	88	79	90%	6.1	1	1.0	YES	4	8	no	1	no	0	Tier 1 residential RBSL never exceeded, no further action
Cadmium	150	134	89%	16	437	2.7	YES	7.4	12	YES	32	YES	27	Tier 1 residential RBSL exceeded, GO TO TIER 2
Chromium	150	149	99%	2.6	110	99.6	YES	9.8	12	YES	139	YES	135	Tier 1 residential RBSL exceeded, GO TO TIER 2
Copper	159	159	100%	na	20,000	69.4	YES	225	225	YES	50	YES	50	Tier 1 residential RBSL exceeded, GO TO TIER 2
Lead	155	152	98%	9.2	1140	16.1	YES	200	750	YES	11	YES	2	Tier 1 residential RBSL exceeded, GO TO TIER 2
Mercury	240	223	93%	0.5	5300	0.4	YES	4.7	10	YES	90	YES	63	Tier 1 residential RBSL exceeded, GO TO TIER 2
Nickel	88	88	100%	na	210	119.8	YES	150	150	YES	1	YES	1	Tier 1 residential RBSL exceeded, GO TO TIER 2
Selenium	131	69	53%	9.2	50	5.6	YES	10	10	YES	4	YES	4	Tier 1 residential RBSL exceeded, GO TO TIER 2
Silver	88	21	24%	2.6	11	1.8	YES	20	40	no	0	no	0	Tier 1 residential RBSL never exceeded, no further action
Thallium	88	73	83%	15	5.8	27.1	no	1.1	2.9	YES	30	YES	5	Background Conc. not exceeded, no further action
Zinc	158	157	99%	61	13,000	106.1	YES	600	600	YES	28	YES	28	Tier 1 residential RBSL exceeded, GO TO TIER 2
PCBs														
Aroclor-1016	14	0	0%	0.07	na	na	na	0.22	1	na	0	na	0	never detected, no further consideration
Aroclor-1221	14	0	0%	0.07	na	na	na	0.22	1	na	0	na	0	never detected, no further consideration
Aroclor-1232	14	0	0%	0.07	na	na	na	0.22	1	na	0	na	0	never detected, no further consideration
Aroclor-1242	14	0	0%	0.07	na	na	na	0.22	1	na	0	na	0	never detected, no further consideration
Aroclor-1248	14	1	7%	0.07	0.880	na	na	0.22	1	YES	1	no	0	Tier 1 residential RBSL exceeded, GO TO TIER 2
Aroclor-1254	14	5	36%	0.016	0.941	na	na	0.22	1	YES	3	no	0	Tier 1 residential RBSL exceeded, GO TO TIER 2
Aroclor-1260	14	1	7%	0.07	0.061	na	na	0.22	1	no	0	no	0	Tier 1 residential RBSL never exceeded, no further action
Aroclor-1262	14	0	0%	0.07	na	na	na	0.22	1	na	0	na	0	never detected, no further consideration
										na		na		
EXPLOSIVES										na		na		
HMX	5	1	20%	0.3	0.370	na	na	3,100	44,000 (2)	no	0	no	0	Tier 1 residential RBSL never exceeded, no further action
PESTICIDES														
4,4'-DDE	15	2	13%	0.12	0.047	na	na	1.7	4	no	0	no	0	Tier 1 residential RBSL never exceeded, no further action
4,4'-DDD	15	0	0%	0.12	na	na	na	2.9	17	na	0	na	0	never detected, no further consideration
4,4'-DDT	15	4	27%	0.12	0.38	na	na	1.7	4	no	0	no	0	Tier 1 residential RBSL never exceeded, no further action
Beta-BHC	15	0	0%	0.058	na	na	na	0.049	0.049 (3)	na	1	na	1	never detected, no further consideration
Alpha-BHC	15	0	0%	0.058	na	na	na	0.049	0.049 (3)	na	1	na	1	never detected, no further consideration
Delta-BHC	15	0	0%	0.058	na	na	na	0.049	0.049 (3)	na	1	na	1	never detected, no further consideration
Lindane (Gamma-BHC)	15	0	0%	0.058	na	na	na	0.049	0.049	na	1	na	1	never detected, no further consideration
Heptachlor	15	0	0%	0.058	na	na	na	0.013	0.013	na	3	na	3	never detected, no further consideration
Endrin	15	0	0%	0.058	na	na	na	0.0006	0.0006	na	15	na	15	never detected, no further consideration
Heptachlor epoxide A	15	1	7%	0.058	0.0059	na	na	0.014	0.014	no	3	no	3	Tier 1 residential RBSL never exceeded, no further action
Dieldrin	15	1	7%	0.12	0.0082	na	na	0.002	0.002	YES	15	YES	15	Tier 1 residential RBSL exceeded, GO TO TIER 2
Chlordane	15	1	7%	0.58	0.092	na	na	0.47	3.1	no	1	no	0	Tier 2 residential RBSL never exceeded, no further action
Tributyltin	0	0	na	na	na	na	na	18	260 (2)	na	0	na	0	Not Analyzed
Pentachlorophenol (PCP)	4	0	0%	40	na	na	na	5	5	na	2	na	2	never detected, no further consideration

Notes:
notes:
(1) LBNL 1995 Lawrence Berkeley Background Concentrations in Soil, Colluvium and Fill
(2) No RBSL available, PRG Region 9 used as shown
(3) No RBSL available, RBSL for Lindane as surrogate used
na not applicable
Chromium is assumed to be 100% total chromium
In bold, chemicals retained for Tier 2

TABLE 3.2. SUMMARY OF ANALYTICAL RESULTS IN SOILS AND TIER 1 EVALUATION - ENTIRE UPLAND - 0 TO 3 FEET
UC-BERKELEY RICHMOND FIELD STATION

REVISED

Analyte	Number Analyzed	Number Detected	Detection Frequency [%]	Max Detection Limit in ND Samples	Max Detected [mg/kg]	Background Conc. (1) [mg/kg]	Does Max Exceed Bkgd Conc. YES/no	Tier 1 RBSL [mg/kg] Residential	Tier 1 RBSL [mg/kg] Industrial	Does Max Detected Conc. Exceed RBSL Residential YES/no	Number of samples exceeding RBSL Residential	Does Max Detected Conc. Exceed RBSL Industrial YES/no	Number of samples exceeding RBSL Industrial	Outcome of Tier 1 Evaluation
METALS														
Antimony	50	1	2%	5.2	8.3	5.5	YES	6.3	40	YES	1	no	0	Tier 1 residential RBSL exceeded, GO TO TIER 2
Arsenic	93	89	96%	8.7	126	19.1	YES	0.39	2.7	YES	92	YES	72	Tier 1 residential RBSL exceeded, GO TO TIER 2
Beryllium	50	48	96%	0.15	0.9	1.0	no	4	8	no	0	no	0	Background Conc. not exceeded, no further action
Cadmium	93	85	91%	16	437	2.7	YES	7.4	12	YES	10	YES	8	Tier 1 residential RBSL exceeded, GO TO TIER 2
Chromium	95	95	100%	na	65.1	99.6	no	9.8	12	YES	91	YES	88	Tier 1 residential RBSL exceeded, GO TO TIER 2
Copper	99	99	100%	na	1400	69.4	YES	225	225	YES	27	YES	27	Tier 1 residential RBSL exceeded, GO TO TIER 2
Lead	95	95	100%	na	1140	16.1	YES	200	750	YES	6	YES	2	Tier 1 residential RBSL exceeded, GO TO TIER 2
Mercury	157	148	94%	0.5	5300	0.4	YES	4.7	10	YES	57	YES	41	Tier 1 residential RBSL exceeded, GO TO TIER 2
Nickel	50	50	100%	na	76	119.8	no	150	150	no	0	no	0	Background Conc. not exceeded, no further action
Selenium	87	41	47%	na	8	5.6	YES	10	10	no	88	no	88	Tier 1 residential RBSL never exceeded, no further action
Silver	50	10	20%	2.6	9.1	1.8	YES	20	40	no	0	no	0	Tier 1 residential RBSL never exceeded, no further action
Thallium	50	45	90%	0.36	3.6	27.1	no	1.1	2.9	YES	15	YES	2	Background Conc. not exceeded, no further action
Zinc	98	98	100%	na	2150	106.1	YES	600	600	YES	6	YES	6	Tier 1 residential RBSL exceeded, GO TO TIER 2
PCBs														
Aroclor-1016	9	0	0%	0.07	na	na	na	0.22	1	na	0	na	0	Not Analyzed
Aroclor-1221	9	0	0%	0.07	na	na	na	0.22	1	na	0	na	0	Not Analyzed
Aroclor-1232	9	0	0%	0.07	na	na	na	0.22	1	na	0	na	0	Not Analyzed
Aroclor-1242	9	0	0%	0.07	ha	na	na	0.22	1	na	0	na	0	Not Analyzed
Aroclor-1248	9	1	11%	0.07	0.880	na	na	0.22	1	YES	1	no	0	Tier 1 residential RBSL exceeded, GO TO TIER 2
Aroclor-1254	9	5	56%	0.016	0.941	na	na	0.22	1	YES	3	no	0	Tier 1 residential RBSL exceeded, GO TO TIER 2
Aroclor-1260	9	1	11%	0.07	0.061	na	na	0.22	1	no	0	no	0	Tier 1 residential RBSL never exceeded, no further action
Aroclor-1262	9	0	0%	0.07	na	na	na	0.22	1	na	0	na	0	Not Analyzed
										na		na		
										na		na		
EXPLOSIVES														
HMX	5	1	20%	0.3	0.370	na	na	3100	44000 (2)	no	0	no	0	Tier 1 residential RBSL never exceeded, no further action
PESTICIDES														
4,4'-DDE	8	2	25%	0.12	0.047	na	na	1.7	4	no	0	no	0	Tier 1 residential RBSL never exceeded, no further action
4,4'-DDD	8	0	0%	0.12	na	na	na	2.9	17	na	0	na	0	Not Analyzed
4,4'-DDT	8	4	50%	0.12	0.38	na	na	1.7	4	no	0	no	0	Tier 1 residential RBSL never exceeded, no further action
Beta-BHC	8	0	0%	0.058	na	na	na	0.049	0.049 (3)	na	1	na	1	Not Analyzed
Alpha-BHC	8	0	0%	0.058	na	na	na	0.049	0.049 (3)	na	1	na	1	Not Analyzed
Delta-BHC	8	0	0%	0.058	na	na	na	0.049	0.049 (3)	na	1	na	1	Not Analyzed
Lindane (Gamma-BHC)	8	0	0%	0.058	na	na	na	0.049	0.049	na	1	na	1	Not Analyzed
Heptachlor	8	0	0%	0.058	na	na	na	0.013	0.013	na	3	na	3	Not Analyzed
Endrin	8	0	0%	0.058	na	na	na	0.0006	0.0006	na	8	na	8	Not Analyzed
Heptachlor epoxide A	8	1	13%	0.058	0.0059	na	na	0.014	0.014	no	3	no	3	Tier 1 residential RBSL never exceeded, no further action
Dieldrin	8	1	13%	0.12	0.0082	na	na	0.002	0.002	YES	8	YES	8	Tier 1 residential RBSL exceeded, GO TO TIER 2
Chlordane	8	1	13%	0.58	0.092	na	na	0.47	3.1	no	1	no	0	Tier 1 residential RBSL never exceeded, no further action
Tributyltin	0	0	0%	na	na	na	na	18	260 (2)	na	0	na	0	Not Analyzed
PENTACHLOROPHENOL (PCP)	4	0	0%	40	na	na	na	5	5	na	2	na	2	Not analyzed

Notes:
(1) LBNL 1995 Lawrence Berkeley Background Concentrations in Soil, Colluvium and Fill
(2) No RBSL available, PRG Region 9 used as shown
(3) No RBSL available, RBSL for Lindane as surrogate used
na=not applicable
Chromium is assumed to be 100% total chromium
In bold, chemicals retained for Tier 2

REVISED

TABLE 3.3. SUMMARY OF ANALYTICAL RESULTS IN SOILS AND TIER 1 EVALUATION
ROADS AND WALKING PATHS - STEGE MARSH - 0 TO 3 FEET
UC-BERKELEY RICHMOND FIELD STATION

Analyte	Number Analyzed	Number Detected	Detection Frequency [%]	Max Detection Limit in ND Samples	Max Detected [mg/kg]	Background Conc. in [mg/kg]	Does Max Exceed Bkgd Conc. YES/no	Outcome of Tier 1 Evaluation
METALS								
Antimony	2	0	0%	3.3	na	5.5	no	never detected, no further consideration
Arsenic	4	4	100%	na	167	19.1	YES	**background conc. exceeded, GO TO TIER 2**
Beryllium	2	2	100%	na	0.54	1.0	no	background conc. not exceeded, no further action
Cadmium	4	4	100%	na	11	2.7	YES	**background conc. exceeded, GO TO TIER 2**
Chromium	4	4	100%	na	35.8	99.6	no	background conc. not exceeded, no further action
Copper	4	4	100%	na	400	69.4	YES	**background conc. exceeded, GO TO TIER 2**
Lead	4	4	100%	na	293	16.1	YES	**background conc. exceeded, GO TO TIER 2**
Mercury	4	3	75%	0.043	15.7	0.4	YES	**background conc. exceeded, GO TO TIER 2**
Nickel	2	2	100%	na	31	119.8	no	background conc. not exceeded, no further action
Selenium	4	1	25%	na	4	5.6	no	background conc. not exceeded, no further action
Silver	2	0	0%	0.27	na	1.8	no	never detected, no further consideration
Thallium	2	2	100%	na	1.5	27.1	no	background conc. not exceeded, no further action
Zinc	4	4	100%	na	752	106.1	YES	**background conc. exceeded, GO TO TIER 2**
PCBs								
Aroclor-1016	2	0	0%	0.06	na	na	na	never detected, no further consideration
Aroclor-1221	2	0	0%	0.06	na	na	na	never detected, no further consideration
Aroclor-1232	2	0	0%	0.06	na	na	na	never detected, no further consideration
Aroclor-1242	2	0	0%	0.06	na	na	na	never detected, no further consideration
Aroclor-1248	2	0	0%	0.06	na	na	na	never detected, no further consideration
Aroclor-1254	2	0	0%	0.06	na	na	na	never detected, no further consideration
Aroclor-1260	2	0	0%	0.06	na	na	na	never detected, no further consideration
Aroclor-1262	2	0	0%	0.06	na	na	na	never detected, no further consideration
EXPLOSIVES								
HMX	0	0	0%	na	na	na	na	Not Analyzed
PESTICIDES								
4,4'-DDE	2	0	0%	0.006	na	na	na	never detected, no further consideration
4,4'-DDD	2	0	0%	0.006	na	na	na	never detected, no further consideration
4,4'-DDT	2	0	0%	0.006	na	na	na	never detected, no further consideration
Beta-BHC	2	0	0%	0.006	na	na	na	never detected, no further consideration
Alpha-BHC	2	0	0%	0.006	na	na	na	never detected, no further consideration
Delta-BHC	2	0	0%	0.006	na	na	na	never detected, no further consideration
Lindane (Gamma-BHC)	2	0	0%	0.006	na	na	na	never detected, no further consideration
Heptachlor	2	0	0%	0.006	na	na	na	never detected, no further consideration
Endrin	2	0	0%	0.006	na	na	na	never detected, no further consideration
Heptachlor epoxide A	2	0	0%	0.006	na	na	na	never detected, no further consideration
Dieldrin	2	0	0%	0.006	na	na	na	never detected, no further consideration
Chlordane	2	0	0%	0.06	na	na	na	never detected, no further consideration
Tributyltin	0	0	0%	na	na	na	na	Not Analyzed
PENTACHLOROPHENOL (PCP)	0	0	na	na	na	na	na	Not Analyzed

Notes:
(2) LBNL 1995. Lawrence Berkeley Background Concentrations in Soil, Colluvium and Fill
na=not applicable
Chromium is assumed to be 100% total chromium
In bold, chemicals retained for Tier 2

TABLE 3.4. SUMMARY OF ANALYTICAL RESULTS IN SEDIMENTS AND TIER 1 EVALUATION
TIDAL SALT MARSH AREA -STEGE MARSH - 0 TO 3 FEET
UC-BERKELEY RICHMOND FIELD STATION

REVISED

Analyte	Number Analyzed	Number Detected	Detection Frequency [%]	Max Detection Limit in ND Samples	Max Detected [mg/kg]	Ambient Conc. (1) [mg/kg]	Does Max Detected Exceed Amb Conc. YES/no	Outcome of Tier 1 Evaluation
METALS								
Antimony	20	8	40%	9.3	29	na	na	no screening criteria, GO TO TIER 2
Arsenic	49	45	92%	348	2210	15.3	YES	background conc. exceeded, GO TO TIER 2
Beryllium	20	15	75%	0.31	0.64	na	na	no screening criteria, GO TO TIER 2
Cadmium	45	45	100%	na	50	0.3	YES	background conc. exceeded, GO TO TIER 2
Chromium	45	45	100%	na	209	112.0	YES	background conc. exceeded, GO TO TIER 2
Copper	49	49	100%	na	8090	68.1	YES	background conc. exceeded, GO TO TIER 2
Lead	49	49	100%	na	814	43.2	YES	background conc. exceeded, GO TO TIER 2
Mercury	49	48	98%	0.12	142	0.4	YES	background conc. exceeded, GO TO TIER 2
Nickel	20	20	100%	na	130	112.0	YES	background conc. exceeded, GO TO TIER 2
Selenium	49	28	57%	na	444	0.6	YES	background conc. exceeded, GO TO TIER 2
Silver	20	12	60%	0.68	7.2	0.6	YES	background conc. exceeded, GO TO TIER 2
Thallium	20	14	70%	0.65	5.4	na	na	no screening criteria, GO TO TIER 2
Zinc	49	49	100%	na	8800	158.0	YES	background conc. exceeded, GO TO TIER 2
PCBs								
Aroclor-1016	14	0	0%	0.25	na	na	na	never detected, no further consideration
Aroclor-1221	14	0	0%	0.25	na	na	na	never detected, no further consideration
Aroclor-1232	14	0	0%	0.25	na	na	na	never detected, no further consideration
Aroclor-1242	14	1	7%	0.25	0.089	na	na	no screening criteria, GO TO TIER 2
Aroclor-1248	14	5	36%	0.25	1.000	na	na	no screening criteria, GO TO TIER 2
Aroclor-1254	14	2	14%	0.25	0.500	na	na	no screening criteria, GO TO TIER 2
Aroclor-1260	14	0	0%	0.25	na	na	na	never detected, no further consideration
Aroclor-1262	8	0	0%	0.25	na	na	na	never detected, no further consideration
EXPLOSIVES								
HMX	0	0	0%	na	na	na	na	Not Analyzed
PESTICIDES								
Sulfate	5	5	100%	na	5400.0	na	na	no screening criteria, GO TO TIER 2
4,4'-DDE	6	1	17%	0.007	na	na	na	no screening criteria, GO TO TIER 2
4,4'-DDD	6	2	33%	0.007	0.0320	na	na	no screening criteria, GO TO TIER 2
4,4'-DDT	10	4	40%	0.007	0.521	na	na	no screening criteria, GO TO TIER 2
Beta-BHC	6	2	33%	0.005	0.0068	na	na	no screening criteria, GO TO TIER 2
Alpha-BHC	10	6	60%	0.006	0.3	na	na	no screening criteria, GO TO TIER 2
Delta-BHC	6	2	33%	0.005	0.028	na	na	no screening criteria, GO TO TIER 2
Lindane (Gamma-BHC)	6	0	0%	0.005	na	na	na	never detected, no further consideration
Heptachlor	6	0	0%	0.005	na	na	na	never detected, no further consideration
Endrin	6	0	0%	0.007	na	na	na	never detected, no further consideration
Heptachlor epoxide A	6	0	0%	0.005	na	na	na	never detected, no further consideration
Dieldrin	6	0	0%	0.007	na	na	na	never detected, no further consideration
Chlordane	6	0	0%	0.05	na	na	na	never detected, no further consideration
Tributyltin	2	0	0%	0.001	na	na	na	never detected, no further consideration
PENTACHLOROPHENOL (PCP)	0	0	na	na	na	na	na	Not Analyzed

Notes:
(1) SFRWQCB 1998. Ambient Concentrations of Toxic Chemicals In SF Bay (100% fine)
na=not applicable
Chromium is assumed to be 100% total chromium
In bold, chemicals retained for Tier 2

TABLE 3.5. SUMMARY OF ANALYTICAL RESULTS IN SEDIMENTS AND TIER 1 EVALUATION
SLOUGHS, MUDFLATS AND PONDS - STEGE MARSH - 0 TO 3 FEET
UC-BERKELEY RICHMOND FIELD STATION

REVISED

Analyte	Number Analyzed	Number Detected	Detection Frequency [%]	Max Detection Limit in ND Samples	Max Detected [mg/kg]	Ambient Conc. (1) [mg/kg]	Does Max Exceed Amb Conc. YES/no	Outcome of Tier 1 Evaluation
METALS								
Antimony	23	3	13%	8.3	0.26	na	na	no screening criteria, GO TO TIER 2
Arsenic	33	29	88%	25.1	1330	15.3	YES	background conc. exceeded, GO TO TIER 2
Beryllium	24	24	100%	na	0.58	na	na	no screening criteria, GO TO TIER 2
Cadmium	33	33	100%	na	44.21	0.3	YES	background conc. exceeded, GO TO TIER 2
Chromium	33	33	100%	na	115	112.0	YES	background conc. exceeded, GO TO TIER 2
Copper	33	33	100%	na	22000	69.1	YES	background conc. exceeded, GO TO TIER 2
Lead	33	33	100%	na	1240	43.2	YES	background conc. exceeded, GO TO TIER 2
Mercury	33	32	97%	0.19	430	0.4	YES	background conc. exceeded, GO TO TIER 2
Nickel	24	24	100%	na	78	112.0	no	background conc. not exceeded, no further action
Selenium	32	19	59%	na	854	0.6	YES	background conc. exceeded, GO TO TIER 2
Silver	23	7	30%	0.69	11	0.6	YES	background conc. exceeded, GO TO TIER 2
Thallium	24	18	75%	0.55	2.1	na	na	no screening criteria, GO TO TIER 2
Zinc	33	33	100%	na	5000	158.0	YES	background conc. exceeded, GO TO TIER 2
PCBs								
Aroclor-1016	24	1	4%	170	1200	na	na	no screening criteria, GO TO TIER 2
Aroclor-1221	24	0	0%	170	na	na	na	never detected, no further consideration
Aroclor-1232	24	0	0%	170	na	na	na	never detected, no further consideration
Aroclor-1242	24	0	0%	170	na	na	na	never detected, no further consideration
Aroclor-1248	24	16	67%	58	1600	na	na	no screening criteria, GO TO TIER 2
Aroclor-1254	24	2	8%	170	400	na	na	no screening criteria, GO TO TIER 2
Aroclor-1260	24	0	0%	170	na	na	na	never detected, no further consideration
Aroclor-1262	18	0	0%	170	na	na	na	never detected, no further consideration
EXPLOSIVES								
HMX	0	0	na	na	na	na	na	Not Analyzed
PESTICIDES								
Sulfate	3	3	100%	na	1700.0	na	na	no screening criteria, GO TO TIER 2
4,4'-DDE	17	0	0%	17	na	na	na	never detected, no further consideration
4,4'-DDD	17	0	0%	17	na	na	na	never detected, no further consideration
4,4'-DDT	17	0	0%	17	na	na	na	never detected, no further consideration
Beta-BHC	17	0	0%	17	na	na	na	never detected, no further consideration
Alpha-BHC	17	0	0%	17	na	na	na	never detected, no further consideration
Delta-BHC	17	0	0%	17	na	na	na	never detected, no further consideration
Lindane (Gamma-BHC)	17	0	0%	17	na	na	na	never detected, no further consideration
Heptachlor	17	0	0%	17	na	na	na	never detected, no further consideration
Endrin	17	0	0%	17	na	na	na	never detected, no further consideration
Heptachlor epoxide A	17	0	0%	17	na	na	na	never detected, no further consideration
Dieldrin	17	0	0%	17	na	na	na	never detected, no further consideration
Chlordane	17	0	0%	170	na	na	na	never detected, no further consideration
Tributyltin	13	1	8%	170	1.00	na	na	no screening criteria, GO TO TIER 2
PENTACHLOROPHENOL (PCP)	0	0	na	na	na	na	na	Not Analyzed

Notes:
(1) SFRWQCB 1998. Ambient Concentrations of Toxic Chemicals in SF Bay (100% fine)
na=not applicable
Chromium is assumed to be 100% total chromium
In bold, chemicals retained for Tier 2

TABLE 3-8. CHEMICAL TRANSPORT FATE MODELS USED TO DEVELOP EXPOSURE POINT CONCENTRATIONS REVISED

Exposure Pathway	Source Medium	Release Mechanism	Exposure Medium	Transport-Fate Model Name and Equation†	Primary Reference for Model	Secondary References for Model
Inhalation of airborne particulates	Surface soil	Particulate emissions to ambient air	Outdoor air	Surface soil → airborne particulates [Appendix B, Equation 4]	Cowherd et al. (1985)	ASTM (1995)
Incidental ingestion of surface soil	Surface soil	None	Shallow soil	None (direct contact); exposure based on representative surface soil concentrations	not applicable	not applicable
Dermal contact with surface soil	Surface soil	None	Shallow soil	None (direct contact); exposure based on representative surface soil concentrations	not applicable	not applicable
Dermal contact with shallow groundwater	Shallow groundwater	Seeps into trenches	None	None (direct contact); exposure based on representative groundwater concentrations	not applicable	not applicable
Ingestion of fish	Surface water	Biouptake	Fish meat	Sediment → fish [Appendix B, Equation 7]	USEPA (1997)	not applicable

† Numbered Transport-Fate Model and HHRE equations appear in Appendix

TABLE 3-12. CHEMICAL-SPECIFIC TOXICITY PARAMETERS

Revised

Project: UCB Richmond

CHEMICAL	Slope Factor [1/(mg/kg-day)]				Reference Dose [mg/kg-day]			
	Oral	Ref.	Inhalation	Ref.	Oral	Ref.	Inhalation	Ref.
Antimony	na	--	na	--	4.0E-4	IRIS	na	--
Arsenic (cancer endpoint)	1.5E+0	Cal/EPA	1.5E+1	IRIS	3.0E-4	IRIS	na	--
Beryllium and compounds	na	--	8.4E+0	Cal/EPA	2.0E-3	IRIS	5.7E-6	IRIS
Cadmium and compounds	3.8E-1	Cal/EPA	1.5E+1	Cal/EPA	5.0E-4	IRIS	na	--
Total Chromium (1:6 ratio Cr VI:Cr III)	na	--	4.2E+1	IRIS	na	--	na	--
Copper and compounds	na	--	na	--	3.7E-2	HEAST	na	--
Lead	8.5E-3	Cal/EPA	4.2E-2	Cal/EPA	na	--	na	--
Methyl Mercury	na	--	na	--	1.0E-4	IRIS	na	--
Nickel (soluble salts)	na	--	na	--	2.0E-2	--	na	--
Selenium	na	--	na	--	5.0E-3	IRIS	na	--
Silver and compounds	na	--	na	--	5.0E-3	IRIS	na	--
Thallium and Compounds	na	--	na	--	6.6E-5	IRIS	na	--
Zinc	na	--	na	--	3.0E-1	IRIS	na	--
Chlordane	3.5E-1	IRIS	3.5E-1	IRIS	5.0E-4	IRIS	2.0E-4	IRIS
DDE	3.4E-1	IRIS	3.4E-1	R. to R.	5.0E-4	IRIS	5.0E-4	R. to R.
DDD	2.4E-1	IRIS	2.4E-1	R. to R.	5.0E-4	IRIS	5.0E-4	R. to R.
DDT	3.4E-1	IRIS	3.4E-1	IRIS	5.0E-4	IRIS	5.0E-4	R. to R.
Dieldrin	1.6E+1	IRIS	1.6E+1	IRIS	5.0E-5	IRIS	5.0E-5	R. to R.
Endrin	na	--	na	--	3.0E-4	IRIS	3.0E-4	R. to R.
Heptachlor	4.5E+0	IRIS	4.6E+0	IRIS	5.0E-4	IRIS	5.0E-4	R. to R.
Heptachlor epoxide	9.1E+0	IRIS	9.1E+0	IRIS	1.3E-5	IRIS	1.3E-5	R. to R.
Hexachlorocyclohexane (HCH) (alpha)	6.3E+0	IRIS	6.3E+0	IRIS	na	--	na	--
Hexachlorocyclohexane (HCH) (beta)	1.8E+0	IRIS	1.8E+0	IRIS	na	--	na	--
Hexachlorocyclohexane (HCH) (gamma) Lindane	1.3E+0	HEAST	1.3E+0	R. to R.	3.0E-4	IRIS	3.0E-4	R. to R.
Hexachlorocyclohexane (HCH) (delta)	4.0E+0	Cal/EPA	4.0E+0	Cal/EPA	na	--	na	--
Aroclor 1016	7.0E-2	IRIS	7.0E-2	IRIS	7.0E-5	IRIS	7.0E-5	R. to R.
Aroclor 1221	2.0E+0	IRIS	2.0E+0	IRIS	na	--	na	--
Aroclor 1232	2.0E+0	IRIS	2.0E+0	IRIS	na	--	na	--
Aroclor 1242	2.0E+0	IRIS	2.0E+0	IRIS	na	--	na	--
Aroclor 1248	2.0E+0	IRIS	2.0E+0	IRIS	na	--	na	--
Aroclor 1254	2.0E+0	IRIS	2.0E+0	IRIS	2.0E-5	IRIS	2.0E-5	R. to R.
Aroclor 1260	2.0E+0	IRIS	2.0E+0	IRIS	na	--	na	--
Aroclor 1262	2.0E+0	IRIS	2.0E+0	IRIS	na	--	na	--
Pentachlorophenol	1.2E-1	IRIS	1.2E-1	R. to R.	3.0E-2	IRIS	3.0E-2	R. to R.

References (in order of priority)
Cal/EPA = Cal/EPA 1994, Memorandum on California Cancer Potency Factors: and OEHHA Toxicity Criteria Database
IRIS, NCEA, HEAST, R. to R., WTDRN = as referenced in USEPA 1999 Region 9 Preliminary Remediation Goals (PRGs).
IRIS = Integrated Risk Information System (IRIS). Online Database. USEPA (2000)
HEAST, NCEA = Health Effects Assessment Summary Tables (HEAST). Annual Update. National Center for Exposure Assessment. USEPA (1997)
R. to R. = route-to-route extrapolation

WTDRN = withdrawn

na = Not Applicable/Not Available.

TABLE 3-13. SUMMARY of RBCs, H-SSTLSs, AND BACKGROUND CONCENTRATIONS FOR SOIL AND SEDIMENTS Revised

Project: UCB Richmond

CHEMICAL	BACKGROUND CONCENTRATIONS (1) [mg/kg]	AMBIENT CONCENTRATIONS (2) [mg/kg]	RESIDENTIAL RECEPTOR SSTLs		COMMERCIAL/ INDUSTRIAL WORKER RECEPTOR		CONSTRUCTION WORKER RECEPTOR		RECREATORS RECEPTORS				ANGLER RECPETORS	
			Surficial Soil Exposure [mg/kg]		Surficial Soil Exposure [mg/kg]		Surficial Soil Exposure [mg/kg]		Surficial Soil Exposure [mg/kg]				Fish and Dermal Exposure	
			Lowest RBC [mg/kg]	H-SSTLs [mg/kg]	Lowest RBC [mg/kg]	H-SSTLs [mg/kg]	Lowest RBC [mg/kg]	H-SSTLs [mg/kg]	For Paths/Roads Area (children 0-6 included) Lowest RBC [mg/kg]	For Paths/Roads Area (children 0-6 included) H-SSTLs [mg/kg]	For Tidal Salt Marsh Area (children 0-6 not included) Lowest RBC [mg/kg]	For Tidal Salt Marsh Area (children 0-6 not included) H-SSTLs [mg/kg]	Lowest RBC [mg/kg]	H-SSTLs [mg/kg]
Antimony	5.5	na	3.13E+01	3.13E+01	8.18E+02	8.18E+02	1.06E+03	1.06E+03	8.76E+2	8.76E+2	8.18E+3	8.18E+3	6.68E+1	6.68E+1
Arsenic (cancer endpoint)	19.1	15.3	3.89E-01	1.91E+01	2.73E+01	2.73E+01	1.20E+02	1.20E+02	1.09E+1	1.91E+1	3.54E+1	3.54E+1	1.25E+2	1.25E+2
Beryllium and compounds	1	na	1.54E+02	1.54E+02	3.69E+03	3.69E+03	4.75E+02	4.75E+02	4.32E+3	4.32E+3	3.88E+4	3.88E+4	3.34E+2	3.34E+2
Cadmium and compounds	2.7	0.33	1.67E+00	2.70E+00	1.47E+02	1.47E+02	3.25E+02	3.25E+02	4.68E+1	4.68E+1	1.55E+2	1.55E+2	4.35E+1	4.35E+1
Total Chromium (1:6 ratio Cr VI:Cr III)	99.6	112	2.11E+02	2.11E+02	4.48E+03	4.48E+03	2.17E+02	2.17E+02	5.90E+3	5.90E+3	9.34E+3	9.34E+3	na	na
Copper and compounds	69.4	68.1	2.91E+03	2.91E+03	7.59E+04	7.59E+04	9.89E+04	9.89E+04	8.13E+4	8.13E+4	1.00E+5 *	1.00E+5 *	4.75E+4	4.75E+4
Lead	16.1	43.2	2.55E+02	2.55E+02	7.50E+02	7.50E+02	7.50E+02	7.50E+02	4.00E+2	4.00E+2	4.00E+2	4.00E+2	4.00E+2	4.00E+2
Mercury and compounds	0.4	0.43	6.11E+00	6.11E+00	8.81E+01	8.81E+01	1.65E+02	1.65E+02	1.71E+2	1.71E+2	1.46E+3	1.46E+3	5.82E+0	5.82E+0
Nickel (soluble salts)	119.8	112	1.56E+03	1.56E+03	4.09E+04	4.09E+04	5.32E+04	5.32E+04	4.38E+4	4.38E+4	1.00E+5 *	1.00E+5 *	8.42E+3	8.42E+3
Selenium	5.6	0.64	3.91E+02	3.91E+02	1.02E+04	1.02E+04	1.33E+04	1.33E+04	1.10E+4	1.10E+4	1.00E+5 *	1.00E+5 *	3.10E+2	3.10E+2
Silver and compounds	1.8	0.58	3.91E+02	3.91E+02	1.02E+04	1.02E+04	1.33E+04	1.33E+04	1.10E+4	1.10E+4	1.00E+5 *	1.00E+5 *	4.36E+3	4.36E+3
Thallium and Compounds	27.1	na	5.16E+00	2.71E+01	1.35E+02	1.35E+02	1.76E+02	1.76E+02	1.45E+2	1.45E+2	1.35E+3	1.35E+3	1.25E+1	1.25E+1
Zinc	106.1	158	2.35E+04	2.35E+04	1.00E+05 *	1.00E+05 *	1.00E+05 *	1.00E+05 *	1.00E+5 *	1.00E+5 *	1.00E+5 *	1.00E+5 *	2.48E+4	2.48E+4
Chlordane	na	na	1.62E+00	1.62E+00	1.07E+02	1.07E+02	5.96E+02	5.96E+02	4.54E+1	4.54E+1	1.47E+2	1.47E+2	3.43E-2	3.43E-2
DDE	na	na	1.72E+00	1.72E+00	1.21E+02	1.21E+02	6.45E+02	6.45E+02	4.80E+1	4.80E+1	1.57E+2	1.57E+2	2.19E-2	2.19E-2
DDD	na	na	2.43E+00	2.43E+00	1.71E+02	1.71E+02	9.13E+02	9.13E+02	6.81E+1	6.81E+1	2.22E+2	2.22E+2	8.51E-1	8.51E-1
DDT	na	na	1.72E+00	1.72E+00	1.21E+02	1.21E+02	6.45E+02	6.45E+02	4.80E+1	4.80E+1	1.57E+2	1.57E+2	2.19E-2	2.19E-2
Dieldrin	na	na	3.03E-02	3.03E-02	1.54E+00	1.54E+00	1.01E+01	1.01E+01	8.50E-1	8.50E-1	2.66E+0	2.66E+0	1.97E-3	1.97E-3
Endrin	na	na	1.83E+01	1.83E+01	2.64E+02	2.64E+02	4.85E+02	4.85E+02	5.13E+2	5.13E+2	4.38E+3	4.38E+3	7.05E-1	7.05E-1
Heptachlor	na	na	1.08E-01	1.08E-01	5.48E+00	5.48E+00	3.59E+01	3.59E+01	3.02E+0	3.02E+0	9.47E+0	9.47E+0	6.76E-3	6.76E-3
Heptachlor epoxide	na	na	5.33E-02	5.33E-02	2.71E+00	2.71E+00	1.78E+01	1.78E+01	1.49E+0	1.49E+0	4.68E+0	4.68E+0	3.34E-3	3.34E-3
Hexachlorocyclohexane (HCH) (alpha)	na	na	9.00E-02	9.00E-02	5.94E+00	5.94E+00	3.31E+01	3.31E+01	2.52E+0	2.52E+0	8.16E+0	8.16E+0	5.03E-3	5.03E-3
Hexachlorocyclohexane (HCH) (beta)	na	na	3.15E-01	3.15E-01	2.08E+01	2.08E+01	1.16E+02	1.16E+02	8.82E+0	8.82E+0	2.86E+1	2.86E+1	1.76E-2	1.76E-2
Hexachlorocyclohexane (HCH) (gamma)	na	na	4.36E-01	4.36E-01	2.88E+01	2.88E+01	1.60E+02	1.60E+02	1.22E+1	1.22E+1	3.95E+1	3.95E+1	2.42E-2	2.42E-2
Hexachlorocyclohexane (HCH) (delta)	na	na	1.42E-01	1.42E-01	9.36E+00	9.36E+00	5.22E+01	5.22E+01	3.97E+0	3.97E+0	1.29E+1	1.29E+1	7.86E-3	7.86E-3
Aroclor 1016	na	na	3.93E+00	3.93E+00	5.02E+01	5.02E+01	9.85E+01	9.85E+01	1.10E+2	1.10E+2	5.46E+2	5.46E+2	5.10E-1	5.10E-1
Aroclor 1221	na	na	2.21E-01	2.21E-01	1.00E+01	1.00E+01	7.03E+01	7.03E+01	6.20E+0	6.20E+0	1.91E+1	1.91E+1	4.60E-2	4.60E-2
Aroclor 1232	na	na	2.21E-01	2.21E-01	1.00E+01	1.00E+01	7.03E+01	7.03E+01	6.20E+0	6.20E+0	1.91E+1	1.91E+1	4.60E-2	4.60E-2
Aroclor 1242	na	na	2.21E-01	2.21E-01	1.00E+01	1.00E+01	7.03E+01	7.03E+01	6.20E+0	6.20E+0	1.91E+1	1.91E+1	4.60E-2	4.60E-2
Aroclor 1248	na	na	2.21E-01	2.21E-01	1.00E+01	1.00E+01	7.03E+01	7.03E+01	6.20E+0	6.20E+0	1.91E+1	1.91E+1	4.60E-2	4.60E-2
Aroclor 1254	na	na	2.21E-01	2.21E-01	1.00E+01	1.00E+01	2.81E+01	2.81E+01	6.20E+0	6.20E+0	1.91E+1	1.91E+1	4.60E-2	4.60E-2
Aroclor 1260	na	na	2.21E-01	2.21E-01	1.00E+01	1.00E+01	7.03E+01	7.03E+01	6.20E+0	6.20E+0	1.91E+1	1.91E+1	4.60E-2	4.60E-2
Aroclor 1262	na	na	2.21E-01	2.21E-01	1.00E+01	1.00E+01	7.03E+01	7.03E+01	6.20E+0	6.20E+0	1.91E+1	1.91E+1	4.60E-2	4.60E-2
Pentachlorophenol	na	na	2.97E+00	2.97E+00	1.11E+02	1.11E+02	8.63E+02	8.63E+02	8.33E+1	8.33E+1	2.49E+2	2.49E+2	1.29E-1	1.29E-1

Notes:

(1) LBNL 1995. Lawrence Berkeley Background Concentrations in Soil, Colluvium and Fill

(2) SFB WQCB 1998. Ambient Concentrations of Toxic Chemicals in SF Bay (100% fine)

na = Not Applicable/Not Available.

nd = Not Detected in Analyzed Samples

* Indicates SSTL exceeded pure component water solubility or soil saturation and hence solubility/saturation is listed as SSTL. Metal soil maximum concentration is 10% = 100,000 mg/kg

1 If maximum detected concentration is lower than the 95% UCL then the maximum detected concentration is compared to the SS

RBCs Risk Based Concentration

H-SSTLs Human Site Specific Threshold Limit, determined by using the higher of the background/Ambient value or RBCs

Table 3-14-a. TIER 2 COMPARISONS-SOILS-ENTIRE UPLAND
ENTIRE UPLAND AREA OF POTENTIAL CONCERN
Project: UCB Richmond

Revised

CHEMICAL	BACKGROUND CONCENTRATIONS (1)	REPRESENTATIVE SITE CONCENTRATIONS			RESIDENTIAL RECEPTOR SSTLs	COMMERCIAL/ INDUSTRIAL WORKER SSTLs	CONSTRUCTION WORKER SSTLs	TIER 2 OUTCOME		
		Maximum Detected [mg/kg]	95 % UCLM Surface Soil 0 - 3 ft [mg/kg]	95 % UCL Surface + Subsurface Soil 0 - 10 ft [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial + Subsurficial Soil Exposure [mg/kg]	Residential Receptor (SSTL compared to maximum detected)	Commercial/ Industrial Worker (SSTL compared to 0 - 3 ft 95% UCL1)	Construction/Excavation Worker (SSTL compared to 0 - 10 ft 95% UCL1)
Antimony	5.5	1.60E+01	na	2.82E+00	3.13E+1	8.18E+2	1.06E+3	no concern	no concern	below background
Arsenic (cancer endpoint)	19.1	1.60E+03	1.06E+01	4.03E+01	1.91E+1	2.73E+1	1.20E+2	SSTL EXCEEDED	below background	no concern
Beryllium and compounds	1	1.00E+00	4.53E-01	4.59E-01	1.54E+2	3.69E+3	4.75E+2	no concern	below background	below background
Cadmium and compounds	2.7	4.37E+02	4.02E+00	6.29E+00	2.70E+0	1.47E+2	3.25E+2	SSTL EXCEEDED	no concern	no concern
Total Chromium (1:6 ratio Cr VI:Cr III)	99.6	1.10E+02	3.14E+01	3.67E+01	2.11E+2	4.48E+3	2.17E+2	no concern	below background	below background
Copper and compounds	69.4	2.00E+04	3.53E+02	7.07E+02	2.91E+3	7.59E+4	9.89E+4	SSTL EXCEEDED	no concern	no concern
Lead	16.1	1.14E+03	6.13E+01	6.81E+01	2.55E+2	7.50E+2	7.50E+2	SSTL EXCEEDED	no concern	no concern
Methyl Mercury	0.4	5.30E+03	6.24E+01	9.61E+01	6.11E+0	8.81E+1	1.65E+2	SSTL EXCEEDED	no concern	no concern
Nickel (soluble salts)	119.8	2.10E+02	3.81E+01	5.24E+01	1.56E+3	4.09E+4	5.32E+4	no concern	below background	below background
Selenium	5.6	5.00E+01	1.14E+00	1.73E+00	3.91E+2	1.02E+4	1.33E+4	no concern	below background	below background
Silver and compounds	1.8	1.10E+01	5.77E-01	1.05E+00	3.91E+2	1.02E+4	1.33E+4	no concern	below background	below background
Thallium and Compounds	27.1	5.80E+00	1.24E+00	1.39E+00	2.71E+1	1.35E+2	1.76E+2	below background	below background	below background
Zinc	106.1	1.30E+04	2.48E+02	6.60E+02	2.35E+4	1.00E+5 *	1.00E+5 *	no concern	no concern	no concern
Chlordane	na	9.20E-02	na	na	1.62E+0	1.07E+2	5.96E+2	no concern	no concern	no concern
DDE	na	4.70E-02	na	na	1.72E+0	1.21E+2	6.45E+2	no concern	no concern	no concern
DDD	na	na	na	na	2.43E+0	1.71E+2	9.13E+2	na	na	na
DDT	na	3.80E-01	na	na	1.72E+0	1.21E+2	6.45E+2	no concern	no concern	no concern
Dieldrin	na	8.20E-03	na	na	3.03E-2	1.54E+0	1.01E+1	no concern	no concern	no concern
Endrin	na	na	na	na	1.83E+1	2.64E+2	4.85E+2	na	na	na
Heptachlor	na	na	na	na	1.05E-1	5.48E+0	3.59E+1	na	na	na
Heptachlor epoxide	na	5.90E-03	na	na	5.33E-2	2.71E+0	1.78E+1	no concern	no concern	no concern
Hexachlorocyclohexane (HCH) (alpha)	na	na	na	na	9.00E-2	5.94E+0	3.31E+1	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	na	na	na	3.15E-1	2.08E+1	1.16E+2	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	na	na	na	4.36E-1	2.88E+1	1.60E+2	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	na	na	1.42E-1	9.36E+0	5.22E+1	na	na	na
Aroclor 1016	na	na	na	na	3.93E+0	5.02E+1	9.85E+1	na	na	na
Aroclor 1221	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1232	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1242	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1248	na	8.80E-01	na	na	2.21E-1	1.00E+1	7.03E+1	SSTL EXCEEDED	no concern	no concern
Aroclor 1254	na	9.41E-01	na	na	2.21E-1	1.00E+1	2.81E+1	SSTL EXCEEDED	no concern	no concern
Aroclor 1260	na	6.10E-02	na	na	2.21E-1	1.00E+1	7.03E+1	no concern	no concern	no concern
Aroclor 1262	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Pentachlorophenol	na	na	na	na	2.97E+0	1.11E+2	8.63E+2	na	na	na

Notes:
(1) LBNL 1995 Lawrence Berkeley Background Concentrations in Soil, colluvium and Fill
na=Not applicable/Not available
nd = Not Detected in Analyzed Samples
* Indicates SSTL exceeded pure component water solubility or soil saturation and hence solubility/saturation is listed as SSTL. Metal soil maximum concentration is 10% = 100,000 mg/kg
1 If maximum detected concentration is lower than the 95% UCL, then the maximum detected concentration is compared to the SSTL.

TABLE 3-14-b. TIER 2 COMPARISONS - UPLAND AREA
FOREST PRODUCTS AREA OF POTENTIAL CONCERN

Revised

Project: UCB Richmond

CHEMICAL	BACKGROUND CONCENTRATIONS (1)	REPRESENTATIVE SITE CONCENTRATIONS			RESIDENTIAL RECEPTOR SSTLs	COMMERCIAL/ INDUSTRIAL WORKER SSTLs	CONSTRUCTION WORKER SSTLs	TIER 2 OUTCOME		
		Maximum Detected [mg/kg]	95 % UCLM Surface Soil 0 - 3 ft [mg/kg]	95 % UCL Surface + Subsurface Soil 0 - 10 ft [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial + Subsurficial Soil Exposure [mg/kg]	Residential Receptor (SSTL compared to maximum detected)	Commercial/ Industrial Worker (SSTL compared to 0 - 3 ft 95% UCL1)	Construction/Excavation Worker (SSTL compared to 0 - 10 ft 95% UCL1)
Antimony	5.5	na	na	na	3.13E+1	8.18E+2	1.06E+3	na	na	na
Arsenic (cancer endpoint)	19.1	6.60E+01	3.85E+01	2.72E+01	1.91E+1	2.73E+1	1.20E+2	SSTL EXCEEDED	SSTL EXCEEDED	no concern
Beryllium and compounds	1	7.90E-01	5.49E-01	5.08E-01	1.54E+2	3.69E+3	4.75E+2	below background	below background	below background
Cadmium and compounds	2.7	2.00E+00	1.77E+00	1.71E+00	2.70E+0	1.47E+2	3.25E+2	below background	below background	below background
Total Chromium (1:6 ratio Cr VI:Cr III)	99.6	4.60E+01	4.54E+01	4.00E+01	2.11E+2	4.48E+3	2.17E+2	below background	below background	below background
Copper and compounds	69.4	3.40E+01	2.71E+01	2.55E+01	2.91E+3	7.59E+4	9.89E+4	below background	below background	below background
Lead	16.1	1.90E+01	1.31E+01	1.07E+01	2.55E+2	7.50E+2	7.50E+2	no concern	below background	below background
Mercury and compounds	0.4	1.30E+00	8.83E+00	3.03E+00	6.11E+0	8.81E+1	1.65E+2	no concern	no concern	no concern
Nickel (soluble salts)	119.8	1.20E+02	4.65E+01	6.89E+01	1.56E+3	4.09E+4	5.32E+4	no concern	below background	below background
Selenium	5.6	7.30E-01	1.13E+00	8.75E-01	3.91E+2	1.02E+4	1.33E+4	below background	below background	below background
Silver and compounds	1.8	na	na	na	3.91E+2	1.02E+4	1.33E+4	na	na	na
Thallium and Compounds	27.1	2.20E+00	1.77E+00	1.77E+00	2.71E+1	1.35E+2	1.76E+2	below background	below background	below background
Zinc	106.1	7.30E+01	5.78E+01	4.81E+01	2.35E+4	1.00E+5 *	1.00E+5 *	below background	below background	below background
Chlordane	na	na	na	na	1.62E+0	1.07E+2	5.96E+2	na	na	na
DDE	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
DDD	na	na	na	na	2.43E+0	1.71E+2	9.13E+2	na	na	na
DDT	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
Dieldrin	na	na	na	na	3.03E-2	1.54E+0	1.01E+1	na	na	na
Endrin	na	na	na	na	1.83E+1	2.64E+2	4.85E+2	na	na	na
Heptachlor	na	na	na	na	1.08E-1	5.48E+0	3.59E+1	na	na	na
Heptachlor epoxide	na	na	na	na	5.33E-2	2.71E+0	1.78E+1	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	na	na	na	9.00E-2	5.94E+0	3.31E+1	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	na	na	na	3.15E-1	2.08E+1	1.16E+2	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	na	na	na	4.36E-1	2.88E+1	1.60E+2	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	na	na	1.42E-1	9.36E+0	5.22E+1	na	na	na
Aroclor 1016	na	na	na	na	3.93E+0	5.02E+1	9.85E+1	na	na	na
Aroclor 1221	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1232	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1242	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1248	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1254	na	na	na	na	2.21E-1	1.00E+1	2.81E+1	na	na	na
Aroclor 1260	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1262	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Pentachlorophenol	na	na	na	na	2.97E+0	1.11E+2	8.63E+2	na	na	na

Notes:
(1) LBNL 1995. Lawrence Berkeley Background Concentrations in Soil, colluvium and Fill
na = Not Applicable/Not Available
nd = Not Detected in Analyzed Samples
* Indicates SSTL exceeded pure component water solubility or soil saturation and hence solubility/saturation is listed as SSTL. Metal soil maximum concentration is 10% = 100,000 mg/kg
[1] If maximum detected concentration is lower than the 95% UCL then the maximum detected concentration is compared to the SSTL

TABLE 3-14-c. TIER 2 COMPARISONS - UPLAND AREA
HISTORICAL TEST PIT AREA OF POTENTIAL CONCERN

Revised

Project: UCB Richmond

CHEMICAL	BACKGROUND CONCENTRATIONS (1)	REPRESENTATIVE SITE CONCENTRATIONS			RESIDENTIAL RECEPTOR SSTLs	COMMERCIAL/ INDUSTRIAL WORKER SSTLs	CONSTRUCTION WORKER SSTLs	TIER 2 OUTCOME		
		Maximum Detected [mg/kg]	95 % UCLM Surface Soil 0 - 3 ft [mg/kg]	95 % UCL Surface + Subsurface Soil 0 - 10 ft [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial + Subsurficial Soil Exposure [mg/kg]	Residential Receptor (SSTL compared to maximum detected)	Commercial/ Industrial Worker (SSTL compared to 0 - 3 ft 95% UCL1)	Construction/Excavation Worker (SSTL compared to 0 - 10 ft 95% UCL1)
Antimony	5.5	na	na	na	3.13E+1	8.18E+2	1.06E+3	na	na	na
Arsenic (cancer endpoint)	19.1	2.12E+01	4.93E+01	2.72E+01	1.91E+1	2.73E+1	3.20E+2	SSTL EXCEEDED	no concern	no concern
Beryllium and compounds	1	4.40E-01	na	6.39E-01	1.54E+2	3.69E+3	4.75E+2	below background	below background	below background
Cadmium and compounds	2.7	9.90E+00	1.97E+01	9.63E+00	2.70E+0	1.47E+2	3.25E+2	SSTL EXCEEDED	no concern	no concern
Total Chromium (1:6 ratio Cr VI:Cr III)	99.6	3.61E+01	3.45E+01	3.44E+01	2.11E+2	4.48E+3	2.17E+2	below background	below background	below background
Copper and compounds	69.4	1.14E+03	na	na	2.91E+3	7.59E+4	9.87E+4	no concern	no concern	no concern
Lead	16.1	4.92E+01	3.79E+02	1.75E+02	2.55E+2	7.50E+2	7.50E+2	no concern	no concern	no concern
Mercury and compounds	0.4	6.66E+00	7.46E+02	4.55E+02	6.11E+0	8.81E+1	1.65E+2	SSTL EXCEEDED	no concern	no concern
Nickel (soluble salts)	119.8	6.50E+01	3.04E+01	8.30E+01	1.56E+3	4.09E+4	5.37E+4	below background	below background	below background
Selenium	5.6	6.80E-01	na	na	3.91E+2	1.02E+4	1.33E+4	below background	below background	below background
Silver and compounds	1.8	na	na	na	3.91E+2	1.02E+4	1.33E+4	na	na	na
Thallium and Compounds	27.1	1.20E+00	na	na	2.71E+1	1.35E+2	1.76E+2	below background	below background	below background
Zinc	106.1	2.27E+02	2.12E+02	2.40E+02	2.35E+4	1.00E+5 *	1.00E+5 *	no concern	no concern	no concern
Chlordane	na	na	na	na	1.62E+0	1.07E+2	5.96E+2	na	na	na
DDE	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
DDD	na	na	na	na	2.43E+0	1.71E+2	9.13E+2	na	na	na
DDT	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
Dieldrin	na	na	na	na	3.03E-2	1.54E+0	1.01E+1	na	na	na
Endrin	na	na	na	na	1.83E+1	2.64E+2	4.85E+2	na	na	na
Heptachlor	na	na	na	na	1.08E-1	5.48E+0	3.59E+1	na	na	na
Heptachlor epoxide	na	na	na	na	5.31E-2	2.71E+0	1.78E+1	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	na	na	na	9.00E-2	5.94E+0	3.31E+1	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	na	na	na	3.15E-1	2.08E+1	1.16E+2	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	na	na	na	4.36E-1	2.88E+1	1.60E+2	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	na	na	1.42E-1	9.36E+0	5.22E+1	na	na	na
Aroclor 1016	na	na	na	na	3.93E+0	5.02E+1	9.85E+1	na	na	na
Aroclor 1221	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1232	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1242	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1248	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1254	na	3.00E-01	na	na	2.21E-1	1.00E+1	2.81E+1	SSTL EXCEEDED	no concern	no concern
Aroclor 1260	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1262	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Pentachlorophenol	na	na	na	na	2.97E+0	1.11E+2	8.63E+2	na	na	na

Notes:
(1) LBNL 1995. Lawrence Berkeley Background Concentrations in Soil, tailings and Fill
na = Not Applicable/Not Available
nd = Not Detected in Analyzed Samples
* Indicates SSTL exceeded pure component water solubility or soil saturation and hence solubility/saturation is listed as SSTL. Metal soil maximum concentration is 10% = 100,000 mg/kg
1 If maximum detected concentration is lower than the 95% UCL then the maximum detected concentration is compared to the SSTL

TABLE 3-14-d. TIER 2 COMPARISONS - UPLAND AREA
EXPLOSIVES STORAGE AREA OF POTENTIAL CONCERN Revised

Project: UCB Richmond

CHEMICAL	BACKGROUND CONCENTRATIONS (1)	REPRESENTATIVE SITE CONCENTRATIONS			RESIDENTIAL RECEPTOR SSTLs	COMMERCIAL/ INDUSTRIAL WORKER SSTLs	CONSTRUCTION WORKER SSTLs	TIER 2 OUTCOME		
		Maximum Detected [mg/kg]	95 % UCLM Surface Soil 0 - 3 ft [mg/kg]	95 % UCL Surface + Subsurface Soil 0 - 10 ft [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial + Subsurficial Soil Exposure [mg/kg]	Residential Receptor (SSTL compared to maximum detected)	Commercial/ Industrial Worker (SSTL compared to 0 - 3 ft 95% UCL1)	Construction/Excavation Worker (SSTL compared to 0 - 10 ft 95% UCL1)
Antimony	5.5	na	na	na	3.13E+1	8.18E+2	1.00E+3	na	na	na
Arsenic (cancer endpoint)	19.1	1.02E+01	5.89E+00	5.22E+00	1.91E+1	2.73E+1	1.20E+2	below background	below background	below background
Beryllium and compounds	1	4.20E-01	na	na	1.54E+2	3.69E+3	4.75E+2	below background	below background	below background
Cadmium and compounds	2.7	4.60E+00	3.29E+00	2.96E+00	2.70E+0	1.47E+2	3.25E+2	SSTL EXCEEDED	no concern	no concern
Total Chromium (1:6 ratio Cr VI:Cr III)	99.6	6.51E+01	4.59E+01	4.38E+01	2.11E+2	4.48E+3	2.17E+2	below background	below background	below background
Copper and compounds	69.4	7.36E+02	8.30E+02	5.76E+02	2.91E+3	7.59E+4	9.89E+4	no concern	no concern	no concern
Lead	16.1	4.00E+01	2.23E+01	2.05E+01	2.35E+2	7.50E+2	7.50E+2	no concern	no concern	no concern
Mercury and compounds	0.4	1.37E+00	1.09E+00	8.28E-01	6.13E+0	8.81E+1	3.65E+2	no concern	no concern	no concern
Nickel (soluble salts)	119.8	6.00E+01	na	na	1.56E+3	4.09E+4	5.32E+4	below background	below background	below background
Selenium	5.6	7.40E-01	na	na	3.91E+2	1.02E+4	1.33E+4	below background	below background	below background
Silver and compounds	1.8	na	na	na	3.91E+2	1.02E+4	1.33E+4	na	na	na
Thallium and Compounds	27.1	1.00E+00	na	na	2.71E+1	1.35E+2	1.76E+2	below background	below background	below background
Zinc	106.1	2.70E+02	3.18E+02	3.53E+02	2.35E+4	1.00E+5 *	1.00E+5 *	no concern	no concern	no concern
Chlordane	na	na	na	na	1.62E+0	1.07E+2	5.96E+2	na	na	na
DDE	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
DDD	na	na	na	na	2.43E+0	1.71E+2	9.13E+2	na	na	na
DDT	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
Dieldrin	na	na	na	na	3.03E-2	1.54E+0	1.01E+1	na	na	na
Endrin	na	na	na	na	1.83E+1	2.64E+2	4.85E+2	na	na	na
Heptachlor	na	na	na	na	1.08E-1	5.48E+0	3.59E+1	na	na	na
Heptachlor epoxide	na	na	na	na	5.33E-2	2.71E+0	1.78E+1	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	na	na	na	9.00E-2	5.94E+0	3.31E+1	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	na	na	na	3.15E-1	2.08E+1	1.16E+2	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	na	na	na	4.36E-1	2.88E+1	1.60E+2	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	na	na	1.47E-1	9.36E+0	5.22E+1	na	na	na
Aroclor 1016	na	na	na	na	3.93E+0	5.02E+1	9.85E+1	na	na	na
Aroclor 1221	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1232	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1242	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1248	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1254	na	na	na	na	2.21E-1	1.00E+1	2.81E+1	na	na	na
Aroclor 1260	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1262	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Pentachlorophenol	na	na	na	na	2.97E+0	1.11E+2	8.63E+2	na	na	na

Notes:
(1) LBNL 1995. Lawrence Berkeley Background Concentrations in Soil, collection and Fill
na = Not Applicable/Not Available
nd = Not Detected in Analyzed Samples
* Indicates SSTL exceeded pure component water solubility or soil saturation and hence solubility/saturation is listed as SSTL. Metal soil maximum concentration is 10% = 100,000 mg/kg
* If maximum detected concentration is lower than the 95% UCL, then the maximum detected concentration is compared to the SSTL

TABLE 3-14-e. TIER 2 COMPARISONS - UPLAND AREA
HISTORICAL BLASTING CAP AREA OF POTENTIAL CONCERN

Revised

Project: UCB Richmond

CHEMICAL	BACKGROUND CONCENTRATIONS (1)	REPRESENTATIVE SITE CONCENTRATIONS			RESIDENTIAL RECEPTOR SSTLs	COMMERCIAL/ INDUSTRIAL WORKER SSTLs	CONSTRUCTION WORKER SSTLs	TIER 2 OUTCOME		
		Maximum Detected (mg/kg)	95 % UCLM Surface Soil 0 - 3 ft (mg/kg)	95 % UCL Surface + Subsurface Soil 0 - 10 ft (mg/kg)	Surficial Soil Exposure (mg/kg)	Surficial Soil Exposure (mg/kg)	Surficial + Subsurficial Soil Exposure (mg/kg)	Residential Receptor (SSTL compared to maximum detected)	Commercial/ Industrial Worker (SSTL compared to 0 - 3 ft 95% UCL1)	Construction/Excavation Worker (SSTL compared to 0 - 10 ft 95% UCL1)
Antimony	5.5	na	na	na	3.13E+1	8.18E+2	1.06E+3	na	na	na
Arsenic (cancer endpoint)	19.1	5.50E+00	na	na	1.91E+1	2.73E+1	1.20E+2	below background	below background	below background
Beryllium and compounds	1	na	na	na	1.54E+2	3.69E+3	4.75E+2	na	na	na
Cadmium and compounds	2.7	2.50E+00	2.48E+00	na	2.70E+0	1.47E+2	3.25E+2	below background	below background	below background
Total Chromium (1:6 ratio Cr VI:Cr III)	99.6	2.71E+01	2.92E+01	2.92E+01	2.11E+2	4.48E+3	2.17E+2	below background	below background	below background
Copper and compounds	69.4	2.32E+02	4.60E+02	4.60E+02	2.91E+3	7.59E+4	9.89E+4	no concern	no concern	no concern
Lead	16.1	6.95E+01	1.62E+02	1.62E+02	2.55E+2	7.50E+2	7.50E+2	no concern	no concern	no concern
Mercury and compounds	0.4	1.75E+00	3.67E+00	3.67E+00	6.11E+0	8.81E+1	1.65E+2	no concern	no concern	no concern
Nickel (soluble salts)	119.8	na	na	na	1.56E+3	4.09E+4	5.32E+4	na	na	na
Selenium	5.6	na	na	na	3.91E+2	1.02E+4	1.33E+4	na	na	na
Silver and compounds	1.8	na	na	na	3.91E+2	1.02E+4	1.33E+4	na	na	na
Thallium and Compounds	27.1	na	na	na	2.71E+1	1.35E+2	1.76E+2	na	na	na
Zinc	106.1	3.92E+02	5.41E+02	5.41E+02	2.35E+4	1.00E+5 *	1.00E+5 *	no concern	no concern	no concern
Chlordane	na	na	na	na	1.62E+0	1.07E+2	5.96E+2	na	na	na
DDE	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
DDD	na	na	na	na	2.43E+0	1.71E+2	9.13E+2	na	na	na
DDT	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
Dieldrin	na	na	na	na	3.03E-2	1.54E+0	1.01E+1	na	na	na
Endrin	na	na	na	na	1.83E+1	2.64E+2	4.83E+2	na	na	na
Heptachlor	na	na	na	na	1.08E-1	5.48E+0	3.59E+1	na	na	na
Heptachlor epoxide	na	na	na	na	5.33E-2	2.71E+0	1.78E+1	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	na	na	na	9.00E-2	5.94E+0	3.31E+1	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	na	na	na	3.15E-1	2.08E+1	1.16E+2	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	na	na	na	4.36E-1	2.88E+1	1.60E+2	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	na	na	1.42E-1	9.36E+0	5.22E+1	na	na	na
Aroclor 1016	na	na	na	na	3.93E+0	5.02E+1	9.85E+1	na	na	na
Aroclor 1221	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1232	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1242	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1248	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1254	na	na	na	na	2.21E-1	1.00E+1	2.81E+1	na	na	na
Aroclor 1260	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1262	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Pentachlorophenol	na	na	na	na	2.97E+0	1.11E+2	8.63E+2	na	na	na

Notes:
(1) LBNL 1995, Lawrence Berkeley Background Concentrations in Soil, colluvium and FSII
na = Not Applicable/Not Available
nd = Not Detected in Analyzed Samples
* Indicates SSTL exceeded pure component water solubility or soil saturation and hence solubility/saturation is listed as SSTL. Metal soil maximum concentration is 10% = 100,000 mg/kg
1 If maximum detected concentration is lower than the 95% UCL, then the maximum detected concentration is compared to the SSTL.

TABLE 3-14-f. TIER 2 COMPARISONS - UPLAND AREA
UPLAND NORTH PYRITE CINDERS AREA OF POTENTIAL CONCERN Revised

Project: UCB Richmond

CHEMICAL	BACKGROUND CONCENTRATIONS (1)	REPRESENTATIVE SITE CONCENTRATIONS			RESIDENTIAL RECEPTOR SSTLs	COMMERCIAL/ INDUSTRIAL WORKER SSTLs	CONSTRUCTION WORKER SSTLs	TIER 2 OUTCOME		
		Maximum Detected [mg/kg]	95 % UCLM Surface Soil 0 - 3 ft [mg/kg]	95 % UCL Surface + Subsurface Soil 0 - 10 ft [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial + Subsurficial Soil Exposure [mg/kg]	Residential Receptor (SSTL compared to maximum detected)	Commercial/ Industrial Worker (SSTL compared to 0 - 3 ft 95% UCL1)	Construction/Excavation Worker (SSTL compared to 0 - 10 ft 95% UCL1)
Antimony	5.5	na	na	na	3.13E+1	8.18E+2	1.06E+3	na	na	na
Arsenic (cancer endpoint)	19.1	3.70E+00	na	na	1.91E+1	2.73E+1	1.20E+2	below background	below background	below background
Beryllium and compounds	1	4.70E-01	na	na	1.54E+2	3.69E+3	4.75E+2	below background	below background	below background
Cadmium and compounds	2.7	1.90E+00	na	na	2.70E+0	1.47E+2	3.25E+2	below background	below background	below background
Total Chromium (1:6 ratio Cr VI:Cr III)	99.6	4.20E+01	na	na	2.11E+2	4.45E+3	2.17E+2	below background	below background	below background
Copper and compounds	69.4	5.50E+02	na	na	2.91E+3	7.59E+4	9.89E+4	no concern	no concern	no concern
Lead	16.1	1.50E+01	na	na	2.55E+2	7.50E+2	7.50E+2	below background	below background	below background
Mercury and compounds	0.4	1.00E+00	na	na	6.11E+0	8.81E+1	1.65E+2	no concern	no concern	no concern
Nickel (soluble salts)	119.8	1.10E+02	na	na	1.56E+3	4.09E+4	5.32E+4	below background	below background	below background
Selenium	5.6	7.30E-01	na	na	3.91E+2	1.02E+4	1.33E+4	below background	below background	below background
Silver and compounds	1.8	na	na	na	3.91E+2	1.02E+4	1.33E+4	na	na	na
Thallium and Compounds	27.1	1.00E+00	na	na	2.71E+1	1.35E+2	1.76E+2	below background	below background	below background
Zinc	106.1	1.70E+02	na	na	2.35E+4	1.00E+5 *	1.00E+5 *	no concern	no concern	no concern
Chlordane	na	na	na	na	1.62E+0	1.07E+2	5.96E+2	na	na	na
DDE	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
DDD	na	na	na	na	2.43E+0	1.71E+2	9.13E+2	na	na	na
DDT	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
Dieldrin	na	na	na	na	3.03E-2	1.54E+0	1.01E+1	na	na	na
Endrin	na	na	na	na	1.81E+1	2.64E+2	4.85E+2	na	na	na
Heptachlor	na	na	na	na	1.08E-1	5.48E+0	3.59E+1	na	na	na
Heptachlor epoxide	na	na	na	na	5.33E-2	2.71E+0	1.78E+1	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	na	na	na	9.00E-2	5.94E+0	3.31E+1	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	na	na	na	3.15E-1	2.08E+1	1.16E+2	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	na	na	na	4.36E-1	2.88E+1	1.60E+2	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	na	na	1.42E-1	9.36E+0	5.22E+1	na	na	na
Aroclor 1016	na	na	na	na	3.93E+0	5.02E+1	9.85E+1	na	na	na
Aroclor 1221	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1232	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1242	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1248	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1254	na	na	na	na	2.21E-1	1.00E+1	2.81E+1	na	na	na
Aroclor 1260	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1262	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Pentachlorophenol	na	na	na	na	2.97E+0	1.11E+2	8.63E+2	na	na	na

Notes:
(1) LBNL 1995. Lawrence Berkeley Background Concentrations in Soil, colluvium and Fill
na = Not Applicable/Not Available
nd = Not Detected in Analyzed Samples
* Indicates SSTL exceeded pure component water solubility or soil saturation and hence solubility/saturation is listed as SSTL. Metal soil analysis concentration is 10% = 100,000 mg/kg
1 If maximum detected concentration is lower than the 95% UCL then the maximum detected concentration is compared to the SSTL

TABLE 3-14-g. TIER 2 COMPARISONS - UPLAND AREA
HISTORICAL SHELL MANUFACTURING AREA OF POTENTIAL CONCERN Revised

Project: UCB Richmond

CHEMICAL	BACKGROUND CONCENTRATIONS (1)	REPRESENTATIVE SITE CONCENTRATIONS			RESIDENTIAL RECEPTOR SSTLs	COMMERCIAL/ INDUSTRIAL WORKER SSTLs	CONSTRUCTION WORKER SSTLs	TIER 2 OUTCOME		
		Maximum Detected [mg/kg]	95 % UCLM Surface Soil 0 - 3 ft [mg/kg]	95 % UCL Surface + Subsurface Soil 0 - 10 ft [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial + Subsurficial Soil Exposure [mg/kg]	Residential Receptor (SSTL compared to maximum detected)	Commercial/ Industrial Worker (SSTL compared to 0 - 3 ft 95% UCL1)	Construction/Excavation Worker (SSTL compared to 0 - 10 ft 95% UCL1)
Antimony	5.5	na	na	na	3.13E+1	8.18E+2	1.06E+3	na	na	na
Arsenic (cancer endpoint)	19.1	1.26E+02	1.55E+01	1.02E+01	1.91E+1	2.73E+1	1.20E+2	SSTL EXCEEDED	below background	below background
Beryllium and compounds	1	9.00E-01	na	6.80E-01	1.54E+2	3.69E+3	4.75E+2	below background	below background	below background
Cadmium and compounds	2.7	7.70E+00	2.33E+00	2.35E+00	2.70E+0	1.47E+2	3.25E+2	SSTL EXCEEDED	below background	below background
Total Chromium (1:6 ratio Cr VI:Cr III)	99.6	7.12E+01	3.40E+01	3.55E+01	2.11E+2	4.48E+3	2.17E+2	below background	below background	below background
Copper and compounds	69.4	8.40E+02	4.66E+02	2.00E+02	2.91E+3	7.59E+4	9.87E+4	no concern	no concern	no concern
Lead	16.1	8.50E+02	4.14E+02	2.94E+01	2.55E+2	7.50E+2	7.50E+2	SSTL EXCEEDED	no concern	no concern
Mercury and compounds	0.4	5.30E+03	6.95E+01	4.15E+02	6.31E+0	8.81E+1	1.65E+2	SSTL EXCEEDED	no concern	SSTL EXCEEDED
Nickel (soluble salts)	119.5	2.10E+02	na	6.00E+01	1.56E+3	4.09E+4	5.32E+4	no concern	no concern	below background
Selenium	5.6	3.00E+00	na	1.85E+00	3.91E+2	1.02E+4	1.33E+4	below background	below background	below background
Silver and compounds	1.8	5.70E+00	na	na	3.91E+2	1.02E+4	1.33E+4	no concern	no concern	no concern
Thallium and Compounds	27.1	3.40E+00	na	2.39E+00	2.71E+1	1.35E+2	1.76E+2	below background	below background	below background
Zinc	106.1	1.40E+03	2.02E+02	1.74E+02	2.35E+4	1.00E+5 *	1.00E+5 *	no concern	no concern	no concern
Chlordane	na	na	na	na	1.62E+0	1.07E+2	5.96E+2	na	na	na
DDE	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
DDD	na	na	na	na	2.43E+0	1.71E+2	9.13E+2	na	na	na
DDT	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
Dieldrin	na	na	na	na	3.03E-2	1.54E+0	1.01E+1	na	na	na
Endrin	na	na	na	na	1.83E+1	2.64E+2	4.85E+2	na	na	na
Heptachlor	na	na	na	na	1.08E-1	5.48E+0	3.59E+1	na	na	na
Heptachlor epoxide	na	na	na	na	5.33E-2	2.71E+0	1.78E+1	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	na	na	na	9.00E-2	5.94E+0	3.31E+1	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	na	na	na	3.15E-1	2.08E+1	1.16E+2	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	na	na	na	4.36E-1	2.88E+1	1.60E+2	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	na	na	1.42E-1	9.36E+0	5.22E+1	na	na	na
Aroclor 1016	na	na	na	na	3.93E+0	5.02E+1	9.85E+1	na	na	na
Aroclor 1221	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1232	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1242	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1248	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1254	na	na	na	na	2.21E-1	1.00E+1	2.81E+1	na	na	na
Aroclor 1260	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1262	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Pentachlorophenol	na	na	na	na	2.97E+0	1.11E+2	8.63E+2	na	na	na

Notes:
(1) LBNL 1995. Lawrence Berkeley Background Concentrations in Soil, subsurface and Fill
na = Not Applicable/Not Available
nd = Not Detected in Analyzed Samples
* Indicates SSTL exceeded pure component water solubility or soil saturation and hence solubility/saturation is listed as SSTL. Metal soil maximum concentration is 10% = 100 000 mg/kg
† If maximum detected concentration is lower than the 95% UCL, then the maximum detected concentration is compared to the SSTL

TABLE 3-14-h. TIER 2 COMPARISONS - UPLAND AREA
MERCURY FULMINATE AREA OF POTENTIAL CONCERN

Revised

Project: UCB Richmond

CHEMICAL	BACKGROUND CONCENTRATIONS (1)	REPRESENTATIVE SITE CONCENTRATIONS			RESIDENTIAL RECEPTOR SSTLs	COMMERCIAL/ INDUSTRIAL WORKER SSTLs	CONSTRUCTION WORKER SSTLs	TIER 2 OUTCOME		
		Maximum Detected [mg/kg]	95 % UCLM Surface Soil 0 - 3 ft [mg/kg]	95 % UCL Surface + Subsurface Soil 0 - 10 ft [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial + Subsurficial Soil Exposure [mg/kg]	Residential Receptor (SSTL compared to maximum detected)	Commercial/ Industrial Worker (SSTL compared to 0 - 3 ft 95% UCL1)	Construction/Excavation Worker (SSTL compared to 0 - 10 ft 95% UCL1)
Antimony	5.5	na	na	na	3.13E+1	8.18E+2	1.06E+3	na	na	na
Arsenic (cancer endpoint)	19.1	9.50E+01	4.04E+01	2.43E+01	1.91E+1	2.73E+1	1.20E+2	SSTL EXCEEDED	SSTL EXCEEDED	no concern
Beryllium and compounds	1	9.00E-01	6.59E-01	9.02E-01	1.54E+2	3.69E+3	4.75E+2	below background	below background	below background
Cadmium and compounds	2.7	4.37E+02	1.31E+02	2.22E+01	2.70E+0	1.47E+2	3.25E+2	SSTL EXCEEDED	no concern	no concern
Total Chromium (1:6 ratio Cr VI:Cr III)	99.6	5.37E+01	3.74E+01	3.96E+01	2.11E+3	4.48E+3	2.17E+2	below background	below background	below background
Copper and compounds	69.4	4.51E+02	4.91E+02	2.06E+02	2.91E+3	7.59E+4	9.89E+4	no concern	no concern	no concern
Lead	16.1	1.14E+03	8.38E+02	2.89E+02	2.55E+2	7.50E+2	7.50E+2	SSTL EXCEEDED	SSTL EXCEEDED	no concern
Mercury and compounds	0.4	5.30E+03	2.99E+02	4.41E+02	6.11E+0	8.81E+1	1.65E+2	SSTL EXCEEDED	SSTL EXCEEDED	SSTL EXCEEDED
Nickel (soluble salts)	119.8	2.10E+02	4.76E+01	6.91E+01	1.56E+3	4.09E+4	5.32E+4	no concern	below background	below background
Selenium	5.6	3.00E+00	2.26E+00	2.77E+00	3.91E+2	1.02E+4	1.33E+4	below background	below background	below background
Silver and compounds	1.8	5.70E+00	1.71E+00	na	3.91E+2	1.02E+4	1.33E+4	no concern	below background	no concern
Thallium and Compounds	27.1	3.40E+00	2.87E+00	3.21E+00	2.71E+1	1.35E+2	1.76E+2	below background	below background	below background
Zinc	106.1	2.15E+03	3.40E+03	9.36E+02	2.35E+4	1.00E+5 *	1.00E+5 *	no concern	no concern	no concern
Chlordane	na	na	na	na	1.62E+0	1.07E+2	5.96E+2	na	na	na
DDE	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
DDD	na	na	na	na	2.43E+0	1.71E+2	9.13E+2	na	na	na
DDT	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
Dieldrin	na	na	na	na	3.03E-2	1.54E+0	1.01E+1	na	na	na
Endrin	na	na	na	na	1.83E+1	2.64E+2	4.85E+2	na	na	na
Heptachlor	na	na	na	na	1.08E-1	5.48E+0	3.59E+1	na	na	na
Heptachlor epoxide	na	na	na	na	5.33E-2	2.71E+0	1.78E+1	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	na	na	na	9.00E-2	5.94E+0	3.31E+1	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	na	na	na	3.15E-1	2.08E+1	1.16E+2	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	na	na	na	4.36E-1	2.88E+1	1.60E+2	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	na	na	1.42E-1	9.36E+0	5.22E+1	na	na	na
Aroclor 1016	na	na	na	na	3.93E+0	5.02E+1	9.85E+1	na	na	na
Aroclor 1221	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1232	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1242	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1248	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1254	na	na	na	na	2.21E-1	1.00E+1	2.81E+1	na	na	na
Aroclor 1260	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1262	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Pentachlorophenol	na	na	na	na	2.97E+0	1.11E+2	8.63E+2	na	na	na

Notes:
(1) LBNL 1995. Lawrence Berkeley Background Concentrations in Soil, collevium and Fill
na = Not Applicable/Not Available
nd = Not Detected in Analyzed Samples
* Indicates SSTL exceeded gray component water solubility or soil saturation and hence solubility/saturation is listed as SSTL. Metal soil saturation concentration is 10% = 100,000 mg/kg
^ If maximum detected concentration is lower than the 95% UCL, then the maximum detected concentration is compared to the SSTL

TABLE 3-14-i. TIER 2 COMPARISONS - UPLAND AREA
UPLAND SOUTH PYRITE CINDERS AREA OF POTENTIAL CONCERN

Revised

Project: UCB Richmond

CHEMICAL	BACKGROUND CONCENTRATIONS (1)	REPRESENTATIVE SITE CONCENTRATIONS			RESIDENTIAL RECEPTOR SSTLs	COMMERCIAL/ INDUSTRIAL WORKER SSTLs	CONSTRUCTION WORKER SSTLs	TIER 2 OUTCOME		
		Maximum Detected [mg/kg]	95 % UCLM Surface Soil 0 - 3 ft [mg/kg]	95 % UCL Surface + Subsurface Soil 0 - 10 ft [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial + Subsurficial Soil Exposure [mg/kg]	Residential Receptor (SSTL compared to maximum detected)	Commercial/ Industrial Worker (SSTL compared to 0 - 3 ft 95% UCL1)	Construction/Excavatio n Worker (SSTL compared to 0 - 10 ft 95% UCL1)
Antimony	5.5	1.60E+01	na	8.12E+00	3.13E+1	8.18E+2	1.06E+3	no concern	no concern	no concern
Arsenic (cancer endpoint)	19.1	1.60E+03	7.06E+01	5.62E+02	1.91E+1	2.73E+1	1.20E+2	SSTL EXCEEDED	SSTL EXCEEDED	SSTL EXCEEDED
Beryllium and compounds	1	5.20E-01	na	3.81E-01	1.54E+2	3.69E+3	4.75E+2	below background	below background	below background
Cadmium and compounds	2.7	3.40E+02	2.55E+01	2.94E+01	2.70E+0	1.47E+2	3.25E+2	SSTL EXCEEDED	no concern	no concern
Total Chromium (1:6 ratio Cr VI:Cr III)	99.6	1.10E+02	2.26E+01	4.55E+01	2.11E+2	4.48E+3	2.17E+2	no concern	below background	below background
Copper and compounds	69.4	2.00E+04	1.63E+03	1.39E+04	2.91E+3	7.59E+4	9.89E+4	SSTL EXCEEDED	no concern	no concern
Lead	16.1	5.70E+02	3.07E+01	1.81E+02	2.55E+2	7.50E+2	7.50E+2	SSTL EXCEEDED	no concern	no concern
Mercury and compounds	0.4	5.00E+02	2.65E+00	1.39E+02	6.11E+0	8.81E+1	1.65E+2	SSTL EXCEEDED	no concern	no concern
Nickel (soluble salts)	119.8	1.20E+02	na	6.78E+01	1.56E+3	4.09E+4	5.32E+4	no concern	no concern	below background
Selenium	5.6	5.00E+01	na	2.65E+02	3.91E+2	1.02E+4	1.33E+4	no concern	no concern	no concern
Silver and compounds	1.8	1.10E+01	na	6.69E+01	3.91E+2	1.02E+4	1.33E+4	no concern	no concern	no concern
Thallium and Compounds	27.1	3.60E+00	na	2.54E+00	2.71E+1	1.35E+2	1.76E+2	below background	below background	below background
Zinc	106.1	1.30E+04	2.17E+02	1.04E+04	2.35E+4	1.00E+5 *	1.00E+5 *	no concern	no concern	no concern
Chlordane	na	na	na	na	1.62E+0	1.07E+2	5.96E+2	na	na	na
DDE	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
DDD	na	na	na	na	2.43E+0	1.71E+2	9.13E+2	na	na	na
DDT	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
Dieldrin	na	na	na	na	3.03E-2	1.54E+0	1.01E+1	na	na	na
Endrin	na	na	na	na	1.83E+1	2.64E+2	4.85E+2	na	na	na
Heptachlor	na	na	na	na	1.08E-1	5.45E+0	3.59E+1	na	na	na
Heptachlor epoxide	na	na	na	na	5.33E-2	2.71E+0	1.78E+1	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	na	na	na	9.00E-2	5.94E+0	3.31E+1	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	na	na	na	3.15E-1	2.08E+1	1.16E+2	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lind	na	na	na	na	4.36E-1	2.88E+1	1.60E+2	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	na	na	1.42E-1	9.36E+0	5.22E+1	na	na	na
Aroclor 1016	na	na	na	na	3.93E+0	5.02E+1	9.85E+1	na	na	na
Aroclor 1221	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1232	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1242	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1248	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1254	na	na	na	na	2.21E-1	1.00E+1	2.81E+1	na	na	na
Aroclor 1260	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1262	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Pentachlorophenol	na	na	na	na	2.97E+0	1.11E+2	8.63E+2	na	na	na

Notes:
(1) LBNL 1995. Lawrence Berkeley Background Concentrations in Soil, colluvium and Fill
na = Not Applicable/Not Available
nd = Not Detected in Analyzed Samples
* Indicates SSTL exceeded pure component water solubility or soil saturation and hence solubility/saturation is listed as SSTL. Metal soil max/pure concentration is 10% = 100,000 mg/kg

TABLE D2-9.BASELINE RISK CALCULATIONS, EXCLUDING BACKGROUND
UPLAND SOUTH PYRITE CINDERS AREA OF POTENTIAL CONCERN

Project: UCB Richmond

CHEMICAL	Commercial/Industrial Cumulative Risk (Soil 0 - 3 ft)					Construction/Excavation Cumulative Risk (Soil 0 - 10 ft)				
	Representative Concentrations (lower max detected or 95% UCL)	Risk Based Concentrations		Cancer Risk	Non-Cancer Hazard	Representative Concentrations (lower max detected or 95% UCL)	Risk Based Concentrations		Cancer Risk	Non-Cancer Hazard
	[mg/kg]	Cancer [mg/kg]	Non-Cancer [mg/kg]			[mg/kg]	Cancer [mg/kg]	Non-Cancer [mg/kg]		
Antimony	1.60E+01	na	8.18E+02	na	1.96E-02	8.12E+00	na	1.06E+03	na	7.63E-03
Arsenic (cancer endpoint)	7.06E+01	2.73E+01	4.39E+02	2.59E-05	1.61E-01	5.62E+02	1.20E+02	6.74E+02	4.68E-05	8.35E-01
Beryllium and compounds	5.20E-01	2.24E+04	3.69E+03	below bkgd	below bkgd	3.81E-01	1.09E+03	4.75E+02	below bkgd	below bkgd
Cadmium and compounds	2.55E+01	1.47E+02	1.01E+03	1.74E-06	2.53E-02	2.94E+01	3.25E+02	1.32E+03	9.05E-07	2.22E-02
Total Chromium (1:6 ratio Cr VI:Cr III)	2.26E+01	4.48E+03	na	below bkgd	na	4.55E+01	2.17E+02	na	below bkgd	na
Copper and compounds	1.63E+03	na	7.59E+04	na	2.15E-02	1.39E+04	na	9.89E+04	na	1.41E-01
Lead	3.07E+01	6.72E+03	na	4.57E-08	na	1.81E+02	2.74E+04	na	6.60E-08	na
Mercury and compounds	2.65E+00	na	8.81E+01	na	3.01E-02	1.39E+02	na	1.65E+02	na	8.46E-01
Nickel (soluble salts)	1.20E+02	na	4.09E+04	na	2.94E-03	6.78E+01	na	5.32E+04	na	below bkgd
Selenium	5.00E+01	na	1.02E+04	na	4.89E-03	5.00E+01	na	1.33E+04	na	3.76E-03
Silver and compounds	1.10E+01	na	1.02E+04	na	1.08E-03	1.10E+01	na	1.33E+04	na	8.27E-04
Thallium and Compounds	3.60E+00	na	1.35E+02	na	below bkgd	2.54E+00	na	1.76E+02	na	below bkgd
Zinc	2.17E+02	na	6.13E+05	na	3.54E-04	1.04E+04	na	7.95E+05	na	1.30E-02
Chlordane	na	1.07E+02	6.69E+02	na	na	na	5.95E+02	1.01E+03	na	na
DDE	na	1.21E+02	na	na	na	na	6.45E+02	na	na	na
DDD	na	1.71E+02	na	na	na	na	9.13E+02	na	na	na
DDT	na	1.21E+02	7.32E+02	na	na	na	6.45E+02	1.10E+03	na	na
Dieldrin	na	1.54E+00	4.40E+01	na	na	na	1.01E+01	8.09E+01	na	na
Endrin	na	na	2.64E+02	na	na	na	na	4.85E+02	na	na
Heptachlor	na	3.45E+00	4.40E+02	na	na	na	3.59E+01	8.09E+02	na	na
Heptachlor epoxide	na	2.71E+00	1.15E+01	na	na	na	1.78E+01	2.10E+01	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	5.94E+00	na	na	na	na	3.31E+01	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	2.08E+01	na	na	na	na	1.16E+02	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lind	na	2.88E+01	4.01E+02	na	na	na	1.60E+02	6.26E+02	na	na
Hexachlorocyclohexane (HCH) (delta)	na	9.36E+00	na	na	na	na	5.22E+01	na	na	na
Aroclor 1016	na	2.87E+02	5.02E+01	na	na	na	2.01E+03	9.85E+01	na	na
Aroclor 1221	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1232	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1242	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1248	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1254	na	1.00E+01	1.44E+01	na	na	na	7.03E+01	2.81E+01	na	na
Aroclor 1260	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1262	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Pentachlorophenol	na	1.11E+02	1.43E+04	na	na	na	8.63E+02	3.11E+04	na	na
CUMULATIVE HEALTH RISK				2.77E-05	2.66E-01	CUMULATIVE HEALTH RISK			4.78E-05	1.87E+00

Notes:
na = Not Applicable/Not Available.
nd = Not Detected in Analytical Samples

TABLE 3-15. SUMMARY OF CUMULATIVE HEALTH RISK RECONCILIATION FOR UPLAND AREA
UC BERCKELEY-RICHMOND FIELD
Revised

LOCATION NAME	Baseline Risk Excluding Background							
	Commercial/Industiral Cumulative Risk (Soil 0 - 3 ft)				Construction/Excavation Cumulative Risk (Soil 0 - 10 ft)			
	Cancer		Non-Cancer		Cancer		Non-Cancer	
UPLAND AREA	Risk	Chemicals Driving	Hazard	Chemicals Driving	Risk	Chemicals Driving	Hazard	Chemicals Driving
Entire Upland	2.36E-06	na	8.04E-01	na	3.86E-06	na	6.90E-01	na
Forest Products Lab	1.41E-05	As	1.02E-01	na	2.26E-06	na	4.82E-02	na
Test Pit	8.82E-06	na	1.70E-01	na	2.12E-06	na	1.02E-01	na
Explosives Storage Area	2.57E-07	na	2.58E-02	na	9.86E-08	na	1.34E-02	na
Historical Blasting Cap	1.03E-07	na	2.36E-02	na	2.54E-08	na	1.35E-02	na
Upland North Pyrite Cinders Area	--	--	1.89E-02	na	--	--	1.18E-02	na
Shell Manufacturing Area	6.15E-07	na	8.01E-01	na	2.90E-08	na	2.52E+00	na
Mercury Fulminate Area	2.49E-05	As,Cd	3.62E+00	Hg	2.81E-06	na	2.74E+00	na
Upland South Cinder Pyrite Area (Subunit 2A)	2.77E-05	As,Cd	2.66E-01	na	4.78E-05	As	1.87E+00	As,Cu,Hg

Notes:
na=not applicable because target risk/hazard is not exceeded
--=no COPCs present above background levels

TABLE 3-16. SUMMARY OF TIER 2 SSTLs - SHALLOW GROUNDWATER - UPLAND AREA

Revised

Project: UCB Richmond

CHEMICAL	MAX DETECTED (mg/L)	CONSTRUCTION WORKER RBCs	GROUNDWATER SSTLs	TIER 2 OUTCOME	
		Dermal Contact + Inhalation (mg/l)	(10x Salt Water RBSLs) (mg/l)	Max Detected Compared to 10x Salt Water RBSLs	Max Detected Compared to Groundwater RBCs
Antimony	na	na	na	na	na
Arsenic (cancer endpoint)	9.2E-2	na	na	na	na
Beryllium and compounds	na	na	na	na	na
Cadmium and compounds	1.3E-2	na	9.3E-2	no concern	no concern
Total Chromium (1:6 ratio Cr VI:Cr III)	na	na	na	na	na
Copper and compounds	8.9E-2	na	na	na	na
Lead	3.5E-3	na	na	na	na
Mercury and compounds	5.9E-3	na	2.5E-4	10x Salt Water RBSL EXCEEDED	no concern
Nickel (soluble salts)	3.2E-1	na	8.2E-2	10x Salt Water RBSL EXCEEDED	no concern
Selenium	1.0E-2	na	na	na	na
Silver and compounds	na	na	na	na	na
Thallium and Compounds	1.1E-2	na	2.1E+1	no concern	no concern
Zinc	1.2E+1	na	8.1E-1	10x Salt Water RBSL EXCEEDED	no concern
Chlordane	na	5.6E-2 *	na	na	na
DDE	na	1.2E-1 *	na	na	na
DDD	na	9.0E-2 *	na	na	na
DDT	na	2.5E-2 *	na	na	na
Dieldrin	na	1.7E-1	na	na	na
Endrin	na	2.5E-1 *	na	na	na
Heptachlor	na	2.0E-1 *	na	na	na
Heptachlor epoxide	na	2.0E-1 *	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	2.4E-1 *	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	2.4E-1 *	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	2.4E+0	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	7.8E-1	na	na	na
Aroclor 1016	na	2.4E-2	3.0E-4	na	na
Aroclor 1221	na	1.7E-2	3.0E-4	na	na
Aroclor 1232	na	1.7E-2	3.0E-4	na	na
Aroclor 1242	na	1.7E-2	3.0E-4	na	na
Aroclor 1248	8.9E-2	1.7E-2	3.0E-4	10x Salt Water RBSL EXCEEDED	H-SSTL EXCEEDED
Aroclor 1254	na	6.8E-3	3.0E-4	na	na
Aroclor 1260	5.9E-3	1.7E-2	3.0E-4	10x Salt Water RBSL EXCEEDED	no concern
Aroclor 1262	na	1.7E-2	3.0E-4	na	na
Pentachlorophenol	na	5.6E-1	3.0E-4	na	na

Notes:

na = Not Applicable because dissolved metals assumed to not penetrate human skin

* Indicates SSTL exceeded pure component water solubility or soil saturation and hence solubility/saturation is listed as SSTL

TABLE 3-17. TIER 2 COMPARISONS - MARSH - SEDIMENTS **Revised**

Project: UCB Richmond

CHEMICAL	REPRESENTATIVE SITE CONCENTRATIONS						RECREATORS H-SSTLs		ANGLER H-SSTLs	TIER 2 OUTCOME		
	Paths / Roads (0-3 ft) [mg/kg]		Tidal Salt Marsh (0-3 ft) [mg/kg]		Bay and Sloughs (0-3 ft) [mg/kg]		For Paths/Roads Area (children 0-6 included) Surficial Soil Exposure [mg/kg]	For Tidal Marsh Area (children 0-6 not included) Surficial Soil Exposure [mg/kg]	Fish and Dermal [mg/kg]	Recreators H-SSTL compared to Paths / Roads	Recreators H-SSTL compared to Tidal Marsh Area	Anglers H-SSTL compared to Bay and Sloughs
	Maximum	95% UCL	Maximum	95% UCL	Maximum	95% UCL						
Antimony	na	na	2.90E+1	1.13E+1	2.60E-1	3.98E+0	8.76E+2	8.18E+3	6.68E+1	na	na	na
Arsenic (cancer endpoint)	1.67E+2	na	2.21E+3	9.98E+2	1.33E+3	1.99E+2	1.91E+1	3.54E+1	1.25E+2	SSTL EXCEEDED	SSTL EXCEEDED	SSTL EXCEEDED
Beryllium and compounds	5.40E-1	na	6.40E-1	4.69E-1	5.80E-1	4.44E-1	4.32E+3	3.88E+4	3.34E+2	no concern	no concern	no concern
Cadmium and compounds	1.10E+1	na	5.00E+1	1.83E+1	4.42E+1	5.25E+0	4.68E+1	1.55E+2	4.35E+1	no concern	no concern	no concern
Total Chromium (1:6 ratio Cr VI:Cr III)	3.58E+1	na	2.09E+2	1.16E+2	1.15E+2	6.54E+1	5.90E+3	9.34E+3	na	below background	no concern	below background
Copper and compounds	4.00E+2	na	8.09E+3	7.46E+2	2.20E+4	7.05E+2	8.13E+4	1.00E+5 *	4.75E+4	no concern	no concern	no concern
Lead	2.93E+2	na	8.14E+2	3.40E+2	1.24E+3	1.98E+2	4.00E+2	4.00E+2	4.00E+2	no concern	no concern	no concern
Mercury and compounds	1.57E+1	na	1.42E+2	2.54E+1	4.30E+2	3.01E+1	1.71E+2	1.46E+3	5.82E+0	no concern	no concern	SSTL EXCEEDED
Nickel (soluble salts)	3.10E+1	na	1.30E+2	8.32E+1	7.80E+1	6.51E+1	4.38E+4	1.00E+5 *	8.42E+3	below background	below background	below background
Selenium	4.00E+0	na	4.44E+2	5.08E+1	8.54E+2	4.33E+1	1.10E+4	1.00E+5 *	3.10E+2	no concern	no concern	no concern
Silver and compounds	na	na	7.20E+0	3.39E+0	1.10E+1	9.76E-1	1.10E+4	1.00E+5 *	4.36E+3	na	na	na
Thallium and Compounds	1.50E+0	na	5.40E+0	2.11E+0	2.10E+0	1.12E+0	1.45E+2	1.35E+3	1.25E+1	no concern	no concern	no concern
Zinc	7.52E+2	na	8.80E+3	1.83E+3	5.00E+3	6.54E+2	1.00E+5 *	1.00E+5 *	2.48E+4	no concern	no concern	no concern
Chlordane	na	na	na	na	na	na	4.54E+1	1.47E+2	3.43E-2	na	na	na
DDE	na	na	na	na	na	na	4.80E+1	1.57E+2	2.19E-2	na	na	na
DDD	na	na	3.20E-2	na	na	na	6.81E+1	2.22E+2	8.51E-1	na	no concern	na
DDT	na	na	5.21E-1	na	na	na	4.80E+1	1.57E+2	2.19E-2	na	no concern	na
Dieldrin	na	na	na	na	na	na	8.50E-1	2.66E+0	1.97E-3	na	na	na
Endrin	na	na	na	na	na	na	5.13E+2	4.38E+3	7.05E-1	na	na	na
Heptachlor	na	na	na	na	na	na	3.02E+0	9.47E+0	6.76E-3	na	na	na
Heptachlor epoxide	na	na	na	na	na	na	1.49E+0	4.68E+0	3.34E-3	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	na	3.00E-1	na	na	na	2.52E+0	8.16E+0	5.03E-3	na	no concern	na
Hexachlorocyclohexane (HCH) (beta)	na	na	6.80E-3	na	na	na	8.82E+0	2.86E+1	1.76E-2	na	no concern	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	na	na	na	na	na	1.22E+1	3.95E+1	2.42E-2	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	2.80E-2	na	na	na	3.97E+0	1.29E+1	7.86E-3	na	no concern	na
Aroclor 1016	na	na	na	na	1.20E+3	na	1.10E+2	5.46E+2	5.10E-1	na	na	SSTL EXCEEDED
Aroclor 1221	na	na	na	na	na	na	6.20E+0	1.91E+1	4.60E-2	na	na	na
Aroclor 1232	na	na	na	na	na	na	6.20E+0	1.91E+1	4.60E-2	na	na	na
Aroclor 1242	na	na	8.90E-2	na	na	na	6.20E+0	1.91E+1	4.60E-2	na	no concern	na
Aroclor 1248	na	na	1.00E+0	na	1.60E+3	1.36E+2	6.20E+0	1.91E+1	4.60E-2	na	no concern	SSTL EXCEEDED
Aroclor 1254	na	na	5.00E-1	na	4.00E+2	na	6.20E+0	1.91E+1	4.60E-2	na	no concern	SSTL EXCEEDED
Aroclor 1260	na	na	na	na	na	na	6.20E+0	1.91E+1	4.60E-2	na	na	na
Aroclor 1262	na	na	na	na	na	na	6.20E+0	1.91E+1	4.60E-2	na	na	na
Pentachlorophenol	na	na	na	na	na	na	8.33E+1	2.49E+2	1.29E-1	na	na	na

Notes:
na = Not Applicable/Not Available.
* Indicates SSTL exceeded pure component water solubility or soil saturation and hence solubility/saturation is listed as SSTL

TABLE 3-18. SUMMARY OF CUMULATIVE HEALTH RISKS RECONCILIATION FOR STEGE MARSH
UC BERCKELEY-RICHMOND FIELD

Revised

LOCATION NAME	Baseline Risk Excluding Background			
	Cancer		Non-Cancer	
STEGE MARSH AREA	Risk	Chemicals Driving	Hazard	Chemicals Driving
Roads and Paths (Recreators adults and children)	1.57E-05	As	3.83E-01	na
Tidal Marsh Area (Recreators adults)	4.95E-06	As	4.97E-02	na
Bay and Sloughs (Anglers)	1.22E-03	DDT, alpha-HCH, delta-HCH, Aroclor 1242, Aroclor 1248, and Aroclor 1254	8.69E+00	DDT, Aroclor 1254

Notes
na=not applicable because target risk/hazard is not exceeded

TABLE 3-20a. STATISTICAL SUMMARY OF RESULTS FOR SOILS AFTER REMOVAL OF DATA POINTS TARGETED FOR REMEDIATION - UPLAND AREA - 0 TO 10 FEET FOREST PRODUCT AREA

Revised

UC-BERKELEY RICHMOND FIELD STATION

Analyte	Number Analyzed	Number Detected	Detection Frequency [%]	Max Detection Limit in ND Samples	Max Detected [mg/kg]	Average Conc.[1] [mg/kg]	95% UCL Conc. [mg/kg]
METALS							
Antimony	10	0	0%	180	0	1.75	na
Arsenic	10	10	100%	8.8	27	6.11	9.92
Beryllium	10	10	100%	6.1	0.79	0.43	0.53
Cadmium	10	10	100%	16	2	1.42	1.69
Chromium	10	10	100%	na	39	30.30	38.58
Copper	10	10	100%	na	29	18.60	23.49
Lead	10	10	100%	9.2	19	8.03	11.07
Mercury	10	8	80%	0.45	1.3	0.34	2.71
Nickel	10	10	100%	na	120	5.08	71.27
Selenium	10	6	60%	9.2	0.73	0.47	0.94
Silver	10	0	0%	2.6	na	0.26	na
Thallium	10	9	90%	15	2.2	1.01	1.88
Zinc	10	10	100%	61	73	35.90	46.37
PCBs							
Aroclor-1016	0	0	0%	na	na	na	na
Aroclor-1221	0	0	0%	na	na	na	na
Aroclor-1232	0	0	0%	na	na	na	na
Aroclor-1242	0	0	0%	na	na	na	na
Aroclor-1248	0	0	0%	na	na	na	na
Aroclor-1254	0	0	0%	na	na	na	na
Aroclor-1260	0	0	0%	na	na	na	na
Aroclor-1262	0	0	0%	na	na	na	na
EXPLOSIVES							
HMX	0	0	0%	na	na	na	na
PESTICIDES							
Sulfate	0	0	0%	na	na	na	na
4,4'-DDE	0	0	0%	na	na	na	na
4,4'-DDD	0	0	0%	na	na	na	na
4,4'-DDT	0	0	0%	na	na	na	na
Beta-BHC	0	0	0%	na	na	na	na
Alpha-BHC	0	0	0%	na	na	na	na
Delta-BHC	0	0	0%	na	na	na	na
Lindane (Gamma-BHC)	0	0	0%	na	na	na	na
Heptachlor	0	0	0%	na	na	na	na
Endrin	0	0	0%	na	na	na	na
Heptachlor epoxide A	0	0	0%	na	na	na	na
Dieldrin	0	0	0%	na	na	na	na
Chlordane	0	0	0%	na	na	na	na
Tributyltin	0	0	0%	na	na	na	na
PENTACHLOROPHENOL (PCP)	3	0	0%	na	na	2.27	na

Notes:
(1) Statistics were calculated substituting half of the reported detection limit in non-detected result

TABLE 3-20b. STATISTICAL SUMMARY OF RESULTS FOR SOILS AFTER REMOVAL
OF DATA POINTS TARGETED FOR REMEDIATION - UPLAND AREA - 0 TO 3 FEET
FOREST PRODUCTS AREA
UC-BERKELEY RICHMOND FIELD STATION

Revised

Analyte	Number Analyzed	Number Detected	Detection Frequency (%)	Max Detection Limit in ND Samples	Max Detected (mg/kg)	Average Conc.(1) (mg/kg)	95% UCL Conc. (mg/kg)
METALS							
Antimony	7	0	0%	5.2	na	1.76	na
Arsenic	7	7	100%	8.7	4.5	3.43	4.09
Beryllium	7	7	100%	0.15	0.79	0.43	0.59
Cadmium	7	7	100%	0.77	1.8	1.38	1.75
Chromium	7	7	100%	na	39	29.14	42.93
Copper	7	7	100%	na	28	16.71	22.88
Lead	7	7	100%	na	19	8.77	15.36
Mercury	7	6	86%	0.43	1.3	0.39	11.95
Nickel	7	7	100%	na	52	4.25	42.71
Selenium	7	4	57%	na	0.73	0.48	1.40
Silver	7	0	0%	2.6	na	0.31	na
Thallium	7	6	86%	0.36	1.3	0.80	1.95
Zinc	7	7	100%	na	73	36.29	57.53
PCBs							
Aroclor-1016	0	0	0%	0.016	na	na	na
Aroclor-1221	0	0	0%	0.016	na	na	na
Aroclor-1232	0	0	0%	0.016	na	na	na
Aroclor-1242	0	0	0%	0.016	na	na	na
Aroclor-1248	0	0	0%	0.016	na	na	na
Aroclor-1254	0	0	0%	0.016	na	na	na
Aroclor-1260	0	0	0%	0.016	na	na	na
Aroclor-1262	0	0	0%	0.016	na	na	na
EXPLOSIVES							
HMX	0	0	na	na	na	na	na
PESTICIDES							
Sulfate	0	0	0%	na	na	na	na
4,4'-DDE	0	0	0%	na	na	na	na
4,4'-DDD	0	0	0%	na	na	na	na
4,4'-DDT	0	0	0%	na	na	na	na
Beta-BHC	0	0	0%	na	na	na	na
Alpha-BHC	0	0	0%	na	na	na	na
Delta-BHC	0	0	0%	na	na	na	na
Lindane (Gamma-BHC)	0	0	0%	na	na	na	na
Heptachlor	0	0	0%	na	na	na	na
Endrin	0	0	0%	na	na	na	na
Heptachlor epoxide A	0	0	0%	na	na	na	na
Dieldrin	0	0	0%	na	na	na	na
Chlordane	0	0	0%	na	na	na	na
Tributyltin	0	0	na	na	na	na	na
PENTACHLOROPHENOL (PCP)	3	0	0%	8.9	na	2.27	na

Notes:
(1) Statistics were calculated substituting half of the reported detection limit to non-detected result
In bold, chemicals retained for Tier 2

TABLE 3-21a. STATISTICAL SUMMARY OF RESULTS FOR SOILS AFTER REMOVAL OF DATA POINTS TARGETED FOR REMEDIATION - UPLAND AREA - 0 TO 10 FEET
MERCURY FULMINATE AREA
UC-BERKELEY RICHMOND FIELD STATION

Revised

Analyte	Number Analyzed	Number Detected	Detection Frequency [%]	Max Detected [mg/kg]	Average Conc.(1) [mg/kg]	95% UCL Conc. [mg/kg]
METALS						
Antimony	13	0	0%	na	8.66	na
Arsenic	15	15	100%	14	4.60	7.37
Beryllium	13	11	85%	0.9	0.64	1.21
Cadmium	15	14	93%	2.3	1.81	2.54
Chromium	15	15	100%	53.7	29.78	36.19
Copper	15	15	100%	370	50.71	92.16
Lead	15	14	93%	59	9.83	13.64
Mercury	56	55	98%	2200	68.35	206.13
Nickel	13	13	100%	210	7.79	85.65
Selenium	15	7	47%	1.5	1.29	3.62
Silver	13	1	8%	na	0.21	na
Thallium	13	10	77%	3.4	1.59	4.41
Zinc	15	14	93%	430	84.18	155.59
PCBs						
Aroclor-1016	0	0	0%	na	na	na
Aroclor-1221	0	0	0%	na	na	na
Aroclor-1232	0	0	0%	na	na	na
Aroclor-1242	0	0	0%	na	na	na
Aroclor-1248	0	0	0%	na	na	na
Aroclor-1254	0	0	0%	na	na	na
Aroclor-1260	0	0	0%	na	na	na
Aroclor-1262	0	0	0%	na	na	na
EXPLOSIVES						
HMX	0	0	0%	na	na	na
PESTICIDES						
Sulfate	0	0	0%	na	na	na
4,4'-DDE	0	0	0%	na	na	na
4,4'-DDD	0	0	0%	na	na	na
4,4'-DDT	0	0	0%	na	na	na
Beta-BHC	0	0	0%	na	na	na
Alpha-BHC	0	0	0%	na	na	na
Delta-BHC	0	0	0%	na	na	na
Lindane (Gamma-BHC)	0	0	0%	na	na	na
Heptachlor	0	0	0%	na	na	na
Endrin	0	0	0%	na	na	na
Heptachlor epoxide A	0	0	0%	na	na	na
Dieldrin	0	0	0%	na	na	na
Chlordane	0	0	0%	na	na	na
Tributyltin	0	0	0%	na	na	na
PENTACHLOROPHENOL (PCP)	0	0	0%	na	na	na

Notes:
(1) Statistics were calculated substituting half of the reported detection limit to non-detected results
(2) LBNL 1995. Lawrence Berkeley Background Concentrations in Soil, Colluvium and Fi

TABLE 3-21b. STATISTICAL SUMMARY OF RESULTS FOR SOILS AFTER REMOVAL OF DATA POINTS TARGETED FOR REMEDIATION - UPLAND AREA - 0 TO 3 FEET
MERCURY FULMINATE AREA
UC-BERKELEY RICHMOND FIELD STATION

Revised

Analyte	Number Analyzed	Number Detected	Detection Frequency [%]	Max Detection Limit in ND Samples	Max Detected [mg/kg]	Average Conc.(1) [mg/kg]	95% UCLM Conc. [mg/kg]
METALS							
Antimony	8	0	0%	5.2	na	1.91	na
Arsenic	8	8	100%	8.7	9.7	3.54	6.03
Beryllium	8	8	100%	0.15	0.9	0.48	0.61
Cadmium	8	8	100%	0.77	2.3	1.21	1.97
Chromium	8	8	100%	na	25	21.38	24.95
Copper	8	8	100%	na	370	65.68	532.31
Lead	8	8	100%	na	59	12.84	33.54
Mercury	34	34	100%	0.43	280	25.55	60.24
Nickel	8	8	100%	na	52	8.28	53.45
Selenium	8	5	63%	na	1.5	0.65	2.59
Silver	8	1	13%	2.6	na	0.25	na
Thallium	8	8	100%	0.36	3.4	1.37	3.31
Zinc	8	8	100%	na	430	119.13	1238.97
PCBs							
Aroclor-1016	0	0	0%	0.016	na	na	na
Aroclor-1221	0	0	0%	0.016	na	na	na
Aroclor-1232	0	0	0%	0.016	na	na	na
Aroclor-1242	0	0	0%	0.016	na	na	na
Aroclor-1248	0	0	0%	0.016	na	na	na
Aroclor-1254	0	0	0%	0.016	na	na	na
Aroclor-1260	0	0	0%	0.016	na	na	na
Aroclor-1262	0	0	0%	0.016	na	na	na
EXPLOSIVES							
HMX	0	0	0%	0.3	na	na	na
PESTICIDES							
Sulfate	0	0	0%	na	na	na	na
4,4'-DDE	0	0	0%	0.12	na	na	na
4,4'-DDD	0	0	0%	0.12	na	na	na
4,4'-DDT	0	0	0%	0.12	na	na	na
Beta-BHC	0	0	0%	0.058	na	na	na
Alpha-BHC	0	0	0%	0.058	na	na	na
Delta-BHC	0	0	0%	0.058	na	na	na
Lindane (Gamma-BHC)	0	0	0%	0.058	na	na	na
Heptachlor	0	0	0%	0.058	na	na	na
Endrin	0	0	0%	0.058	na	na	na
Heptachlor epoxide A	0	0	0%	0.058	na	na	na
Dieldrin	0	0	0%	0.12	na	na	na
Chlordane	0	0	0%	0.58	na	na	na
Tributyltin	0	0	0%	na	na	na	na
PENTACHLOROPHENOL (PCP)	0	0	0%	8.9	na	na	na

Notes:
(1) Statistics were calculated substituting half of the reported detection limit to non-detected results
(2) LBNL 1995. Lawrence Berkeley Background Concentrations in Soil, Colluvium and Fill
In bold, chemicals retained for Tier 2

TABLE 3-22a. STATISTICAL SUMMARY OF RESULTS FOR SOILS AFTER REMOVAL OF DATA POINTS TARGETED FOR REMEDIATION - UPLAND AREA - 0 TO 10 FEET
SOUTH PYRITE CINDER AREA
UC-BERKELEY RICHMOND FIELD STATION

Revised

Analyte	Number Analyzed	Number Detected	Detection Frequency [%]	Max Detected [mg/kg]	Average Conc.(1) [mg/kg]	95% UCL Conc. [mg/kg]
METALS						
Antimony	0	0	0%	na	na	na
Arsenic	0	0	0%	na	na	na
Beryllium	0	0	0%	na	na	na
Cadmium	0	0	0%	na	na	na
Chromium	0	0	0%	na	na	na
Copper	0	0	0%	na	na	na
Lead	0	0	0%	na	na	na
Mercury	0	0	0%	na	na	na
Nickel	0	0	0%	na	na	na
Selenium	0	0	0%	na	na	na
Silver	0	0	0%	na	na	na
Thallium	0	0	0%	na	na	na
Zinc	0	0	0%	na	na	na
PCBs						
Aroclor-1016	0	0	0%	na	na	na
Aroclor-1221	0	0	0%	na	na	na
Aroclor-1232	0	0	0%	na	na	na
Aroclor-1242	0	0	0%	na	na	na
Aroclor-1248	0	0	0%	na	na	na
Aroclor-1254	0	0	0%	na	na	na
Aroclor-1260	0	0	0%	na	na	na
Aroclor-1262	0	0	0%	na	na	na
EXPLOSIVES						
HMX	0	0	0%	na	na	na
PESTICIDES						
Sulfate	0	0	0%	na	na	na
4,4'-DDE	0	0	0%	na	na	na
4,4'-DDD	0	0	0%	na	na	na
4,4'-DDT	0	0	0%	na	na	na
Beta-BHC	0	0	0%	na	na	na
Alpha-BHC	0	0	0%	na	na	na
Delta-BHC	0	0	0%	na	na	na
Lindane (Gamma-BHC)	0	0	0%	na	na	na
Heptachlor	0	0	0%	na	na	na
Endrin	0	0	0%	na	na	na
Heptachlor epoxide A	0	0	0%	na	na	na
Dieldrin	0	0	0%	na	na	na
Chlordane	0	0	0%	na	na	na
Tributyltin	0	0	0%	na	na	na
PENTACHLOROPHENOL (PCP)	0	0	0%	na	na	na

Notes:
(1) Statistics were calculated substituting half of the reported detection limit to non-detected results
(2) LBNL 1995. Lawrence Berkeley Background Concentrations in Soil, Colluvium and Fill

TABLE 3-22b. STATISTICAL SUMMARY OF RESULTS FOR SOILS AFTER REMOVAL OF DATA POINTS TARGETED FOR REMEDIATION - UPLAND AREA - 0 TO 3 FEET SOUTH PYRITE CINDER AREA

UC-BERKELEY RICHMOND FIELD STATION

Revised

Analyte	Number Analyzed	Number Detected	Detection Frequency (%)	Max Detection Limit in ND Samples	Max Detected (mg/kg)	Average Conc.(1) (mg/kg)	95% UCLM Conc. (mg/kg)
METALS							
Antimony	0	0	0%	5.2	na	na	na
Arsenic	0	0	0%	8.7	na	na	na
Beryllium	0	0	0%	0.15	na	na	na
Cadmium	0	0	0%	0.77	na	na	na
Chromium	0	0	0%	na	na	na	na
Copper	0	0	0%	na	na	na	na
Lead	0	0	0%	na	na	na	na
Mercury	0	0	0%	0.43	na	na	na
Nickel	0	0	0%	na	na	na	na
Selenium	0	0	0%	na	na	na	na
Silver	0	0	0%	2.6	na	na	na
Thallium	0	0	0%	0.36	na	na	na
Zinc	0	0	0%	na	na	na	na
PCBs			0%		na	na	na
Aroclor-1016	0	0	0%	0.016	na	na	na
Aroclor-1221	0	0	0%	0.016	na	na	na
Aroclor-1232	0	0	0%	0.016	na	na	na
Aroclor-1242	0	0	0%	0.016	na	na	na
Aroclor-1248	0	0	0%	0.016	na	na	na
Aroclor-1254	0	0	0%	0.016	na	na	na
Aroclor-1260	0	0	0%	0.016	na	na	na
Aroclor-1262	0	0	0%	0.016	na	na	na
EXPLOSIVES			0%		na	na	na
HMX	0	0	0%	0.3	na	na	na
PESTICIDES			0%		na	na	na
Sulfate	0	0	0%	na	na	na	na
4,4'-DDE	0	0	0%	0.12	na	na	na
4,4'-DDD	0	0	0%	0.12	na	na	na
4,4'-DDT	0	0	0%	0.12	na	na	na
Beta-BHC	0	0	0%	0.058	na	na	na
Alpha-BHC	0	0	0%	0.058	na	na	na
Delta-BHC	0	0	0%	0.058	na	na	na
Lindane (Gamma-BHC)	0	0	0%	0.058	na	na	na
Heptachlor	0	0	0%	0.058	na	na	na
Endrin	0	0	0%	0.058	na	na	na
Heptachlor epoxide A	0	0	0%	0.058	na	na	na
Dieldrin	0	0	0%	0.12	na	na	na
Chlordane	0	0	0%	0.58	na	na	na
Tributyltin	0	0	0%	na	na	na	na
PENTACHLOROPHENOL (PCP)	0	0	0%	8.9	na	na	na

Notes:
(1) Statistics were calculated substituting half of the reported detection limit to non-detected results
In bold, chemicals retained for Tier 2

TABLE 3-23a. STATISTICAL SUMMARY OF RESULTS FOR SOILS AFTER REMOVAL OF DATA POINTS TARGETED FOR REMEDIATION - MARSH AREA - 0 TO 3 FEET ROAD AND PATHS

UC-BERKELEY RICHMOND FIELD STATION

Revised

Analyte	Number Analyzed	Number Detected	Detection Frequency [%]	Max Detection Limit in ND Samples	Max Detected [mg/kg]	Average Conc.(1) [mg/kg]	Standard Deviation (1)	95% UCLM Conc. [mg/kg]
METALS								
Antimony	2	0	0%	5.2	na	1.63	0.04	na
Arsenic	2	2	100%	8.7	2.4	2.00	0.57	na
Beryllium	2	2	100%	0.15	0.54	0.47	0.10	na
Cadmium	2	2	100%	0.77	1.9	1.75	0.21	na
Chromium	2	2	100%	na	12	12.00	0.00	na
Copper	2	2	100%	na	16	14.50	2.12	na
Lead	2	2	100%	na	10	9.80	0.28	na
Mercury	2	1	50%	0.43	0.051	0.04	0.02	na
Nickel	2	2	100%	na	31	1.25	7.97	na
Selenium	2	0	0%	na	na	0.14	0.00	na
Silver	2	0	0%	2.6	na	0.14	0.00	na
Thallium	2	2	100%	0.36	1.5	1.40	0.14	na
Zinc	2	2	100%	na	48	44.00	5.66	na
PCBs								
Aroclor-1016	2	0	0%	0.016	na	na	na	na
Aroclor-1221	2	0	0%	0.016	na	na	na	na
Aroclor-1232	2	0	0%	0.016	na	na	na	na
Aroclor-1242	2	0	0%	0.016	na	na	na	na
Aroclor-1248	2	0	0%	0.016	na	na	na	na
Aroclor-1254	2	0	0%	0.016	na	na	na	na
Aroclor-1260	2	0	0%	0.016	na	na	na	na
Aroclor-1262	2	0	0%	0.016	na	na	na	na
EXPLOSIVES								
HMX	0	0	0%	0.3	na	na	na	na
PESTICIDES								
Sulfate	0	0	0%	na	na	na	na	na
4,4'-DDE	2	0	0%	0.12	na	na	na	na
4,4'-DDD	2	0	0%	0.12	na	na	na	na
4,4'-DDT	2	0	0%	0.12	na	na	na	na
Beta-BHC	2	0	0%	0.058	na	na	na	na
Alpha-BHC	2	0	0%	0.058	na	na	na	na
Delta-BHC	2	0	0%	0.058	na	na	na	na
Lindane (Gamma-BHC)	2	0	0%	0.058	na	na	na	na
Heptachlor	2	0	0%	0.058	na	na	na	na
Endrin	2	0	0%	0.058	na	na	na	na
Heptachlor epoxide A	2	0	0%	0.058	na	na	na	na
Dieldrin	2	0	0%	0.12	na	na	na	na
Chlordane	2	0	0%	0.58	na	na	na	na
Tributyltin	0	0	0%	na	na	na	na	na
PENTACHLOROPHENOL (PCP)	0	0	0%	8.9	na	na	na	na

Notes:
(1) Statistics were calculated substituting half of the reported detection limit to non-detected results

TABLE 3-23b. STATISTICAL SUMMARY OF RESULTS FOR SEDIMENTS AFTER REMOVAL OF DATA POINTS TARGETED FOR REMEDIATION - MARSH AREA - 0 TO 3 FEET TIDAL SALT MARSH

UC-BERKELEY RICHMOND FIELD STATION

Revised

Analyte	Number Analyzed	Number Detected	Detection Frequency [%]	Max Detection Limit in ND Samples	Max Detected [mg/kg]	Average Conc.(1) [mg/kg]	Standard Deviation (1)	95% UCLM Conc. [mg/kg]
METALS								
Antimony	7	2	29%	5.2	0.48	1.69	1.12	9.79
Arsenic	15	12	80%	8.7	119	28.48	29.65	74.88
Beryllium	7	7	100%	0.15	0.63	0.36	0.16	na
Cadmium	15	15	100%	0.77	9.8	3.25	2.64	5.99
Chromium	15	15	100%	na	115	68.60	32.65	93.92
Copper	15	15	100%	na	260	99.59	64.80	196.41
Lead	15	15	100%	na	240	93.21	70.64	395.08
Mercury	15	14	93%	0.43	9.3	1.80	2.27	6.36
Nickel	7	7	100%	na	75	19.53	92.77	71.21
Selenium	15	5	33%	8.7	2.4	4.13	3.39	9.15
Silver	7	3	43%	2.6	1.5	0.48	0.48	na
Thallium	7	5	71%	0.36	1.6	0.70	0.64	5.07
Zinc	15	15	100%	na	930	342.46	254.85	795.31
PCBs								
Aroclor-1016	4	0	0%	0.016	na	na	na	na
Aroclor-1221	4	0	0%	0.016	na	na	na	na
Aroclor-1232	4	0	0%	0.016	na	na	na	na
Aroclor-1242	4	0	0%	0.016	na	na	na	na
Aroclor-1248	4	2	50%	0.016	1.000	0.360	0.46	na
Aroclor-1254	4	0	0%	0.016	na	na	na	na
Aroclor-1260	4	0	0%	0.016	na	na	na	na
Aroclor-1262	2	0	0%	0.016	na	na	na	na
EXPLOSIVES								
HMX	0	0	0%	0.3	na	na	na	na
PESTICIDES								
Sulfate	1	1	100%	na	na	na	na	na
4,4'-DDE	2	0	0%	0.12	na	na	na	na
4,4'-DDD	2	0	0%	0.12	na	na	na	na
4,4'-DDT	2	0	0%	0.12	0.000	na	na	na
Beta-BHC	2	0	0%	0.058	na	na	na	na
Alpha-BHC	2	0	0%	0.058	na	na	na	na
Delta-BHC	2	0	0%	0.058	na	na	na	na
Lindane (Gamma-BHC)	2	0	0%	0.058	na	na	na	na
Heptachlor	2	0	0%	0.058	na	na	na	na
Endrin	2	0	0%	0.058	na	na	na	na
Heptachlor epoxide A	2	0	0%	0.058	na	na	na	na
Dieldrin	2	0	0%	0.12	na	na	na	na
Chlordane	2	0	0%	0.58	na	na	na	na
Tributyltin	2	0	0%	na	na	na	na	na
PENTACHLOROPHENOL (PCP)	0	0	0%	8.9	na	na	na	na

Notes:
(1) Statistics were calculated substituting half of the reported detection limit to non-detected results

TABLE 3-23c. STATISTICAL SUMMARY OF RESULTS FOR SEDIMENTS AFTER REMOVAL OF DATA POINTS TARGETED FOR REMEDIATION - MARSH AREA - 0 TO 3 FEET CREEKS, SLOUGHS, AND BAY

UC-BERKELEY RICHMOND FIELD STATION

Revised

Analyte	Number Analyzed	Number Detected	Detection Frequency [%]	Max Detection Limit in ND Samples	Max Detected [mg/kg]	Average Conc.(1) [mg/kg]	Standard Deviation (1)	95% UCLM Conc. [mg/kg]
METALS								
Antimony	15	3	20%	5.2	0.26	2.00	1.04	na
Arsenic	20	18	90%	8.7	160	20.89	34.51	36.03
Beryllium	16	16	100%	0.15	0.56	0.37	0.12	0.44
Cadmium	20	20	100%	0.77	5.6	2.25	1.35	3.62
Chromium	20	20	100%	na	95.6	52.46	19.82	62.40
Copper	20	20	100%	na	1300	138.12	280.36	221.13
Lead	20	20	100%	na	143	55.13	37.30	96.71
Mercury	20	20	100%	0.43	46	3.34	10.09	5.99
Nickel	16	16	100%	na	69	8.06	55.26	62.79
Selenium	19	8	42%	na	9.4	2.27	2.77	6.34
Silver	15	4	27%	2.6	0.57	0.24	0.11	0.29
Thallium	16	13	81%	0.36	2.1	0.73	0.55	1.35
Zinc	20	20	100%	na	750	222.30	177.30	316.25
PCBs								
Aroclor-1016	17	0	0%	0.016	na	na	na	na
Aroclor-1221	17	0	0%	0.016	na	na	na	na
Aroclor-1232	17	0	0%	0.016	na	na	na	na
Aroclor-1242	17	0	0%	0.016	na	na	na	na
Aroclor-1248	17	12	71%	0.016	0.840	0.309	0.25	1.08
Aroclor-1254	17	1	6%	0.016	0.450	0.047	0.10	na
Aroclor-1260	17	0	0%	0.016	na	na	na	na
Aroclor-1262	13	0	0%	0.016	na	na	na	na
EXPLOSIVES								
HMX	0	0	0%	0.3	na	na	na	na
PESTICIDES								
Sulfate	1	1	100%	na	na	na	na	na
4,4'-DDE	12	0	0%	0.12	na	na	na	na
4,4'-DDD	12	0	0%	0.12	na	na	na	na
4,4'-DDT	12	0	0%	0.12	na	na	na	na
Beta-BHC	12	0	0%	0.058	na	na	na	na
Alpha-BHC	12	0	0%	0.058	na	na	na	na
Delta-BHC	12	0	0%	0.058	na	na	na	na
Lindane (Gamma-BHC)	12	0	0%	0.058	na	na	na	na
Heptachlor	12	0	0%	0.058	na	na	na	na
Endrin	12	0	0%	0.058	na	na	na	na
Heptachlor epoxide A	12	0	0%	0.058	na	na	na	na
Dieldrin	12	0	0%	0.12	na	na	na	na
Chlordane	12	0	0%	0.58	na	na	na	na
Tributyltin	9	0	0%	na	na	na	na	na
PENTACHLOROPHENOL (PCP)	0	0	0%	8.9	na	na	na	na

Notes:
(1) Statistics were calculated substituting half of the reported detection limit to non-detected results

TABLE 3-24. POST-REMEDIATION SCENARIO TIER 2 COMPARISONS - UPLAND AREA
FOREST PRODUCTS AREA OF POTENTIAL CONCERN **Revised**

Project: UCB Richmond

CHEMICAL	BACKGROUND CONCENTRATIONS (1)	REPRESENTATIVE SITE CONCENTRATIONS			RESIDENTIAL RECEPTOR SSTLs	COMMERCIAL/ INDUSTRIAL WORKER SSTLs	CONSTRUCTION WORKER SSTLs	TIER 2 OUTCOME		
		Maximum Detected [mg/kg]	95 % UCLM Surface Soil 0 - 3 ft [mg/kg]	95 % UCL Surface + Subsurface Soil 0 - 10 ft [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial + Subsurficial Soil Exposure [mg/kg]	Residential Receptor (SSTL compared to maximum detected)	Commercial/ Industrial Worker (SSTL compared to 0 - 3 ft 95% UCL1)	Construction/Excavation Worker (SSTL compared to 0 - 10 ft 95% UCL1)
Antimony	5.5	0.0E+00	na	na	3.13E+1	5.18E+2	1.06E+3	below background	below background	below background
Arsenic (cancer endpoint)	19.1	2.7E+01	4.09E+00	9.9E+00	1.91E+1	2.73E+1	1.30E+2	SSTL EXCEEDED	below background	below background
Beryllium and compounds	1	7.9E-01	5.92E-01	5.3E-01	1.54E+2	3.69E+3	4.75E+2	below background	below background	below background
Cadmium and compounds	2.7	2.0E+00	1.75E+00	1.7E+00	2.70E+0	1.47E+2	3.25E+2	below background	below background	below background
Total Chromium (1:6 ratio Cr VI:Cr III)	99.6	3.9E+01	4.29E+01	3.9E+01	2.11E+2	4.45E+3	2.17E+2	below background	below background	below background
Copper and compounds	69.4	2.9E+01	2.29E+01	2.3E+01	2.91E+3	7.59E+4	9.89E+4	below background	below background	below background
Lead	16.1	1.9E+01	1.54E+01	1.1E+01	2.55E+2	7.50E+2	7.50E+2	no concern	below background	below background
Mercury and compounds	0.4	1.3E+00	1.19E+01	2.7E+00	6.11E+0	8.81E+1	2.65E+2	no concern	no concern	no concern
Nickel (soluble salts)	119.8	1.2E+02	4.27E+01	7.3E+01	1.56E+3	4.09E+4	5.32E+4	no concern	below background	below background
Selenium	5.6	7.3E-01	1.40E+00	9.4E-01	3.91E+2	1.02E+4	1.33E+4	below background	below background	below background
Silver and compounds	1.8	na	na	na	3.91E+2	1.02E+4	1.33E+4	na	na	na
Thallium and Compounds	27.1	2.2E+00	1.95E+00	1.9E+00	2.71E+1	8.35E+2	1.76E+2	below background	below background	below background
Zinc	106.1	7.3E+01	5.35E+01	4.6E+01	2.35E+4	1.00E+5 *	1.00E+5 *	below background	below background	below background
Chlordane	na	na	na	na	1.62E+0	1.07E+2	5.96E+2	na	na	na
DDE	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
DDD	na	na	na	na	2.43E+0	1.71E+2	9.11E+2	na	na	na
DDT	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na
Dieldrin	na	na	na	na	3.03E-2	1.54E+0	1.01E+1	na	na	na
Endrin	na	na	na	na	1.81E+1	2.64E+2	4.85E+2	na	na	na
Heptachlor	na	na	na	na	1.06E-1	5.48E+0	3.59E+1	na	na	na
Heptachlor epoxide	na	na	na	na	5.33E-2	2.72E+0	1.79E+1	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	na	na	na	9.00E-2	5.94E+0	3.31E+1	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	na	na	na	3.15E-1	2.08E+1	1.16E+2	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	na	na	na	4.36E-1	2.88E+1	1.60E+2	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	na	na	1.42E-1	9.36E+0	5.22E+1	na	na	na
Aroclor 1016	na	na	na	na	3.93E+0	5.02E+1	9.85E+1	na	na	na
Aroclor 1221	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1232	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1242	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1248	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1254	na	na	na	na	2.21E-1	1.00E+1	2.81E+1	na	na	na
Aroclor 1260	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Aroclor 1262	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na
Pentachlorophenol	na	na	na	na	2.97E+0	1.11E+2	8.63E+2	na	na	na

Notes:
na = Not Applicable/Not Available
nd = Not Detected in Analyzed Sample

* Indicates SSTL extended past component water solubility or soil saturation and hence solubility/saturation is listed as SSTL. Metal soil maximum concentration is 10% = 100,000 mg/kg
1 If maximum detected concentration is lower than the 95% UCL, then the maximum detected concentration is compared to the SSTL

TABLE 3-25.POST-REMEDIATION SCENARIO TIER 2 COMPARISONS - UPLAND AREA
MERCURY FULMINATE AREA **Revised**

Project: UCB Richmond

CHEMICAL	BACKGROUND CONCENTRATIONS (1)	REPRESENTATIVE SITE CONCENTRATIONS			RESIDENTIAL RECEPTOR SSTLs	COMMERCIAL/ INDUSTRIAL WORKER SSTLs	CONSTRUCTION WORKER SSTLs	TIER 2 OUTCOME			BACKGROUND CONCENTRATIONS (1)
		Maximum Detected [mg/kg]	95 % UCLM Surface Soil 0 - 3 ft [mg/kg]	95 % UCL Surface + Subsurface Soil 0 - 10 ft [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial + Subsurficial Soil Exposure [mg/kg]	Residential Receptor (SSTL compared to maximum detected)	Commercial/ Industrial Worker (SSTL compared to 0 - 3 ft 95% UCL1)	Construction/Excavation Worker (SSTL compared to 0 - 10 ft 95% UCL1)	
Antimony	5.5	na	na	na	3.13E+1	8.14E+3	3.05E+3	na	na	na	5.5
Arsenic (cancer endpoint)	19.1	1.40E+01	6.03E+00	7.37E+00	1.91E+1	2.75E+1	3.20E+2	below background	below background	below background	19.1
Beryllium and compounds	1	9.00E-01	6.00E-01	1.21E+00	1.54E+2	3.69E+3	4.73E+2	below background	below background	below background	1
Cadmium and compounds	2.7	2.30E+00	1.97E+00	2.54E+00	2.70E+0	1.47E+2	3.25E+2	below background	below background	below background	2.7
Total Chromium (1:4 ratio Cr VI:Cr III)	99.6	5.37E+01	2.49E+01	3.62E+01	2.11E+2	4.44E+3	2.17E+2	below background	below background	below background	99.6
Copper and compounds	69.4	3.70E+02	3.32E+02	9.22E+01	2.91E+3	7.59E+4	9.49E+4	no concern	no concern	no concern	69.4
Lead	16.1	5.90E+01	3.35E+01	1.36E+01	2.53E+2	7.50E+2	7.50E+2	no concern	no concern	below background	16.1
Mercury and compounds	0.4	2.20E+03	6.02E+01	2.05E+03	6.31E+0	8.81E+1	1.03E+2	SSTL EXCEEDED	no concern	SSTL EXCEEDED	0.4
Nickel (soluble salts)	119.8	2.10E+02	5.34E+01	8.56E+01	1.56E+3	4.09E+4	5.32E+4	no concern	below background	below background	119.8
Selenium	5.6	1.30E+00	2.59E+00	3.62E+00	3.91E+2	1.02E+4	1.33E+4	below background	below background	below background	5.6
Silver and compounds	1.5	na	na	na	3.91E+2	1.02E+4	1.33E+4	na	na	na	1.5
Thallium and Compounds	27.1	3.40E+00	3.31E+00	4.41E+00	2.71E+1	1.35E+2	1.76E+2	below background	below background	below background	27.1
Zinc	106.1	4.30E+02	1.24E+03	1.56E+02	2.35E+4	1.00E+5 *	1.00E+5 *	no concern	no concern	no concern	106.1
Chlordane	na	na	na	na	1.62E+0	1.07E+2	5.96E+2	na	na	na	na
DDE	na	na	na	na	1.72E+0	1.21E+2	6.43E+2	na	na	na	na
DDD	na	na	na	na	2.43E+0	1.71E+2	9.13E+2	na	na	na	na
DDT	na	na	na	na	1.72E+0	1.21E+2	6.43E+2	na	na	na	na
Dieldrin	na	na	na	na	3.03E-2	1.54E+0	1.01E+1	na	na	na	na
Endrin	na	na	na	na	3.03E+1	2.64E+2	4.85E+2	na	na	na	na
Heptachlor	na	na	na	na	1.00E-1	5.42E+0	3.99E+1	na	na	na	na
Heptachlor epoxide	na	na	na	na	5.33E-2	2.71E+0	1.78E+1	na	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	na	na	na	9.02E-2	5.94E+0	3.31E+1	na	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	na	na	na	3.15E-1	2.08E+1	1.16E+2	na	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	na	na	na	4.36E-1	2.88E+1	1.60E+2	na	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	na	na	1.42E-1	9.36E+0	5.22E+1	na	na	na	na
Aroclor 1016	na	na	na	na	3.93E+0	5.10E+1	9.85E+1	na	na	na	na
Aroclor 1221	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na	na
Aroclor 1232	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na	na
Aroclor 1242	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na	na
Aroclor 1248	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na	na
Aroclor 1254	na	na	na	na	2.21E-1	1.00E+1	2.81E+1	na	na	na	na
Aroclor 1260	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na	na
Aroclor 1262	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na	na
Pentachlorophenol	na	na	na	na	2.97E+0	1.31E+1	8.63E+2	na	na	na	na

Notes:
na = Not Applicable/Not Available
nd = Not Detected in Analyzed Samples
* Indicates SSTL extended pore component water solubility or soil saturation and heavy solubility/saturation is listed as SSTL. Metal soil maximum concentration is 10% = 100,000 mg/kg
1 If maximum detected concentration is lower than the 95% UCL then the maximum detected concentration is compared to the SSTL

TABLE 3-26. POST-REMEDIATION SCENARIO TIER 2 COMPARISONS - UPLAND AREA
UPLAND SOUTH PYRITE CINDERS AREA Revised

Project: UCB Richmond

CHEMICAL	BACKGROUND CONCENTRATIONS (1)	REPRESENTATIVE SITE CONCENTRATIONS			RESIDENTIAL RECEPTOR SSTLs	COMMERCIAL/ INDUSTRIAL WORKER SSTLs	CONSTRUCTION WORKER SSTLs	TIER 2 OUTCOME			BACKGROUND CONCENTRATIONS (1)
		Maximum Detected 0-10 ft [mg/kg]	95 % UCLM Surface Soil 0 - 3 ft [mg/kg]	95 % UCL Surface + Subsurface Soil 0 - 10 ft [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial Soil Exposure [mg/kg]	Surficial + Subsurficial Soil Exposure [mg/kg]	Residential Receptor (SSTL compared to maximum detected)	Commercial/ Industrial Worker (SSTL compared to 0 - 3 ft 95% UCL[1])	Construction/Excavatio n Worker (SSTL compared to 0 - 10 ft 95% UCL[1])	
Antimony	5.5	na	na	na	3.13E+1	8.18E+2	1.06E+3	0-10 feet soil removed	0-10 feet soil removed	0-10 feet soil removed	5.5
Arsenic (cancer endpoint)	19.1	na	na	na	1.91E+1	2.73E+1	1.20E+2	0-10 feet soil removed	0-10 feet soil removed	0-10 feet soil removed	19.1
Beryllium and compounds	1	na	na	na	1.54E+2	3.69E+3	4.75E+2	0-10 feet soil removed	0-10 feet soil removed	0-10 feet soil removed	1
Cadmium and compounds	2.7	na	na	na	2.70E+0	1.47E+2	3.25E+2	0-10 feet soil removed	0-10 feet soil removed	0-10 feet soil removed	2.7
Total Chromium (1:6 ratio Cr VI:Cr III)	99.6	na	na	na	2.11E+2	4.48E+3	2.17E+2	0-10 feet soil removed	0-10 feet soil removed	0-10 feet soil removed	99.6
Copper and compounds	69.4	na	na	na	2.91E+3	7.59E+4	9.89E+4	0-10 feet soil removed	0-10 feet soil removed	0-10 feet soil removed	69.4
Lead	16.1	na	na	na	2.55E+2	7.50E+2	7.50E+2	0-10 feet soil removed	0-10 feet soil removed	0-10 feet soil removed	16.1
Mercury and compounds	0.4	na	na	na	6.11E+0	8.81E+1	1.65E+2	0-10 feet soil removed	0-10 feet soil removed	0-10 feet soil removed	0.4
Nickel (soluble salts)	119.8	na	na	na	1.56E+3	4.09E+4	5.32E+4	0-10 feet soil removed	0-10 feet soil removed	0-10 feet soil removed	119.8
Selenium	5.6	na	na	na	3.91E+2	1.02E+4	1.33E+4	0-10 feet soil removed	0-10 feet soil removed	0-10 feet soil removed	5.6
Silver and compounds	1.8	na	na	na	3.91E+2	1.02E+4	1.33E+4	0-10 feet soil removed	0-10 feet soil removed	0-10 feet soil removed	1.8
Thallium and Compounds	27.1	na	na	na	2.71E+1	1.35E+2	1.76E+2	0-10 feet soil removed	0-10 feet soil removed	0-10 feet soil removed	27.1
Zinc	106.1	na	na	na	2.35E+4	1.00E+5 *	1.00E+5 *	0-10 feet soil removed	0-10 feet soil removed	0-10 feet soil removed	106.1
Chlordane	na	na	na	na	1.62E+0	1.07E+2	5.96E+2	na	na	na	na
DDE	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na	na
DDD	na	na	na	na	2.43E+0	1.71E+2	9.13E+2	na	na	na	na
DDT	na	na	na	na	1.72E+0	1.21E+2	6.45E+2	na	na	na	na
Dieldrin	na	na	na	na	3.03E-2	1.34E+0	1.01E+1	na	na	na	na
Endrin	na	na	na	na	1.83E+1	2.64E+2	4.85E+2	na	na	na	na
Heptachlor	na	na	na	na	1.08E-1	5.48E+0	3.59E+1	na	na	na	na
Heptachlor epoxide	na	na	na	na	5.33E-2	2.71E+0	1.78E+1	na	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	na	na	na	9.00E-2	5.94E+0	3.31E+1	na	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	na	na	na	3.15E-1	2.08E+1	1.16E+2	na	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	na	na	na	4.36E-1	2.88E+1	1.60E+2	na	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	na	na	1.42E-1	9.36E+0	5.22E+1	na	na	na	na
Aroclor 1016	na	na	na	na	3.93E+0	5.02E+1	9.85E+1	na	na	na	na
Aroclor 1221	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na	na
Aroclor 1232	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na	na
Aroclor 1242	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na	na
Aroclor 1248	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na	na
Aroclor 1254	na	na	na	na	2.21E-1	1.00E+1	2.81E+1	na	na	na	na
Aroclor 1260	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na	na
Aroclor 1262	na	na	na	na	2.21E-1	1.00E+1	7.03E+1	na	na	na	na
Pentachlorophenol	na	na	na	na	2.97E+0	1.11E+2	8.63E+2	na	na	na	na

Notes:
na = Not Applicable/Not Available
nd = Not Detected in Analyzed Samples
* Indicates SSTL exceeded pure component water solubility or soil saturation and hence solubility/saturation is listed as SSTL. Metal soil maximum concentration is 10% = 100,000 mg/kg

TABLE 3-27.POST-REMEDIATION SCENARIO TIER 2 COMPARISONS FOR SOIL/SEDIMENT -STEGE MARSH AREA

Revised

Project: UCB Richmond

CHEMICAL	REPRESENTATIVE SITE CONCENTRATIONS						RECREATORS SSTL		ANGLER SSTL	TIER 2 OUTCOME		
	Paths / Roads (0-3 ft) [mg/kg]		Tidal Salt Marsh (0-3 ft) [mg/kg]		Bay and Sloughs (0-3 ft) [mg/kg]		For Paths/Roads Area (children 0-6 included) Surficial Soil Exposure [mg/kg]	For Tidal Marsh Area (children 0-6 not included) Surficial Soil Exposure [mg/kg]	Fish and Dermal [mg/kg]	Recreators SSTL compared to Paths / Roads	Recreators SSTL compared to Tidal Marsh Area	Anglers SSTL compared to Bay and Sloughs
	Maximum	95% UCL	Maximum	95% UCL	Maximum	95% UCL						
Antimony	na	na	4.80E-1	9.79E+0	2.60E-1	na	8.76E+2	8.18E+3	6.68E+1	na	no concern	no concern
Arsenic (cancer endpoint)	2.40E+0	na	1.19E+2	7.49E+1	1.60E+2	3.60E+1	1.91E+1	3.54E+1	1.25E+2	below background	SSTL EXCEEDED	no concern
Beryllium and compounds	5.40E-1	na	6.30E-1	na	5.60E-1	4.45E-1	4.32E+3	3.88E+4	3.34E+2	no concern	no concern	no concern
Cadmium and compounds	1.90E+0	na	9.80E+0	5.99E+0	5.60E+0	3.62E+0	4.68E+1	1.55E+2	4.35E+1	no concern	no concern	no concern
Total Chromium (1:6 ratio Cr VI:Cr III)	1.20E+1	na	1.15E+2	9.39E+1	9.56E+1	6.24E+1	5.90E+3	9.34E+3	na	below background	below background	below background
Copper and compounds	1.60E+1	na	2.60E+2	1.96E+2	1.30E+3	2.21E+2	8.13E+4	1.00E+5 *	4.75E+4	below background	no concern	no concern
Lead	1.00E+1	na	2.40E+2	3.95E+2	1.43E+2	9.67E+1	4.00E+2	4.00E+2	4.00E+2	below background	no concern	no concern
Mercury and compounds	5.10E-2	na	9.30E+0	6.36E+0	4.60E+1	5.99E+0	1.71E+2	1.46E+3	5.82E+0	below background	no concern	SSTL EXCEEDED
Nickel (soluble salts)	3.10E+1	na	7.50E+1	7.12E+1	6.90E+1	6.28E+1	4.38E+4	1.00E+5 *	8.42E+3	below background	below background	below background
Selenium	na	na	2.40E+0	9.15E+0	9.40E+0	6.34E+0	1.10E+4	1.00E+5 *	3.10E+2	na	no concern	no concern
Silver and compounds	na	na	1.50E+0	na	5.70E-1	2.95E-1	1.10E+4	1.00E+5 *	4.36E+3	na	no concern	below background
Thallium and Compounds	1.50E+0	na	1.60E+0	5.07E+0	2.10E+0	1.35E+0	1.45E+2	1.35E+3	1.25E+1	no concern	no concern	no concern
Zinc	4.80E+1	na	9.30E-2	7.95E+2	7.50E+2	3.16E+2	1.00E+5 *	1.00E+5 *	2.48E+4	below background	below background	no concern
Chlordane	na	na	na	na	na	na	4.54E+1	1.47E+2	3.43E-2	na	na	na
DDE	na	na	na	na	na	na	4.80E+1	1.57E+2	2.19E-2	na	na	na
DDD	na	na	na	na	na	na	6.81E+1	2.22E+2	8.51E-1	na	na	na
DDT	na	na	na	na	na	na	4.80E+1	1.57E+2	2.19E-2	na	na	na
Dieldrin	na	na	na	na	na	na	8.50E-1	2.66E+0	1.97E-3	na	na	na
Endrin	na	na	na	na	na	na	5.13E+2	4.38E+3	7.05E-1	na	na	na
Heptachlor	na	na	na	na	na	na	3.02E+0	9.47E+0	6.76E-3	na	na	na
Heptachlor epoxide	na	na	na	na	na	na	1.49E+0	4.68E+0	3.34E-3	na	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	na	na	na	na	na	2.52E+0	8.16E+0	5.03E-3	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	na	na	na	na	na	8.82E+0	2.86E+1	1.76E-2	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	na	na	na	na	na	1.22E+1	3.95E+1	2.42E-2	na	na	na
Hexachlorocyclohexane (HCH) (delta)	na	na	na	na	na	na	3.97E+0	1.29E+1	7.86E-3	na	na	na
Aroclor 1016	na	na	na	na	na	na	1.10E+2	5.46E+2	5.10E-1	na	na	na
Aroclor 1221	na	na	na	na	na	na	6.20E+0	1.91E+1	4.60E-2	na	na	na
Aroclor 1232	na	na	na	na	na	na	6.20E+0	1.91E+1	4.60E-2	na	na	na
Aroclor 1242	na	na	na	na	na	na	6.20E+0	1.91E+1	4.60E-2	na	na	na
Aroclor 1248	na	na	na	na	na	na	6.20E+0	1.91E+1	4.60E-2	na	na	na
Aroclor 1254	na	na	1.00E+0	na	8.40E-1	1.08E+0	6.20E+0	1.91E+1	4.60E-2	na	no concern	SSTL EXCEEDED
Aroclor 1260	na	na	na	na	4.50E-1	na	6.20E+0	1.91E+1	4.60E-2	na	na	SSTL EXCEEDED
Aroclor 1262	na	na	na	na	na	na	6.20E+0	1.91E+1	4.60E-2	na	na	na
Pentachlorophenol	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.33E+1	2.49E+2	1.29E-1	no concern	no concern	no concern

Notes:

na = Not Applicable/Not Available.

* Indicates SSTL exceeded pure component water solubility or soil saturation and hence solubility/saturation is listed as SSTL

TABLE 3-28. SUMMARY OF CUMULATIVE HEALTH RISKS RECONCILIATION FOR AOCs AFTER SOIL/SEDIMENT REMOVAL
POST REMEDIATION SCENARIO
UC BERCKELEY-RICHMOND FIELD

Revised

LOCATION NAME	Post Remediation Scenario Risk Excluding Background							
	Commercial/Industrial Cumulative Risk (Soil 0 - 3 ft)				Construction/Excavation Cumulative Risk (Soil 0 - 10 ft)			
	Cancer		Non-Cancer		Cancer		Non-Cancer	
UPLAND AREA	Risk	Chemicals Driving	Hazard	Chemical Driving	Risk	Chemicals Driving	Hazard	Chemicals Driving
Forest Products Lab	--	--	1.48E-02	na	--	--	7.89E-03	na
Mercury Fulminate Area	4.99E-08	na	6.89E-01	na	--	--	1.25E+00	Mercury
Upland South Cinder Pyrite Area (Subunit 2A)	--	--	--	--	--	--	--	--

LOCATION NAME	Post Remediation Scenario RiskRisk excluding Background			
	Cancer		Non-Cancer	
MARSH AREA	Risk	Chemicals Driving	Hazard	Chemicals Driving
Roads and Paths (Recreators adults and children)	--	--	--	--
Tidal Marsh Area (Recreators adults)	2.24E-06	As	2.40E-02	na
Bay and Sloughs (Anglers)/Including PCBs	2.81E-04	Aroclor 1248, Aroclor 1254	6.96E+00	Aroclor 1254
Bay and Sloughs (Anglers)/Excluding PCBs	3.96E-07	na	1.19E+00	na

Notes
na=not applicable because target risk/hazard is not exceeded
--=no COPCs present above background concentrations

TABLE D2-1.BASELINE RISK CALCULATIONS, EXCLUDING BACKGROUND
ENTIRE UPLAND AREA OF POTENTIAL CONCERN
Project: UCB Richmond

CHEMICAL	Commercial/Industrial Cumulative Risk (Soil 0 - 3 ft)					Construction/Excavation Cumulative Risk (Soil 0 - 10 ft)				
	Representative Concentrations (lower max detected or 95%	Risk Based Concentrations		Cancer Risk	Non-Cancer Hazard	Representative Concentrations (lower max detected or	Risk Based Concentrations		Cancer Risk	Non-Cancer Hazard
	[mg/kg]	Cancer [mg/kg]	Non-Cancer [mg/kg]			[mg/kg]	Cancer [mg/kg]	Non-Cancer [mg/kg]		
Antimony	1.60E+01	na	8.18E+02	na	1.96E-02	2.82E+00	na	1.06E+03	na	below bkgd
Arsenic (cancer endpoint)	1.06E+01	2.73E+01	4.39E+02	below bkgd	below bkgd	4.03E+01	1.20E+02	6.74E+02	3.35E-06	5.98E-02
Beryllium and compounds	4.53E-01	2.24E+04	3.69E+03	below bkgd	below bkgd	4.59E-01	1.09E+03	4.75E+02	below bkgd	below bkgd
Cadmium and compounds	4.02E+00	1.47E+02	1.01E+03	2.74E-07	3.99E-03	6.29E+00	3.25E+02	1.32E+03	1.94E-07	4.76E-03
Total Chromium (1:6 ratio Cr VI:Cr III)	3.14E+01	4.48E+03	na	below bkgd	na	3.67E+01	2.17E+02	na	below bkgd	na
Copper and compounds	3.53E+02	na	7.59E+04	na	4.65E-03	7.07E+02	na	9.89E+04	na	7.15E-03
Lead	6.13E+01	6.72E+03	na	9.11E-08	na	6.81E+01	2.74E+04	na	2.49E-08	na
Mercury and compounds	6.24E+01	na	8.81E+01	na	7.08E-01	9.61E+01	na	1.65E+02	na	5.83E-01
Nickel (soluble salts)	3.81E+01	na	4.09E+04	na	below bkgd	5.24E+01	na	5.32E+04	na	below bkgd
Selenium	1.14E+00	na	1.02E+04	na	below bkgd	1.73E+00	na	1.33E+04	na	below bkgd
Silver and compounds	5.77E-01	na	1.02E+04	na	below bkgd	1.05E+00	na	1.33E+04	na	below bkgd
Thallium and Compounds	1.24E+00	na	1.35E+02	na	below bkgd	1.39E+00	na	1.76E+02	na	below bkgd
Zinc	2.48E+02	na	6.13E+05	na	4.04E-04	6.60E+02	na	7.98E+05	na	8.27E-04
Chlordane	9.20E-02	1.07E+02	6.69E+02	8.60E-09	1.38E-04	9.20E-02	5.96E+02	1.01E+03	1.54E-09	9.12E-05
DDE	4.70E-02	1.21E+02	na	3.90E-09	na	4.70E-02	6.45E+02	na	7.29E-10	na
DDD	na	1.71E+02	na	na	na	na	9.13E+02	na	na	na
DDT	3.80E-01	1.21E+02	7.32E+02	3.15E-08	5.19E-04	3.80E-01	6.45E+02	1.10E+03	5.89E-09	3.47E-04
Dieldrin	8.20E-03	1.54E+00	4.40E+01	5.32E-08	1.86E-04	8.20E-03	1.01E+01	8.09E+01	8.11E-09	1.01E-04
Endrin	na	na	2.64E+02	na	na	na	na	4.85E+02	na	na
Heptachlor	na	5.48E+00	4.40E+02	na	na	na	3.59E+01	8.09E+02	na	na
Heptachlor epoxide	5.90E-03	2.71E+00	1.15E+01	2.18E-08	5.15E-04	5.90E-03	1.78E+01	2.10E+01	3.32E-09	2.81E-04
Hexachlorocyclohexane (HCH) (alpha)	na	5.94E+00	na	na	na	na	3.31E+01	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	2.08E+01	na	na	na	na	1.16E+02	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	2.88E+01	4.01E+02	na	na	na	1.60E+02	6.26E+02	na	na
Hexachlorocyclohexane (HCH) (delta)	na	9.36E+00	na	na	na	na	5.22E+01	na	na	na
Aroclor 1016	na	2.87E+02	5.02E+01	na	na	na	2.01E+03	9.85E+01	na	na
Aroclor 1221	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1232	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1242	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1248	8.80E-01	1.00E+01	na	8.76E-07	na	8.80E-01	7.03E+01	na	1.25E-07	na
Aroclor 1254	9.41E-01	1.00E+01	1.44E+01	9.37E-07	6.56E-02	9.41E-01	7.03E+01	2.81E+01	1.34E-07	3.34E-02
Aroclor 1260	6.10E-02	1.00E+01	na	6.07E-08	na	6.10E-02	7.03E+01	na	8.67E-09	na
Aroclor 1262	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Pentachlorophenol	na	1.11E+02	1.43E+04	na	na	na	8.63E+02	3.11E+04	na	na
	CUMULATIVE HEALTH RISK			2.36E-06	8.04E-01	CUMULATIVE HEALTH RISK			3.86E-06	6.90E-01

Notes:
Only
na = Not Applicable/Not Available.
nd = Not Detected in Analyzed Sample

TABLE D2-2.BASELINE RISK CALCULATIONS, EXCLUDING BACKGROUND
FOREST PRODUCTS AREA OF POTENTIAL CONCERN

Project: UCB Richmond

CHEMICAL	Commercial/Industrial Cumulative Risk (Soil 0 - 3 ft)					Construction/Excavation Cumulative Risk (Soil 0 - 10 ft)				
	Representative Concentrations (lower max detected or 95% [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard	Representative Concentrations (lower max detected or [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard
Antimony	na	na	8.18E+02	na	na	na	na	1.06E+03	na	na
Arsenic (cancer endpoint)	3.85E+01	2.73E+01	4.39E+02	1.41E-05	8.76E-02	2.72E+01	1.20E+02	6.74E+02	2.26E-06	4.03E-07
Beryllium and compounds	5.49E-01	2.24E+04	3.69E+03	below bkgd	below bkgd	5.08E-01	1.09E+03	4.75E+02	below bkgd	below bkgd
Cadmium and compounds	1.77E+00	1.47E+02	1.01E+03	below bkgd	below bkgd	1.71E+00	3.25E+02	1.32E+03	below bkgd	below bkgd
Total Chromium (1:6 ratio Cr VI:Cr III)	4.54E+01	4.48E+03	na	below bkgd	na	4.00E+01	2.17E+02	na	below bkgd	na
Copper and compounds	2.71E+01	na	7.59E+04	na	below bkgd	2.55E+01	na	9.89E+04	na	below bkgd
Lead	1.31E+01	6.72E+03	na	below bkgd	na	1.07E+01	2.74E+04	na	below bkgd	na
Mercury and compounds	1.30E+00	na	8.81E+01	na	1.48E-02	1.30E+00	na	1.65E+02	na	7.89E-03
Nickel (soluble salts)	4.65E+01	na	4.09E+04	na	below bkgd	6.89E+01	na	5.32E+04	na	below bkgd
Selenium	7.30E-01	na	1.02E+04	na	below bkgd	7.30E-01	na	1.33E+04	na	below bkgd
Silver and compounds	na	na	1.02E+04	na	na	na	na	1.33E+04	na	na
Thallium and Compounds	1.77E+00	na	1.35E+02	na	below bkgd	1.77E+00	na	1.76E+02	na	below bkgd
Zinc	5.78E+01	na	6.13E+05	na	below bkgd	4.81E+01	na	7.98E+05	na	below bkgd
Chlordane	na	1.07E+02	6.69E+02	na	na	na	5.96E+02	1.01E+03	na	na
DDE	na	1.21E+02	na	na	na	na	6.45E+02	na	na	na
DDD	na	1.71E+02	na	na	na	na	9.13E+02	na	na	na
DDT	na	1.21E+02	7.32E+02	na	na	na	6.45E+02	1.10E+03	na	na
Dieldrin	na	1.54E+00	4.40E+01	na	na	na	1.01E+01	8.09E+01	na	na
Endrin	na	na	2.64E+02	na	na	na	na	4.85E+02	na	na
Heptachlor	na	5.48E+00	4.40E+02	na	na	na	3.59E+01	8.09E+02	na	na
Heptachlor epoxide	na	2.71E+00	1.15E+01	na	na	na	1.78E+01	2.10E+01	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	5.94E+00	na	na	na	na	3.31E+01	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	2.08E+01	na	na	na	na	1.16E+02	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	2.88E+01	4.01E+02	na	na	na	1.60E+02	6.26E+02	na	na
Hexachlorocyclohexane (HCH) (delta)	na	9.36E+00	na	na	na	na	5.22E+01	na	na	na
Aroclor 1016	na	2.87E+02	5.02E+01	na	na	na	2.01E+03	9.85E+01	na	na
Aroclor 1221	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1232	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1242	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1248	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1254	na	1.00E+01	1.44E+01	na	na	na	7.03E+01	2.81E+01	na	na
Aroclor 1260	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1262	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Pentachlorophenol	na	1.11E+02	1.43E+04	na	na	na	8.63E+02	3.11E+04	na	na
CUMULATIVE HEALTH RISK				1.41E-05	1.02E-01	CUMULATIVE HEALTH RISK			2.26E-06	4.03E-07

Notes:
nd = Not Detected in Analyzed Samples

TABLE D2-3.BASELINE RISK CALCULATIONS, EXCLUDING BACKGROUND
HISTORICAL TEST PIT AREA OF POTENTIAL CONCERN

Project: UCB Richmond

CHEMICAL	Commercial/Industrial Cumulative Risk (Soil 0 - 3 ft)					Construction/Excavation Cumulative Risk (Soil 0 - 10 ft)				
	Representative Concentrations (lower conc) [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard	Representative Concentrations (lower conc) [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard
Antimony	na	na	8.18E+02	na	na	na	na	1.06E+03	na	na
Arsenic (cancer endpoint)	2.12E+01	2.73E+01	4.39E+03	7.77E-06	4.83E-02	2.12E+01	1.20E+02	6.74E+02	1.76E-06	3.15E-02
Beryllium and compounds	4.40E-01	2.24E+04	3.69E+03	below bkgd	below bkgd	4.40E-01	1.09E+03	4.75E+02	below bkgd	below bkgd
Cadmium and compounds	9.50E+00	1.47E+02	1.01E+03	6.74E-07	9.81E-03	9.63E+00	3.25E+02	1.32E+03	2.96E-07	7.28E-03
Total Chromium (3:6 ratio Cr VI:Cr III)	3.45E+01	4.48E+03	na	below bkgd	na	3.44E+01	2.17E+02	na	below bkgd	na
Copper and compounds	1.14E+03	na	7.59E+04	na	1.50E-02	1.14E+03	na	9.89E+04	na	1.15E-02
Lead	4.92E+01	6.72E+03	na	7.32E-08	na	4.92E+01	2.74E+04	na	1.80E-08	na
Mercury and compounds	6.66E+00	na	8.81E+01	na	7.56E-02	6.66E+00	na	1.65E+02	na	4.04E-02
Nickel (soluble salts)	3.04E+01	na	4.09E+04	na	below bkgd	6.50E+01	na	5.32E+04	na	below bkgd
Selenium	6.80E-01	na	1.02E+04	na	below bkgd	6.80E-01	na	1.33E+04	na	below bkgd
Silver and compounds	na	na	1.02E+04	na	na	na	na	1.33E+04	na	na
Thallium and Compounds	1.20E+00	na	1.35E+02	na	below bkgd	1.20E+00	na	1.76E+02	na	below bkgd
Zinc	2.12E+02	na	6.13E+05	na	3.45E-04	2.27E+02	na	7.98E+05	na	2.84E-04
Chlordane	na	1.07E+02	6.69E+02	na	na	na	5.96E+02	1.01E+03	na	na
DDE	na	1.21E+01	na	na	na	na	6.45E+02	na	na	na
DDD	na	1.71E+02	na	na	na	na	9.13E+02	na	na	na
DDT	na	1.21E+02	7.32E+02	na	na	na	6.45E+02	1.10E+03	na	na
Dieldrin	na	1.54E+00	4.40E+01	na	na	na	1.01E+01	8.09E+01	na	na
Endrin	na	na	2.64E+02	na	na	na	na	4.85E+02	na	na
Heptachlor	na	5.48E+00	4.40E+02	na	na	na	3.59E+01	8.09E+02	na	na
Heptachlor epoxide	na	2.71E+00	1.15E+01	na	na	na	1.78E+01	2.10E+01	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	5.94E+00	na	na	na	na	3.31E+01	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	2.08E+01	na	na	na	na	1.16E+02	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	2.88E+01	4.01E+02	na	na	na	1.60E+02	6.26E+02	na	na
Hexachlorocyclohexane (HCH) (delta)	na	9.36E+00	na	na	na	na	5.22E+01	na	na	na
Aroclor 1016	na	2.87E+02	5.02E+01	na	na	na	2.01E+03	9.85E+01	na	na
Aroclor 1221	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1232	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1242	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1248	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1254	3.00E-01	1.00E+01	1.44E+01	2.99E-07	2.09E-02	3.00E-01	7.03E+01	2.81E+01	4.27E-08	1.07E-02
Aroclor 1260	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1262	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Pentachlorophenol	na	1.11E+02	1.43E+04	na	na	na	8.63E+02	3.11E+04	na	na
CUMULATIVE HEALTH RISK				8.82E-06	1.76E-01	CUMULATIVE HEALTH RISK			2.12E-06	1.92E-01

Notes:
na = Not Applicable/Not Available.
nd = Not Detected in Analyzed Samples

TABLE D2-4. BASELINE RISK CALCULATIONS, EXCLUDING BACKGROUND
EXPLOSIVES STORAGE AREA OF POTENTIAL CONCERN

Project: UCB Richmond

CHEMICAL	Commercial/Industrial Cumulative Risk (Soil 0 - 3 ft)					Construction/Excavation Cumulative Risk (Soil 0 - 10 ft)				
	Representative Concentrations (lower max detected or 95% [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard	Representative Concentrations (lower max detected or 95% [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard
Antimony	na	na	8.18E+02	na	na	na	na	1.06E+03	na	na
Arsenic (cancer midpoint)	5.89E+00	2.73E+01	4.39E+02	below bkgd	below bkgd	5.22E+00	1.20E+02	6.74E+02	below bkgd	below bkgd
Beryllium and compounds	4.20E-01	2.24E+04	3.69E+03	below bkgd	below bkgd	4.20E-01	1.09E+03	4.75E+02	below bkgd	below bkgd
Cadmium and compounds	3.29E+00	1.47E+02	1.01E+03	2.24E-07	3.26E-03	2.96E+00	3.23E+02	1.32E+03	9.11E-08	2.24E-03
Total Chromium (1:6 ratio Cr VI:Cr III)	4.59E+01	4.48E+03	na	below bkgd	na	4.38E+01	2.17E+02	na	below bkgd	na
Copper and compounds	7.36E+02	na	7.59E+04	na	9.69E-03	5.76E+02	na	9.89E+04	na	5.83E-03
Lead	2.23E+01	6.72E+03	na	3.32E-08	na	2.05E+01	2.74E+04	na	7.48E-09	na
Mercury and compounds	1.09E+00	na	8.81E+01	na	1.24E-02	8.28E-01	na	1.65E+02	na	5.03E-03
Nickel (soluble salts)	6.00E+01	na	4.09E+04	na	below bkgd	6.00E+01	na	5.32E+04	na	below bkgd
Selenium	7.40E-01	na	1.02E+04	na	below bkgd	7.40E-01	na	1.33E+04	na	below bkgd
Silver and compounds	na	na	1.02E+04	na	na	na	na	1.33E+04	na	na
Thallium and Compounds	1.00E+00	na	1.35E+02	na	below bkgd	1.00E+00	na	1.76E+02	na	below bkgd
Zinc	2.70E+02	na	6.13E+05	na	4.40E-04	2.70E+02	na	7.98E+05	na	3.38E-04
Chlordane	na	1.07E+02	6.69E+02	na	na	na	5.96E+02	1.01E+03	na	na
DDE	na	1.21E+02	na	na	na	na	6.45E+02	na	na	na
DDD	na	1.71E+02	na	na	na	na	9.13E+02	na	na	na
DDT	na	1.21E+02	7.32E+02	na	na	na	6.45E+02	1.10E+03	na	na
Dieldrin	na	1.54E+00	4.40E+01	na	na	na	1.01E+01	8.09E+01	na	na
Endrin	na	na	2.64E+02	na	na	na	na	4.85E+02	na	na
Heptachlor	na	5.43E+00	4.40E+02	na	na	na	3.59E+01	8.09E+02	na	na
Heptachlor epoxide	na	2.71E+00	1.15E+01	na	na	na	1.78E+01	2.10E+01	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	5.94E+00	na	na	na	na	3.31E+01	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	2.08E+01	na	na	na	na	1.16E+02	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	2.88E+01	4.01E+01	na	na	na	1.60E+02	6.26E+02	na	na
Hexachlorocyclohexane (HCH) (delta)	na	9.36E+00	na	na	na	na	5.22E+01	na	na	na
Aroclor 1016	na	2.87E+02	5.02E+01	na	na	na	2.01E+03	9.83E+01	na	na
Aroclor 1221	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1232	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1242	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1248	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1254	na	1.00E+01	1.44E+01	na	na	na	7.03E+01	2.81E+01	na	na
Aroclor 1260	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1262	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Pentachlorophenol	na	1.11E+02	1.43E+04	na	na	na	8.63E+02	3.11E+04	na	na
	CUMULATIVE HEALTH RISK			2.57E-07	2.58E-02	CUMULATIVE HEALTH RISK			9.84E-08	1.34E-02

Notes:
na = Not Applicable/Not Available.
nd = Not Detected in Analyzed Samples

TABLE D2-5.BASELINE RISK CALCULATIONS, EXCLUDING BACKGROUND
HISTORICAL BLASTING CAP AREA OF POTENTIAL CONCERN

Project: UCB Richmond

CHEMICAL	Commercial/Industrial Cumulative Risk (Soil 0 - 3 ft)					Construction/Excavation Cumulative Risk (Soil 0 - 10 ft)				
	Representative Concentrations (lower max detected or 95% [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard	Representative Concentrations (lower max detected or 95% [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard
Antimony	na	na	8.18E+02	na	na	na	na	1.06E+03	na	na
Arsenic (cancer endpoint)	5.50E+00	2.73E+01	4.39E+02	below bkgd	below bkgd	5.50E+00	1.20E+02	6.74E+02	below bkgd	below bkgd
Beryllium and compounds	na	2.24E+04	3.69E+03	na	na	na	1.09E+03	4.75E+02	na	na
Cadmium and compounds	2.48E+00	1.47E+02	1.01E+03	below bkgd	below bkgd	2.50E+00	3.25E+02	1.32E+03	below bkgd	below bkgd
Total Chromium (1:6 ratio Cr VI:Cr III)	2.71E+01	4.48E+03	na	below bkgd	na	2.71E+01	2.17E+02	na	below bkgd	na
Copper and compounds	2.32E+02	na	7.59E+04	na	3.06E-03	2.32E+02	na	9.89E+04	na	2.35E-03
Lead	6.95E+01	6.72E+03	na	1.03E-07	na	6.95E+01	2.74E+04	na	2.54E-08	na
Mercury and compounds	1.75E+00	na	8.81E+01	na	1.99E-02	1.75E+00	na	1.65E+02	na	1.06E-02
Nickel (soluble salts)	na	na	4.09E+04	na	na	na	na	5.32E+04	na	na
Selenium	na	na	1.02E+04	na	na	na	na	1.33E+04	na	na
Silver and compounds	na	na	1.02E+04	na	na	na	na	1.33E+04	na	na
Thallium and Compounds	na	na	1.35E+02	na	na	na	na	1.76E+02	na	na
Zinc	3.92E+02	na	6.13E+05	na	6.39E-04	3.92E+02	na	7.98E+05	na	4.91E-04
Chlordane	na	1.07E+02	6.69E+02	na	na	na	5.96E+02	1.01E+03	na	na
DDE	na	1.21E+02	na	na	na	na	6.45E+02	na	na	na
DDD	na	1.71E+02	na	na	na	na	9.13E+02	na	na	na
DDT	na	1.21E+02	7.32E+02	na	na	na	6.45E+02	1.10E+03	na	na
Dieldrin	na	1.54E+00	4.40E+01	na	na	na	1.01E+01	8.09E+01	na	na
Endrin	na	na	2.64E+02	na	na	na	na	4.85E+02	na	na
Heptachlor	na	5.48E+00	4.40E+02	na	na	na	3.59E+01	8.09E+02	na	na
Heptachlor epoxide	na	2.71E+00	1.15E+03	na	na	na	1.78E+01	2.10E+03	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	5.94E+00	na	na	na	na	3.31E+01	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	2.08E+01	na	na	na	na	1.16E+02	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	2.88E+01	4.01E+02	na	na	na	1.60E+02	6.26E+02	na	na
Hexachlorocyclohexane (HCH) (delta)	na	9.36E+00	na	na	na	na	5.22E+01	na	na	na
Aroclor 1016	na	2.87E+02	5.02E+01	na	na	na	2.01E+03	9.85E+01	na	na
Aroclor 1221	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1232	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1242	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1248	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1254	na	1.00E+01	1.44E+01	na	na	na	7.03E+01	2.81E+01	na	na
Aroclor 1260	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1262	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Pentachlorophenol	na	1.11E+02	1.43E+04	na	na	na	8.63E+02	3.11E+04	na	na
	CUMULATIVE HEALTH RISK			1.03E-07	2.34E-02	CUMULATIVE HEALTH RISK			2.54E-06	1.35E-02

Notes:
na = Not Applicable/Not Available.
nd = Not Detected in Analyzed Samples

TABLE D2-10 BASELINE RISK CALCULATIONS FOR WESTERN STEGE MARSH, EXCLUDING BACKGROUND

Project: UCB Richmond

CHEMICAL	Road and Paths Cumulative Risk (Soil 0 - 3 ft)					Tidal Salt Marsh Cumulative Risk (Soil 0 - 3 ft)					Sloughs and Bay Cumulative Risk (Soil 0 - 3 ft)				
	Representative Concentrations (lower max detected or 95% UCL) [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard	Representative Concentrations (lower max detected or 95% UCL) [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard	Representative Concentrations (lower max detected or 95% UCL) [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard
Antimony	na	na	8.76E+02	na	na	2.90E+01	na	8.18E+03	na	3.55E-03	2.90E+01	na	6.68E+01	na	4.34E-01
Arsenic (cancer endpoint)	1.67E+02	1.09E+01	6.06E+02	1.53E-05	2.76E-01	1.67E+02	3.54E+01	5.48E+03	4.71E-06	3.05E-02	1.67E+02	1.25E+02	4.17E+03	1.33E-06	4.01E-02
Beryllium and compounds	5.40E-01	2.95E+04	4.32E+03	below bkgd	below bkgd	5.40E-01	4.67E+04	3.88E+04	1.16E-11	1.39E-05	5.40E-01	na	3.34E+02	na	1.62E-03
Cadmium and compounds	1.10E+01	4.68E+01	1.09E+03	2.35E-07	1.01E-02	1.10E+01	1.55E+02	1.02E+04	7.08E-08	1.08E-03	1.10E+01	4.35E+01	6.10E+02	2.53E-07	1.80E-02
Total Chromium (1:6 ratio Cr VI:Cr III)	3.58E+01	5.90E+03	na	below bkgd	na	3.58E+01	9.34E+03	na	below bkgd	na	3.58E+01	na	na	na	na
Copper and compounds	4.00E+02	na	8.13E+04	na	4.92E-03	4.00E+02	na	7.59E+05	na	5.27E-04	4.00E+02	na	4.75E+04	na	8.42E-03
Lead	2.93E+02	2.10E+03	na	1.39E-07	na	2.93E+02	7.01E+03	na	4.18E-08	na	2.93E+02	3.73E+03	na	7.85E-08	na
Mercury and compounds	1.57E+01	na	1.71E+02	na	9.18E-02	1.57E+01	na	1.46E+03	na	1.07E-02	1.57E+01	na	5.82E+00	na	2.70E+00
Nickel (soluble salts)	3.10E+01	na	4.38E+04	na	below bkgd	3.10E+01	na	4.09E+05	na	below bkgd	3.10E+01	na	8.42E+03	na	below bkgd
Selenium	4.00E+00	na	1.10E+04	na	below bkgd	4.00E+00	na	1.02E+05	na	3.91E-05	4.00E+00	na	3.10E+02	na	1.29E-02
Silver and compounds	na	na	1.10E+04	na	na	7.20E+00	na	1.02E+05	na	7.05E-05	7.20E+00	na	4.36E+03	na	1.65E-03
Thallium and Compounds	1.50E+00	na	1.45E+02	na	below bkgd	1.50E+00	na	1.35E+03	na	1.11E-03	1.50E+00	na	1.25E+01	na	1.20E-01
Zinc	7.52E+02	na	6.57E+05	na	1.14E-03	7.52E+02	na	6.13E+06	na	1.23E-04	7.52E+02	na	2.48E+04	na	3.03E-02
Chlordane	na	4.54E+01	9.85E+02	na	na	na	1.47E+02	8.81E+03	na	na	na	3.43E-02	4.43E-01	na	na
DDE	na	4.80E+01	1.01E+03	na	na	na	1.57E+02	9.13E+03	na	na	na	2.19E-02	na	na	na
DDD	na	6.81E+01	1.01E+03	na	na	3.20E-02	2.22E+02	9.13E+03	1.44E-10	3.51E-06	3.20E-02	8.51E-01	na	3.76E-07	na
DDT	na	4.80E+01	1.01E+03	na	na	5.21E-01	1.57E+02	9.13E+03	3.33E-09	5.71E-05	5.21E-01	2.19E-02	2.75E-01	2.38E-04	1.90E+00
Dieldrin	na	8.50E-01	8.55E+01	na	na	na	2.66E+00	7.30E+02	na	na	na	1.97E-03	1.17E-01	na	na
Endrin	na	na	5.13E+02	na	na	na	na	4.38E+03	na	na	na	na	7.05E-01	na	na
Heptachlor	na	3.02E+00	8.55E+02	na	na	na	9.47E+00	7.30E+03	na	na	na	6.76E-03	1.17E+00	na	na
Heptachlor epoxide	na	1.49E+00	2.22E+01	na	na	na	4.68E+00	1.90E+02	na	na	na	3.34E-03	3.03E-02	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	2.52E+00	na	na	na	3.00E-01	8.16E+00	na	3.68E-08	na	3.00E-01	5.03E-03	na	5.96E-04	na
Hexachlorocyclohexane (HCH) (beta)	na	8.82E+00	na	na	na	6.80E-03	2.86E+01	na	2.38E-10	na	6.80E-03	1.76E-02	na	3.86E-06	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	1.22E+01	5.91E+02	na	na	na	3.95E+01	5.29E+03	na	na	na	2.42E-02	7.03E-01	na	na
Hexachlorocyclohexane (HCH) (delta)	na	3.97E+00	na	na	na	2.80E-02	1.29E+01	na	2.18E-09	na	2.80E-02	7.86E-03	na	3.56E-05	na
Aroclor 1016	na	1.77E+02	1.10E+02	na	na	na	5.46E+02	9.18E+02	na	na	na	1.31E+00	5.10E-01	na	na
Aroclor 1221	na	6.20E+00	na	na	na	na	1.91E+01	na	na	na	na	4.60E-02	na	na	na
Aroclor 1232	na	6.20E+00	na	na	na	na	1.91E+01	na	na	na	na	4.60E-02	na	na	na
Aroclor 1242	na	6.20E+00	na	na	na	8.90E-02	1.91E+01	na	4.65E-09	na	8.90E-02	4.60E-02	na	1.94E-05	na
Aroclor 1248	na	6.20E+00	na	na	na	1.00E+00	1.91E+01	na	5.23E-08	na	1.00E+00	4.60E-02	na	2.18E-04	na
Aroclor 1254	na	6.20E+00	3.15E+01	na	na	5.00E-01	1.91E+01	2.62E+02	2.61E-08	1.91E-03	5.00E-01	4.60E-02	1.46E-01	1.09E-04	3.43E+00
Aroclor 1260	na	6.20E+00	na	na	na	na	1.91E+01	na	na	na	na	4.60E-02	na	na	na
Aroclor 1262	na	6.20E+00	na	na	na	na	1.91E+01	na	na	na	na	4.60E-02	na	na	na
Pentachlorophenol	na	8.33E+01	3.86E+04	na	na	na	2.49E+02	3.07E+05	na	na	na	1.29E-01	5.88E+01	na	na
	CUMULATIVE HEALTH RISK			1.57E-05	3.83E-01	CUMULATIVE HEALTH RISK			4.95E-06	4.97E-02	CUMULATIVE HEALTH RISK			1.22E-03	8.69E+00

Notes:

na = Not Applicable/Not Available.

nd = Not Detected in Analyzed Samples

TABLE D2-11. POST REMEDIATION SCENARIO RISK CALCULATION AND RECONCILIATION, EXCLUDING BACKGROUND FOREST PRODUCTS AREA OF POTENTIAL CONCERN

Project: UCB Richmond

CHEMICAL	Commercial/Industrial Cumulative Risk (Soil 0 - 3 ft)					Construction/Excavation Cumulative Risk (Soil 0 - 10 ft)				
	Representative Concentrations (lower max detected or 95% UCL)	Risk Based Concentrations		Cancer Risk	Non-Cancer Hazard	Representative Concentrations (lower max detected or 95% UCL)	Risk Based Concentrations		Cancer Risk	Non-Cancer Hazard
	[mg/kg]	Cancer [mg/kg]	Non-Cancer [mg/kg]			[mg/kg]	Cancer [mg/kg]	Non-Cancer [mg/kg]		
Antimony	0.00E+00	na	8.19E+02	na	below bkgd	0.00E+00	na	3.06E+03	na	below bkgd
Arsenic (cancer endpoint)	4.09E+00	2.73E+01	4.39E+02	below bkgd	below bkgd	9.92E+00	1.20E+02	6.74E+02	below bkgd	below bkgd
Beryllium and compounds	5.92E-01	2.54E+04	3.69E+03	below bkgd	below bkgd	5.30E-01	1.09E+03	4.75E+02	below bkgd	below bkgd
Cadmium and compounds	8.75E+00	1.47E+02	1.01E+03	below bkgd	below bkgd	1.69E+00	3.25E+02	1.32E+03	below bkgd	below bkgd
Total Chromium (1:6 ratio Cr VI:Cr III)	3.90E+01	4.48E+03	na	below bkgd	na	3.86E+01	2.17E+02	na	below bkgd	na
Copper and compounds	2.29E+01	na	7.59E+04	na	below bkgd	2.35E+01	na	9.89E+04	na	below bkgd
Lead	1.54E+01	6.72E+03	na	below bkgd	na	1.11E+01	2.74E+04	na	below bkgd	na
Mercury and compounds	1.30E+00	na	8.81E+03	na	1.48E-02	1.30E+00	na	1.63E+02	na	7.89E-03
Nickel (soluble salts)	4.27E+01	na	4.07E+04	na	below bkgd	7.11E+01	na	5.32E+04	na	below bkgd
Selenium	7.30E-01	na	1.02E+04	na	below bkgd	7.30E-01	na	1.33E+04	na	below bkgd
Silver and compounds	na	na	1.02E+04	na	na	na	na	1.33E+04	na	na
Thallium and Compounds	1.95E+00	na	1.35E+02	na	below bkgd	1.84E+00	na	1.76E+02	na	below bkgd
Zinc	5.75E+01	na	6.13E+05	na	below bkgd	4.64E+01	na	7.98E+05	na	below bkgd
Chlordane	na	1.07E+02	6.69E+02	na	na	na	5.96E+02	1.01E+03	na	na
DDE	na	1.21E+02	na	na	na	na	6.45E+02	na	na	na
DDD	na	1.71E+02	na	na	na	na	9.13E+02	na	na	na
DDT	na	1.21E+03	7.37E+02	na	na	na	6.45E+02	1.10E+03	na	na
Dieldrin	na	1.54E+00	4.40E+01	na	na	na	1.01E+01	8.07E+01	na	na
Endrin	na	na	2.64E+02	na	na	na	na	4.83E+02	na	na
Heptachlor	na	5.48E+00	4.40E+03	na	na	na	3.59E+01	8.07E+02	na	na
Heptachlor epoxide	na	2.71E+00	1.15E+01	na	na	na	1.78E+01	2.10E+01	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	3.94E+00	na	na	na	na	3.31E+01	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	2.08E+01	na	na	na	na	1.16E+02	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	2.88E+01	4.01E+02	na	na	na	1.60E+02	6.26E+02	na	na
Hexachlorocyclohexane (HCH) (delta)	na	9.36E+00	na	na	na	na	5.22E+01	na	na	na
Aroclor 1016	na	2.87E+02	5.02E+01	na	na	na	2.01E+03	9.83E+01	na	na
Aroclor 1221	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1232	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1242	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1248	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1254	na	1.00E+01	1.44E+01	na	na	na	7.03E+01 *	2.81E+01	na	na
Aroclor 1260	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1262	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Pentachlorophenol	na	1.31E+02	1.43E+04	na	na	na	8.63E+02	3.11E+04	na	na
	CUMULATIVE HEALTH RISK			na	1.48E-02	CUMULATIVE HEALTH RISK			na	7.89E-03

Notes:
na = Not Applicable/Not Available.
nd = Not Detected in Analyzed Samples

* = 2 constituents compriseing sub soil, including dioxin - furan product

TABLE D2-12 . POST REMEDIATION SCENARIO RISK CALCULATION AND RECONCILIATION, EXCLUDING BACKGROUND
MERCURY FULMINATE AREA

Project: UCB Richmond

CHEMICAL	Commercial/Industrial Cumulative Risk (Soil 0 - 3 ft)					Construction/Excavation Cumulative Risk (Soil 0 - 10 ft)				
	Representative Concentrations (lower max detected or 95% UCL)	Risk Based Concentrations		Cancer Risk	Non-Cancer Hazard	Representative Concentrations (lower max detected or 95% UCL)	Risk Based Concentrations		Cancer Risk	Non-Cancer Hazard
	[mg/kg]	Cancer [mg/kg]	Non-Cancer [mg/kg]			[mg/kg]	Cancer [mg/kg]	Non-Cancer [mg/kg]		
Antimony	na	na	8.18E+02	na	na	na	na	1.06E+03	na	na
Arsenic (cancer endpoint)	6.03E+00	2.73E+01	4.39E+02	below bkgd	below bkgd	7.37E+00	1.20E+02	6.74E+02	below bkgd	below bkgd
Beryllium and compounds	6.00E-01	2.24E+04	3.69E+03	below bkgd	below bkgd	9.00E-01	1.09E+03	4.73E+02	below bkgd	below bkgd
Cadmium and compounds	1.97E+00	3.47E+03	1.01E+03	below bkgd	below bkgd	2.30E+00	3.25E+03	1.32E+03	below bkgd	below bkgd
Total Chromium (1:6 ratio Cr VI:Cr III)	2.49E+01	4.48E+03	na	below bkgd	na	3.62E+01	2.17E+02	na	below bkgd	na
Copper and compounds	3.70E+02	na	7.39E+04	na	4.87E-03	9.22E+01	na	9.89E+04	na	9.32E-04
Lead	3.33E+01	6.72E+03	na	4.99E-08	na	1.36E+01	2.74E+04	na	below bkgd	na
Mercury and compounds	6.02E+01	na	8.81E+01	na	6.84E-01	2.06E+02	na	1.65E+02	na	1.25E+00
Nickel (soluble salts)	5.34E+01	na	4.07E+04	na	below bkgd	8.36E+01	na	5.32E+04	na	below bkgd
Selenium	1.50E+00	na	1.02E+04	na	below bkgd	1.50E+00	na	3.33E+04	na	below bkgd
Silver and compounds	na	na	1.02E+04	na	na	na	na	1.33E+04	na	na
Thallium and Compounds	3.31E+00	na	1.33E+03	na	below bkgd	3.40E+00	na	1.76E+02	na	below bkgd
Zinc	4.30E+02	na	6.13E+05	na	7.01E-04	1.56E+02	na	3.91E+05	na	1.91E-04
Chlordane	na	1.07E+02	6.69E+01	na	na	na	5.96E+02	1.01E+03	na	na
DDE	na	1.21E+03	na	na	na	na	6.43E+03	na	na	na
DDD	na	1.71E+02	na	na	na	na	9.13E+02	na	na	na
DDT	na	1.21E+02	7.32E+03	na	na	na	6.45E+03	1.10E+03	na	na
Dieldrin	na	1.54E+00	4.40E+01	na	na	na	1.01E+01	8.09E+01	na	na
Endrin	na	na	2.64E+02	na	na	na	na	4.85E+02	na	na
Heptachlor	na	3.48E+00	4.46E+02	na	na	na	3.59E+01	8.07E+02	na	na
Heptachlor epoxide	na	2.71E+00	1.15E+02	na	na	na	1.78E+01	2.10E+01	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	5.94E+00	na	na	na	na	3.31E+01	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	2.08E+01	na	na	na	na	1.16E+02	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	2.88E+01	4.01E+02	na	na	na	1.60E+02	6.266E+02	na	na
Hexachlorocyclohexane (HCH) (delta)	na	9.36E+00	na	na	na	na	5.22E+01	na	na	na
Aroclor 1016	na	2.87E+02	5.02E+01	na	na	na	3.01E+03	9.83E+01	na	na
Aroclor 1221	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1232	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1242	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1248	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1254	na	1.00E+01	1.44E+01	na	na	na	7.03E+01	2.81E+01	na	na
Aroclor 1260	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1262	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Pentachlorophenol	na	2.11E+02	1.43E+04	na	na	na	8.63E+02	3.11E+04	na	na
CUMULATIVE HEALTH RISK				4.99E-08	6.89E-01	CUMULATIVE HEALTH RISK			na	1.23E-00

Notes:
na = Not Applicable/Not Available.
nd = Not Detected in Analyzed Samples

TABLE D2-13. POST REMEDIATION SCENARIO RISK CALCULATION AND RECONCILIATION, EXCLUDING BACKGROUND
UPLAND SOUTH PYRITE CINDERS AREA

Project: UCB Richmond

CHEMICAL	Commercial/Industrial Cumulative Risk (Soil 0 - 3 ft)					Construction/Excavation Cumulative Risk (Soil 0 - 10 ft)				
	Representative Concentrations (lower max detected or 95% UCL)	Risk Based Concentrations		Cancer Risk	Non-Cancer Hazard	Representative Concentrations (lower max detected or 95% UCL)	Risk Based Concentrations		Cancer Risk	Non-Cancer Hazard
	[mg/kg]	Cancer [mg/kg]	Non-Cancer [mg/kg]			[mg/kg]	Cancer [mg/kg]	Non-Cancer [mg/kg]		
Antimony	na	na	8.18E+02	na	na	na	na	1.06E+03	na	na
Arsenic (cancer endpoint)	na	2.73E+01	4.39E+02	na	na	na	1.20E+02	6.74E+02	na	na
Beryllium and compounds	na	2.24E+04	3.69E+03	na	na	na	1.09E+03	4.75E+02	na	na
Cadmium and compounds	na	1.47E+02	1.01E+03	na	na	na	3.25E+02	1.32E+03	na	na
Total Chromium (1:6 ratio Cr VI:Cr III)	na	4.48E+03	na	na	na	na	2.17E+02	na	na	na
Copper and compounds	na	na	7.59E+04	na	na	na	na	9.89E+04	na	na
Lead	na	6.72E+03	na	na	na	na	2.74E+04	na	na	na
Mercury and compounds	na	na	8.81E+01	na	na	na	na	1.65E+02	na	na
Nickel (soluble salts)	na	na	4.09E+04	na	na	na	na	5.32E+04	na	na
Selenium	na	na	1.02E+04	na	na	na	na	1.33E+04	na	na
Silver and compounds	na	na	1.02E+04	na	na	na	na	1.33E+04	na	na
Thallium and Compounds	na	na	1.35E+02	na	na	na	na	1.76E+02	na	na
Zinc	na	na	6.13E+05	na	na	na	na	7.98E+05	na	na
Chlordane	na	1.07E+02	6.69E+02	na	na	na	5.96E+02	1.01E+03	na	na
DDE	na	1.21E+02	na	na	na	na	6.45E+02	na	na	na
DDD	na	1.71E+02	na	na	na	na	9.13E+02	na	na	na
DDT	na	1.21E+02	7.32E+02	na	na	na	6.45E+02	1.10E+03	na	na
Dieldrin	na	1.54E+00	4.40E+01	na	na	na	1.01E+01	8.09E+01	na	na
Endrin	na	na	2.64E+02	na	na	na	na	4.85E+02	na	na
Heptachlor	na	5.48E+00	4.40E+02	na	na	na	3.59E+01	8.09E+02	na	na
Heptachlor epoxide	na	2.71E+00	1.15E+01	na	na	na	1.78E+01	2.10E+01	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	5.94E+00	na	na	na	na	3.31E+01	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	2.08E+01	na	na	na	na	1.16E+02	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Lindane	na	2.88E+01	4.01E+02	na	na	na	1.60E+02	6.26E+02	na	na
Hexachlorocyclohexane (HCH) (delta)	na	9.36E+00	na	na	na	na	5.22E+01	na	na	na
Aroclor 1016	na	2.87E+02	5.02E+01	na	na	na	2.01E+03	9.85E+01	na	na
Aroclor 1221	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1232	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1242	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1248	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1254	na	1.00E+01	1.44E+01	na	na	na	7.03E+01	2.81E+01	na	na
Aroclor 1260	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Aroclor 1262	na	1.00E+01	na	na	na	na	7.03E+01	na	na	na
Pentachlorophenol	na	1.11E+02	1.43E+04	na	na	na	8.63E+02	3.11E+04	na	na
	CUMULATIVE HEALTH RISK			na	na	CUMULATIVE HEALTH RISK			na	na

Notes:
na = Not Applicable/Not Available.
nd = Not Detected in Analyzed Sample

TABLE D2-14. POST REMEDIATION SCENARIO RISK CALCULATION AND RECONCILIATION, EXCLUDING BACKGROUND
MARSH AREA
Project: UCB Richmond

CHEMICAL	Road and Paths Cumulative Risk (Soil 0 - 3 ft)					Tidal Salt Marsh Cumulative Risk (Soil 0 - 3 ft)					Sloughs and Bay Cumulative Risk (Soil 0 - 3 ft)				
	Representative Concentrations (lower max detected or 95% UCL) [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard	Representative Concentrations (lower max detected or 95% UCL) [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard	Representative Concentrations (lower max detected or 95% UCL) [mg/kg]	Risk Based Concentrations Cancer [mg/kg]	Risk Based Concentrations Non-Cancer [mg/kg]	Cancer Risk	Non-Cancer Hazard
Antimony	na	na	8.76E+02	na	na	4.80E-01	na	8.18E+03	na	5.87E-05	2.60E-01	na	6.68E+01	na	3.89E-03
Arsenic (cancer endpoint)	2.40E+00	1.09E+01	6.06E+02	below bkgd	below bkgd	7.49E+01	3.54E+01	5.48E+03	2.11E-06	1.37E-02	3.60E+01	1.25E+02	4.17E+03	2.87E-07	8.65E-03
Beryllium and compounds	5.40E-01	2.95E+04	4.32E+03	below bkgd	below bkgd	6.30E-01	4.67E+04	3.88E+04	1.35E-11	1.62E-05	4.45E-01	na	3.34E+02	na	1.33E-03
Cadmium and compounds	1.90E+00	4.68E+01	1.09E+03	below bkgd	below bkgd	5.99E+00	1.55E+02	1.02E+04	3.86E-08	5.88E-04	3.62E+00	4.35E+01	6.10E+02	8.33E-08	5.94E-03
Total Chromium (1:6 ratio Cr VI:Cr III)	1.20E+01	5.90E+03	na	below bkgd	na	9.39E+01	9.34E+03	na	below bkgd	na	6.24E+01	na	na	na	na
Copper and compounds	1.60E+01	na	8.13E+04	na	below bkgd	1.96E+02	na	7.59E+05	na	2.59E-04	2.21E+02	na	4.75E+04	na	4.65E-03
Lead	1.00E+01	2.10E+03	na	below bkgd	na	2.40E+02	7.01E+03	na	3.42E-08	na	9.67E+01	3.73E+03	na	2.59E-08	na
Mercury and compounds	5.10E-02	na	1.71E+02	na	below bkgd	6.36E+00	na	1.46E+03	na	4.36E-03	5.99E+00	na	5.82E+00	na	1.03E+00
Nickel (soluble salts)	3.10E+01	na	4.38E+04	na	below bkgd	7.12E+01	na	4.09E+05	na	below bkgd	6.28E+01	na	8.42E+03	na	below bkgd
Selenium	na	na	1.10E+04	na	na	2.40E+00	na	1.02E+05	na	2.35E-05	6.34E+00	na	3.10E+02	na	2.05E-02
Silver and compounds	na	na	1.10E+04	na	na	1.50E+00	na	1.02E+05	na	1.47E-05	2.95E-01	na	4.36E+03	na	below bkgd
Thallium and Compounds	1.50E+00	na	1.45E+02	na	below bkgd	1.60E+00	na	1.35E+03	na	1.19E-03	1.35E+00	na	1.25E+01	na	1.07E-01
Zinc	4.80E+01	na	6.57E+05	na	below bkgd	9.30E-02	na	6.13E+06	na	below bkgd	3.16E+02	na	2.48E+04	na	1.27E-02
Chlordane	na	4.54E+01	9.85E+02	na	na	na	1.47E+02	8.81E+03	na	na	na	3.43E-02	4.43E-01	na	na
DDE	na	4.80E+01	1.01E+03	na	na	na	1.57E+02	9.13E+03	na	na	na	2.19E-02	na	na	na
DDD	na	6.81E+01	1.01E+03	na	na	na	2.22E+02	9.13E+03	na	na	na	8.51E-01	na	na	na
DDT	na	4.80E+01	1.01E+03	na	na	na	1.57E+02	9.13E+03	na	na	na	2.19E-02	2.75E-01	na	na
Dieldrin	na	8.50E-01	8.55E+01	na	na	na	2.66E+00	7.30E+02	na	na	na	1.97E-03	1.17E-01	na	na
Endrin	na	na	5.13E+02	na	na	na	na	4.38E+03	na	na	na	na	7.05E-01	na	na
Heptachlor	na	3.02E+00	8.55E+02	na	na	na	9.47E+00	7.30E+03	na	na	na	6.76E-03	1.17E+00	na	na
Heptachlor epoxide	na	1.49E+00	2.22E+01	na	na	na	4.68E+00	1.90E+02	na	na	na	3.34E-03	3.03E-02	na	na
Hexachlorocyclohexane (HCH) (alpha)	na	2.52E+00	na	na	na	na	8.16E+00	na	na	na	na	5.03E-03	na	na	na
Hexachlorocyclohexane (HCH) (beta)	na	8.82E+00	na	na	na	na	2.86E+01	na	na	na	na	1.76E-02	na	na	na
Hexachlorocyclohexane (HCH) (gamma) Linda	na	1.22E+01	5.91E+02	na	na	na	3.95E+01	5.29E+03	na	na	na	2.42E-02	7.03E-01	na	na
Hexachlorocyclohexane (HCH) (delta)	na	3.97E+00	na	na	na	na	1.29E+01	na	na	na	na	7.86E-03	na	na	na
Aroclor 1016	na	1.77E+02	1.10E+02	na	na	na	5.46E+02	9.18E+02	na	na	na	1.31E+00	5.10E-01	na	na
Aroclor 1221	na	6.20E+00	na	na	na	na	1.91E+01	na	na	na	na	4.60E-02	na	na	na
Aroclor 1232	na	6.20E+00	na	na	na	na	1.91E+01	na	na	na	na	4.60E-02	na	na	na
Aroclor 1242	na	6.20E+00	na	na	na	na	1.91E+01	na	na	na	na	4.60E-02	na	na	na
Aroclor 1248	na	6.20E+00	na	na	na	na	1.91E+01	na	na	na	na	4.60E-02	na	na	na
Aroclor 1254	na	6.20E+00	3.15E+01	na	na	1.00E+00	1.91E+01	2.62E+02	5.23E-08	3.81E-03	3.40E-01	4.60E-02	1.46E-01	1.83E-04	5.77E+00
Aroclor 1260	na	6.20E+00	na	na	na	na	1.91E+01	na	na	na	4.50E-01	4.60E-02	na	9.79E-05	na
Aroclor 1262	na	6.20E+00	na	na	na	na	1.91E+01	na	na	na	na	4.60E-02	na	na	na
Pentachlorophenol	0.00E+00	8.33E+01	3.86E+04	0.00E+00	0.00E+00	0.00E+00	2.49E+02	3.07E+05	0.00E+00	0.00E+00	0.00E+00	1.29E-01	5.88E+01	0.00E+00	0.00E+00
			CUMULATIVE HEALTH RISK	na	na			CUMULATIVE HEALTH RISK	2.24E-06	2.40E-02			CUMULATIVE HEALTH RISK (Including PCBs Exceedances)	2.81E-04	6.96E+00
													CUMULATIVE HEALTH RISK (Excluding PCBs Exceedances [grey numbers])	3.96E-07	1.19E+00

Notes:
na = Not Applicable/Not Available
Tier 2 remediation comparison with and revised AH - Tier 2 compar-marsh
nd = Not Detected in Analyzed Samples

10/17/2002 mcf

ECOLOGICAL RISK ASSESSMENT

Table 4-2
Characterization of Site-Related Analytes in Soil (0 to 6 feet below ground surface) of the Upland Habitat
UC - Berkeley Richmond Field Station

ANALYTE	SUMMARY STATISTICS					EVALUATION FOR SITE-RELATED ANALYTES			
	NUMBER OF DETECTIONS	NUMBER OF SAMPLES ANALYZED	DETECTION FREQUENCY	LOWER OF MAX AND 95% UCLM CONCENTRATION (mg/kg dry weight)	MAXIMUM DETECTED CONCENTRATION (mg/kg dry weight)	DETECTION FREQUENCY >5%?	BACKGROUND CONCENTRATION (mg/kg dry weight)	DOES MAXIMUM CONCENTRATION EXCEED BACKGROUND CONCENTRATION?	RETAIN AS SITE-RELATED ANALYTE?
INORGANICS									
Antimony	5	65	8%	16	16	YES	5.5	YES	YES
Arsenic	124	128	97%	45	2,210	YES	19.1	YES	YES
Beryllium	60	65	92%	0.49	0.90	YES	1	NO	NO
Cadmium	112	128	88%	6.2	437	YES	2.7	YES	YES
Chromium	126	127	99%	40	185	YES	99.6	YES	YES
Copper	134	134	100%	437	9,300	YES	69.4	YES	YES
Lead	127	130	98%	88	1,140	YES	16.1	YES	YES
Mercury	186	200	93%	75	5,300	YES	0.4	YES	YES
Nickel	62	62	100%	49	210	YES	119.8	YES	YES
Selenium	50	113	44%	2.6	249	YES	5.6	YES	YES
Silver	13	65	20%	0.90	11	YES	1.8	YES	YES
Thallium	52	65	80%	1.3	3.6	YES	27.1	NO	NO
Zinc	132	133	99%	477	13,000	YES	106.1	YES	YES
PCBs									
Aroclor-1016	0	15	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1221	0	15	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1232	0	15	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1242	0	15	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1248	1	15	7%	0.88	0.88	YES	not applicable	no comparison	YES
Aroclor-1254	5	14	36%	0.83	0.94	YES	not applicable	no comparison	YES
Aroclor-1260	1	15	7%	0.061	0.061	YES	not applicable	no comparison	YES
Aroclor-1262	0	15	0%	none	none	NO	not applicable	no comparison	NO
Total PCBs	5	15	33%	0.88	1.88	YES	not applicable	no comparison	YES
Pesticides									
4,4'-DDE	0	7	0%	none	none	NO	not applicable	no comparison	NO
4,4'-DDD	0	7	0%	none	none	NO	not applicable	no comparison	NO
4,4'-DDT	0	7	0%	none	none	NO	not applicable	no comparison	NO
Beta-BHC	0	7	0%	none	none	NO	not applicable	no comparison	NO
Alpha-BHC	0	7	0%	none	none	NO	not applicable	no comparison	NO
Delta-BHC	0	7	0%	none	none	NO	not applicable	no comparison	NO
Gamma-BHC	0	7	0%	none	none	NO	not applicable	no comparison	NO
Heptachlor	0	7	0%	none	none	NO	not applicable	no comparison	NO
Endrin	0	7	0%	none	none	NO	not applicable	no comparison	NO
Heptachlor epoxide A	0	7	0%	none	none	NO	not applicable	no comparison	NO

Table 4-2
Characterization of Site-Related Analytes in Soil (0 to 6 feet below ground surface) of the Upland Habitat
UC - Berkeley Richmond Field Station

ANALYTE	SUMMARY STATISTICS					EVALUATION FOR SITE-RELATED ANALYTES			
	NUMBER OF DETECTIONS	NUMBER OF SAMPLES ANALYZED	DETECTION FREQUENCY	LOWER OF MAX AND 95% UCLM CONCENTRATION[a] (mg/kg dry weight)	MAXIMUM DETECTED CONCENTRATION (mg/kg dry weight)	DETECTION FREQUENCY >5%?	BACKGROUND CONCENTRATION[b] (mg/kg dry weight)	DOES MAXIMUM CONCENTRATION EXCEED BACKGROUND CONCENTRATION?	RETAIN AS SITE-RELATED ANALYTE?[c]
Dieldrin	0	7	0%	none	none	NO	not applicable	no comparison	NO
Chlordane	0	7	0%	none	none	NO	not applicable	no comparison	NO
EXPLOSIVES									
HMX	1	4	25%	0.37	0.37	YES	not applicable	no comparison	YES

[a] 95% UCLM concentration was calculated using one-half of the reported detection limit for non-detect results and assuming lognormally-distributed data.
[b] Based on LBNL (1995).
[c] Analytes are retained as site-related if:
(1) detection frequency > 5%; and
(2) if inorganic, maximum concentration exceeds background concentration.

Table 4-5
Characterization of Site-Related Analytes in Sediment (0 to 1 foot below ground surface) of the Tidal Salt Marsh Habitat
UC - Berkeley Richmond Field Station

ANALYTE	SUMMARY STATISTICS					EVALUATION FOR SITE-RELATED ANALYTES			
	NUMBER OF DETECTIONS	NUMBER OF SAMPLES ANALYZED	DETECTION FREQUENCY	LOWER OF MAX. AND 95% UCLM CONCENTRATION[a] (mg/kg dry weight)	MAXIMUM DETECTED CONCENTRATION (mg/kg dry weight)	DETECTION FREQUENCY >5%?	BACKGROUND CONCENTRATION[b] (mg/kg dry weight)	DOES MAXIMUM DETECTED EXCEED BACKGROUND CONCENTRATION?	RETAIN AS SITE-RELATED ANALYTE[c]
INORGANICS									
Antimony	5	11	45%	20	20	YES	not available	no comparison	YES
Arsenic	26	29	90%	1,012	1,140	YES	15.3	YES	YES
Beryllium	9	11	82%	0.64	0.64	YES	not available	no comparison	YES
Cadmium	25	25	100%	25	34	YES	0.33	YES	YES
Chromium	25	25	100%	117	209	YES	112	YES	YES
Copper	29	29	100%	483	1,330	YES	68.1	YES	YES
Lead	29	29	100%	303	814	YES	43.2	YES	YES
Mercury	29	29	100%	59	142	YES	0.43	YES	YES
Nickel	11	11	100%	111	130	YES	112	YES	YES
Selenium	14	29	48%	74	444	YES	0.64	YES	YES
Silver	8	11	73%	3.4	4.77	YES	0.58	YES	YES
Thallium	7	11	64%	2.2	5.4	YES	not available	no comparison	YES
Zinc	29	29	100%	1,326	3,930	YES	158	YES	YES
PCBs									
Aroclor-1016	0	8	0%	none	none	NO	not applicable	no comparison	ND
Aroclor-1221	0	8	0%	none	none	NO	not applicable	no comparison	ND
Aroclor-1232	0	8	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1242	0	8	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1248	5	8	63%	1	1	YES	not applicable	no comparison	YES
Aroclor-1254	2	8	25%	0.50	0.50	YES	not applicable	no comparison	YES
Aroclor-1260	0	8	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1262	0	2	0%	none	none	NO	not applicable	no comparison	NO
Total PCBs	7	8	88%	1.1	1.1	YES	not applicable	no comparison	YES
PESTICIDES									
4,4'-DDE	0	1	0%	none	none	NO	not applicable	no comparison	NO
4,4'-DDD	1	1	100%	0.0082	0.0082	YES	not applicable	no comparison	YES
4,4'-DDT	4	5	80%	0.521	0.521	YES	not applicable	no comparison	YES
Beta-BHC	1	1	100%	0.0068	0.0068	YES	not applicable	no comparison	YES
Alpha-BHC	4	5	80%	0.3	0.3	YES	not applicable	no comparison	YES
Delta-BHC	1	1	100%	0.019	0.019	YES	not applicable	no comparison	YES
Gamma-BHC	0	1	0%	none	none	NO	not applicable	no comparison	NO
Heptachlor	0	1	0%	none	none	NO	not applicable	no comparison	NO
Endrin	0	1	0%	none	none	NO	not applicable	no comparison	NO
Heptachlor epoxide	0	1	0%	none	none	NO	not applicable	no comparison	NO
Dieldrin	0	1	0%	none	none	NO	not applicable	no comparison	NO
Chlordane	0	1	0%	none	none	NO	not applicable	no comparison	NO

[a] 95% UCLM concentration was calculated using one-half of the reported detection limit for non-detect results and assuming lognormally-distributed data.

[b] Based on RWQCB (1998).

[c] Analytes are retained as site-related if:
(1) detection frequency > 5%; and
(2) If inorganic, maximum concentration exceeds background concentration.

Table 4-6
Characterization of Site-Related Analytes in Sediment (1 to 3 feet below ground surface) of the Tidal Salt Marsh Habitat
UC - Berkeley Richmond Field Station

ANALYTE	SUMMARY STATISTICS					EVALUATION FOR SITE-RELATED ANALYTES[c]			
	NUMBER OF DETECTIONS	NUMBER OF SAMPLES ANALYZED	DETECTION FREQUENCY	LOWER OF MAX AND 95% UCLM CONCENTRATION[a] (mg/kg dry weight)	MAXIMUM DETECTED CONCENTRATION (mg/kg dry weight)	DETECTION FREQUENCY >5%?	BACKGROUND CONCENTRATION[b] (mg/kg dry weight)	DOES MAXIMUM CONCENTRATION EXCEED BACKGROUND CONCENTRATION?	RETAIN AS SITE-RELATED ANALYTE?
INORGANICS									
Antimony	1	1	100%	5.1	5.1	YES	not available	no comparison	YES
Arsenic	4	5	80%	895	895	YES	15.3	YES	YES
Beryllium	0	1	0%	none	none	NO	not available	no comparison	NO
Cadmium	5	5	100%	50	50	YES	0.33	YES	YES
Chromium	5	5	100%	140	140	YES	112	YES	YES
Copper	5	5	100%	8090	8090	YES	68.1	YES	YES
Lead	5	5	100%	345	345	YES	43.2	YES	YES
Mercury	5	5	100%	53	53	YES	0.43	YES	YES
Nickel	1	1	100%	18	18	YES	112	NO	NO
Selenium	4	5	80%	78	78	YES	0.64	YES	YES
Silver	1	1	100%	5.4	5.4	YES	0.58	YES	YES
Thallium	1	1	100%	1.9	1.9	YES	not available	no comparison	YES
Zinc	5	5	100%	5290	5290	YES	158	YES	YES
PCBs									
Aroclor-1016	0	1	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1221	0	1	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1232	0	1	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1242	1	1	100%	0.089	0.089	YES	not applicable	no comparison	YES
Aroclor-1248	0	1	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1254	0	1	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1260	0	1	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1262	0	1	0%	none	none	NO	not applicable	no comparison	NO
Total PCBs	1	1	100%	0.089	0.089	YES	not applicable	no comparison	YES

[a] 95% UCLM concentration was calculated using one-half of the reported detection limit for non-detect results and assuming lognormally-distributed data.

[b] Based on RWQCB (1998).

[c] Analytes are retained as site-related if:
(1) detection frequency > 5%; and
(2) if inorganic, maximum concentration exceeds background concentration.

Table 4-7
Characterization of Site-Related Analytes in Sediment (0 to 1 foot below ground surface) of the Shallow Bay and Channel Habitat
UC - Berkeley Richmond Field Station

ANALYTE	SUMMARY STATISTICS					EVALUATION FOR SITE-RELATED ANALYTES			
	NUMBER OF DETECTIONS	NUMBER OF SAMPLES ANALYZED	DETECTION FREQUENCY (%)	LOWER OF MAX AND 95% UCLM CONCENTRATION[a] (mg/kg dry weight)	MAXIMUM DETECTED CONCENTRATION (mg/kg dry weight)	DETECTION FREQUENCY > 5%[b]	BACKGROUND CONCENTRATION (mg/kg dry weight)	DOES MAXIMUM CONCENTRATION EXCEED BACKGROUND CONCENTRATION	RETAIN AS SITE-RELATED ANALYTE[c]
INORGANICS									
Antimony	3	15	20%	0.26	0.26	YES	not available	no comparison	YES
Arsenic	21	25	84%	305	1,020	YES	15.3	YES	YES
Beryllium	15	16	94%	0.47	0.58	YES	not available	no comparison	YES
Cadmium	25	25	100%	6.5	21	YES	0.33	YES	YES
Chromium	25	25	100%	91	138	YES	112	YES	YES
Copper	25	25	100%	258	745	YES	68.1	YES	YES
Lead	25	25	100%	169	485	YES	43.2	YES	YES
Mercury	24	25	96%	3.8	27.5	YES	0.43	YES	YES
Nickel	16	16	100%	73	120	YES	112	YES	YES
Selenium	13	24	54%	28	854	YES	0.64	YES	YES
Silver	5	15	33%	1.8	11	YES	0.58	YES	YES
Thallium	10	16	63%	1.25	2.1	YES	not available	no comparison	YES
Zinc	25	25	100%	493	1,100	YES	158	YES	YES
PCBs									
Aroclor-1016	1	16	6%	1,200	1,200	YES	not applicable	no comparison	YES
Aroclor-1221	0	16	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1232	0	16	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1242	0	16	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1248	10	16	63%	23	23	YES	not applicable	no comparison	YES
Aroclor-1254	2	16	13%	400	400	YES	not applicable	no comparison	YES
Aroclor-1260	0	16	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1262	0	10	0%	none	none	NO	not applicable	no comparison	NO
Total PCBs	13	16	81%	1,745	1,745	YES	not applicable	no comparison	YES
PESTICIDES									
4,4'-DDE	0	10	0%	none	none	NO	not applicable	no comparison	NO
4,4'-DDD	0	10	0%	none	none	NO	not applicable	no comparison	NO
4,4'-DDT	0	10	0%	none	none	NO	not applicable	no comparison	NO
Beta-BHC	1	10	10%	0.0054	0.0054	YES	not applicable	no comparison	YES
Alpha-BHC	1	10	10%	0.017	0.017	YES	not applicable	no comparison	YES
Delta-BHC	1	10	10%	0.028	0.028	YES	not applicable	no comparison	YES
Gamma-BHC	0	10	0%	none	none	NO	not applicable	no comparison	NO
Heptachlor	0	10	0%	none	none	NO	not applicable	no comparison	NO
Endrin	0	10	0%	none	none	NO	not applicable	no comparison	NO
Heptachlor epoxide	0	10	0%	none	none	NO	not applicable	no comparison	NO
Dieldrin	0	10	0%	none	none	NO	not applicable	no comparison	NO
Chlordane	0	10	0%	none	none	NO	not applicable	no comparison	NO

[a] 95% UCLM concentration was calculated using one-half of the reported detection limit for non-detect results and assuming lognormally-distributed data.

[b] Based on RWQCB (1998).

[c] Analytes are retained as site-related if:
(1) detection frequency > 5%; and
(2) if inorganic, maximum concentration exceeds background concentration.

Table 4-8
Characterization of Site-Related Analytes in Sediment (1 to 3 feet below ground surface) of the Shallow Bay and Channel Habitat
UC - Berkeley Richmond Field Station

ANALYTE	SUMMARY STATISTICS					EVALUATION FOR SITE-RELATED ANALYTES			
	NUMBER OF DETECTIONS	NUMBER OF SAMPLES ANALYZED	DETECTION FREQUENCY (%)	LOWER OF MAX DETECTED CONCENTRATION AND 95% UCLM[a] CONCENTRATION (mg/kg dry weight)	MAXIMUM DETECTED CONCENTRATION (mg/kg dry weight)	DETECTION FREQUENCY >5%?	BACKGROUND CONCENTRATION[b] (mg/kg dry weight)	DOES MAXIMUM CONCENTRATION EXCEED BACKGROUND CONCENTRATION	RETAIN AS SITE-RELATED ANALYTE[c]
INORGANICS									
Antimony	1	9	11%	29	29	YES	not available	no comparison	YES
Arsenic	10	10	100%	1,330	1,330	YES	15.3	YES	YES
Beryllium	8	9	89%	0.56	0.56	YES	not available	no comparison	YES
Cadmium	10	10	100%	41	44	YES	0.33	YES	YES
Chromium	10	10	100%	52	52	YES	112	NO	NO
Copper	10	10	100%	22,000	22,000	YES	68.1	YES	YES
Lead	10	10	100%	1,240	1,240	YES	43.2	YES	YES
Mercury	10	10	100%	430	430	YES	0.43	YES	YES
Nickel	9	9	100%	75	77	YES	112	NO	NO
Selenium	8	10	80%	610	610	YES	0.64	YES	YES
Silver	3	9	33%	2.8	7.2	YES	0.58	YES	YES
Thallium	9	9	100%	1.3	1.5	YES	not available	no comparison	YES
Zinc	10	10	100%	8,800	8,800	YES	158	YES	YES
PCBs									
Aroclor-1016	0	10	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1221	0	10	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1232	0	10	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1242	0	10	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1248	6	10	60%	1,600	1,600	YES	not applicable	no comparison	YES
Aroclor-1254	0	10	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1260	0	10	0%	none	none	NO	not applicable	no comparison	NO
Aroclor-1262	0	10	0%	none	none	NO	not applicable	no comparison	NO
Total PCBs	6	10	60%	2,195	2,195	YES	not applicable	no comparison	YES
PESTICIDES									
4,4'-DDE	1	9	11%	0.085	0.085	YES	not applicable	no comparison	YES
4,4'-DDD	1	9	11%	0.032	0.032	YES	not applicable	no comparison	YES
4,4'-DDT	0	9	0%	none	none	NO	not applicable	no comparison	NO
Beta-BHC	0	9	0%	none	none	NO	not applicable	no comparison	NO
Alpha-BHC	1	9	11%	0.043	0.043	YES	not applicable	no comparison	YES
Delta-BHC	0	9	0%	none	none	NO	not applicable	no comparison	NO
Gamma-BHC	0	9	0%	none	none	NO	not applicable	no comparison	NO
Heptachlor	0	9	0%	none	none	NO	not applicable	no comparison	NO
Endrin	0	9	0%	none	none	NO	not applicable	no comparison	NO
Heptachlor epoxide	0	9	0%	none	none	NO	not applicable	no comparison	NO
Dieldrin	0	9	0%	none	none	NO	not applicable	no comparison	NO
Chlordane	0	9	0%	none	none	NO	not applicable	no comparison	NO

[a] 95% UCLM concentration was calculated using one-half of the reported detection limit for non-detect results and assuming lognormally-distributed data.

[b] Based on RWQCB (1998).

[c] Analytes are retained as site-related if:
(1) detection frequency > 5%; and
(2) if inorganic, maximum concentration exceeds background concentration.

Table 4-9
Tier 1 Evaluation of Site-Related Analytes in Soil (0 to 6 feet below ground surface) of the Upland Habitat
UC - Berkeley Richmond Field Station

TIER 1 COPC	SITE CONCENTRATION (mg/kg dw)		TIER 1 EVALUATION		
	LOWER OF MAX AND 95% UCLM CONCENTRATION	MAXIMUM DETECTED CONCENTRATION	SOIL PRG FOR PLANTS, EARTHWORMS, OR WILDLIFE (mg/kg dry weight)	DOES MAXIMUM CONCENTRATION EXCEED THE SOIL PRG?	RETAIN FOR TIER 2 EVALUATION?
INORGANICS					
Antimony	16	16	5.5	YES	YES
Arsenic	45	2,210	19.1	YES	YES
Cadmium	6.2	437	4	YES	YES
Chromium	40	185	99.6	YES	YES
Copper	437	9,300	69.4	YES	YES
Lead	88	1140	40.5	YES	YES
Mercury	75	5,300	0.4	YES	YES
Nickel	49	210	119.8	YES	YES
Selenium	2.6	249	5.6	YES	YES
Silver	0.90	11	2	YES	YES
Zinc	477	13,000	106.1	YES	YES
PCBs					
Aroclor-1248	0.88	0.88	0.371	YES	YES
Aroclor-1254	0.83	0.94	0.371	YES	YES
Aroclor-1260	0.061	0.061	0.371	NO	YES
Total PCBs	0.88	1.88	0.371	YES	YES
EXPLOSIVES					
HMX	0.37	0.37	not available	no comparison	YES

[a] 95% UCLM concentration was calculated using one-half of the reported detection limit for non-detect results and assuming lognormally-distributed dat
[b] Represents the higher of the Soil PRG (Efroymson *et al.*, 1997) and the soil background concentration (Table 4-2).
[c] COPCs are retained for Tier 2 evaluation if:
(1) the maximum concentrations exceed the soil PRG;
(2) there are no available Tier 1 Screening-Benchmarks; or
(3) the COPC is bioaccumulative.

Table 4-12
Tier 1 Evaluation of Site-Related Analytes in Sediment (0 to 1 foot below ground surface) of the Tidal Salt Marsh Habitat
UC - Berkeley Richmond Field Station

TIER 1 COPC	SITE CONCENTRATION (mg/kg dw)		TIER 1 EVALUATION (all concentrations mg/kg dw)		
	LOWER OF MAX AND 95% UCLM CONCENTRATION[a]	MAXIMUM DETECTED CONCENTRATION	EFFECTS RANGE-MEDIAN (ER-M)[b]	DOES MAXIMUM CONCENTRATION EXCEED THE ER-M?	RETAIN FOR TIER 2 EVALUATION?[c]
INORGANICS					
Antimony	20	20	not available	no comparison	YES
Arsenic	1,012	1,140	70	YES	YES
Beryllium	0.64	0.64	not available	no comparison	YES
Cadmium	25	34	10	YES	YES
Chromium	117	209	370	NO	NO
Copper	483	1,330	270	YES	YES
Lead	303	814	218	YES	YES
Mercury	19	142	0.71	YES	YES
Nickel	111	130	51.6	YES	YES
Selenium	74	444	not available	no comparison	YES
Silver	3.4	4.77	3.7	YES	YES
Thallium	2.2	5.4	not available	no comparison	YES
Zinc	1,326	3,930	410	YES	YES
PCBs					
Aroclor-1248	1	1	0.18	YES	YES
Aroclor-1254	0.50	0.50	0.18	YES	YES
Total PCBs	1.1	1.1	0.18	YES	YES
PESTICIDES					
4,4'-DDD	0.0082	0.0082	0.02	NO	YES
4,4'-DDT	0.521	0.521	0.007	YES	YES
Beta-BHC	0.0068	0.0068	not available	no comparison	YES
Alpha-BHC	0.3	0.3	not available	no comparison	YES
Delta-BHC	0.019	0.019	not available	no comparison	YES

[a] 95% UCLM concentration was calculated using one-half of the reported detection limit for non-detect results and assuming lognormally-distributed dat

[b] Based on Buchman (1999).

[c] COPCs are retained for Tier 2 evaluation if:
(1) maximum concentrations exceed ER-M values;
(2) there are no available Tier 1 Screening-Benchmarks; or
(3) the analyte is bioaccumulative.

Table 4-13
Tier 1 Evaluation of Site-Related Analytes in Sediment (1 to 3 feet below ground surface) of the Tidal Salt Marsh Habitat
UC - Berkeley Richmond Field Station

TIER 1 COPC	SITE CONCENTRATION (mg/kg dw)		TIER 1 EVALUATION (all concentrations mg/kg dw)		
	LOWER OF MAX AND 95% UCLM CONCENTRATION[a]	MAXIMUM DETECTED CONCENTRATION	EFFECTS RANGE-MEDIAN (ER-M)[b]	DOES MAXIMUM CONCENTRATION EXCEED THE ER-M?	RETAIN FOR TIER 2 EVALUATION?[c]
INORGANICS					
Antimony	5.1	5.1	not available	no comparison	YES
Arsenic	895	895	70	YES	YES
Cadmium	50	50	10	YES	YES
Chromium	140	140	370	NO	NO
Copper	8090	8090	270	YES	YES
Lead	345	345	218	YES	YES
Mercury	53	53	0.71	YES	YES
Selenium	78	78	not available	no comparison	YES
Silver	5.4	5.4	3.7	YES	YES
Thallium	1.9	1.9	not available	no comparison	YES
Zinc	5290	5290	410	YES	YES
PCBs					
Aroclor-1242	0.089	0.089	0.18	NO	YES
Total PCBs	0.089	0.089	0.18	NO	YES

[a] 95% UCLM concentration was calculated using one-half of the reported detection limit for non-detect results and assuming lognormally-distributed data.

[b] Based on Buchman (1999).

[c] COPCs are retained for Tier 2 evaluation if:
(1) maximum concentrations exceed ER-M values;
(2) there are no available Tier 1 Screening-Benchmarks; or
(3) the analyte is bioaccumulative.

Table 4-14
Tier 1 Evaluation of Site-Related Analytes in Sediment (0 to 1 foot below ground surface) of the Shallow Bay and Channel Habitat
UC - Berkeley Richmond Field Station

TIER 1 COPC	SITE CONCENTRATION (mg/kg dw)		TIER 1 EVALUATION (all concentrations mg/kg dw)		
	LOWER OF MAX AND 95% UCLM CONCENTRATION	MAXIMUM DETECTED CONCENTRATION	EFFECTS RANGE-MEDIAN (ER-M)	DOES MAXIMUM CONCENTRATION EXCEED THE ER-M?	RETAIN FOR TIER 2 EVALUATION?
INORGANICS					
Antimony	0.26	0.26	not available	no comparison	YES
Arsenic	305	1,020	70	YES	YES
Beryllium	0.47	0.58	not available	no comparison	YES
Cadmium	6.5	21	10	YES	YES
Chromium	91	138	370	NO	NO
Copper	258	745	270	YES	YES
Lead	169	485	218	YES	YES
Mercury	3.8	27.5	0.71	YES	YES
Nickel	73	120	51.6	YES	YES
Selenium	28	854	not available	no comparison	YES
Silver	1.8	11	3.7	YES	YES
Thallium	1.25	2.1	not available	no comparison	YES
Zinc	493	1,100	410	YES	YES
PCBs					
Aroclor-1016	1,200	1,200	0.18	YES	YES
Aroclor-1248	23	23	0.18	YES	YES
Aroclor-1254	400	400	0.18	YES	YES
Total PCBs	1,745	1,745	0.18	YES	YES
PESTICIDES					
Beta-BHC	0.0054	0.0054	not available	no comparison	YES
Alpha-BHC	0.017	0.017	not available	no comparison	YES
Delta-BHC	0.028	0.028	not available	no comparison	YES

[a] 95% UCLM concentration was calculated using one-half of the reported detection limit for non-detect results and assuming lognormally-distributed data.

[b] Based on Buchman (1999).

[c] COPCs are retained for Tier 2 evaluation if:
(1) maximum concentrations exceed ER-M values;
(2) there are no available Tier 1 Screening-Benchmarks; or
(3) the analyte is bioaccumulative.

Table 4-15

Tier 1 Evaluation of Site-Related Analytes in Sediment (1 to 3 feet below ground surface) of the Shallow Bay and Channel Habitat UC - Berkeley Richmond Field Station

TIER 1 COPC	SITE CONCENTRATION (mg/kg dw)		TIER 1 EVALUATION (all concentrations mg/kg dw)		
	LOWER OF MAX AND 95% UCLM CONCENTRATION[a]	MAXIMUM DETECTED CONCENTRATION	EFFECTS RANGE-MEDIAN (ER-M)[b]	DOES MAXIMUM CONCENTRATION EXCEED THE ER-M?	RETAIN FOR TIER 2 EVALUATION?[c]
INORGANICS					
Antimony	29	29	not available	no comparison	YES
Arsenic	1,330	1,330	70	YES	YES
Beryllium	0.56	0.56	not available	no comparison	YES
Cadmium	41	44	10	YES	YES
Copper	22,000	22,000	270	YES	YES
Lead	1,240	1,240	218	YES	YES
Mercury	430	430	0.71	YES	YES
Selenium	610	610	not available	no comparison	YES
Silver	2.8	7.2	3.7	YES	YES
Thallium	1.3	1.5	not available	no comparison	YES
Zinc	8,800	8,800	410	YES	YES
PCBs					
Aroclor-1248	1,600	1,600	0.18	YES	YES
Total PCBs	2,195	2,195	0.18	YES	YES
PESTICIDES					
4,4'-DDE	0.085	0.085	0.027	YES	YES
4,4'-DDD	0.032	0.032	0.02	YES	YES
Alpha-BHC	0.043	0.043	not available	no comparison	YES

[a] 95% UCLM concentration was calculated using one-half of the reported detection limit for non-detect results and assuming lognormally-distributed data.

[b] Based on Buchman (1999).

[c] COPCs are retained for Tier 2 evaluation if:
(1) maximum concentrations exceed ER-M values;
(2) there are no available Tier 1 Screening-Benchmarks; or
(3) the analyte is bioaccumulative.

Table 4-22
Initial Roster of Tier 2 COPCs
UC - Berkeley Richmond Field Station

TIER 2 COPC	UPLAND SOILS (0 - 6 feet)	TIDAL SALT MARSH SEDIMENT (0 - 1 foot)	TIDAL SALT MARSH SEDIMENT (1 - 3 feet)	SHALLOW BAY AND CHANNEL SEDIMENT (0 - 1 foot)	SHALLOW BAY AND CHANNEL SEDIMENT (1 - 3 feet)
INORGANICS					
Antimony	X	X	X	X	X
Arsenic	X	X	X	X	X
Beryllium		X		X	X
Cadmium	X	X	X	X	X
Chromium	X				
Copper	X	X	X	X	X
Lead	X	X	X	X	X
Mercury	X	X	X	X	X
Nickel	X	X		X	
Selenium	X	X	X	X	X
Silver	X	X	X	X	X
Thallium		X	X	X	X
Zinc	X	X	X	X	X
PCBS					
Aroclor-1016				X	
Aroclor-1242			X		
Aroclor-1248	X	X		X	X
Aroclor-1254	X	X		X	
Total PCBs		X	X	X	X
PESTICIDES					
4,4'-DDE					X
4,4'-DDD		X			X
4,4'-DDT		X			
Beta-BHC		X		X	
Alpha-BHC		X		X	X
Delta-BHC		X		X	
EXPLOSIVES					
HMX	X				

Table 4-23
Exposure Point Concentrations for Terrestrial Plants and Small Mammals in the Upland Habitat
UC - Berkeley Richmond Field Station

TIER 2 COPC	TERRESTRIAL PLANT UPTAKE FACTOR (kg soil dry weight/ kg plant tissue dry weight)	ESTIMATED COPC CONCENTRATION IN PLANT TISSUE (mg chemical/ kg plant tissue dry weight)	SMALL MAMMAL TRANSFER FACTOR (kg soil dry weight/ kg mammal tissue dry weight)	ESTIMATED COPC CONCENTRATION IN SMALL MAMMAL TISSUE (mg chemical/ kg mammal tissue dry weight)
INORGANICS				
Antimony	0.2 [a]	3.2	0.000001 [b]	0.000016
Arsenic	0.06 [a]	2.7	0.016 [b]	0.73
Cadmium	0.14 [a]	0.86	0.448 [b]	2.8
Chromium	0.0075 [a]	0.30	0.309 [b]	12
Copper	0.024 [a]	10	1.29 [b]	564
Lead	0.000013 [a]	0.0011	0.187 [b]	16
Mercury	0.002 [a]	0.15	0.024 [b]	1.8
Nickel	0.11 [a]	5.4	0.898 [b]	44
Selenium	0.006 [a]	0.016	0.155 [b]	0.41
Silver	0.4 [a]	0.36	0.00741 [b]	0.0067
Zinc	0.096 [a]	46	2.3 [b]	1,104
PCBs				
Aroclor-1248	0.0101 [c]	0.0089	0.040 [c]	0.0011
Aroclor-1254	0.0068 [c]	0.0056	0.079 [c]	0.0014
Aroclor-1260	0.0045 [c]	0.00028	0.16 [c]	0.00014
Total PCBs	0.0101 [c]	0.0089	0.16 [c]	0.003

[a] Research Triangle Institute, 1995.
[b] Sample *et al.*, 1998.
[c] Travis and Arms, 1988. Estimated tissue concentrations are based on the following octanol:water partition coefficients (K_{ow}):
Aroclor-1248 $K_{ow} = 6.2$
Aroclor-1254 $K_{ow} = 6.5$
Aroclor-1260 $K_{ow} = 6.8$

Table 4-25

Site-Specific Biota-Sediment Accumulation Factors[a]
UC - Berkeley Richmond Field Station

CRAB OR MUSSEL SAMPLE	LP1MA (mussel)	LP1MB (mussel)	SM103 (mussel)	SM104 (mussel)	SM109 (mussel)	AVERAGE BIOTA-SEDIMENT ACCUMULATION FACTOR FOR MUSSELS	LP2CO (crab)
CO-LOCATED SEDIMENT SAMPLE	LP1SA	LP1SB	SM-103-TOX/BIO	SM-104-BIO	SM-109-BIO		LP2SO
			(kg sediment dry weight/kg benthic organism tissue dry weight)				
INORGANICS							
Antimony	0.0769 [b]	0.08 [b]	na	na	na	0.078	0.143 [b]
Arsenic	0.49	0.33	na	na	na	0.41	0.39
Beryllium	0.0417 [b]	0.0377 [b]	na	na	na	0.04	0.0870 [b]
Cadmium	3.1	10.0	na	na	na	6.6	0.83
Chromium	0.033	0.029	na	na	na	0.031	0.042
Copper	0.26	0.33	na	na	na	0.3	2.75
Lead	0.032	0.037	na	na	na	0.035	0.0261
Mercury	0.74	0.75	na	na	na	0.74	0.72
Methylmercury	86.64	74.60	10 [e]	ND [d]	1.28 [e]	43.1	34.11
Nickel	0.166	0.121	na	na	na	0.14	0.122
Selenium	2.3 [c]	2.5 [c]	0.089	0.012 [b]	0.067	1.0	1.0 [d]
Silver	0.89	1.60	na	na	na	1.2	2.00
Thallium	0.29	0.125 [b]	na	na	na	0.21	0.118 [b]
Zinc	0.30	0.42	na	na	na	0.36	0.43
PCBs							
Aroclor-1016	ND [d]	ND [d]	ND [d]	ND [d]	ND [d]	not applicable	ND [d]
Aroclor-1221	ND [d]	ND [d]	ND [d]	ND [d]	ND [d]	not applicable	ND [d]
Aroclor-1232	ND [d]	ND [d]	ND [d]	ND [d]	ND [d]	not applicable	ND [d]
Aroclor-1242	ND [d]	ND [d]	12.56 [e]	4.20 [e]	20.09 [e]	12.28	ND [d]
Aroclor-1248	10.5	6.19	ND [d]	ND [d]	ND [d]	8.36	0.427
Aroclor-1254	ND [d]	ND [d]	0.9	0.02	2.99	1.31	ND [d]
Aroclor-1260	ND [d]	ND [d]	ND [d]	ND [d]	ND [d]	not applicable	ND [d]

[a] Biota sediment accumulation factors were calculated by dividing the analyte concentration in benthic organism tissue (mg/kg dry weight) by the analyte concentration in the co-located sediment sample (mg/kg dry weight).

[b] Represents the maximum biota sediment accumulation factor since the analyte was detected in the sediment but was not detected in the benthic organism tissue; the reporting limit of the benthic organism tissue sample was used as the concentration in the benthic organism.

[c] Half of the reporting limit for the sediment sample was used to calculate the biota sediment accumulation factor since the analyte was detected in the benthic organism tissue but not in the sediment.

[d] Analyte not detected in sediment OR benthic organism tissue sample. For selenium, the mussel-based BSAF used as crab-based BSAF for calculation purposes.

e Represents the maximum biota sediment accumulation factor since the analyte was not detected in the benthic organism tissue and the reporting limit of the tissue sample was used as the concentration in the benthic organism. Methyl mercury was not analyzed for in sediment at these locations, so the concentration of methyl mercury in sediment was estimated based on the total mercury concentration.

Table 4-28
Average Daily Dose for the California Ground Squirrel
Upland Habitat (0 to 6 feet below ground surface)
UC - Berkeley Richmond Field Station

TIER 2 COPC	COPC CONCENTRATIONS IN MEDIA		AVERAGE DAILY DOSE
	SOIL[a] (mg/kg dry weight)	TERRESTRIAL PLANT[b] (mg/kg dry weight)	(mg/kg-body weight/day)
INORGANICS			
Antimony	16	3.2	0.11
Arsenic	45	2.7	0.12
Cadmium	6.2	0.86	0.031
Chromium	40	0.30	0.039
Copper	437	10	0.64
Lead	88	0.0011	0.065
Mercury	75	0.15	0.06
Nickel	49	5.4	0.20
Selenium	2.6	0.016	0.0024
Silver	0.90	0.36	0.0117
Zinc	477	46	1.8
PCBs			
Aroclor-1248	0.88	0.0089	0.00092
Aroclor-1254	0.83	0.0056	0.00079
Aroclor-1260	0.061	0.00028	0.000053
Total PCBs	0.88	0.0089	0.00092
EXPLOSIVES			
HMX	0.37	not available	not applicable

[a] See Table 4-2.
[b] See Table 4-19.
[c] As described in Section 4.2.1.1.6:

$$ADD = \frac{IR_{food}\sum_{i=1}^{n_i}\left(C_{food_i} \times df_i\right) + \left(IR_{soil\ or\ sediment} \times C_{soil\ or\ sediment}\right) + \left(IR_{water} \times C_{water}\right)}{BW}$$

Using additional exposure-variable values below:

Description	Variable	Ground Squirrel
Body Weight	BW	0.5903 kg
Food Ingestion	IR_{food}	0.0181 kg dw/day
Concentration in "i"	$C_{food\ i}$	chemical-specific plant concentration
Dietary Fraction, "i"	df_i	100%
Soil or Sediment Ingestion	$IR_{soil\ or\ sediment}$	0.0004344 kg dw/day
Concentration in Soil	$C_{soil\ or\ sediment}$	chemical-specific 95% UCLM
Water Ingestion	IR_{water}	0
Concentration in Water	C_{water}	0

Table 4-29
Average Daily Dose for the Red-tailed Hawk
Upland Habitat (0 to 6 feet below ground surface)
UC - Berkeley Richmond Field Station

TIER 2 COPC	COPC CONCENTRATIONS IN MEDIA		AVERAGE DAILY DOSE
	SOIL[a] (mg/kg dry weight)	SMALL MAMMAL[b] (mg/kg dry weight)	(mg/kg-body weight/day)
INORGANICS			
Antimony	16	0.000016	0.031
Arsenic	45	0.73	0.16
Cadmium	6.2	2.8	0.28
Chromium	40	12	1.3
Copper	437	564	55
Lead	88	16	1.8
Mercury	75	1.8	0.32
Nickel	49	44	4
Selenium	2.6	0.41	0.04
Silver	0.90	0.0067	0.0024
Zinc	477	1,104	108
PCBs			
Aroclor-1248	0.88	0.0011	0.0018
Aroclor-1254	0.83	0.0014	0.0017
Aroclor-1260	0.061	0.00014	0.00013
Total PCBs	0.88	0.003	0.002
EXPLOSIVES			
HMX	0.37	not available	not applicable

[a] See Table 4-2.
[b] See Table 4-19.
[c] As described in Section 4.2.1.1.6:

$$ADD = \frac{IR_{food}\sum_{i=1}^{n_i}\left(C_{food_i} \times df_i\right) + \left(IR_{soil\ or\ sediment} \times C_{soil\ or\ sediment}\right) + \left(IR_{water} \times C_{water}\right)}{BW}$$

Using additional exposure-variable values below:

Description	Variable	Red-tailed Hawk
Body Weight	BW	1.126 kg
Food Ingestion	IR_{food}	0.109 kg dw/day
Concentration in "*i* th" Food-type	$C_{food\ i}$	chemical-specific small mammal concentratior
Dietary Fraction, "*i* th" Food-type	df_i	100%
Soil or Sediment Ingestion	$IR_{soil\ or\ sediment}$	0.00218 kg dw /day
Concentration in Soil or Sediment	$C_{soil\ or\ sediment}$	chemical-specific 95% UCLM
Water Ingestion	IR_{water}	0
Concentration in Water	C_{water}	0

Table 4-30
Average Daily Dose for the Salt Marsh Harvest Mouse
Tidal Salt Marsh Habitat (0 to 1 foot below ground surface)
UC - Berkeley Richmond Field Station

TIER 2 COPC	COPC CONCENTRATIONS IN MEDIA			AVERAGE DAILY DOSE (mg/kg-body weight/day)
	SEDIMENT[a] (mg/kg dry weight)	SURFACE WATER[b] (mg/L)	PICKLEWEED[c] (mg/kg dry weight)	
INORGANICS				
Antimony	20	not detected	3.3	1.0
Arsenic	1,012	1.6	22	13
Beryllium	0.64	0.0052	0.03 [e]	0.013
Cadmium	25	0.075	15	4.3
Copper	483	30	67	26
Lead	303	0.02	6.8	3.8
Mercury	19	0.00026	1.5 [e]	0.52
Nickel	111	1.2	5.0	2.3
Selenium	74	0.047	0.44 [e]	0.62
Silver	3.4	not detected	0.19 [e]	0.073
Thallium	2.2	0.022	0.9	0.26
Zinc	1,326	55	220	76
PCBs				
Aroclor-1248	1	0.00088	0.20 [e]	0.061
Aroclor-1254	0.50	not detected	0.10 [e]	0.03
Total PCBs	1.1	0.00088	0.22	0.067
PESTICIDES				
4,4'-DDD	0.0082	not detected	0.000095 [f]	0.000055
4,4'-DDT	0.52	0.0015	0.0034 [f]	0.0037
Beta-BHC	0.0068	0.00015	0.0017 [f]	0.000068
Alpha-BHC	0.3	0.0073	0.0046 [f]	0.0031
Delta-BHC	0.019	0.00039	0.00029 [f]	0.00019

[a] See Table 4-5.
[b] See Table 4-3.
[c] See Table 4-16.
[d] As described in Section 4.2.1.1.6:

$$ADD = \frac{IR_{food}\sum_{i=1}^{n}\left(C_{food_i} \times df_i\right) + \left(IR_{soil\ or\ sediment} \times C_{soil\ or\ sediment}\right) + \left(IR_{water} \times C_{water}\right)}{BW}$$

Using additional exposure-variable values below:

Description	Variable	Salt Marsh Harvest Mouse
Body Weight	BW	0.015 kg
Food Ingestion	IR_{food}	0.004 kg dw/day
Concentration in "i th" Food-type	$C_{food\ i}$	chemical-specific pickleweed concentration
Dietary Fraction, "i th" Food-type	df_i	100%
Soil or Sediment Ingestion	$IR_{soil\ or\ sediment}$	0.0001 kg dw/day
Concentration in Soil or Sediment	$C_{soil\ or\ sediment}$	chemical-specific 95% UCLM
Water Ingestion	IR_{water}	0.00226 L/day
Concentration in Water	C_{water}	chemical-specific 95% UCLM

[e] Value repesents the reporting limit for the plant tissue sample, as the chemical was not detected.
[f] Estimated chemical concentration in pickleweed, as the chemical was not analyzed-for in the plant tissue sample.

Table 4-31
Average Daily Dose for the California Clapper Rail
Tidal Salt Marsh Habitat (0 to 1 foot below ground surface)
UC - Berkeley Richmond Field Station

TIER 2 COPC	COPC CONCENTRATIONS IN MEDIA				AVERAGE DAILY DOSE
	SEDIMENT[a] (mg/kg dry weight)	SURFACE WATER[b] (mg/L)	MUSSELS[c] (mg/kg dry weight)	CRABS[c] (mg/kg dry weight)	(mg/kg-body weight/day)
INORGANICS					
Antimony	20	not detected	1.6 [e]	2.8 [e]	0.37
Arsenic	1,012	1.6	415	392	32
Cadmium	25	0.075	164	21	4.6
Copper	483	30	143	1,327	43
Lead	303	0.02	10	7.9	4.6
Mercury	19	0.00026	14	13	0.88
Nickel	111	1.2	16	14	2.3
Selenium	74	0.047	74	74 [g]	4.4
Silver	3.4	not detected	4.2	6.7	0.29
Thallium	2.2	0.022	0.46	0.26 [e]	0.048
Zinc	1,326	55	478	575	47
PCBs					
Aroclor-1248	1	0.00088	8.4	0.43	0.21
Aroclor-1254	0.50	not detected	0.65 [e]	0.21 [e]	0.027
Total PCBs	1.1	0.00088	9.2	0.47	0.23
PESTICIDES					
4,4'-DDD	0.0082	not detected	0.017 [f]	0.017 [f]	0.00087
4,4'-DDT	0.52	0.0015	1.1 [f]	1.1 [f]	0.055
Beta-BHC	0.0068	0.00015	0.0099 [f]	0.0099 [f]	0.00056
Alpha-BHC	0.3	0.0073	6 [f]	6 [f]	0.28
Delta-BHC	0.019	0.00039	0.44 [f]	0.44 [f]	0.02

[a] See Table 4-5.
[b] See Table 4-3.
[c] See Table 4-17.
[d] As described in Section 4.2.1.1.6:

$$ADD = \frac{IR_{food}\sum_{i=1}^{N}\left(C_{food_i} \times df_i\right) + \left(IR_{soil\ or\ sediment} \times C_{soil\ or\ sediment}\right) + \left(IR_{water} \times C_{water}\right)}{BW}$$

Using additional exposure-variable values below:

Description	Variable	Clapper Rail
Body Weight	BW	0.297 kg
Food Ingestion	IR_{food}	0.0135 kg dw/day
Concentration in "i th" Food-type	$C_{food\ i}$	chemical-specific concentration in crabs and mussels
Dietary Fraction, "i th" Food-type	df_i	50% crabs, 50% mussels
Soil or Sediment Ingestion	$IR_{soil\ or\ sediment}$	0.004104 kg dw/day
Concentration in Soil or Sediment	$C_{soil\ or\ sediment}$	chemical-specific 95% UCLM
Water Ingestion	IR_{water}	0.02616 L/day
Concentration in Water	C_{water}	chemical-specific 95% UCLM

[e] Value repesents the reporting limit for the benthic invertebrate tissue sample, as the chemical was not detected.
[f] Estimated chemical concentration in the benthic invertebrate, as the chemical was not analyzed-for in the benthic invertebrate tissue sample.
[g] Selenium not detected in crab tissue, so BSAF for mussels was used to calculate dose.

Table 4-32
Average Daily Dose for the Salt Marsh Harvest Mouse
Tidal Salt Marsh Habitat (1 to 3 feet below ground surface)
UC - Berkeley Richmond Field Station

TIER 2 COPC	COPC CONCENTRATIONS IN MEDIA[a]			
	SEDIMENT[b] (mg/kg dry weight)	SURFACE WATER[b] (mg/L)	PICKLEWEED[c] (mg/kg dry weight)	AVERAGE DAILY DOSE[d] (mg/kg-body weight/day)
INORGANICS				
Antimony	5.1	not detected	0.85	0.26
Arsenic	895	1.6	20	11
Cadmium	50	0.075	31	8.5
Copper	8,090	30	1,119	357
Lead	345	0.02	7.7	4.4
Mercury	53	0.00026	4.24 [e]	1.5
Selenium	78	0.047	0.47 [e]	0.65
Silver	5.4	not detected	0.31 [e]	0.12
Thallium	1.9	0.022	0.78	0.22
Zinc	5,290	55	879	278
PCBs				
Aroclor-1242	0.089	not detected	0.018 [e]	0.0054
Total PCBs	0.089	not detected	0.018	0.0054

[a] See Table 4-6.
[b] See Table 4-3.
[c] See Table 4-16.
[d] As described in Section 4.2.1.1.6:

$$ADD = \frac{IR_{food}\sum_{i=1}^{m}\left(C_{food\,i} \times df_i\right) + \left(IR_{soil\ or\ sediment} \times C_{soil\ or\ sediment}\right) + \left(IR_{water} \times C_{water}\right)}{BW}$$

Using additional exposure-variable values below:

Description	Variable	Salt Marsh Harvest Mouse
Body Weight	BW	0.015 kg
Food Ingestion	IR_{food}	0.004 kg dw/day
Concentration in "*i* th" Food-type	$C_{food\,i}$	chemical-specific pickleweed concentration
Dietary Fraction, "*i* th" Food-type	df_i	100%
Soil or Sediment Ingestion	$IR_{soil\ or\ sediment}$	0.0001 kg dw/day
Concentration in Soil or Sediment	$C_{soil\ or\ sediment}$	chemical-specific 95% UCLM
Water Ingestion	IR_{water}	0.00226 L/day
Concentration in Water	C_{water}	chemical-specific 95% UCLM

[e] Value repesents the reporting limit for the plant tissue sample, as the chemical was not detected.

Table 4-33
Average Daily Dose for the California Clapper Rail
Tidal Salt Marsh Habitat (1 to 3 feet below ground surface)
UC - Berkeley Richmond Field Station

TIER 2 COPC	COPC CONCENTRATIONS IN MEDIA				AVERAGE DAILY DOSE
	SEDIMENT[a] (mg/kg dry weight)	SURFACE WATER[b] (mg/L)	MUSSELS[c] (mg/kg dry weight)	CRABS[c] (mg/kg dry weight)	(mg/kg body weight/day)
INORGANICS					
Antimony	5.1	not detected	0.40 [e]	0.73 [e]	0.096
Arsenic	895	1.6	367	347	29
Cadmium	50	0.075	328	41	9.1
Copper	8,090	30	2,398	22,216	674
Lead	345	0.02	12	9.0	5.2
Mercury	53	0.00026	39	38	2.5
Selenium	78	0.047	78	78 [f]	4.6
Silver	5.4	not detected	6.7	11	0.47
Thallium	1.9	0.022	0.40	0.22 [e]	0.042
Zinc	5,290	55	1,909	2,294	173
PCBs					
Aroclor-1242	0.089	not detected	1.1 [e]	0.038 [e]	0.027
Total PCBs	0.089	not detected	1.1	0.038	0.027

[a] See Table 4-6.
[b] See Table 4-3.
[c] See Table 4-17.
[d] As described in Section 4.2.1.1.6:

$$ADD = \frac{IR_{food}\sum_{i=1}^{n_i}\left(C_{food\,i} \times df_i\right) + \left(IR_{soil\ or\ sediment} \times C_{soil\ or\ sediment}\right) + \left(IR_{water} \times C_{water}\right)}{BW}$$

Using additional exposure-variable values below:

Description	Variable	Clapper Rail
Body Weight	BW	0.297 kg
Food Ingestion	IR_{food}	0.0135 kg dw/day
Concentration in "*i* th" Food-type	$C_{food\,i}$	chemical-specific concentration in crabs and mussels
Dietary Fraction, "*i* th" Food-type	df_i	50% crabs, 50% mussels
Soil or Sediment Ingestion	$IR_{soil\ or\ sediment}$	0.004104 kg dw/day
Concentration in Soil or Sediment	$C_{soil\ or\ sediment}$	chemical-specific 95% UCLM
Water Ingestion	IR_{water}	0.02616 L/day
Concentration in Water	C_{water}	chemical-specific 95% UCLM

[e] Value repesents the reporting limit for the benthic invertebrate tissue sample, as the chemical was not detected.

[f] Selenium not detected in crab tissue, so BSAF for mussels was used to calculate dose.

Table 4-34
Average Daily Dose for the California Clapper Rail
Shallow Bay and Channel Habitat (0 to 1 foot below ground surface)
UC - Berkeley Richmond Field Station

TIER 2 COPC	COPC CONCENTRATIONS IN MEDIA				AVERAGE DAILY DOSE (mg/kg-body weight/day)
	SEDIMENT[a] (mg/kg dry weight)	SURFACE WATER (mg/L)	MUSSELS[b] (mg/kg dry weight)	CRABS[b] (mg/kg dry weight)	
INORGANICS					
Antimony	0.26	not detected	0.02	0.037	0.0049
Arsenic	305	0.23	125	118	9.8
Beryllium	0.47	not detected	0.018 [e]	0.04	0.0078
Cadmium	6.5	0.094	43	5.4	1.19
Copper	258	0.21	77	709	21
Lead	169	0.016	5.8	4.4	2.6
Mercury	3.8	0.00045	2.8	2.8	0.18
Nickel	73	0.45	10	8.9	1.49
Selenium	28	0.0082	28	28 [e]	1.67
Silver	1.8	not detected	2.3	3.7	0.16
Thallium	1.25	0.012	0.26	0.15 [e]	0.028
Zinc	493	6.6	178	214	16
PCBs					
Aroclor-1016	1,200	not detected	14,740	513	363
Aroclor-1248	23	not detected	192	9.8	4.9
Aroclor-1254	400	not detected	523	171	21
Total PCBs	1,745	not detected	14,587	746	373
PESTICIDES					
Beta-BHC	0.0054	not detected	0.0079 [f]	0.0079 [f]	0.00043
Alpha-BHC	0.017	0.0019	0.34 [f]	0.34 [f]	0.016
Delta-BHC	0.028	0.0024	0.64 [f]	0.64 [f]	0.03

[a] See Table 4-7.
[b] See Table 4-4.
[c] See Table 4-17.
[d] As described in Section 4.2.1.1.6:

$$ADD = \frac{IR_{food}\sum_{i=1}^{n}\left(C_{food_i} \times df_i\right) + \left(IR_{soil\ or\ sediment} \times C_{soil\ or\ sediment}\right) + \left(IR_{water} \times C_{water}\right)}{BW}$$

Using additional exposure-variable values below:

Description	Variable	Clapper Rail
Body Weight	BW	0.297 kg
Food Ingestion	IR_{food}	0.0135 kg dw/day
Concentration in "ith" Food-type	$C_{food\,i}$	chemical-specific concentration in crabs and mussels
Dietary Fraction, "ith" Food-type	df_i	50% crabs, 50% mussels
Soil or Sediment Ingestion	$IR_{soil\ or\ sediment}$	0.004104 kg dw/day
Concentration in Soil or Sediment	$C_{soil\ or\ sediment}$	chemical-specific 95% UCLM
Water Ingestion	IR_{water}	0.02616 L/day
Concentration in Water	C_{water}	chemical-specific 95% UCLM

[e] Value repesents the reporting limit for the benthic invertebrate tissue sample, as the chemical was not detected.
[f] Estimated chemical concentration in the benthic invertebrate, as the chemical was not analyzed-for in the benthic invertebrate tissue sample.

Table 4-35
Average Daily Dose for the California Clapper Rail
Shallow Bay and Channel Habitat (1 to 3 feet below ground surface)
UC - Berkeley Richmond Field Station

TIER 2 COPC	COPC CONCENTRATIONS IN MEDIA				AVERAGE DAILY DOSE[d] (mg/kg-body weight/day)
	SEDIMENT[a] (mg/kg dry weight)	SURFACE WATER[b] (mg/L)	MUSSELS[c] (mg/kg dry weight)	CRABS[c] (mg/kg dry weight)	
INORGANICS					
Antimony	29	not detected	2.3 [e]	4.1 [e]	0.5
Arsenic	1,330	0.23	545	516	43
Beryllium	0.56	not detected	0.022 [e]	0.049	0.0094
Cadmium	41	0.094	267	34	7.4
Copper	22,000	0.21	6,521	60,415	1,825
Lead	1,240	0.016	43	32	19
Mercury	430	0.00045	319	311	20
Selenium	610	0.0082	611	611 [g]	36
Silver	2.8	not detected	3.5	5.6	0.24
Thallium	1.3	0.012	0.3	0.2 [e]	0.028
Zinc	8,800	6.6	3,176	3,816	281
PCBs					
Aroclor-1248	1,600	not detected	13,375	684	342
Total PCBs	2,195	not detected	18,349	938	469
PESTICIDES					
4,4'-DDE	0.085	not detected	0.17	0.17	0.009
4,4'-DDD	0.032	not detected	0.065	0.065	0.003
Alpha-BHC	0.043	0.0019	0.86	0.86	0.04

[a] See Table 4-8.
[b] See Table 4-4.
[c] See Table 4-17.
[d] As described in Section 4.2.1.1.6:

$$ADD = \frac{IR_{food}\sum_{i=1}^{N_i}\left(C_{food_i} \times df_i\right) + \left(IR_{soil\ or\ sediment} \times C_{soil\ or\ sediment}\right) + \left(IR_{water} \times C_{water}\right)}{BW}$$

Using additional exposure-variable values below:

Description	Variable	Clapper Rail
Body Weight	BW	0.297 kg
Food Ingestion	IR_{food}	0.0135 kg dw/day
Concentration in "i th" Food-type	$C_{food\ i}$	chemical-specific concentration in crabs and mussels
Dietary Fraction, "i th" Food-type	df_i	50% crabs, 50% mussels
Soil or Sediment Ingestion	$IR_{soil\ or\ sediment}$	0.004104 kg dw/day
Concentration in Soil or Sediment	$C_{soil\ or\ sediment}$	chemical-specific 95% UCLM
Water Ingestion	IR_{water}	0.02616 L/day
Concentration in Water	C_{water}	chemical-specific 95% UCLM

[e] Value repesents the reporting limit for the benthic invertebrate tissue sample, as the chemical was not detected.
[f] Estimated chemical concentration in the benthic invertebrate, as the chemical was not analyzed-for in the benthic invertebrate tissue sample.
[g] Selenium not detected in crab tissue, so BSAF for mussels was used to calculate dose.

Table 4-38
Hazard Quotients for the California Ground Squirrel and Red-tailed Hawk
Upland Habitat (0 to 6 feet below ground surface)
UC - Berkeley Richmond Field Station

TIER 2 COPC	CALIFORNIA GROUND SQUIRREL		RED-TAILED HAWK	
	HAZARD QUOTIENT BASED ON TRV NOAEL	HAZARD QUOTIENT BASED ON TRV EFFECT	HAZARD QUOTIENT BASED ON TRV NOAEL	HAZARD QUOTIENT BASED ON TRV EFFECT
INORGANICS				
Antimony	0.81	0.081	0.00097	0.00097
Arsenic	0.36	0.025	0.029	0.0072
Cadmium	0.52	0.012	3.5	0.027
Chromium	0.0059	0.0015	1.3	0.26
Copper	0.24	0.001	24	1.06
Lead	43	0.00027	126	0.20
Mercury	0.24	0.015	8.2	1.8
Nickel	1.5	0.0064	3.2	0.079
Selenium	0.05	0.002	0.19	0.048
Silver	0.0008	0.00013	0.000014	0.0000048
Zinc	0.18	0.0043	6.3	0.63
PCBs				
Aroclor-1248	0.0026	0.00072	0.02	0.0014
Aroclor-1254	0.0022	0.00061	0.019	0.0014
Aroclor-1260	0.00015	0.000042	0.0015	0.0001
Total PCBs	0.0026	0.00072	0.022	0.0016
EXPLOSIVES				
HMX	not available	not available	not available	not available
HAZARD INDICES =	**47**	**0.15**	**172**	**4.1**

Table 4-39
Hazard Quotients for the Salt Marsh Harvest Mouse and California Clapper Rail
Tidal Salt Marsh Habitat (0 to 1 foot below ground surface)
UC - Berkeley Richmond Field Station

TIER 2 COPC	SALT MARSH HARVEST MOUSE		CALIFORNIA CLAPPER RAIL	
	HAZARD QUOTIENT BASED ON TRV NOAEL	HAZARD QUOTIENT BASED ON TRV EFFECT	HAZARD QUOTIENT BASED ON TRV NOAEL	HAZARD QUOTIENT BASED ON TRV EFFECT
INORGANICS				
Antimony	7.5	0.75	0.012	0.012
Arsenic	40	2.8	5.9	1.48
Beryllium	0.01	0.01	not available	not available
Cadmium	71	1.61	57	0.44
Copper	10	0.04	19	0.82
Lead	2,560	0.016	329	0.53
Mercury	2.1	0.13	22	4.9
Nickel	17	0.071	1.68	0.042
Selenium	12	0.51	19	4.7
Silver	0.0049	0.00082	0.0018	0.00059
Thallium	0.54	0.18	0.2	0.2
Zinc	7.9	0.18	2.7	0.27
PCBs				
Aroclor-1248	0.17	0.047	2.4	0.17
Aroclor-1254	0.084	0.024	0.30	0.021
Total PCBs	0.185	0.052	2.61	0.185
PESTICIDES				
4,4'-DDD	0.000068	0.0000034	0.097	0.00058
4,4'-DDT	0.0046	0.00023	6.2	0.037
Beta-BHC	0.0014	0.000018	0.001	0.00025
Alpha-BHC	0.062	0.00083	0.5	0.12
Delta-BHC	0.0037	0.000049	0.036	0.009
HAZARD INDICES =	**2,729**	**6.4**	**469**	**14**

Table 4-40
Hazard Quotients for the Salt Marsh Harvest Mouse and California Clapper Rail
Tidal Salt Marsh Habitat (1 to 3 feet below ground surface)
UC - Berkeley Richmond Field Station

TIER 2 COPC	SALT MARSH HARVEST MOUSE		CALIFORNIA CLAPPER RAIL	
	HAZARD QUOTIENT BASED ON TRV NOAEL	HAZARD QUOTIENT BASED ON TRV EFFECT	HAZARD QUOTIENT BASED ON TRV NOAEL	HAZARD QUOTIENT BASED ON TRV EFFECT
INORGANICS				
Antimony	1.9	0.19	0.003	0.003
Arsenic	36	2.4	5.2	1.3
Cadmium	142	3.2	114	0.87
Copper	134	0.56	293	13
Lead	2,911	0.018	375	0.6
Mercury	5.9	0.37	64	14
Selenium	13	0.54	20	5.0
Silver	0.0079	0.0013	0.0029	0.00095
Thallium	0.5	0.16	0.18	0.18
Zinc	29	0.68	10	1.0
PCBs				
Aroclor-1242	0.015	0.0042	0.3	0.021
Total PCBs	0.015	0.0042	0.3	0.021
HAZARD INDICES =	**3,272**	**8.2**	**881**	**36**

Table 4-41
Hazard Quotients for Fish and Pelagic Invertebrates Exposed to Surface- and Ground- Water in the Tidal Salt Marsh Habitat
UC - Berkeley Richmond Field Station

Tier 2 COPC	Lower of 95% UCLM and Maximum Concentration[a] (mg/L)	TRV (mg/L)	Hazard Quotient
INORGANICS			
Arsenic	1.57	0.99	1.6
Beryllium	0.0052	none available	not calculated
Cadmium	0.075	0.86	0.09
Chromium	0.61	10.3	0.06
Copper	30	0.0055	5,455
Lead	0.02	0.6	0.033
Mercury	0.00026	0.0062	0.04
Nickel	1.2	0.556	2.2
Selenium	0.047	10	0.005
Thallium	0.022	0.086	0.26
Zinc	55	0.12	458
pH	2.2	5.5	400 [b]
PCBs			
Aroclor-1248	0.00088	0.00032	2.8
Total PCBs	0.00088	0.00032	2.8
PESTICIDES			
alpha-BHC	0.0073	none available	not calculated
beta-BHC	0.00015	none available	not calculated
delta-BHC	0.00039	none available	not calculated
gamma-BHC	0.00019	0.0075	0.03
Sum of BHC isomers	0.00784	0.0075	1.0
DDT	0.0015	0.0004	3.8
Endrin	0.0018	0.0000325	55.4

[a] From Table 4-3.

[b] HQ was calculated as (Site H^+ Concentration) / (H^+ TRV), where the H^+ concentration = $10^{(-pH)}$.

Table 4-46
Hazard Quotients for the California Clapper Rail
Shallow Bay and Channel Habitat (0 to 1 foot below ground surface)
UC - Berkeley Richmond Field Station

TIER 2 COPC	CALIFORNIA CLAPPER RAIL	
	HAZARD QUOTIENT BASED ON TRV NOAEL	HAZARD QUOTIENT BASED ON TRV EFFECT
INORGANICS		
Antimony	0.00015	0.00015
Arsenic	1.77	0.44
Beryllium	not available	not available
Cadmium	15	0.11
Copper	9.3	0.41
Lead	184	0.29
Mercury	4.6	1.0
Nickel	1.08	0.027
Selenium	7.3	1.8
Silver	0.00097	0.00032
Thallium	0.12	0.12
Zinc	0.95	0.095
PCBs		
Aroclor-1016	4,036	286
Aroclor-1248	55	3.9
Aroclor-1254	237	17
Total PCBs	4,140	293
PESTICIDES		
Beta-BHC	0.00077	0.00019
Alpha-BHC	0.028	0.0071
Delta-BHC	0.053	0.013
HAZARD INDICES =	**8,691**	**604**

Table 4-47
Hazard Quotients for the California Clapper Rail
Shallow Bay and Channel Habitat (1 to 3 feet below ground surface)
UC - Berkeley Richmond Field Station

TIER 2 COPC	CALIFORNIA CLAPPER RAIL	
	HAZARD QUOTIENT BASED ON TRV NOAEL	HAZARD QUOTIENT BASED ON TRV LOAEL
INORGANICS		
Antimony	0.017	0.017
Arsenic	7.7	1.9
Beryllium	not available	not available
Cadmium	92	0.71
Copper	794	35
Lead	1,346	2.2
Mercury	520	113
Selenium	157	39
Silver	0.0015	0.00049
Thallium	0.12	0.12
Zinc	16	1.6
PCBs		
Aroclor-1248	3,796	269
Total PCBs	5,207	369
PESTICIDES		
4,4'-DDE	0.015	0.015
4,4'-DDD	0.38	0.0023
Alpha-BHC	0.071	0.018
HAZARD INDICES =	**11,937**	**831**

Table 4-53
Ecological Site-Specific Target Levels for the Tidal Salt Marsh Habitat
UC - Berkeley Richmond Field Station

TIER 2 COPC	SALT MARSH HARVEST MOUSE			CALIFORNIA CLAPPER RAIL			
	PLANT UPTAKE FACTOR FOR PICKLEWEED[a] (kg soil dry weight/ kg plant tissue dry weight)	TRV_{EFFECT} FOR MAMMALS[b] (mg/kg - body weight/day)	$E\text{-}SSTL_{SEDIMENT}$[c] FOR THE MOUSE (mg/kg dry weight)	BIOTA-SEDIMENT ACCUMULATION FACTOR FOR MUSSELS[d] (kg soil dry weight/ kg mammal tissue dry weight)	BIOTA-SEDIMENT ACCUMULATION FACTOR FOR CRABS[d] (kg soil dry weight/ kg mammal tissue dry weight)	TRV_{EFFECT} FOR BIRDS[b] (mg/kg - body weight/day)	$E\text{-}SSTL_{SEDIMENT}$[c] FOR THE RAIL (mg/kg dry weight)
INORGANICS							
Antimony	0.167	1.351	26	0.078	0.143	32[e]	1,698
Arsenic	0.0221	4.7	355	0.41	0.39	22.01	685
Beryllium	0.0476	not available	68	0.04	0.0870	not available	not available
Cadmium	0.611	2.64	15	6.6	0.83	10.43	57
Copper	0.138	631.58	14,399	0.3	2.75	52.26	598
Lead	0.0224	240.64	19,026	0.035	0.0261	8.75	576
Mercury	0.080	4	143	0.74	0.72	0.18	3.8
Nickel	0.0449	31.6	1,685	0.14	0.122	55.16	2,773
Selenium	0.006	1.21	145	1.0	1.0	0.93	16
Zinc	0.166	411.43	7,905	0.36	0.43	172	5,244
PCBs							
Aroclor-1248	0.202	1.28	21	8.36	0.427	1.27	5.9
Total PCBs	0.202	1.28	21	8.36	0.427	1.27	5.9
PESTICIDES							
4,4'-DDT	0.0065[f]	16	2,400	2.03[g]	2.03[g]	1.5	14
Alpha-BHC	0.015[f]	3.75	562	6.01[h]	6.01[h]	2.25	2.4
Delta-BHC	0.015[f]	3.75	562	0.44[h]	0.44[h]	2.25	2.1

[a] See Table 4-41.

[b] See Table 4-32.

[c] As described in Section 4.3.3.1:

$$E-SSTL = \frac{TRV_{effect} \times BW}{IR_{food}\left(\left[AF_1 \times df_1\right]+\left[AF_2 \times df_2\right]\right)+IR_{soil\ or\ sediment}+\left(IR_{water}+C_{water}\right)}$$

Using additional exposure-variable values below:

Description	Variable	Salt Marsh Harvest Mouse	Clapper Rail
Body Weight	BW	0.015 kg	0.297 kg
Food Ingestion	IR_{food}	0.004 kg dw/day	0.0135 kg dw/day
Accumulation Factor Food-type 1	AF_1	chemical-specific PUF	chemical-specific BSAF
Dietary Fraction, Food-type 1	df_1	100%	50%
Accumulation Factor Food-type 2	AF_2	none	chemical-specific BSAF
Dietary Fraction, Food-type 2	df_2	none	50%
Soil or Sediment Ingestion	$IR_{soil\ or\ sediment}$	0.0001 kg dw/day	0.004104 kg dw/day
Water Ingestion	IR_{water}	0.00226 L/day	0.02616 L/day
Concentration in Water	C_{water}	Table 2-3	Table 2-3

[d] See Table 4-27.

[e] TRV_{Effect} not available so TRV_{NOAEL} used to calculate E-SSTL.

[f] Kow-based equation provided by Travis and Arms (1988) used to calculate sediment to plant uptake factors for pesticides.

[g] Mean of median BSAFs reported for inverts exposed to pesticides in sediments (Tracey and Hansen 1996).

[h] No invertebrate-based BSAF available, so chemical-specific BCF and FCM (Sample et al. 1996) multiplied by estimated concentration in surface water.
Alpha-BHC --> BCF = 17,636 and FCM = 14
Delta-BHC --> BCF = 17,636 and FCM = 14

Table 4-54
Ecological Site-Specific Target Levels for the Shallow Bay and Channel Habitat
UC - Berkeley Richmond Field Station

TIER 2 COPC	CALIFORNIA CLAPPER RAIL			
	BIOTA-SEDIMENT ACCUMULATION FACTOR FOR MUSSELS (kg soil dry weight/kg mammal tissue dry weight)	BIOTA-SEDIMENT ACCUMULATION FACTOR FOR CRABS (kg soil dry weight/kg mammal tissue dry weight)	TRV_{EFFECT} FOR BIRDS (mg/kg - body weight/day)	E-SSTL SEDIMENT FOR THE RAIL (mg/kg dry weight)
INORGANICS				
Arsenic	0.41	0.39	22.01	688
Beryllium	0.04	0.0870	not available	not available
Cadmium	6.6	0.83	10.43	57
Copper	0.3	2.75	52.26	630
Lead	0.035	0.0261	8.75	576
Mercury	0.74	0.72	0.18	3.8
Nickel	0.14	0.122	55.16	2,778
Selenium	1.0	1.0	0.93	16
Zinc	0.36	0.43	172	5,378
PCBs				
Aroclor-1016	12.3	0.427	1.27	4.2
Aroclor-1248	8.36	0.427	1.27	5.9
Aroclor-1254	1.31	0.427	1.27	24
Total PCBs	8.36	0.427	1.27	5.9
PESTICIDES				
Alpha-BHC	49[c]	49[c]	2.25	2.4
Delta-BHC	49[c]	49[c]	2.25	2.1

[a] See Table 4-42.
[b] See Table 4-32.
[c] As described in Section 4.3.3.1:

$$E-SSTL = \frac{TRV_{Effect} \times BW}{IR_{food}([AF_1 \times df_1]+[AF_2 \times df_2])+IR_{soil\,or\,sediment}+(IR_{water}+C_{water})}$$

Using additional exposure-variable values below:

Description	Clapper Rail
Body Weight	0.297 kg
Food Ingestion	0.0135 kg dw/day
Accumulation Factor Food-type 1	chemical-specific BSAF
Dietary Fraction, Food-type 1	50%
Accumulation Factor Food-type 2	chemical-specific BSAF
Dietary Fraction, Food-type 2	50%
Soil or Sediment Ingestion	0.004104 kg dw/day
Water Ingestion	0.02616 L/day
Concentration in Water	Table 2-4

[d] TRV_{Effect} not available so TRV_{NOAEL} used to calculate E-SSTL.

[e] No invertebrate-based BSAF available, so chemical-specific BCF and FCM (Sample et al. 1996) multilplied by estimated concentration in surface water
Alpha-BHC –> BCF = 17,636 and FCM = 14
Delta-BHC –> BCF = 17,636 and FCM = 14

Table 4-56
Tier 2 Evaluation of COPCs in Sediment (0 to 1 foot below ground surface) of the Tidal Salt Marsh Habitat
UC - Berkeley Richmond Field Station

TIER 2 COPC	TIER 2 EVALUATION					
	LOWER OF MAX AND 95% UCLM CONCENTRATION[a] (mg/kg dry weight)	E-SSTL$_{SEDIMENT}$ FOR SALT MARSH HARVEST MOUSE[b] (mg/kg dry weight)	DOES 95% UCLM CONCENTRATION EXCEED THE MOUSE E-SSTL$_{SEDIMENT}$?	E-SSTL$_{SEDIMENT}$ FOR CALIFORNIA CLAPPER RAIL[b] (mg/kg dry weight)	DOES 95% UCLM CONCENTRATION EXCEED THE RAIL E-SSTL$_{SEDIMENT}$?	RETAIN FOR FURTHER ANALYSIS?[c]
INORGANICS						
Antimony	20	26	NO	1,698	NO	NO
Arsenic	1,012	355	YES	685	YES	YES
Beryllium	0.64	68	NO	not available	no comparison	YES
Cadmium	25	15	YES	57	NO	YES
Copper	483	14,399	NO	598	NO	NO
Lead	303	19,026	NO	576	NO	NO
Mercury	19	143	NO	3.8	YES	YES
Nickel	111	1,685	NO	2,773	NO	NO
Selenium	74	145	NO	16	YES	YES
Zinc	1,326	7,905	NO	5,244	NO	NO
PCBs						
Aroclor-1248	1	21	NO	5.9	NO	NO
Total PCBs	1.1	21	NO	5.9	NO	NO
PESTICIDES						
4,4'-DDT	0.52	2,400	NO	14	NO	NO

[a] 95% UCLM concentration was calculated using one-half of the reported detection limit for non-detect results and assuming lognormally-distributed data.

[b] COPCs for which the hazard quotient is below or equal to 1 do not require an ecological site-specific target level (E-SSTL).

[c] COPCs are retained for further analysis if the 95% UCLM concentration exceeds the E-SSTL$_{SEDIMENT}$ for the Salt Marsh Harvest Mouse OR California Clapper Rail.

Table 4-58
Tier 2 Evaluation of COPCs in Sediment (0 to 1 foot below ground surface) of the Shallow Bay and Channel Habitat
UC - Berkeley Richmond Field Station

TIER 2 COPC	TIER 2 EVALUATION			
	95% UCLM CONCENTRATION IN SEDIMENT[a] (mg/kg dry weight)	E-SSTL$_{SEDIMENT}$ FOR CALIFORNIA CLAPPER RAIL[b] (mg/kg dry weight)	DOES 95% UCLM CONCENTRATION EXCEED THE RAIL E-SSTL$_{SEDIMENT}$?	RETAIN FOR FURTHER ANALYSIS?
INORGANICS				
Arsenic	305	688	NO	NO
Beryllium	0.47	not available	no comparison	YES
Cadmium	6.5	57	NO	NO
Copper	258	630	NO	NO
Lead	169	576	NO	NO
Mercury	3.8	3.8	NO	NO
Nickel	73	2,778	NO	NO
Selenium	28	16	YES	YES
PCBs				
Aroclor-1016	1,200	4	YES	YES
Aroclor-1248	23	5.9	YES	YES
Aroclor-1254	400	24	YES	YES
Total PCBs	1,745	5.9	YES	YES

[a] 95% UCLM concentration was calculated using one-half of the reported detection limit for non-detect results and assuming lognormally-distributed data.

[b] COPCs for which the hazard quotient is below or equal to 1 do not require an ecological site-specific target level (E-SSTL).

[c] COPCs are retained for further analysis if the 95% UCLM concentration exceeds the E-SSTL$_{SEDIMENT}$ for the California Clapper Rail.

Table 4-59
Tier 2 Evaluation of COPCs in Sediment (1 to 3 feet below ground surface) of the Shallow Bay and Channel Habitat
UC - Berkeley Richmond Field Station

TIER 2 COPC	TIER 2 EVALUATION			
	95% UCLM CONCENTRATION IN SEDIMENT[a] (mg/kg dry weight)	E-SSTL$_{SEDIMENT}$ FOR CALIFORNIA CLAPPER RAIL[b] (mg/kg dry weight)	DOES 95% UCLM CONCENTRATION EXCEED THE RAIL E-SSTL$_{SEDIMENT}$?	RETAIN FOR FURTHER ANALYSIS[c]
INORGANICS				
Arsenic	1,330	688	YES	YES
Beryllium	0.56	not available	no comparison	YES
Cadmium	41	57	NO	NO
Copper	22,000	630	YES	YES
Lead	1,240	576	YES	YES
Mercury	430	3.8	YES	YES
Selenium	610	16	YES	YES
Zinc	8,800	5,378	YES	YES
PCBs				
Aroclor-1248	1,600	5.9	YES	YES
Total PCBs	2,195	5.9	YES	YES

[a] 95% UCLM concentration was calculated using one-half of the reported detection limit for non-detect results and assuming lognormally-distributed data.

[b] COPCs for which the hazard quotient is below or equal to 1 do not require an ecological site-specific target level (E-SSTL).

[c] COPCs are retained for further analysis if the 95% UCLM concentration exceeds the E-SSTL$_{SEDIMENT}$ for the California Clapper Rail.

FIGURES

HUMAN HEALTH RISK ASSESSMENT

ECOLOGICAL RISK ASSESSMENT

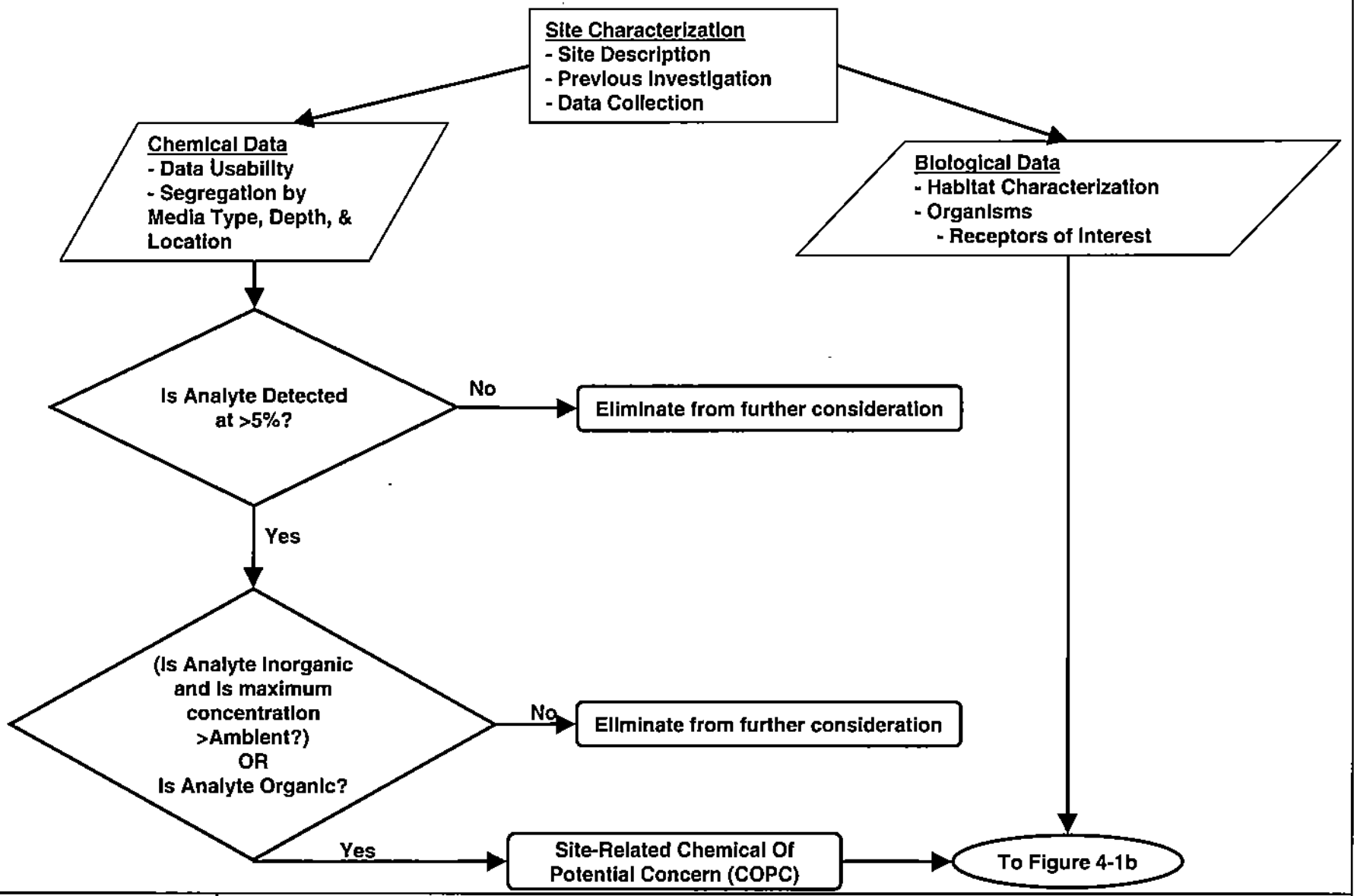

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Figure 4-1a
Problem Formulation for Ecological Risk Assessment.
University of California, Berkeley, Richmond Field Station

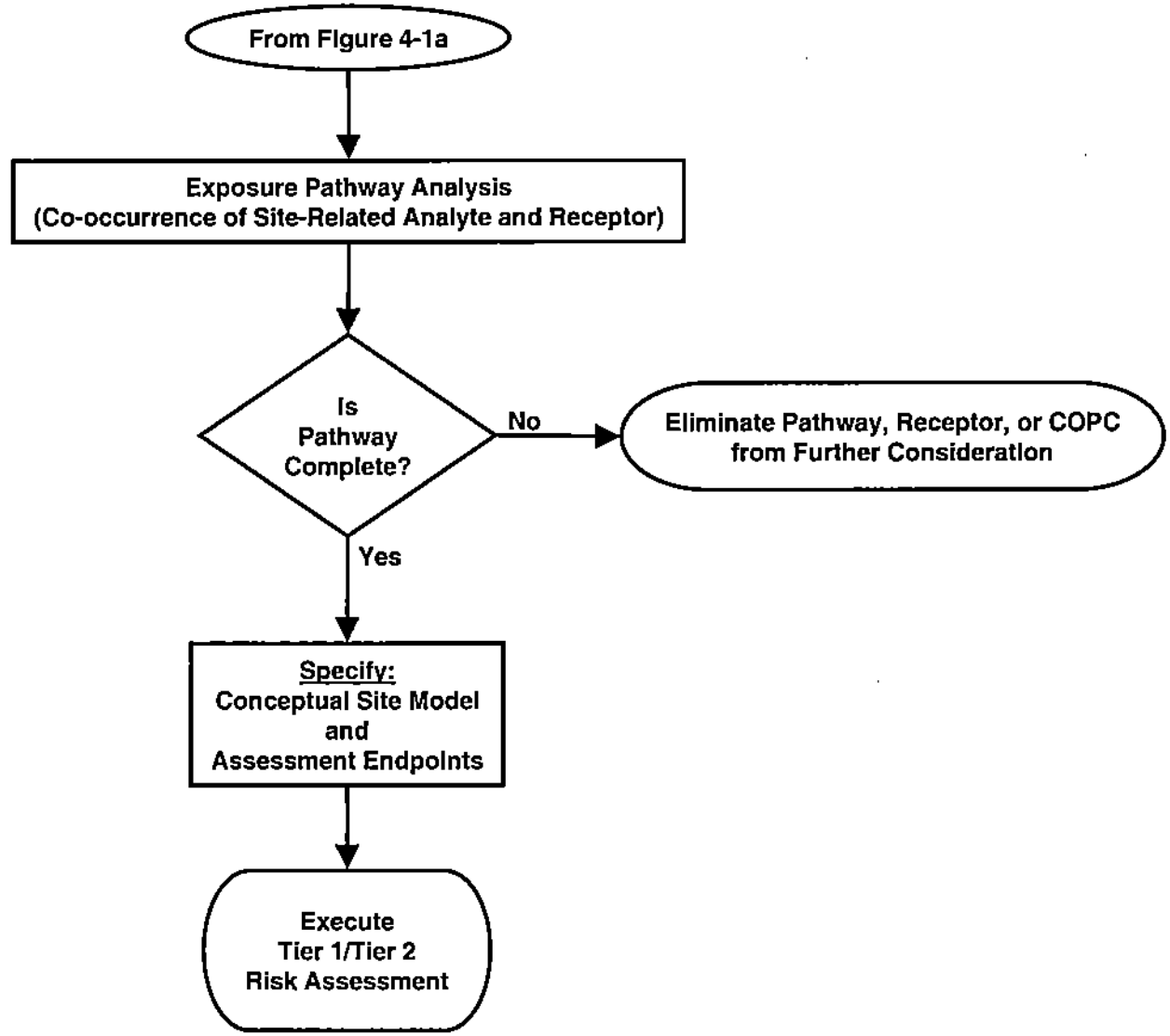

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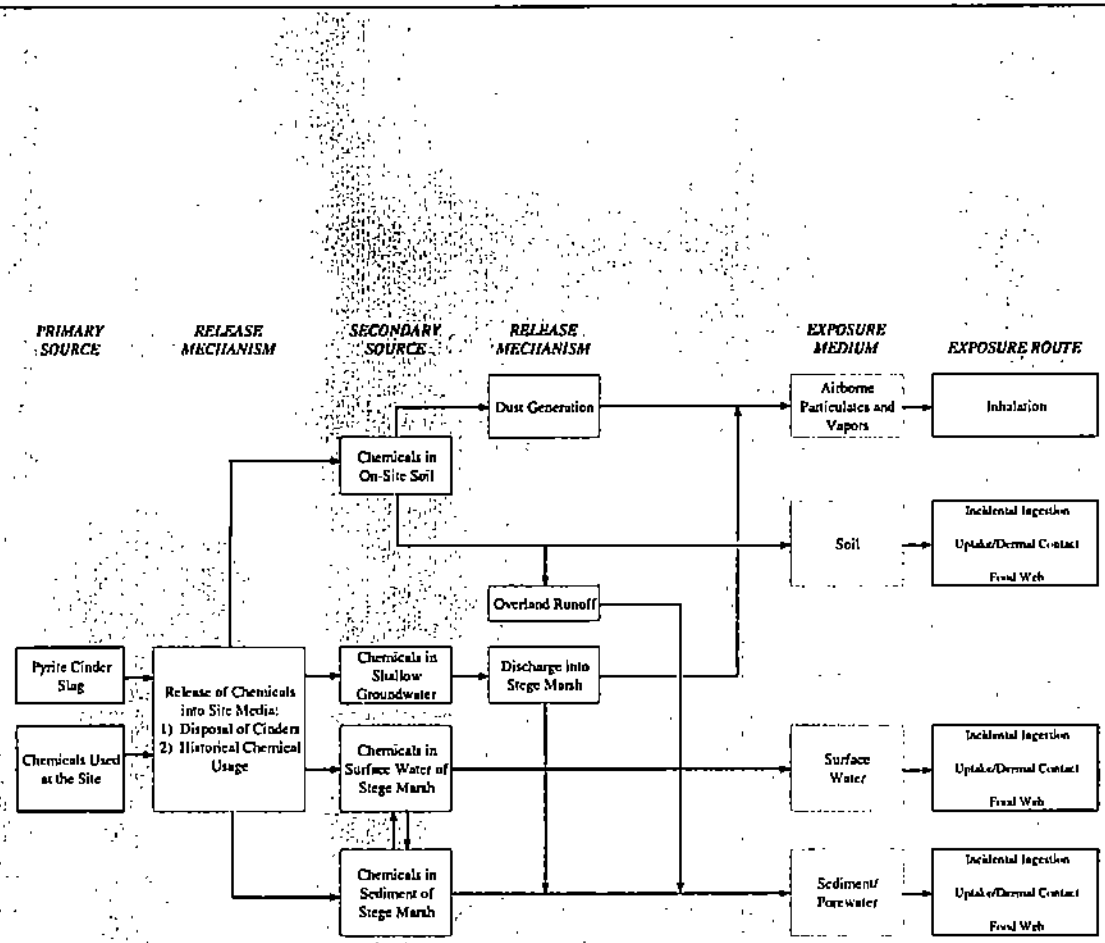
Figure 4-1b
Problem Formulation for Ecological Risk Assessment.
University of California, Berkeley, Richmond Field Station



EXPOSURE ROUTE	UPLAND				TIDAL SALT MARSH					SHALLOW BAY AND CHANNEL			
	Terrestrial Plants	Soil-dwelling Invertebrates	California Ground Squirrel	Red-tailed Hawk	Wetland Plants	Benthic Invertebrates	Fish and Aquatic Invertebrates	Salt Marsh Harvest Mouse	California Clapper Rail	Aquatic Plants	Fish and Aquatic Invertebrates	Benthic Invertebrates	California Clapper Rail
Inhalation	NA	NA	○	○	NA	NA	NA	NA	NA	NA	NA	NA	NA
Soil – Incidental Ingestion	NA	●	●	●	NA	NA	NA	NA	NA	NA	NA	NA	NA
Soil – Uptake/Dermal Contact	●	●	○	○	NA	NA	NA	NA	NA	NA	NA	NA	NA
Soil – Food Web	NA	NA	●	●	NA	NA	NA	NA	NA	NA	NA	NA	NA
Surface Water – Incidental Ingestion	NA	NA	NA	NA	NA	○	●	●	●	NA	●	○	●
Surface Water – Uptake/Dermal Contact	NA	NA	NA	NA	○	○	●	○	○	●	●	○	○
Surface Water – Food Web	NA	NA	NA	NA	NA	NA	●	○	○	NA	●	NA	○
Sediment/ Porewater – Incidental Ingestion	NA	NA	NA	NA	NA	●	○	●	●	NA	○	●	●
Sediment/ Porewater – Uptake/Dermal Contact	NA	NA	NA	NA	●	●	○	○	○	○	○	●	○
Sediment/ Porewater – Food Web	NA	NA	NA	NA	NA	NA	●	●	●	NA	●	NA	●

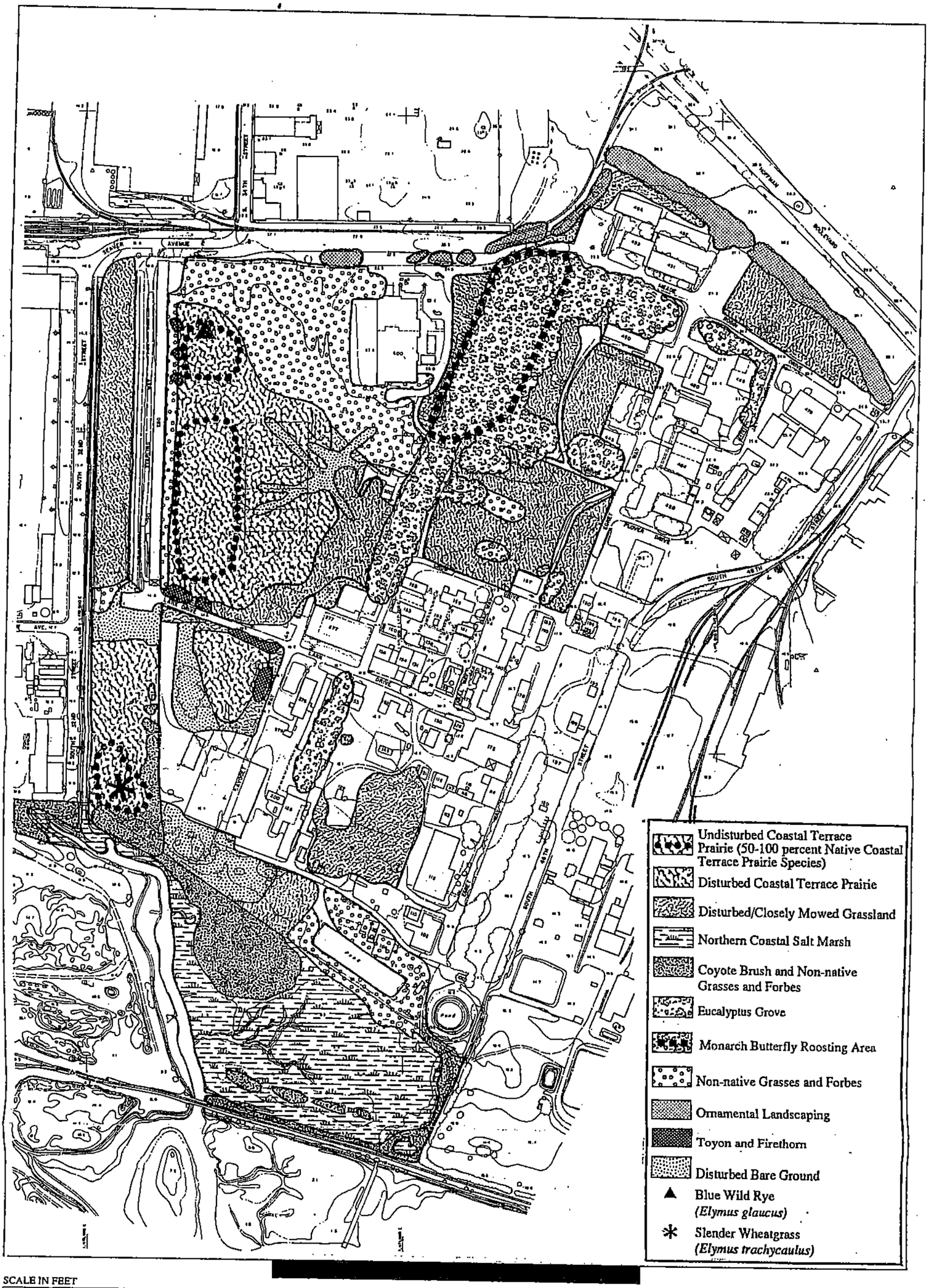
Legend:

● Potentially complete pathway: will be evaluated with respect to site-specific target levels (SSTLs)

○ Minor or Insignificant pathway: will be evaluated in a qualitative way

NA Not applicable because pathway not relevant to receptor or exposure medium not associated with receptor's habitat.

Project No. 51-09967067.00	UCB Richmond Field Station	CONCEPTUAL SITE MODEL FOR ECOLOGICAL RISK ASSESSMENT SITE-WIDE PROBLEM FORMULATION	Figure 4-4
	URS Corporation		



SCALE IN FEET
0 300 600 1200

Richmond Research Center
ENVIRONMENTAL IMPACT REPORT

FIGURE 8
Habitat Areas

N

BRADY AND ASSOCIATES, INC.
PLANNERS AND LANDSCAPE ARCHITECTS

DEVELOPMENT OF BACKGROUND LIMITS FOR COMPARISON WITH SITE CONTAMINATION DATA

Background and Purpose

In evaluating potential risk due to long-term (chronic) exposure to low-level of chemicals in environmental media it is paramount to be able to quantify the contributions of a chemical to exposure and risk due to site-related activities and sources and compare it to the contribution of the naturally occurring levels of the same chemical. In general, this is important for metals in soil and groundwater. The purpose of this comparison is to protect human health and the environment and at the same time minimize unnecessary remedial action. This is based on the assumption that the potential effect of a chemical does not depend on the source that generated it and that remedial action is not warranted for soils that are within the background thresholds.

The significance of site contamination data is often evaluated by comparison with background data; i.e., data from a comparable adjacent area that is not impacted by the site operation. A common approach is to develop background limits on the concentration of chemicals of concern based on a statistical analysis of the background data and compare the site concentrations to the background limits. If the site concentration at one or more locations exceeds the background limits, a further evaluation is made of whether the increase is confirmed and attributed to site operation, and whether it poses a significant risk to human health or environment. A decision is then made regarding whether a corrective action is necessary.

This report discusses the key issues involved in developing the background limits based on a statistical analysis of background data, evaluates alternative approaches to developing the background limits, and identifies a preferred approach that addresses these issues logically and rationally.

Key Issues in Developing Background Limits

The choice of an appropriate statistical method to establish background limits depends on the process that will be used to compare site data against the background data.

Two alternative processes may be considered; the *location-to-population* comparison and *population-to-population* comparison, as described below.

Location-to-Population Comparison

In this process, each individual site location is compared against a representative background limit derived from the population of the background data. This process offers two main advantages. One advantage is that it allows the calculation of a background limit based solely on the background data, prior to collecting any site data. The other advantage is that it is simple to apply, because, after the site data are collected, it only requires a direct comparison of each site data point against the background limit (no statistical analysis is necessary). The two statistical methods to establish the background limits for the comparison process are the tolerance limit

(USEPA, 1989, Pages 5-19 to 5-22) and the prediction limit (USEPA, 1989, Pages 5-22 to 5-26). These two methods are described in a following section.

Population-to-Population Comparison

In this process, one compares the average site concentration in each distinct exposure area against the average background concentration. If one can conclude, with a high degree of confidence, that the average site concentration in a given exposure area exceeds the average background concentration, a further evaluation of site conditions may be undertaken. Otherwise, the average site concentration is considered to be no different from the average background concentration. For this comparison process, one must have both background data and site data. The common statistical analysis approach is to establish a limit on the *difference* between the site average concentration and the background average concentration, taking into account the variability in both data sets. If the observed difference between the average concentrations of the two data sets exceeds this limit, one would conclude that the site average concentration is significantly higher than the background average concentration. Statistical methods for establishing the limit on the difference between the average concentrations of two data sets include the Student's two-sample t-test (USEPA, 2000, Pages 3-23 to 3-27) and the Wilcoxon Rank Sum test (USEPA, 2000, Pages 3-31 to 3-34).

The main disadvantages of this process are as follows. Both the background and site data must be collected before the process can be applied; a statistical evaluation of the two data sets is required; and a "background limit" in its true sense cannot be established because the process only allows one to establish a limit on the difference between the means of the site and background populations.

Preferred Method for Developing Background Limits

If the goal is to develop background limits that are derived solely based on the background data set, only the location-to-population comparison process meets this goal. As noted above, the potential statistical methods to develop background limits for this process are the tolerance limit and prediction limit. Both limits are established to represent the upper end of the background data distribution. However, the key difference between the two methods is the following. The prediction limit is established such that *all* site concentrations would be below this limit with a specified degree of confidence. On the other hand, the tolerance limit is established such that a specified (high) *percentage* of all site concentrations would be below the limit with a specified degree of confidence. As noted in Gibbons (1984), the prediction limit is appropriate only if a potentially small and finite number of site locations are to be compared against the limit. If the number of site locations is either large or unknown at the time of establishing the background limit, the tolerance limit is recommended.

For the evaluation of soil contamination, the exact number of site sampling locations would not be known at the time of establishing the background limits. Furthermore, the number of site sampling locations is likely to be relatively large (20+). Based on these considerations, the tolerance limit may be considered to be the better choice between the two methods. Equations for calculating the tolerance limit for a given background data set are presented below.

Calculation of Tolerance Limit

The procedure to calculate tolerance limits is described in USEPA (1989, Pages 5-19 to 5-22). Because only higher-than-background concentration values are of concern, one calculates the upper tolerance limit (UTL). The main steps in calculating the UTL are as follows:

1. Compile a valid background data set. These data should be collected from an area that has similar hydro-geo-chemical conditions to the site under evaluation and is unaffected by the site operation.
2. Perform an Exploratory Data Analysis (EDA) to understand the trends, patterns, and limitations of the background data. EDA methods include both graphical summaries (histogram, probability plot, and box-and-whisker plot) and numerical summaries (mean, median, standard deviation, coefficient of variation, and coefficient of skewness).
3. Apply a normality test (such as the Shapiro-Wilk W test) to the background data to check whether the data can be assumed to be normally distributed. If the data pass the normality test, calculate the upper tolerance limit (UTL) from:

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

in which

$\bar{x}$ = sample mean of background data,

s = sample standard deviation of background data, and

K = one - sided normal tolerance factor found in Table 5 of USEPA (1989).

4. If the data do not pass the normality test, apply the normality test to the log-transformed data. If the transformed data pass the normality test, calculate the UTL in the log scale first using the equation above and then transform the limit to the arithmetic scale by taking the anti-logarithm. Because the log transform is highly nonlinear, one needs to be careful that the resulting UTL in arithmetic scale is not unreasonably high.
5. If neither the raw nor the log-transformed data pass the normality test, calculate the nonparametric UTL, which is defined to be the maximum observed value in the background data. However, in this case, the confidence level associated with the UTL is a function of the number of background data points (Gibbons, 1994, Page 93). To achieve a desired confidence level for the nonparametric UTL, a large number of background data points is generally needed.

Interpretation of Tolerance Limit

The underlying principle of the tolerance limit implies that a small percentage of the site concentrations would be expected to exceed the tolerance limit even when the site data are drawn from the same population as the background data. Therefore, one should interpret the results of comparing site concentrations to the tolerance limit with caution. If some of the site

concentrations are found to exceed the tolerance limit, this should be taken only as a preliminary indication of potential contamination. Further evaluation should be undertaken to consider such factors as the magnitude by which the site concentration exceeds the background limit, the spatial pattern of site concentrations around a location where potential contamination is indicated, the types of contaminants that would expected from the site operation, and the consistency of behavior of geo-chemically related parameters. Conclusions regarding whether site concentrations exceed the background should be made based on an evaluation of all relevant factors.

A Numerical Example: Arsenic in Bay Area Soils

Two sets of arsenic concentrations were evaluated as report (2001) in the LBL study. The raw datasets, arsenic (f/c) and arsenic (gv), are shown in Table 1, sorted in descending order. The investigator was interested to calculate the tolerance limit and prediction limit of each individual dataset as well as the combined dataset. EDA was performed and the histograms and box-and-whisker plots are shown in Figures 1 and 2, respectively.

Based on the Shapiro-Wilk W test (at 5% significance level), the arsenic (f/c) set and the combined set cannot be assumed to be normally or lognormally distributed, whereas the arsenic (gv) set can be assumed to be lognormally distributed. Therefore, for the former case, the prediction limit and tolerance limit were set to be the maximum observed value, and the coverage of the tolerance limit was determined to be above 95%, due to the large sample size. For the latter case, the prediction limit and tolerance limit were first calculated in the log scale, and then back tranformed to the arithmetic scale. A summary of statistical results is shown in Table 2.

:Note that the prediction limit requires *all* site measurements be less than or equal to the calculated limit with an overall confidence level of 95% (Type I error, $\alpha = 5\%$). For the comparison of each site measurement, it is necessary to use a lower α so as to achieve the overall α of 5%. The Bonferroni method can be used to adjust the α. To maintain an adequate power of detecting exceedance of the background, EPA guidance documents suggest placing a lower bound of 1% on the adjusted α. This lower bound of 1% (i.e., confidence level of 99%) was used for this example and is reflected in the results shown in Table 2. For the nonparametric method, the two limits are the same, set equal to the maximum observed value. However, for a parametric method, the two limits can be substantially different. For this numerical example, the comparison of the prediction and tolerance limits for arsenic (gv) shows that the prediction limit is approximately 40% higher than the tolerance limit and hence would have lower power of detecting an exceedance of the background. This confirms that, for a large number of site measurements, the tolerance limit would be a better choice for defining background limits.

REFERENCES

Gibbons, Robert D. (1994). *Statistical Methods for Groundwater Monitoring.* John Wiley & Sons, Inc. New York.

LBL (2001).

USEPA (2000). *Guidance for Data Quality Assessment – Practical Methods for Data Analysis.* EPA QA/G-9.

USEPA (1989). *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities. Interim Final Guidance.* EPA/530-SW-89-026.

Table 1. Raw datasets of arsenic concentrations (in mg/kg)

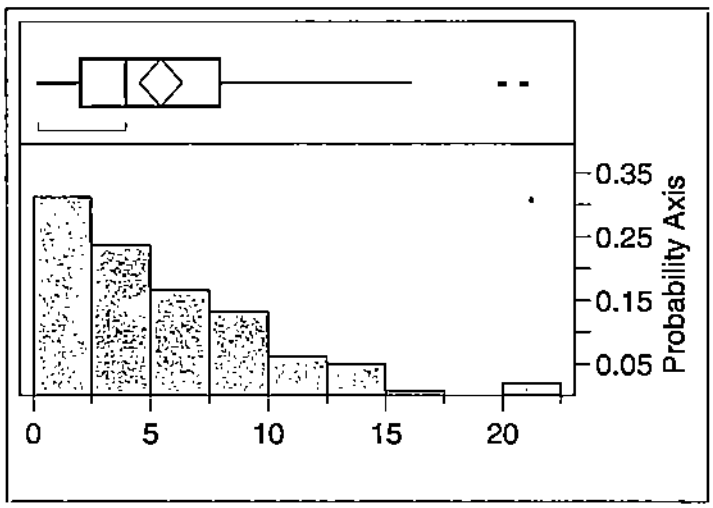
Arsenic (f/c)		Arsenic (gv)	
21	4	63	9.4
20	4	42	9
16	3.9	42	9
14	3.9	34	9
14	3.7	30	9
13	3.4	29	9
13	3.4	28	9
13	3	26	9
12	3	25	8.9
12	3	25	8.9
12	3	24	8.8
12	3	24	8.7
11	3	21	8.6
10	3	19	8
9.9	3	19	8
9.7	3	18	8
9	2.4	18	8
9	2.2	18	8
9	2.1	17	8
8.7	2	17	8
8.6	2	17	7.2
8.4	2	17	7
8.1	2	16	7
8	1.9	16	6.7
8	1.8	15	6.6
8	1.7	14	6.5
7.6	1.6	14	6.3
7	1.5	14	6
7	1.4	14	6
7	1.3	14	5.4
6.9	1.1	13	5.4
6.6	1	13	5
6.5	1	13	5
6	1	13	4.4
6	0.98	12	4
6	0.94	12	4
6	0.71	12	4
6	0.54	12	4
5.2	0.5	12	3
5.1	0.25	11	2
5	0.25	11	2
5	0.25	11	2
5	0.25	10	1.9
4.7	0.25	10	1.8
4.6	0.25	10	1
4.1	0.25	10	
4		10	
4		10	
4		9.8	
4		9.6	

Table 2. Summary of statistical results

Dataset	p-value of Shapiro-Wilk W test		Distribution	99% Prediction Limit	95% Tolerance Limit	Tolerance coverage
	Normal	Lognormal				
Arsenic (f/c)	0.000	0.000	Non-parametric	21	21	96.9%
Arsenic (gv)	0.000	0.160	Lognormal	56.03	40.55	95.0%
Combined set	0.000	0.000	Non-parametric	63	63	98.4%

Dataset=Arsenic (f/c)
Distributions

Raw Data



Quantiles

100.0%	maximum	21.000
99.5%		21.000
97.5%		18.300
90.0%		12.000
75.0%	quartile	8.000
50.0%	median	4.000
25.0%	quartile	2.000
10.0%		0.659
2.5%		0.250
0.5%		0.250
0.0%	minimum	0.250

Moments

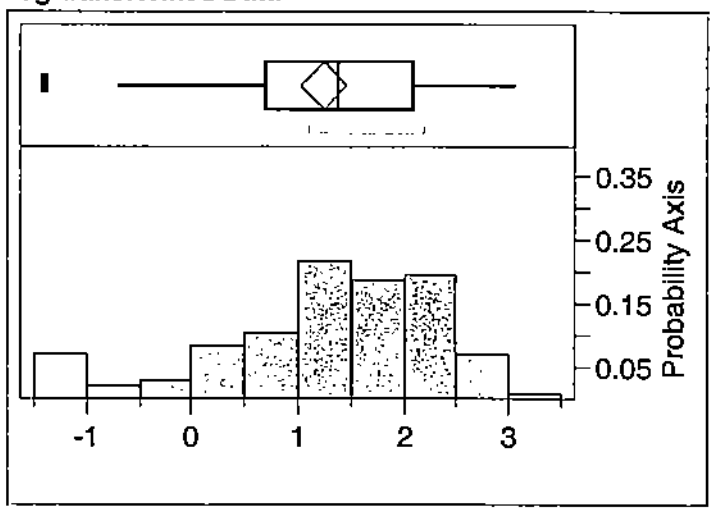
Mean	5.410625
Std Dev	4.4754304
Std Err Mean	0.4567717
upper 95% Mean	6.3174315
lower 95% Mean	4.5038185
N	96
Sum Wgts	96
Sum	519.42
Variance	20.029478
Skewness	1.192808
Kurtosis	1.378089
CV	82.715591

Fitted Normal
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.887562	<.0001

Log-transformed Data



Quantiles

100.0%	maximum	3.045
99.5%		3.045
97.5%		2.901
90.0%		2.485
75.0%	quartile	2.079
50.0%	median	1.386
25.0%	quartile	0.693
10.0%		-0.425
2.5%		-1.386
0.5%		-1.386
0.0%	minimum	-1.386

Moments

Mean	1.2418243
Std Dev	1.1063761
Std Err Mean	0.112919
upper 95% Mean	1.4659969
lower 95% Mean	1.0176516
N	96
Sum Wgts	96
Sum	119.21513
Variance	1.2240681
Skewness	-0.873229
Kurtosis	0.2705971
CV	89.092808

Fitted Normal
Goodness-of-Fit Test

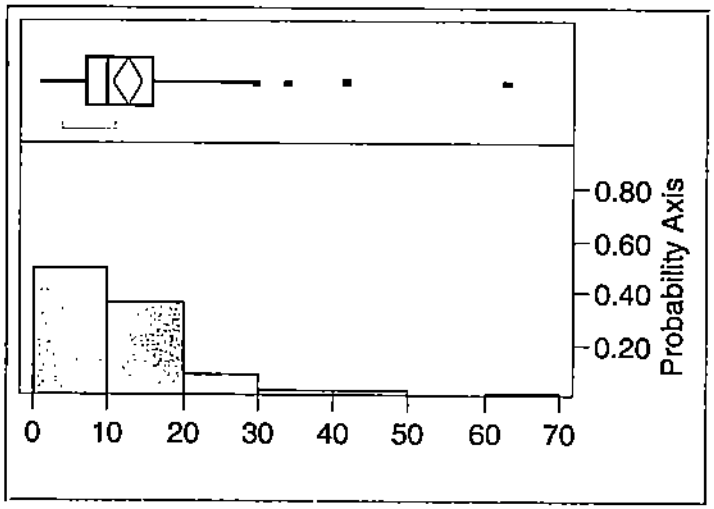
Shapiro-Wilk W Test

W	Prob<W
0.910375	<.0001

Figure 1. Histograms of three sets of arsenic concentrations (in mg/kg)

Dataset=Arsenic (gv)
Distributions

Raw Data



Quantiles

100.0%	maximum	63.000
99.5%		63.000
97.5%		42.000
90.0%		25.000
75.0%	quartile	16.000
50.0%	median	10.000
25.0%	quartile	7.000
10.0%		4.000
2.5%		1.840
0.5%		1.000
0.0%	minimum	1.000

Moments

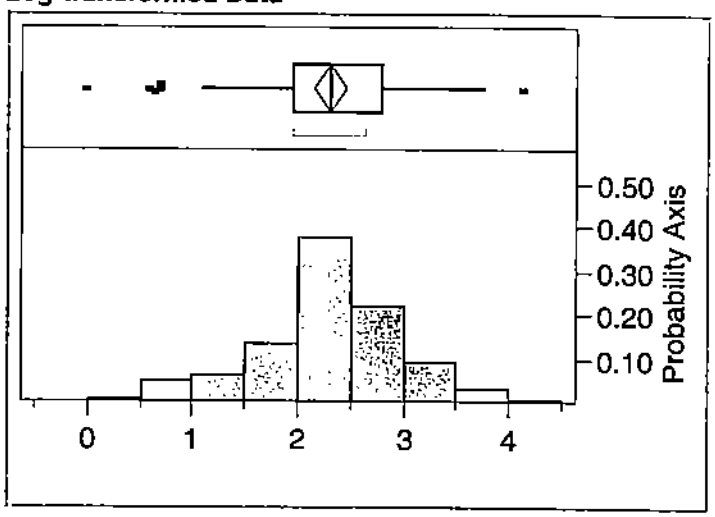
Mean	12.641053
Std Dev	9.6382383
Std Err Mean	0.9888624
upper 95% Mean	14.604462
lower 95% Mean	10.677643
N	95
Sum Wgts	95
Sum	1200.9
Variance	92.895637
Skewness	2.3719799
Kurtosis	8.2262623
CV	76.245536

Fitted Normal
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.804857	0.0000

Log-transformed Data



Quantiles

100.0%	maximum	4.1431
99.5%		4.1431
97.5%		3.7377
90.0%		3.2189
75.0%	quartile	2.7726
50.0%	median	2.3026
25.0%	quartile	1.9459
10.0%		1.3863
2.5%		0.6094
0.5%		0.0000
0.0%	minimum	0.0000

Moments

Mean	2.2940785
Std Dev	0.7279302
Std Err Mean	0.0746841
upper 95% Mean	2.4423654
lower 95% Mean	2.1457915
N	95
Sum Wgts	95
Sum	217.93746
Variance	0.5298824
Skewness	-0.459535
Kurtosis	0.9967455
CV	31.730833

Fitted Normal
Goodness-of-Fit Test

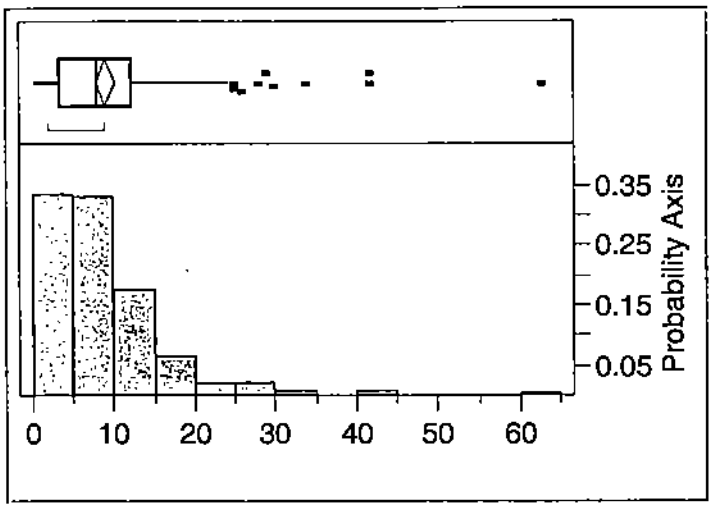
Shapiro-Wilk W Test

W	Prob<W
0.970307	0.1603

Figure 1. Histograms of three sets of arsenic concentrations (in mg/kg) (cont'd)

Dataset=Combined Set
Distributions

Raw Data



Quantiles

100.0%	maximum	63.000
99.5%		63.000
97.5%		30.800
90.0%		18.000
75.0%	quartile	12.000
50.0%	median	8.000
25.0%	quartile	3.400
10.0%		1.420
2.5%		0.250
0.5%		0.250
0.0%	minimum	0.250

Moments

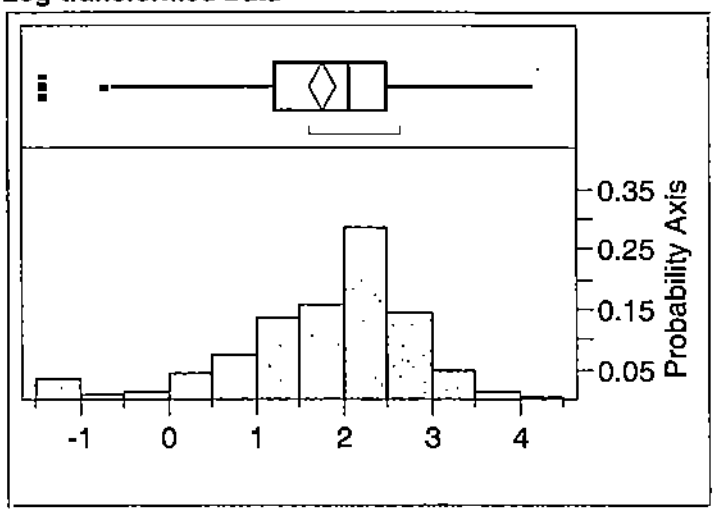
Mean	9.006911
Std Dev	8.3133526
Std Err Mean	0.6015331
upper 95% Mean	10.193452
lower 95% Mean	7.82037
N	191
Sum Wgts	191
Sum	1720.32
Variance	69.111832
Skewness	2.5934036
Kurtosis	10.995116
CV	92.299709

Fitted Normal
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.800075	0.0000

Log-transformed Data



Quantiles

100.0%	maximum	4.143
99.5%		4.143
97.5%		3.426
90.0%		2.890
75.0%	quartile	2.485
50.0%	median	2.079
25.0%	quartile	1.224
10.0%		0.350
2.5%		-1.386
0.5%		-1.386
0.0%	minimum	-1.386

Moments

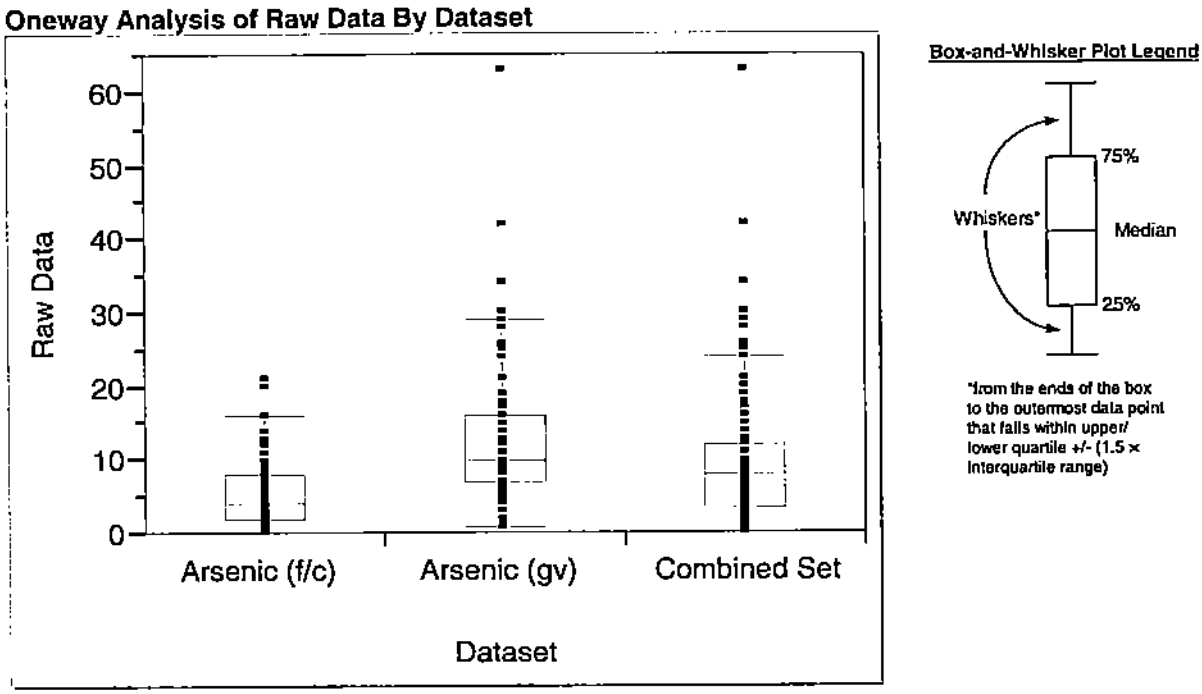
Mean	1.7651968
Std Dev	1.0735201
Std Err Mean	0.0776772
upper 95% Mean	1.9184172
lower 95% Mean	1.6119763
N	191
Sum Wgts	191
Sum	337.15258
Variance	1.1524454
Skewness	-0.98701
Kurtosis	1.1915413
CV	60.815888

Fitted Normal
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.922263	<.0001

Figure 1. Histograms of three sets of arsenic concentrations (in mg/kg) (cont'd)



Quantiles

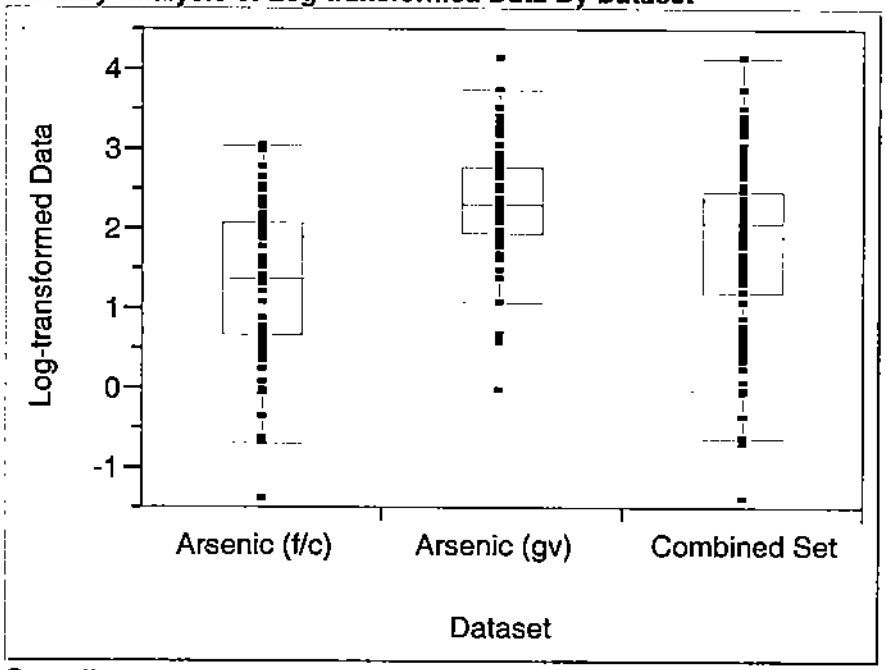
Level	Minimum	10%	25%	Median	75%	90%	Maximum
Arsenic (f/c)	0.25	0.659	2	4	8	12	21
Arsenic (gv)	1	4	7	10	16	25	63
Combined Set	0.25	1.42	3.4	8	12	18	63

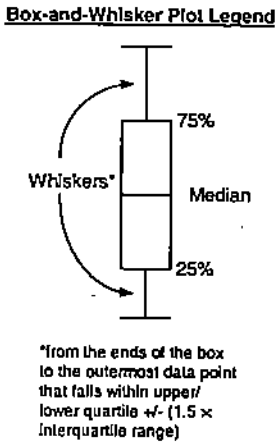
Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
Arsenic (f/c)	96	5.4106	4.47543	0.45677	4.504	6.317
Arsenic (gv)	95	12.6411	9.63824	0.98886	10.678	14.604
Combined Set	191	9.0069	8.31335	0.60153	7.820	10.193

Figure 2. Box-and-whisker plots of three sets of arsenic concentrations (in mg/kg)

Oneway Analysis of Log-transformed Data By Dataset





Quantiles

Level	Minimum	10%	25%	Median	75%	90%	Maximum
Arsenic (f/c)	-1.38629	-0.4246	0.693147	1.386294	2.079442	2.484907	3.044522
Arsenic (gv)	0	1.386294	1.94591	2.302585	2.772589	3.218876	4.143135
Combined Set	-1.38629	0.350271	1.223775	2.079442	2.484907	2.890372	4.143135

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
Arsenic (f/c)	96	1.24182	1.10638	0.11292	1.0177	1.4660
Arsenic (gv)	95	2.29408	0.72793	0.07468	2.1458	2.4424
Combined Set	191	1.76520	1.07352	0.07768	1.6120	1.9184

Figure 2. Box-and-whisker plots of three sets of arsenic concentrations (in mg/kg) (cont'd)