

## K1.0 INTRODUCTION

This appendix updates the results and conclusions of the quantitative assessments presented in the main text of the Baseline Ecological Risk Assessment (ERA) for Fort Ord, California. A portion of the data was still being collected, analyzed, reported, or validated after submittal of the ERA with the Draft Final Basewide Remedial Investigation/Feasibility Study (RI/FS) in December 1994. Data used to draw conclusions in the December 1994 ERA are referred to herein as the Draft Final Report (DFR) data set. This appendix discusses only changes in data, results, and/or conclusions made from the updated data. Background information and methods are discussed in detail in the main text of the ERA. Any new methodologies or changes to the methodologies used in the main text of the report will be discussed where appropriate.

The quantitative ecological risk assessment (Section 6.0 in the ERA main text) contained evaluations of the potential impacts of chemicals detected at Sites 1, 2, 3, 11, 12, 15, 16, 21, 22, 24, 25, 29, 31, 32, 33, 35, and 41 to plants (i.e., wild oat, California brome, hottentot fig), mammals (i.e., deer mouse and gray fox), the leaf litter community, and aquatic receptors. The quantitative ecological risk assessment also included evaluations of potential impacts to buckwheat and mourning doves at Site 3. The quantitative ecological screening assessment (Section 5.0 in the ERA main text) contained evaluations of the potential impacts to mammals from chemicals detected at Sites 17 and 40 as well. An extensive amount of biota and soil was collected in the field to validate the results of the conservative screening assessment (Section 5.0 in the ERA main text) and to provide additional information about potential impacts. None of the new data or validated data evaluated herein were applicable to the assessments for mourning doves and aquatic receptors, so they are not discussed in this appendix; however, changes in the results and/or conclusions for the plant, buckwheat, mammal, and leaf litter assessments are discussed below.

Table K1 summarizes the status of the DFR data set in December 1994. DFR data that were not collected, analyzed, or validated by December 1994 and that are discussed in this appendix include:

- Soil data for Sites 1, 16, 22, 24, 25, 29, 31, 32, 33, 39, 40, and 41 and the reference sites, which were collected, analyzed, or validated
- Plant tissue data analyzed or validated for hottentot fig at Sites 2 and 3 and the reference sites and for buckwheat at Site 3
- Plant biomass assays for buckwheat at Site 3
- All leaf litter data
- All mammal data.

Section K2.0 provides a more detailed overview of the data discussed in this appendix. Updated results of plant, buckwheat, mammal, and leaf litter assessments are presented in Sections K3.0 through K6.0. The revised conclusions based on these assessments are presented in Section K7.0. The text focuses on conclusions that differ, due to the incorporation of additional or validated data, from those presented in the main text of the ERA.

## K2.0 RESULTS

The updated results of chemical analyses of soil and biota for all sites are summarized in Attachment A. Sites that were evaluated in the quantitative assessments for the DFR are discussed in this appendix. The remaining sites, which were identified as lacking complete exposure pathways for ecological receptors (PHA1; Section 3.0 of the ERA), are not discussed herein because the changes in the DFR data set did not affect the assessment results.

Table K2 shows where the data for soil from the DFR data set and the updated data set can be found. As shown, the DFR data for soil are in Appendixes A and G of the ERA, the DFR data for plants are presented in Appendixes G and H of the ERA, and the DFR data for mammals and leaf litter are in Appendix G of the ERA. Updated soil data are presented in Attachment A of this appendix in Tables A1 through A90, updated plant data are presented in Tables A91 through A96, updated mammal data are presented in Tables A97 through A107, and updated litter data are presented in Tables A108 through A116. The DFR data are compared to the updated data for reference soil in Table K3 and for mammals in Tables K4 through K14. The updated data for leaf litter are in Table K15. Results of data comparisons are presented below. Further evaluation based on these results are presented in Sections K3.0 through K6.0.

Due to the collection of new data, COPC selection was revised for several sites; the revised COPCs are discussed below. COPCs were selected as described in Sections 2.5 and 6.1.2 in the main text of the ERA.

### K2.1 Soil

New data collection efforts and/or validation of previously collected data at several sites (Sites 1, 16, 22, 24, 25, 29, 31, 32, 33, 39, 40, and 41 and the reference sites) have resulted in differences between the DFR data set and the updated data set (Tables K1 and K2). Mean concentrations between the DFR data set and the updated data set were compared and COPC selection was reevaluated. Chemicals were eliminated as COPCs if the mean concentration in the updated data set was less than the mean background concentration. For Sites 22, 29, 32, and 33, no changes were made in the selected COPCs; mean chemical concentrations in the updated data set were either the same or lower than those in the DFR data set. For Sites 1, 16, 24, 25, 31, 39, 40, and 41, some COPCs have changed and/or some concentrations have increased. Changes in the COPCs selected for these latter sites and differences in mean chemical concentrations based on the results for soil analyses in the updated data set are summarized below:

- For Site 1, all but one of the five COPCs selected using the DFR data set were also selected as COPCs using the updated data set. Nickel was eliminated as a COPC using the updated data set because the mean concentration was less than the mean background concentration. The mean chemical concentrations in soil for the remaining COPCs in the updated data set were less than or equal to those in the DFR data set.
- For Site 16, all 33 COPCs selected using the DFR data set were also selected as COPCs using the updated data set. For 11 of the COPCs (chlordan, total HpCDD, total HxCDD, total OCDD, arsenic, cadmium, chromium, copper, lead, mercury, and nickel), the mean chemical concentrations reported in the updated data set increased by less than 50 percent compared to those in the DFR data set. For the remaining 22 COPCs, the mean chemical concentrations reported in the updated data set were less than or equal to those in the DFR data set. Two

additional chemicals (benzo(k)fluoranthene and benzo(ghi)perylene) that were not previously detected in soil were detected and selected as COPCs using the updated data set.

- For Site 24, all 15 COPCs selected using the DFR data set were also selected as COPCs using the updated data set. Arochlor-1260, chlordane, and mercury were detected at slightly higher mean chemical concentrations (less than 10 percent higher) than those previously reported. For all other COPCs, the mean chemical concentrations in soil for the COPCs selected using the updated data set were less than or equal to those previously reported.
- For Site 25, all 15 COPCs selected using the DFR data set were also selected as COPCs using the updated data set. Dieldrin was detected at a mean chemical concentration almost three orders of magnitude higher than that previously reported. For all other COPCs, the mean chemical concentrations of soil for the COPCs in the updated data set were less than or equal to those in the DFR data set.
- For Site 31, all 34 COPCs selected using the DFR data set were also selected as COPCs using the updated data set. Of the 34 COPCs, total HpCDD and mercury were detected at slightly higher mean chemical concentrations (less than 10 percent higher) than previously reported. For all other COPCs, the mean chemical concentrations of soil in the updated data set were less than or equal to those reported in the DFR data set. In addition, one metal (nickel), which was not previously selected as a COPC in the DFR data set, was selected as a COPC using the updated data set.
- For Site 39, all but one of the 19 COPCs selected in the DFR data set were also selected as COPCs using the updated data set. Nickel was eliminated as a COPC in the updated data set because the mean concentration was less than the mean background concentration. The mean chemical concentrations of soil for the remaining COPCs in the updated data set were less than or equal to those reported in the DFR data set. In addition, one metal (nickel), which was not previously selected as a COPC, was selected as a COPC using the updated data set.
- For Site 40, which was only evaluated in the screening assessment based on maximum soil concentrations, all four COPCs selected using the DFR data set were also selected as COPCs using the updated data set. All COPCs with the exception of acetone were detected at higher maximum chemical concentrations than those previously reported (up to three times higher). Seven additional chemicals, including five organics (fluoranthene, pentachlorophenol, pyrene, tetrachloroethene, and trichloroethene) and two metals (cadmium and lead), which were not previously selected as COPCs, were selected as COPCs using the updated data set.
- For Site 41, all 12 COPCs selected using the DFR data set were also selected as COPCs using the updated data set. Arsenic and lead were detected at slightly higher mean chemical concentrations than those previously reported (less than 10 percent higher). For all other COPCs, the mean chemical concentrations of soil for the COPCs in the updated data set were less than or equal to those reported in the DFR data set. In addition, bis(2-ethylhexyl)phthalate, which was not previously detected, was selected as a COPC using the updated data set.
- For the soil samples from reference sites (Table K3), no changes to the chemicals detected or mean concentrations were observed for the central maritime chaparral or upland ruderal reference sites. For the coast live oak woodland reference site, beryllium, which was reported as not detected in the updated data set, was reported as detected in the DFR data set.

Results and conclusions based on these new soil values are presented in Sections K3.0 through K7.0.

## K2.2 Plants

Only Sites 2 and 3 and the reference sites had newly collected, analyzed, or validated plant data (Table K1). No data for the hottentot fig were previously available for Site 2; conclusions in the main ERA text regarding potential impacts to plants at Site 2 were based on a qualitative comparison of data from other sites. Conclusions in the main ERA text for plants at Site 3 were based on unvalidated data for buckwheat because hottentot fig data were unavailable. Subsequently, hottentot fig data for Sites 2, 3, and the reference sites became available for use in the evaluations of Sites 2 and 3. There were no differences between the DFR data set and the updated data set for the remainder of sites. However, the results for plants at Site 39 changed because the Site 39 assessment in the main ERA text was based on data for buckwheat at Site 3. The results of the analyses on hottentot fig and validated buckwheat data are summarized in Attachment A, Tables A91 through A96; the DFR data are in Appendixes G and H (Table K2). Mean concentrations were compared between the DFR data set and the updated data set, and any new chemicals detected in plant tissues were selected as COPCs. Changes in the selected COPCs and differences in mean chemical concentrations based on the results for plant tissue in the updated data set are summarized below.

- For Site 2, five metals (chromium, copper, lead, nickel, and zinc) were detected in hottentot fig tissue in the updated data set. No plant tissue data were previously available for Site 2. Therefore, these five metals were selected as COPCs.
- For Site 3, all five of the COPCs that were detected in buckwheat tissue in the DFR data set were also detected in the updated data set. Antimony was detected at a slightly higher concentration in the updated data set than in the DFR data set (the mean concentration increased from 0.30 mg/kg to 0.46 mg/kg; Attachment A, Table A93). No plant tissue data were previously available for hottentot fig at Site 3 in the DFR. Concentrations of six metals (antimony, chromium, copper, lead, nickel, and zinc) were detected in hottentot fig tissue from Site 3 in the updated data set. Therefore, these six metals were selected as COPCs for hottentot fig.
- For the hottentot fig tissue from reference sites, two new metals (arsenic and lead) were detected at the central maritime chaparral reference site, three new metals (arsenic, copper and lead) were detected at the coast live oak woodland reference site, and one new metal (arsenic) was detected at the upland ruderal reference site.

Changes to the conclusions of the plant assessment based on newly selected COPCs are discussed in Section K3.0. Potential impacts to Smith's blue butterfly were evaluated previously by assessing potential impacts to buckwheat at Site 3. This assessment was made by evaluating the results of root elongation tests. Plant biomass tests conducted on buckwheat were not complete and therefore were not discussed in the main text. The results of the biomass tests are discussed in Section K4.0.

## K2.3 Mammals

All deer mouse data used in the main ERA text to estimate potential impacts to mammals were unvalidated (Table K1). Tables K4 through K14 compare the mean chemical concentrations for unvalidated mammal data to those for validated mammal data. COPCs were eliminated in the updated data set if detected chemicals were qualified as nondetected due to data validation. Additional COPCs were selected where data not reported in the DFR data set were reported as detected in the updated data set. For Sites 2, 11, 24, 25, and 29, the updated data show that the mean chemical concentrations are the same or lower than those reported in the main ERA text; the number of COPCs based on mammal data decreased for these five sites (Tables K4, K6, K7, K8, and K9, respectively). For Sites 3, 31, 33, and 35, the updated data show that one or more chemical

concentrations in tissue were higher and/or additional COPCs were selected. Changes in the COPCs selected for these sites and differences in chemical concentrations based on the results for mammal tissue in the updated data set for these sites and the reference sites are summarized below.

- For Site 3 (Table K5), two metals (cadmium and chromium) were eliminated as COPCs after data validation. Of the five remaining COPCs, zinc was detected at a slightly higher concentration than previously reported (less than 10 percent higher). In all other cases, the mean chemical concentrations in mammal tissue using the updated data set were less than or equal to those reported in the DFR data set. In addition, one chemical (gamma-chlordane) that was not previously reported in the DFR data set was detected and selected as a COPC in the updated data set.
- For Site 31 (Table K10), four metals (cadmium, chromium, thallium, and vanadium) were eliminated as COPCs based on mean mammal tissue concentrations after data validation. Of the 43 remaining COPCs, naphthalene and total HpCDD were detected at slightly higher mean chemical concentrations than those reported in the DFR data set (less than 10 and 30 percent higher, respectively). In all other cases, the mean chemical concentrations in mammal tissue in the updated data set were less than or equal to those reported in the DFR data set. In addition, one chemical (gamma-chlordane) that was not previously reported, was detected and selected as a COPC in the updated data set.
- For Site 33 (Table K11), three metals (cadmium, nickel, and thallium) and chlordane were eliminated as COPCs after data validation. Of the four remaining COPCs, barium was detected at a slightly higher mean chemical concentration than reported in the DFR data set (less than 30 percent higher). In all other cases, the mean chemical concentrations in mammal tissue using the updated data set were less than those reported in the DFR data set.
- For Site 35 (Table K12), six metals (cadmium, chromium, copper, nickel, thallium, and vanadium) were eliminated as COPCs after data validation. For the 16 other COPCs, the mean chemical concentrations in mammal tissue using the updated data set were less than or equal to those reported in the DFR data set. In addition, one chemical (alpha-BHC) that was not previously reported in the DFR data set, was detected and selected as a COPC in the updated data set.
- Results for the reference sites are presented in Tables K13 and K14. For the central maritime chaparral reference site (Table K13), two metals (chromium and vanadium) and gamma-chlordane were eliminated as detected chemicals after data validation. For the coast live oak woodland reference site (Table K14), three metals (chromium, lead, and vanadium) were eliminated as detected chemicals based on mean mammal tissue concentrations after data validation. Two metals (nickel and zinc) that were not previously reported in the DFR data set were detected and selected as COPCs for the coast live oak woodland reference site in the updated data set (Table K14). Ten PAHs (Table K13) and one metal (zinc) that were not previously reported in the DFR data set were detected at the central maritime chaparral reference site in the updated data set.

Potential impacts to mammals at these sites based on the validated data are discussed in Section K5.0.

## K2.4 Leaf Litter Data

Discussion of potential impacts to lizards presented in the main text was based on analysis of validated data soil and invalidated leaf litter data (Table K1). Impacts were assessed by comparing habitats within sites to similar reference habitats. Potential impacts to lizards are reevaluated herein using validated chemical analyses data for leaf litter presented in Table K15; the DFR data set are in Appendix G (Table G34). These data are summarized below for Sites 16, 24, 25, 29, 31, and 35 and the reference sites (coastal marine chaparral, coast live oak, and upland ruderal sites).

For these sites, a number of the metals previously evaluated were eliminated as detected chemicals using the updated data set due to issues of contamination of laboratory blanks. In addition, data for some PAHs had been analyzed but not reported in time for the submittal of the Draft Final RI/FS. These validated PAH data were reported as detected values in the updated data set. The changes in the updated data set compared to the DFR data set are discussed on a site-by-site basis below.

- For Site 16, there were no changes in the number of chemicals detected. Beryllium and cadmium were detected in eight and five fewer samples, respectively, in the updated data set. The concentrations of 4,4'-DDE, 4,4'-DDT, and chlordane were 3 orders of magnitude lower than those reported in the DFR data set. No other changes were observed.
- At Site 24, antimony, arsenic, and silver were detected in six, five, and four fewer samples, respectively, in the updated data set. Dieldrin and 4,4'-DDE were each detected in two additional samples. Four PAHs (acenaphthene, benzo(b)fluoranthene, phenanthrene, and pyrene) were each detected in one sample in the updated data set. No other changes were observed.
- For Site 25, antimony, arsenic, and silver were detected in four, two, and three fewer samples, respectively, in the updated data set. Concentrations of 4,4'-DDE were detected in one additional sample. The concentration of mercury increased in one sample by less than 1 order of magnitude (an increase of approximately 25 percent) in the updated data set. No other changes were observed.
- For Site 29, antimony, arsenic, beryllium, and silver were not detected in any of the four samples analyzed in the updated data set. Concentrations of 4,4'-DDT were detected in two additional samples. One PAH (indeno[1,2,3-cd]pyrene) was detected in one sample. No other changes were observed.
- For Site 31, antimony and beryllium were not detected in any of the four samples analyzed in the updated data set. Arsenic and 4,4'-DDT were detected in one fewer sample, silver was detected in two fewer samples, and 4,4'-DDE was detected in one additional sample. Two PAHs (fluoranthene and pyrene) were each detected in one sample, and two other PAHs (naphthalene and phenanthrene) were each detected in three samples in the updated data set. No other changes were observed.
- For Site 35, antimony and arsenic were detected in eight and nine fewer samples, respectively in the updated data set. Chromium and silver were each detected in one fewer sample. Concentrations of 4,4'-DDE and 4,4'-DDT were detected in six and one additional samples, respectively. Three PAHs (benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene) were each detected in one sample, and one PAH (benzo(ghi)perylene) was detected in two additional samples in the updated data set. No other changes were observed.

- For both the central maritime chaparral and coast live oak woodland reference sites, beryllium and cadmium were not detected in any of the samples in the updated data set. The concentration of chromium in the updated central maritime chaparral reference site data was 1 order of magnitude greater than reported in the main ERA text. In addition, the concentration of 4,4'-DDE in the updated data set was 3 orders of magnitude smaller than in the DFR. At the upland ruderal reference site, beryllium was not detected in the updated data set. No other changes were observed for the three reference sites.

Potential impacts to the leaf litter community at these sites based on the updated data set are discussed in Section K6.0 of this appendix.

### **K3.0 PLANT ASSESSMENT**

This section summarizes the changes to the analysis and risk estimation components of the plant assessment, Section 6.2 in the main text. The changes were based on analyses conducted using the updated data set. These revisions affect only the results for Sites 2 and 3, the sites where hottentot fig and/or buckwheat data were collected. Results were also revised for Site 39, because its analysis was based on Site 3 data.

#### **K3.1 Regression Analysis**

A regression analysis was performed for hottentot fig and buckwheat for all metals consistently detected in collocated samples of both soil and plant tissue. The analysis compared in-plant chemical concentrations to soil chemical concentrations to evaluate the uptake of metals by plants. Chromium, copper, lead, nickel, and zinc were evaluated for hottentot fig (Table K16). Antimony, chromium, copper, lead, and zinc were evaluated for buckwheat (Table K17).

The results of the regression analysis for hottentot fig showed significant correlations between plant tissue and soil chemical concentrations for nontransformed nickel data only. This correlation was negative (i.e., increasing soil concentrations were associated with decreasing uptake). The uptake factors (Attachment A, Table A117) for lead and zinc were up to 1 order of magnitude lower than those calculated using Baes et al. (1984) while those for chromium, copper, and nickel were higher than the Baes uptake factors.

The results of the regression analysis for buckwheat (Attachment A, Table A118) were similar to those discussed in the main text of the ERA, with significant correlations between plant tissue and soil chemical concentrations for antimony, copper, and lead. The uptake factors for antimony, copper, and lead were up to 1 order of magnitude lower than the Baes uptake factors, while those for chromium and zinc were higher than the Baes uptake factors.

#### **K3.2 Reference Sites**

Table K18 presents the revised hazard quotients for the reference sites. Background hazard quotients were calculated using both the y-intercept from the plant to soil regression analysis, which was considered to represent background, as well as the chemical concentrations of plant tissues from the reference sites. Revised hazard quotients calculated for Sites 2, 3, and 39 are presented in Table K19. Hazard quotients for the sites that were less than or equal to the background hazard quotients were not included in the totals.

#### **K3.3 Risk Estimation**

All metals except chromium and zinc were eliminated as COPCs at Sites 2, 3, and 39 because they were detected below benchmark concentrations (BCs) in plant tissue (BCs used in this evaluation are discussed in Section 6.1 in the main ERA text). The hazard quotients for chromium and zinc as well as the hazard indices for Sites 2, 3, and 39 are shown on Table K19. Table K20 presents a comparison of these hazard indices to those calculated based on soil concentrations in the ecological screening assessment. The results indicate "possible concern" at Sites 2, 3, and 39 based on the hottentot fig tissue concentrations and "no concern" at Site 3 and 39 based on the buckwheat tissue concentrations.

### K3.4 Ecological Significance

Tissue concentrations indicate that the only contribution to the "possible concern" at Sites 3 and 39 is chromium. However, mean soil concentrations of chromium at Sites 3 and 39 (Attachment A, Tables A7 and A76) were lower than the background threshold of 24.0 mg/kg for chromium. Because site soil concentrations are not different from the background soil threshold, no site-related adverse impacts of chromium to plants at Sites 3 and 39 are expected.

The mean chromium concentration of 26.3 mg/kg in soil at Site 2 (Attachment A, Table A4) is slightly above the shallow background soil chromium threshold of 24.0 mg/kg as well as above the deep background soil chromium threshold of 16.6 mg/kg. However, the mean chromium tissue concentration of 0.54 mg/kg (Attachment A, Table A91) at Site 2 is roughly equivalent to the benchmark concentration of 0.5 mg/kg in tissue for chromium, which represents the upper bound of the normal range of tissue concentrations. Therefore, chromium is not expected to cause adverse impacts to plants at Site 2.

The mean zinc concentration of 259.5 mg/kg in soil at Site 2 (Attachment A, Table A4) exceeds background soil zinc concentrations. In addition, the mean zinc tissue concentration of 117.9 mg/kg (Attachment A, Table A91) exceeds the benchmark concentration of 100 mg/kg for zinc. However, the benchmark concentration represents the lower bound of the toxic range of tissue concentrations; the upper bound of the normal range is 150 mg/kg. In addition, two sources (*Gough et al., 1979* and *Mortvedt et al., 1972*) report that normal concentrations of zinc in plants range from 25 to 150 mg/kg and that toxic effects are only present at concentrations greater than 400 mg/kg. Another source reports that toxic levels range from 160 to 320 mg/kg (*Davis et al., 1978*). This information indicates that no adverse impacts to plants at Site 2 are expected.

#### **K4.0 BUCKWHEAT ASSESSMENT**

Buckwheat analyses and bioassays were conducted to assess potential impacts to the Smith's blue butterfly at Site 3, as discussed in the main ERA text. The following analyses and bioassays were conducted:

- Chemical analysis of soil
- Chemical analysis of buckwheat tissue from Site 3
- Root elongation bioassay using soil elutriates and buckwheat seeds from Site 3
- Bioaccumulation, uptake, and biomass assay using buckwheat seeds and soil from Site 3.

Results of the first three analyses are presented in the main ERA text. The root elongation bioassay is further discussed in Appendix J of the ERA. The bioaccumulation assay was still being conducted when the main text was first submitted. This assay is now complete and is briefly discussed below.

Buckwheat plants grow slowly in the field. Buckwheat seeds were obtained from Site 3 and grown in the laboratory, although roots were not well developed in young seedlings prior to transplanting. As a result, the survival of seedlings transplanted by the bioassay laboratory was less than 10 percent. At the end of the experiment, the survival rate of the seedlings that survived transplanting was only 22 percent. Therefore, the results of this bioassay were not considered acceptable, and the data were not usable for risk assessment. No additional information was obtained from this assay, and conclusions regarding the Smith's butterfly cannot be revised.

## **K5.0 MAMMAL ASSESSMENT**

This section summarizes the changes to the results presented in Section 6.4 in the main ERA text made on the basis of analyses conducted using the updated data set. These changes in results apply to all of the quantitative ecological risk assessment sites (Sites 1, 2, 3, 11, 12, 15, 16, 21, 22, 24, 25, 29, 31, 32, 33, 35, 39, and 41) as well as Sites 17 and 40 from the quantitative ecological screening assessment. The old and revised (new) hazard indices are presented in Tables K21 through K58.

### **K5.1 Body Burden Analysis**

An additional evaluation was conducted using the chemical analysis results for mammal tissue to evaluate differences among the three age classes of deer mice. Table K59 presents means and standard deviations of chemical concentrations in tissue for adult, subadult, and juvenile deer mice. The results of this analysis can be summarized as follows:

- Pesticides: There are no apparent trends in chemical concentrations among the different age classes of deer mice as the mean concentrations among the age classes are not significantly different.
- PAHs: There are no apparent trends in chemical concentrations among the different age classes of deer mice as the mean concentrations among the age classes are not significantly different and the data for a given age group are highly variable (standard deviations generally similar to means).
- Dioxins/Furans: Chemical concentrations for most of the dioxins/furans in juveniles are higher than those measured in adults at Site 31, the only site for which dioxins were analyzed in deer mice. However, the data for a given age group, congener, and congener group are highly variable (standard deviations generally similar to means). No subadults were collected at Site 31. This trend is opposite of the expectation that concentrations should accumulate over time because dioxins are known to bioaccumulate. No mice from reference areas were analyzed for dioxins. However, the concentrations of 2,3,7,8-TCDF and total TCDF in mice from both age groups at Site 31 are less than half the background concentrations reported by Thiel, et al. (1989; see Table 6.16). Therefore, regardless of the mechanism responsible for this trend, it is unlikely that the higher concentrations in juvenile mice will cause adverse impacts to the deer mouse population at Site 31.
- Metals: There are no apparent trends in chemical concentrations among the different age classes of deer mice as the mean concentrations among the age classes are not significantly different.

### **K5.2 Monte Carlo Analysis**

Monte Carlo simulations were conducted using the updated data set. The simulations were conducted and the results were interpreted in the same manner as described in Section 6.4.2.2 of the main text, with the exception that 2,000 iterations were used for all simulations. Table K60 summarizes the results of the simulations. Site-specific results are presented in Tables A124 through A129. For all sites, chemicals, and receptors except for the mouse hazard quotient estimates for lead at Site 2 and the fox hazard quotient estimates for total PeCDF at Site 31, the analysis using the updated data set resulted in the same or lower values for the expected values, the lower 95th percentile, and the upper 95th percentile. In addition, based on the updated data, selenium at

Site 2 and thallium at Sites 29 and 31 were not included in the updated Monte Carlo analysis since their HQs were less than 1.0.

For the mouse at Site 2, the expected value for the revised Monte Carlo simulation increased from 1.0 to 1.5 and the upper bound of the upper 95th percentile increased from 1.5 to 2.1. For the fox at Site 31, the expected value for the revised Monte Carlo simulation increased from 1.3 to 1.4 and the upper 95th percentile increased from 3.7 to 3.9. However, the expected values are close to one and the upper 95th percentiles for both distributions are 4 or less. Consistent with the interpretations in the main text, the conclusion that it is unlikely that deer mouse populations at these sites are adversely affected by these chemicals is still appropriate. In addition, for the remaining sites where the values from the updated Monte Carlo analysis were the same or lower, the conclusions for those sites were unchanged from those presented in the main text.

### **K5.3 Conclusions**

Comparison of the results based on the DFR data set with those based on the updated data set are presented in Tables K21 through K58 and can be summarized as follows:

- For Sites 12, 15, 17, 21, 22, and 32, there were no changes in the data or the resulting hazard indices as a consequence of data validation. Therefore, the conclusions for those sites have not been changed from those presented in the main text.
- For Sites 1, 2, 3, 11, 16, 24, 25, 29, 31, 33, 35, 39, and 41, hazard indices calculated based on the updated data were lower than those calculated using the DFR data set. Therefore, the conclusions for those sites have not been changed from those presented in the main text.
- For Site 40, the results of the quantitative ecological screening assessment in the DFR indicated "no concern" for mammals due to chemicals at the site. However, based on the updated data set, the hazard indices of 75 for the deer mouse and 11 for the gray fox indicate "probable concern" for mammals due to chemicals at the site. The COPC responsible for most of the estimated risks for the mouse is lead; soil ingestion was the major route of exposure. The COPCs responsible for most of the estimated risks for the fox, in order of importance, were lead and cadmium; soil and plant ingestion were the major routes of exposure. In the DFR data set, lead was not selected as a COPC since the concentrations were below background. Newly collected data, however, indicated that the maximum lead concentration in soil was 669 mg/kg. Cadmium was also not detected above background levels in the DFR data set and was not previously selected as a COPC. All concentrations of cadmium and lead detected above background levels were found in upland ruderal areas adjacent to a paved area. Interim remedial action is planned for those areas. Potential risks to terrestrial receptors are expected to be acceptable following remedial actions. Therefore, the conclusion that Site 40 requires no further action, as presented in the main text, is still valid.
- Changes in the chemical concentrations at the reference sites did not change the evaluation of potential impacts at any sites except Site 31. Site 31 consists mostly of coast live oak woodland habitat. Seven out of eight mammal tissue samples collected from Site 31 had detected lead concentrations whereas lead was not detected at the coast live oak reference site. However, all of the detected lead concentrations in mammal tissue from Site 31 were less than the lead concentrations detected in mammal tissue from the other reference site. The measured tissue concentrations of lead in mammals in the updated data set were also lower than those in the DFR data set. Therefore, the conclusion for this site has not been changed from that presented in the main text.

## K6.0 LEAF LITTER ASSESSMENT

This section summarizes the changes to the results presented in Section 6.6 in the main ERA text comparing chemical concentrations in leaf litter and the species composition and abundance data. The results were revised to accommodate information from analyses conducted using the updated data set. These revisions affect the results for all sites at which litter was collected (Sites 16, 21, 24, 25, 29, 31, and 35). Comparison of the results based on the DFR data set and the updated data set are summarized below by habitat type. This approach is consistent with the approach used previously. The analysis of community structure is discussed in the main ERA text.

- For the coast live oak woodland habitat (six transects, Sites 29, 31, and 35), revised graphs based on the updated data are provided in Figures K1 and K2. Comparison of graphs for lead and zinc from the main ERA text and those based on the updated data (Figures K1 and K2, respectively) indicated that there are no apparent trends associated with increasing concentrations of lead or zinc in either data set. The detected concentrations of 4,4'-DDE, 4,4'-DDT, and six PAHs (benzo(b)fluoranthene, benzo(ghi)perylene, fluoranthene, naphthalene, phenanthrene, and pyrene) are low (near the detection limit) and no trends in number of taxa or abundance are apparent in samples in which these chemicals were detected. Therefore, the conclusions for this habitat have not been changed from those presented in the main text.
- For the central maritime chaparral habitat (11 transects, Sites 16 and 35), revised graphs based on the updated data are provided in Figures K3 through K6. No leaf litter data were evaluated for this habitat in the DFR. Evaluation of graphs for chromium and nickel based on the updated data (Figures K3 and K5, respectively) indicate that abundance and diversity of leaf litter taxa are lower at the transect associated with the highest detected concentrations. These trends were not evident based on soil data for these chemicals. No trends are apparent for lead or zinc (Figures K4 and K6, respectively). The detected concentrations of 4,4'-DDE, 4,4'-DDT, chlordane, and three PAHs (benzo(a)pyrene, benzo(ghi)perylene, and dibenzo(a,h)anthracene) are low (near the detection limit); no trends in number of taxa or abundance are apparent in samples in which these chemicals were detected. Because the trend seen for chromium and nickel based on leaf litter data is not evident from soil data, it is unclear if any chemicals are affecting the leaf litter community. Because of the lack of clear and consistent trends, the conclusions for this habitat have not been changed from those presented in the main ERA text.
- For the upland ruderal habitat (20 transects, Sites 16, 24, 25, 29, and 35), revised graphs based on the updated data are provided in Figures K7 through K11. Comparison of graphs for copper and zinc based on the DFR data set and those based on the updated data (Figures K8 and K11, respectively) do not indicate different trends. New graphs based on updated data for chromium, nickel, and lead do not indicate any trends. The detected concentrations of 4,4'-DDE, 4,4'-DDT, chlordane, and four PAHs (acenaphthalene, benzo(b)fluoranthene, phenanthrene, and pyrene) are low (near the detection limit); no trends in number of taxa or abundance are apparent in samples in which these chemicals were detected. Therefore, the conclusions for this habitat have not been changed from those presented in the main ERA text.

The conclusion that no impacts are expected to the silvery legless lizard due to chemical concentrations in litter was further evaluated by examining relationships between chemical concentrations in leaf litter and functional composition of the litter organisms. For each transect, the identified taxa were categorized into one or more of the following five general functional groups:

- Detritivores
- Predators
- Herbivores
- Parasitic on animals
- Parasitic on plants.

These groups were considered to adequately represent the important functional constituents of the litter community. Because of the wide diversity of taxa within the identified orders, many of the orders have more than one function. Each of these five general functions performed by species within each taxonomic group were included in this evaluation. As a result, the total number of functions for each transect is greater than the number of identified taxa. The functional categorization of the 19 identified orders, based on a review of the available literature, is provided in Table K61. The breakdown of functional groups for each transect is provided in Table K62. Table K62 is organized by habitat and by site for each habitat. Because there are different totals for each transect within each habitat, comparisons between the transects are difficult. To directly compare data across transects within a habitat type, the functional composition of taxa was normalized on a percent basis for each transect. For example, 53 functions were identified for the taxa collected from transect 16-1 (Table K62). Of these 53 functions, detritivores comprised 13 (24.5 percent) of the total. This normalized value of 24.5 percent was then graphed against the litter chemical concentration measured at that transect (Figure K12). Graphs of these normalized values are presented for all three habitats in Figures K12 through K26. Figures K12 through K16 present data for chromium, copper, lead, nickel, and zinc for the upland ruderal habitat. Figures K17 through K21 and K22 through K26 present similar data for the central maritime chaparral and coast live oak woodland habitats, respectively. For each chemical, the five functional groups are plotted on two separate graphs for ease in interpretation; detritivore, predator, and herbivore data are presented on the "a" figures, and the two parasitic functions are presented on the "b" figures. Data collected from the reference transect for each habitat type are included in the figures and in Table K62. For all three habitat types, the normalized abundances of the five functional groups are similar between the reference and site transects.

For the upland ruderal habitat, some trends are apparent. At higher concentrations for all five metals, the percentage of predators is greater than those for other nonparasitic functions (Figures K12a, K13a, K14a, K15a, K16a). The percentage of detritivores and herbivores are closely related. Both parasitic functions are closely related and often show identical patterns, especially at higher concentrations (e.g., Figures K13b, K15b). Parasitic functions are generally as abundant as predatory functions. No clear patterns are discernable due to the large variation in results over the range of detected litter concentrations. For copper, lead, and nickel, the highest normalized abundance of parasitic functions were seen at the highest litter concentrations. However, although the abundance of predators also increased at higher concentrations, the abundance of herbivores and detritivores at higher concentrations were not depressed below abundances seen at some lower concentrations. These patterns suggest that while there may be changes to some of the functional components of the litter community at the highest metal concentrations, the overall community functional composition is within the variability observed at lower metals concentrations detected in litter. In the upland ruderal habitat, because no functions are completely absent at higher concentrations, impacts to the litter community as a result of loss of the functional groups related to chemical concentrations in leaf litter are not anticipated.

The same trends for the relative abundances of the five functions are also apparent in the central maritime chaparral habitat (Figures K17 through K21). The abundance of parasitic functions were highest at the highest litter concentration for copper, lead, and zinc (Figures K18b, K19b, and K21b). Similar abundances of these functions were also seen at lower concentrations of these three metals. The patterns of parasitic functions were very closely related for all five metals (Figures K17b, K18b, K19b, K20b, and K21b). The patterns seen in the central maritime chaparral habitat are similar to those observed in the upland ruderal habitat. These patterns suggest that while there may be changes to some of the functional components of the litter community at the highest metal concentrations, the overall community functional composition is within the variability observed at lower metals concentrations detected in litter. In the central maritime chaparral habitat, because no functions are completely absent at higher concentrations, impacts to the litter community as a result of loss of the functional groups related to chemical concentrations in leaf litter are not anticipated.

Different patterns were observed in the coast live oak woodland habitat. This is to be expected because this habitat is characterized by oak trees, which provide a different litter structure than those observed in the other two habitats that are dominated by shrubs and/or opportunistic weedy species. Patterns are less consistent in this habitat than in the other two habitats, perhaps because the heterogeneity of the litter is greater. Transects that pass within the drip line of oak trees would have substantially different litter composition than transects that do not pass within the drip line; therefore interpretation of the data presented in Figures K22 through K26 is more complex. Also, this habitat contained the fewest transects, increasing the variability associated with the few available data points.

In general, abundance of predators is greatest in leaf litter in the coast live oak woodland habitat. Detritivores are second in abundance and herbivores are less abundant. These overall trends are apparent across the range of chemical concentrations observed in leaf litter. The main difference between patterns observed in this habitat and those seen in the other habitats lies in the relative abundance of parasitic functions. In general, the abundance of parasitic functions declines as the chemical concentration in litter increases (Figures K22b, K23b, K24b, K25b, and K26b). However, the lowest abundances are seen at concentrations less than the maximum. Due to the large variation in results over the range of detected litter concentrations, there is no clear impact on any of the five functions at higher concentrations. In the coast live oak woodland habitat, because no functions are completely absent at higher concentrations, impacts to the litter community as a result of loss of the functional groups related to chemical concentrations in leaf litter are not anticipated.

In summary, no clear patterns related to chemical concentrations in leaf litter are discernable in any habitat type due to the large variation in results over the range of detected litter concentrations. Chemical concentrations at the reference transects are consistent with background, and the normalized abundances of the five functional groups are similar between reference and site transects. This indicates that the overall community functional composition in each habitat is within the variability observed at metals concentrations consistent with background in litter. Therefore, impacts to the litter community as a result of loss of the functional groups related to chemical concentrations in leaf litter are not anticipated.

## K7.0 CONCLUSIONS

This section summarizes the conclusions for the quantitative assessment sites. The conclusions were based on an evaluation of differences between the DFR data set and the updated data set. The assessments for mourning doves (Site 3 only), aquatic receptors, and plants for sites other than Sites 2, 3, and 39 are not discussed in this appendix because none of the new data and/or newly validated data evaluated were applicable to those assessments. Therefore, the conclusions presented in the main text have not changed. Conclusions of the assessments for plants at Sites 2 and 3, buckwheat at Site 3, mammals at Sites 1, 2, 3, 11, 12, 15, 16, 17, 21, 22, 24, 25, 29, 31, 32, 33, 35, 39, 40, and 41, and leaf litter at Sites 16, 21, 24, 25, 29, 31, and 35 are presented below and summarized in Table K63. The conclusions are discussed below in relation to how they differ from those presented in the main ERA text. The conclusions presented in the main text can be found for plants in Sections 6.2.2 and 7.2, for buckwheat in Sections 6.3.2, 7.2, and 7.3, for mammals in Sections 6.4.2, 7.2, and 7.3, and for leaf litter in Sections 6.6, 7.2, and 7.3.

- For Site 1, only the mammal assessment was affected by changes in the data set due to data collection/validation. For mammals, hazard indices were lower when based on the updated data set than those based on the DFR data set. Therefore, the conclusions for Site 1 presented in Section 6.8.1 of the main text have not been changed.
- For Site 2, the results of the plant and mammal assessments were affected by changes in the data set due to data collection/validation. The results of the plant assessment indicate that concentrations in detected hottentot fig tissue are consistent with either background or normal tissue concentrations. For mammals, hazard indices were lower based on the updated data set than those based on the DFR data set. Therefore, the conclusions for Site 2 presented in Sections 6.8.2 and 7.2 of the main text have not been changed.
- For Site 3, the results of the plant, buckwheat, and mammal assessments were affected by changes in the data set due to data collection/validation. The results of the plant assessment indicate that concentrations detected in hottentot fig tissue are consistent with background concentrations. Because no additional information on impacts to buckwheat was obtained from the plant bioaccumulation, uptake, and biomass assays, no changes were made to the conclusions regarding potential impacts to the Smith's blue butterfly. For mammals, hazard indices were lower based on the updated data set than those based on the DFR data set. Therefore, the conclusions for Site 3 presented in Sections 6.8.3, 7.2, and 7.3 of the main text have not been changed.
- For Sites 11, 33, and 41, where only mammal assessment was affected by changes in the data set due to data collection/validation, hazard indices were lower when based on the updated data set than those based on the DFR data set. Therefore, there are no changes to the conclusions in the main text for Sites 11, 33, and 41; the conclusions are presented in Sections 6.8.4 and 7.2, Sections 6.8.15 and 7.2, and Section 6.8.18, respectively.
- For Sites 12, 15, 17, 22, and 32, where only mammal assessment was affected by changes in the data set due to data collection/validation, hazard indices did not change when based on the updated data set from those based on the DFR data set. Therefore, there are no changes to the conclusions in the main text for Sites 12, 15, 17, 22, and 32; the conclusions are presented in Section 6.8.5, Sections 6.8.6, 7.2, and 7.3, Section 5.4.8, Section 6.8.9, and Section 6.8.14, respectively.

- For Sites 16, 24, 25, 29, 31, and 35, the mammal and litter assessments were affected by changes in the data set due to data collection/validation. For mammals, hazard indices were lower when based on the updated data set than those based on the DFR data set. The conclusions for litter have not changed because there were no trends in number of taxa or abundance in samples in which chemicals were detected. Therefore, there are no changes to the conclusions in the main text for Sites 16, 24, 25, 29, 31, and 35; the conclusions are presented in Section 6.8.7, Section 6.8.10, Sections 6.8.11 and 7.2, Sections 6.8.12 and 7.2, Sections 6.8.13 and 7.2, and Section 6.8.16, respectively.
- For Site 21, the mammal and litter assessments were affected by changes in the data set due to data collection/validation. For mammals, hazard indices were the same when based on the updated data set as those based on the DFR data set. There are no changes to the conclusions for litter have not changed because there were no trends in number of taxa or abundance in samples in which chemicals were detected. Therefore, the conclusions for Site 21 presented in Section 6.8.8 of the main text have not changed.
- For Site 39, the plant, mammal, and litter assessments were affected by changes in the data set due to data collection/validation. The results of the plant assessment indicate that concentrations detected in hottentot fig tissue are consistent with background concentrations. For mammals, hazard indices were lower when based on the updated data set than those based on the DFR data set. The conclusions for litter have not changed because there were no trends in number of taxa or abundance in samples in which chemicals were detected. Therefore, there are no changes to the conclusions for Site 39 presented in Sections 6.8.17, 7.2, and 7.3 of the main text.
- For Site 40, only the mammal assessment was affected by updating the data set by collecting or validating soil data. The results of the quantitative ecological screening assessment in the main ERA indicate "probable concern" for mammals on site due to chemicals at the site. However, the COPCs responsible for most of the estimated risks are cadmium and lead. The detected concentrations of cadmium and lead above background levels were found adjacent to a paved area in upland ruderal areas that are planned for interim remedial action. The potential risks to terrestrial receptors are expected to be acceptable following remedial actions. Therefore, the conclusion of no further action for Site 40 presented in Section 5.4.19 of the DFR is still valid.

## K8.0 REFERENCES

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