4/1/08-00718

REVIEW COMMENTS
DRAFT SITE 2 EXPANDED REMEDIAL INVESTIGATION REPORT
ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA
APRIL 2008

Ref: (a) DoD. 2007. Department of Defense. Memorandum from the Department of Defense for Deputy Assistant Secretary of the Army, Deputy Assistant Secretary of the Navy, and Deputy Assistant Secretary of the Air Force, RE: Actions in Response to Perchlorate Releases, Attachment 1-Identification and Selection of Toxicity Values/Criteria for CERCLA and Hazardous Waste Site Risk Assessment in the Absence of IRIS Values. 21 Sept 2007.

(b) USEPA. 2003. Human Health Toxicity Values in Superfund Risk Assessments. OSWER Directive 9285.7-53. 5 Dec 2003.

(c) Office of Environmental Health Hazard Assessment (OEHHA), 2002 Technical Support Document for Describing Available Cancer Potency Factors.

(d) OEHHA, 1999 Public Health Goal for Trichloroethylene in Drinking Water.

(e) USEPA. 1997. Health Effects Assessment Summary Tables. FY 1997 Update. EPA/540-R-97-036. July.

(f) USEPA. 1989. Risk Assessment Guidance for Superfund Volume I. Human Health Evaluation Manual (Part A) Interim Final. Office of Solid Waste and Emergency Response. Washington, D.C. December 1989. EPA/540/1-89-002.

(g) USEPA. 2004. "Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final." EPA/540/R/99/005. OSWER 9285.7-02EP. July.

(h) USEPA. 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors". OSWER Directive 9285.6-03. March 25, 1991.

(i) USEPA. 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure. Draft.

(j) USEPA. 1999. Guidelines for carcinogen risk assessment (review draft). Risk Assessment Forum, Washington, DC. NCEA-F-0644.

(k) USEPA. 2005. Guidelines for Carcinogen Risk Assessment. Risk Assessment Forum. EPA/630/P-03/001F. March 2005.

General Comments:

1. This report relies on the U.S. Environmental Protection Agency (USEPA) Region 3 risk-based concentrations (RBCs) to identify constituents of potential concern (COPCs) for the baseline human health risk assessment (HHRA). Effective Spring 2008, the USEPA Region 3 RBC table was replaced by the Regional Screening Table (RST) developed by Oak Ridge National Laboratory for the USEPA (available online at: http://epa-prgs.ornl.gov/chemicals/index.shtml). In many cases, the soil screening levels (SLs) on the RST are more conservative than the Region 3 soil RBCs since the RST includes exposure pathways that were not used by Region 3 (i.e., dermal contact and

inhalation). As such, if the new SLs are used, some additional COPCs would be identified in the baseline HHRA.

We recommend comparing the RST SLs to the Region 3 RBCs that were used in this report to identify the potential impact that using the new SLs would have on COPC identification and subsequent risk assessment calculations. If the use of the new SLs would not impact the HHRA risk characterization and conclusions, we recommend documenting this in the HHRA. However, if the results of this analysis suggest that the conclusions drawn from the risk characterization could change based on the addition of new COPCs, it may be appropriate to update the HHRA with these new screening levels before finalizing the report.

2. The trichloroethylene (TCE) toxicity values used in this HHRA are not consistent with the draft agreement reached between USEPA and the U.S. Department of Defense (DOD). This draft agreement is based on DOD's endorsement (reference [a]) of the USEPA's updated hierarchy of sources for human health toxicity values (reference [b]). Based on ref (a), we recommend using the California Environmental Protection Agency (Cal-EPA) inhalation unit risk value of 2.0E-6 $(ug/m^3)^{-1}$ per ref (c) and Cal-EPA's oral cancer slope factor (CSF) of 0.013 $(mg/kg\text{-}day)^{-1}$ ref (d) for both the COPC screening and risk calculations.

3. Section 5.1.5 of the report states that the results of the subsurface soil investigation "*indicate a strong likelihood of DNAPL contamination.*" Section 5.1.6 states that, "*The maximum TCE concentration in Columbia aquifer monitoring wells (330,000 µg/L) is approximately 30 percent of the TCE solubility level (11,000 µg/L), indicating the likely presence of DNAPL.*"

In comparison, other sections of this report (e.g., Sections 5.1.5 and 10) state that the nature and extent of contamination has been adequately characterized. Since there is a "*strong likelihood of DNAPL contamination*" at this site which has not been confirmed, it seems premature to state that the nature and extent of contamination has been adequately characterized. We recommend either clarifying the statements about DNAPL or about the nature and extent throughout the report.

4. Section 7.2.2 of the HHRA lists vapor intrusion from groundwater to indoor air as a potentially complete exposure pathway. However, neither the text nor the tables in Section 7 contain any sort of qualitative or quantitative evaluation of this pathway. The reader does not learn that this pathway was not evaluated until they look at Appendix M, Table 1. The complete omission of any discussion about this pathway in the baseline HHRA is a fairly significant shortcoming, particularly considering the potential presence of dense non-aqueous phase liquids (DNAPL) at Site 2. Based on the risk characterization for future residents in contact with groundwater, we concur that a quantitative evaluation of this pathway would not change the HHRA conclusions. However, we recommend that the baseline HHRA be updated to include a qualitative discussion of this pathway, including an explanation of why this pathway was not quantitatively evaluated.

5. The nature and extent section of the report concludes that DNAPL is likely present at Site 2. Although the nature and extent of possible DNAPL has not been delineated in this report, it is unlikely that it is present across the entire 4 acre site based on a review of Figures 5-11, 5-14, and 5-15.

We recommend reviewing the nature and extent data to determine if it would be appropriate to perform a "hot spot" analysis for this site. The HHRA combined data across the entire 4-acre site into one dataset to develop the exposure point concentrations (EPCs). Due to the size of the site, it is unlikely that the receptors evaluated in the HHRA would have contact with all parts of the site at the same rate. As such, when risks were calculated at potentially unacceptable levels, this suggests a remedial action may be warranted at the entire site, which may not actually be case if the risk is driven by exposure to the lone area of higher contamination.

6. A thorough quality assurance/quality control (QA/QC) review of the intake and risk calculations was not performed, in part because of the specific comments below that would impact the calculation results. Also, Tables 7.1.RME to 7.7.RME in Appendix M were missing from our hard copy, which made it difficult to confirm the intakes.

However, during a cursory review of the calculation tables in Appendix M, we noticed on Table 9.1.RME M that the current/future adult trespasser had a higher cancer risk from contact with benzo(b)fluoranthene in sediment than from benzo(a)pyrene. Since benzo(a)pyrene has a higher EPC (per Table 3.4.RME in Appendix M) and a higher cancer slope factor (CSF), there must be an error on this table. We also noticed this table reports the carcinogenic risk from exposure to vinyl chloride in sediment as zero, which is also an error. We recommend that a thorough QA/QC be conducted of the calculations before this report is finalized.

7. The Executive Summary is missing sufficient detail to provide the entire "picture", making it necessary to review the body of the report for missing information. For example, it would be helpful if the Site Description and History section included a figure that clearly depicts where the different buildings and other identified features are located within Site 2. Without a visual depiction of the layout it is difficult to follow the text.

In other cases, information in the Executive Summary is edited to the point where it is inaccurate, or presents a misleading picture. For example, on page xi it is misleading to state "*There are no non-carcinogenic hazards or carcinogenic risks...*" It should be stated that the hazard indices and carcinogenic risks are below benchmark levels (e.g., less than a1.0E-06 cancer risk). We recommend updating the Executive Summary so it can be a stand-alone section that provides sufficient and accurate information about the site, the investigation, and the report conclusions.

Specific Comments:

1. Page 5-4. Section 5.1.5 Subsurface Soil Sampling

a. The first sentence in this section states, "*Subsurface soil samples collected during the Site 2 RI adequately defined the nature and extent of subsurface soil contamination.*"

Per General Comment 3, the rest of this section concludes that DNAPL may be present, although it wasn't specifically observed during the sampling. Since there is a "*strong likelihood of DNAPL contamination*" at this site that hasn't been confirmed, it seems premature to state that the nature and extent of contamination has been adequately characterized.

b. This section does not present the results of the dioxon/furan analyses that were performed. We recommend including this information in this section.

2. Page 5-13. Section 5.2 Sources of Contamination

The first sentence of the second paragraph in this section states, "*Constituents in surface and subsurface soil reflective of potential impacts from Site 2 are inorganics, PAHs, pesticides, and dioxin.*"

It is unclear why CVOCs are not included in this list. Since Section 5.1.5 of this report concludes that CVOCs may be present as DNAPL in saturated soils, we recommend explaining why CVOCs are not discussed in this section.

3. Table 5-1. Surface Soil Detections and Exceedances of Screening Criteria.

There are several "NA" entries on this table which do not make sense. For example, the 4,4-DDT result for sample SJS02-SS03-00 is reported as "NA" which means not analyzed according to the footnotes. However, since there are other pesticide results for this sample, including 4,4-DDD and 4,4-DDE, it is counterintuitive that this sample was not analyzed for the presence of 4,4-DDT. We recommend reviewing the information on this table to ensure it is correct and that all rejected results are shown.

4. Page 6-9. Section 6.2 Contaminant Transport. Unsaturated Zone Migration.

The first paragraph of this section states, "*Volatilization of VOCs into soil gas or even the atmosphere in surface soil can occur in the unsaturated zone; although this is considered a minor transport pathway.*"

We recommend adding text to this section that supports the conclusion in the above sentence.

5. Page 6-11. Section 6.3 Fate and Transport Modeling Assessment
Page 6-12. Section 6.4 Summary of Current Migration Pathways

These sections do not include a discussion of the potential transport of VOC vapors from subsurface to the surface. The combination of the constituent concentrations in groundwater, the short distance between the shallow groundwater aquifer water table and ground surface and the soil composition indicate that vapor intrusion could potentially be an important exposure pathway. We recommend updating these sections to include an evaluation of this pathway so this chapter provides a more complete evaluation of all possible migration/transport pathways that are evaluated (even qualitatively) in the HHRA.

6. Figure 6-1. Site 2 Conceptual Site Model

The conceptual site model does not include the inhalation of vapors pathway for future industrial workers and residents due to potential vapor intrusion. We recommend updating this figure so this potentially complete exposure pathway is included.

7. Page 7-4. Section 7.1.2 Selection of Chemicals of Potential Concern, 2nd bullet
Page 7-4. Section 7.1.2 Selection of Chemicals of Potential Concern, 3rd bullet

Both of these bullets incorrectly state that the RBCs based on carcinogenic effects were used as presented in the RBC table. As stated earlier in this section, the RBCs were multiplied by ten; since the RBCs based on noncarcinogenic endpoints were adjusted to account for a target hazard index (HI) of 0.1, these are the screening values that were used as shown on the Region 3 RBC table. We recommend editing this text as appropriate.

8. Page 7-4. Section 7.1.2 Selection of Chemicals of Potential Concern, 4th bullet

Editorial: The last sentence should reference Appendix M instead of Appendix L.

9. Page 7-9. Section 7.2.2 Identification of Exposure Pathways, Future Exposure Routes

a. It is unclear why the vapor intrusion pathway is listed separately from the other exposure pathways listed for the future residents. Since this is the same receptor, we recommend deleting the second bullet on this page and including the vapor intrusion pathway with the first two bullets for the future residents.

b. The vapor intrusion pathway is potentially complete for the future industrial worker. We recommend including this pathway in the last bullet in this section.

c. Consistent with General Comment #4, we recommend adding text to this section that discusses the vapor intrusion pathway.

10. Page 7-11. Section 7.3.1 Toxicity Information for Non-carcinogenic Effects

The last paragraph, second sentence states, "*USEPA's NCEA develops subchronic RfDs...*" There are other sources of subchronic RfDs such as EPA's Provisional Peer-Reviewed Toxicity Value (PPRTV) database and ref (e). We recommend including these additional sources in this sentence.

11. Page 7-12. Section 7.3.1 Toxicity Information for Non-carcinogenic Effects

The second paragraph states, "*These UFs and MFs range between **10** and 10,000 and are based on professional judgment*" (emphasis added). The range of uncertainty factors (UFs) and modifying factors (MFs) that USEPA may assign when developing reference doses (RfDs) is actually between 1 and 10,000 (e.g., the oral RfD for manganese). We recommend replacing "10" with "1" in the sentence above.

12. Page 7-12. Section 7.3.2 Toxicity Information for Carcinogenic Effects

This section presents a description of the weight-of-evidence classification based on the USEPA's previous guidance. The carcinogen classification should be updated with the classification scheme presented in USEPA's current guidelines (reference [k]).

13. Page 7-13. Section 7.4.1 Non-carcinogenic and Carcinogenic Risk Estimation Methods

Editorial: The last sentence on this page reads, "*If the HI for each target organ is not above 1, it can be assumed that there is no non-carcinogenic hazard to the receptor **above the USEPA's target level***" (emphasis added).

We recommend deleting the last five words in the above sentence.

14. Page 7-14. Section 7.4.1 Non-carcinogenic and Carcinogenic Risk Estimation Methods

The section on "Carcinogenic Risk Estimation" only shows the linear low dose cancer risk equation. Consistent with reference (f), the "*linear equation is valid only at low risk levels (i.e., below estimated risks of 0.01). For sites where chemical intakes might be high (i.e., risk above 0.01), an alternate calculation equation should be used. The one-hit equation, which is consistent with the linear low-dose model given above and described in the box on page 8-11, should be used instead.*"

We recommend that this section be updated to include the one-hit equation. Please also confirm that the correct equation was used to estimate the future lifetime resident risk from exposure to shallow groundwater, since the excess lifetime cancer risk (0.22) warrants the use of the one-hit model according to reference (f).

15. Page 7-15. Section 7.4.2 Risk Assessment Results, Future Adult Resident
Page 7-16. Section 7.4.2 Risk Assessment Results, Future Child Resident

The first sentence in both sections states that "*hazards **and risks***" were evaluated for these receptors and provides a reference to the specific tables that show these calculations (emphasis added). We recommend removing "and risk" from these statements since the text and corresponding tables only include the evaluation of noncarcinogenic hazards. The evaluation of carcinogenic risk was performed for a future lifetime resident and these calculations are shown on different tables.

16. Page 7-20. Section 7.5.1 General Uncertainty in COPC Selection

According to Table 2-7 in Appendix M, the detection limits for several VOCs are greater than the screening levels. This should be discussed in the uncertainty section since several compounds with detection limits greater than the screening values were not selected as COPCs.

17. Page 7-20. Section 7.5.2 Uncertainty Associated with Exposure Assessment

The second paragraph is this section discusses the unvalidated subsurface soil samples that were not included in the quantitative risk characterization since these samples had detections of CVOCs at fairly shallow depths (4.5 – 6.5 ft bgs). The last sentence concludes, "*This results in a potential underestimation of potential risks associated with exposure to subsurface soil, particularly for a future construction worker, and potentially, **although less likely** for a future industrial worker or resident*" (emphasis added).

The conclusion about potential risks to future industrial workers and residents does not seems to consider the vapor intrusion pathway, which wasn't quantitatively or qualitatively evaluated in this risk assessment. Since the phrase "although less likely" could be open to debate, we recommend deleting those words from the above sentence.

18. Page 7-20. Section 7.5.2 Uncertainty Associated with Exposure Assessment
Page 7-23. Section 7.5.4 Uncertainty in Risk Characterization

Consistent with General Comment #4, this baseline HHRA did not evaluate one of the potentially complete exposure pathways (vapor intrusion). We recommend that this be discussed in these sections of the uncertainty assessment so that it has been documented that the Navy understands the impact that this has on the quantitative risk evaluation.

19. Page 7-21. Section 7.5.3 Uncertainty Associated with Toxicity Assessment

Tables 5.1 and 5.2 in Appendix M includes a column with uncertainty associated with the non-carcinogenic toxicity values. Uncertainty factors are inherent to the development of toxicity values. Since these values are presented we recommend including a discussion in this section about the confidence in the toxicity values used to calculate risks.

20. Page 7-24. Section 7.6.2 Combined Surface and Subsurface Soil

a. The first sentence on this page states, "*...and therefore the non-carcinogenic hazard is acceptable.*" This is a risk management conclusion and should not be included in the risk characterization section. Alternatively, results should be compared to benchmark levels to provide context. Additionally, since Section 5.1.5 states that DNAPL is likely present in subsurface soil, but the vapor intrusion pathway was not quantitatively evaluated, this conclusion may be premature. A possible updated version of this sentence could read, ""*...and therefore the non-carcinogenic hazard for the exposure pathways evaluated is below the USEPA's target HI of one.*"

b. The first paragraph, next to last sentence, reads: "*There are no carcinogenic risks to the child resident based on exposure to combined surface and subsurface soil.*" We recommend deleting this sentence since the child resident was not evaluated separately for carcinogenic risk (the carcinogenic risk was evaluated for the combined adult/child resident).

c. The last paragraph is this section discusses the unvalidated subsurface soil samples that were not included in the quantitative risk characterization. The last sentence concludes, "*Based on the qualitative evaluation... and potentially,* ***although less likely*** *for a future industrial worker or resident...*" (emphasis added).

The conclusion about potential risks to future industrial workers and residents does not consider the potential exposure and risk from the vapor intrusion pathway, which was not quantitatively or qualitatively evaluated in this risk assessment. Since the phrase "although less likely" could be open to debate, we recommend deleting those words from the above sentence.

21. Page 7-24. Section 7.6.4 Sediment

There are several sentences in this section that state there is "*no risk.*" Since this is technically inaccurate, and the "acceptability" of hazards/risks is part of the risk management step rather than the risk characterization, we recommend removing these statements. Alternatively, the calculated risks can be compared to the USEPA's target levels.

22. Figure 7-1. Conceptual Site Model for Potential Human Exposures

a. We recommend updating this figure so it clearly includes the potential exposure to future residents and industrial workers via the vapor intrusion pathway.

b. Technically, when inhalation is the route of exposure, "groundwater" is not the accurate "exposure media" to show on this table. The "Groundwater Inhalation" pathway is more appropriately identified as the inhalation of vapors from groundwater pathway, with vapors as the exposure medium.

23. Appendix M.

Editorial: While reviewing these tables, we noticed numerous typographical errors. For example, some tables have footnotes that do not apply (e.g., Table 3.8 CTE; Medium-Specific Exposure Point Concentration Summary- the first footnote that applies to this table is number 5), are missing units (e.g., Table 4.7 RME-Daily Intake Calculations- for both the adult and child resident, there aren't any units listed for the CW term for dermal exposure calculations), and include typos (e.g., several Table 9s identify "prostrate" instead of "prostate" as the "Primary Target Organ.".

24. Appendix M. Table 1 Selection of Exposure Pathways

a. The entries for the future adult, child, and child/adult exposure to surface water via incidental ingestion for "type of analysis" are listed as "none." Since a quantitative evaluation was performed we recommend changing "none" to "quantitative."

b. Currently, this table only includes volatiles in groundwater as a potential source of volatile contaminants in indoor air for future scenarios. Section 5.1.5 (Subsurface Soil Sampling) states that DNAPL may be present in subsurface soil. As such, this may serve as a source of potential VOCs in indoor air for future scenarios. We recommend adding rows for this pathway to the table and explaining why it this pathway was not evaluated quantitatively in the risk assessment.

c. A future onsite industrial worker is included in the evaluation of future pathways for direct contact with soil (ingestion, dermal contact, and inhalation) and groundwater (ingestion). However, this table does not include information for the future onsite industrial worker exposure to volatile constituents in soil/groundwater that migrate to indoor air. This pathway should be added to this table, along with an explanation of why it may not be quantitatively evaluated in the risk assessment.

25. Appendix M. Table 2-1 Occurrence, Distribution, and Selection of Chemicals of Potential Concern, Surface Soil

Editorial: The qualifiers for the minimum detected concentration of gamma-Chlordane is incorrectly reported as "UJ." This should be changed to "J" consistent with the results that are reported for sample SJS02-SS-16-000 on Table 5-1.

26. Appendix M. Table 2-5 Occurrence, Distribution, and Selection of Chemicals of Potential Concern, Soil*

Editorial: The qualifier and sample ID for the maximum detected concentration of fluorene are incorrectly reported as "UJ" and "SJS02-SB-10-001." Since fluorene was not detected in subsurface soil according to Table 5-2, the values on Table 2-5 in Appendix M should be consistent with the information reported on Table 2-1 in Appendix M.

27. Appendix M. Table 2-7 Occurrence, Distribution, and Selection of Chemicals of Potential Concern, Shallow Groundwater

The maximum reported concentration of vanadium (2.5 L µg/L at SJS02-MW13S-04D-P) could not be verified with the information in Appendix C, Table C-3. The Table in Appendix C reports this value as 2 L µg/L. Although this is a minor difference and would not be expected to influence the outcome of the risk assessment calculations, it raises concerns about the data that were used to generate Table 2-7 in Appendix M. We recommend ensuring that the correct data was used in all risk assessment calculations.

28. Appendix M. Table 2-8 Occurrence, Distribution, and Selection of Chemicals of Potential Concern, Shallow Groundwater

This table identifies COPCs for the inhalation of volatiles while showering based solely on screening levels based on oral ingestion. It is not necessarily appropriate to assume that dose-response is equivalent for these two pathways. While this change does not need to be incorporated into this report, it should be considered for future risk assessments.

29. Appendix M. Table 4-1.RME Values Used for Daily Intake Calculations, Scenario Timeframe: Current/Future; Medium: Surface Soil; Exposure Medium: Surface Soil

a. The information provided in this table about the hypothetical adolescent trespasser is inconsistent. Footnote 2 explains that the exposure duration (ED) was assumed to be 9 years based on an adolescent from 9 to 18 years old. However, footnote 4 states that the exposed skin surface area (SA) available for contact with soil was based on receptors aged 7 to 18 years. The corresponding text for the HHRA (Chapter 7) does not provide any additional details regarding the receptor that is being evaluated for this pathway.

b. Footnote 4 states that the exposed skin SA available for contact with soil (5,300 cm^2) was based on receptors aged 7 to 18 years. This value could not be reproduced based on table C-1 in reference (g). Additionally, we recommend that the age ranges used for this value are consistent with the other parameters for this receptor (see comment above). We recommend verifying that this value was calculated correctly.

c. The value shown for the adult landscaper's averaging time for non-carcinogenic effects (8,760 days) is incorrect. This value should be 9,125 days so it corresponds with the ED of 25 years. Please verify that the correct value was used in the calculations.

30. Appendix M. Table 4-2.RME Values Used for Daily Intake Calculations, Scenario Timeframe: Current/Future; Medium: Soil; Exposure Medium: Air

a. The ED reported on this table for the adult landscaper is 9 years. Since this is the same receptor that is described on Table 4-1.RME, the ED should be consistent with the ED for the soil contact pathways. We recommend changing the value on this table to 25 years, so it is consistent with Table 4-1.RME and the EPA's recommended ED for

industrial workers. Please verify that the correct value (25 years) was used in the calculations.

b. The value shown for the adult landscaper's averaging time for non-carcinogenic effects (AT-NC) is incorrect (8,760 days). Consistent with comment a, this value should be 9,125 days so it corresponds with the ED of 25 years. Please verify that the correct value (9,125 days) was used in the calculations.

c. The exposure frequency (EF) reported on this table for the adult landscaper is 52 days. Since this is the same receptor that is described on Table 4-1.RME, the EF should be consistent with the EF for the soil contact pathways. We recommend changing the value on this table to 26 days, so it is consistent with Table 4-1.RME. Please verify that the correct value (25 years) was used in the calculations.

31. Appendix M. Table 4-3.RME Values Used for Daily Intake Calculations, Scenario Timeframe: Current/Future; Medium: Surface Water; Exposure Medium: Surface Water

Appendix M. Table 4-4.RME Values Used for Daily Intake Calculations, Scenario Timeframe: Current/Future; Medium: Sediment; Exposure Medium: Sediment

Appendix M. Table 4-3.CTE Values Used for Daily Intake Calculations, Scenario Timeframe: Current/Future; Medium: Surface Water; Exposure Medium: Surface Water

Appendix M. Table 4-4.CTE Values Used for Daily Intake Calculations, Scenario Timeframe: Current/Future; Medium: Sediment; Exposure Medium: Sediment

The exposed adolescent trespasser's skin SA available for contact with surface water (4,046 cm^2) couldn't be reproduced based on table C-1 in reference (g). We recommend verifying that this value was calculated correctly.

32. Appendix M. Table 4-5.RME Values Used for Daily Intake Calculations, Scenario Timeframe: Future; Medium: Soil*, Exposure Medium: Soil*

a. The age-adjusted dermal absorption factor for the future adult/child resident (602 mg-year/kg-day) could not be reproduced. Our calculations are shown below. We recommend correcting this table if necessary and ensuring that the correct value was used in the risk calculations.

$$\text{DA - adj} = \left(\frac{ED_{adult} \times SA_{adult} \times AF_{adult}}{BW_{adult}}\right) + \left(\frac{ED_{child} \times SA_{child} \times AF_{child}}{BW_{child}}\right)$$

$$\text{DA - adj} = \left(\frac{24\text{ years} \times 5700\text{cm}^2 \times 0.07\text{mg/cm}^2\text{ - day}}{70\text{ kg}}\right) + \left(\frac{6\text{ years} \times 2800\text{cm}^2 \times 0.2\text{mg/cm}^2\text{ - day}}{15\text{ kg}}\right)$$

$$\text{DA - adj} = 136.8\frac{\text{mg - year}}{\text{kg - day}} + 224\frac{\text{mg - year}}{\text{kg - day}} = 360.8\frac{\text{mg - year}}{\text{kg - day}}$$

b. Editorial. The units shown for the DA-adj in the last column of this table include a typographical error. Replace "kd" with "kg."

33. Appendix M. Table 4-6.RME Values Used for Daily Intake Calculations, Scenario Timeframe: Future; Medium: Soil*, Exposure Medium: Air

a. The EF (125 days/year), ED (1 year), and AT-NC (365 days) reported on this table for the industrial worker are inconsistent with the values shown on Table 4-5.RME for the same receptor in direct contact with soil. Since this is the same receptor that is described on Table 4-5.RME, we recommend that the EF and ED should be consistent with the soil contact pathways and EPA's recommended values per ref (h). We recommend changing the EF to 250 days/year, the ED to 25 years, and the AT-NC to 9,125 days. Please verify that the correct values were used in the calculations.

34. Appendix M. Table 4-7.RME Values Used for Daily Intake Calculations, Scenario Timeframe: Future; Medium: Groundwater, Exposure Medium: Shallow Groundwater

a. The construction worker EF for dermal contact with groundwater is twice as long as the construction worker's EF for direct contact with soils (Table 4-5.RME). We recommend using a consistent EF for contact with all media. Please ensure that the same EF is used in all the risk calculations for construction worker contact with shallow groundwater and soil.

b. There is no explanation for the derivation of the construction worker's skin SA available for contact with groundwater (3,300 cm^2). Since this is the same value that was used for the worker's contact with soil, it is assumed that this may represent contact by the head, hands, and forearms which seems conservative for groundwater. We recommend including a footnote to explain how this value was derived.

35. Appendix M. Table 4-8.RME Values Used for Daily Intake Calculations, Scenario Timeframe: Future; Medium: Groundwater, Exposure Medium: Air

The construction worker EF for contact with groundwater is twice as long as the construction worker's EF for direct contact with soils (Table 4-5.RME). We recommend using a consistent EF for contact with all media. Please ensure that the same EF is used in all the risk calculations for construction worker contact with shallow groundwater and soil.

36. Appendix M. Table 4-9.RME Values Used for Daily Intake Calculations, Scenario Timeframe: Current/Future; Medium: Groundwater; Exposure Medium: Deep Groundwater

Appendix M. Table 4-10.RME Values Used for Daily Intake Calculations, Scenario Timeframe: Current/Future; Medium: Groundwater; Exposure Medium: Air

Appendix M. Table 4-8.CTE Values Used for Daily Intake Calculations, Scenario Timeframe: Current/Future; Medium: Groundwater; Exposure Medium: Deep Groundwater

Appendix M. Table 4-9.CTE Values Used for Daily Intake Calculations, Scenario Timeframe: Current/Future; Medium: Groundwater; Exposure Medium: Air

Since contact with the deep aquifer is not quantitatively evaluated in the baseline HHRA, these tables can be omitted from the report.

37. Appendix M. Table 4-11.RME Values Used for Daily Intake Calculations, Scenario Timeframe: Future; Medium: Surface water, Exposure Medium: Surface Water

a. The source for the adult and child ingestion rate (0.08 liters/day) in the first two rows of this table is given as ref (f). However, this value could not be found in that source. Page 6-34 of reference (f) states, *"Incidental ingestion rates (IR)while swimming have not been found in the available literature. SEAM (EPA 1988b) recommends using an incidental ingestion rate of 50 ml/hour of swimming."*

The only way to convert the value recommended in ref (f) to 0.08 l/day is if the exposure time (ET) is 1.6 hours/day. However, the ET listed on this table for the child/adult is 20.6 hour/day which would result in an IR of 0.13 liters/day. We recommend verifying the IR and ET shown in this table and confirming that the correct exposure factors were used in the corresponding risk calculations.

b. The child/adult incidental ingestion rate provided in the third row of this table is reported to be 0.08 liters/hour for 2.6 hours/day. This is inconsistent with the values reported in the first two rows of this table for the same receptors. We recommend verifying the IR and ET shown in this table and confirming that the correct exposure factors were used in the corresponding risk calculations.

c. The adjusted IR for the lifetime resident (0.17 l-year/kg-day) could not be reproduced. This may be due to the inconsistencies described in a and b, above. We recommend verifying this calculation and confirming that the correct exposure factors were used in the corresponding risk calculations.

d. The time spent swimming for the incidental ingestion (2.6 hours) and the dermal contact (1 hour/event) pathways are different on this table. Please update this so the values are consistent for both pathways since it is unlikely that incidental ingestion of surface water would continue after the receptors have ceased all dermal contact with surface water. The risk assessment calculations should also be updated to ensure that the same ET is used for both pathways.

e. Editorial: for the future child/adult resident in dermal contact with surface water, the units for the adult body weight are "ke." This should be changed to "kg."

38. Appendix M. Table 4-12.RME Values Used for Daily Intake Calculations, Scenario Timeframe: Future; Medium: Sediment, Exposure Medium: Sediment

a. Editorial: There is a typographical error in the units for the IR-SED-Adj in the last column. "mg-year/kd-day" should be changed to "mg-year/kg-day."

b. Editorial: There is a typographical error in the units for the DA-Adj in the last column. "mg-year/kd-day" should be changed to "mg-year/kg-day."

c. The age-adjusted dermal absorption factor for the future adult/child resident (16,428 mg-year/kg-day) could not be reproduced. Our calculations are shown below. We recommend correcting this table if necessary and ensuring that the correct value was used in the risk calculations.

$$\text{DA - adj} = \left(\frac{\text{ED}_{\text{adult}} \times \text{SA}_{\text{adult}} \times \text{AF}_{\text{adult}}}{\text{BW}_{\text{adult}}}\right) + \left(\frac{\text{ED}_{\text{child}} \times \text{SA}_{\text{child}} \times \text{AF}_{\text{child}}}{\text{BW}_{\text{child}}}\right)$$

$$\text{DA - adj} = \left(\frac{24\text{ years} \times 5{,}672\text{cm}^2 \times 0.6\text{mg/cm}^2\text{ - day}}{70\text{ kg}}\right) + \left(\frac{6\text{ years} \times 1{,}852\text{cm}^2 \times 21\text{mg/cm}^2\text{ - day}}{15\text{ kg}}\right)$$

$$\text{DA - adj} = 1{,}166.8\frac{\text{mg - year}}{\text{kg - day}} + 15{,}556.8\frac{\text{mg - year}}{\text{kg - day}} = 16{,}723\frac{\text{mg - year}}{\text{kg - day}}$$

39. Appendix M. Table 4-1.CTE Values Used for Daily Intake Calculations, Scenario Timeframe: Current/Future; Medium: Surface Soil; Exposure Medium: Surface Soil

a. The SA for the adult (1,306 cm^2) and adolescent (1,212 cm^2) trespasser is reported in footnote 2 to account for the head and hands. It seems as though the value reported on this table is actually for the face (which is assumed to be approximately 1/3 of the total head) and hands. We recommend either correcting the value or updating the footnote.

40. Appendix M. Table 4-5.CTE Values Used for Daily Intake Calculations, Scenario Timeframe: Future; Medium: Soil*, Exposure Medium: Soil*

a. The industrial worker ED (6.6 years) is cited as being from reference (i). However, Section 4.1.2 states that "*the occupational central tendency default exposure duration of 5 years...*" However, USEPA has updated this value in reference (g). Consistent with Exhibit 3-5 in reference (RAGS E), we recommend that the CTE ED for the industrial worker in direct contact with soil be 9 years. This change should be reflected on this table and the appropriate risk assessment calculations.

41. Appendix M. Table 4-5.CTE Values Used for Daily Intake Calculations, Scenario Timeframe: Future; Medium: Soil*, Exposure Medium: Soil*

a. The age-adjusted dermal absorption factor for the future adult/child resident (263 mg-year/kg-day) could not be reproduced. Our calculations are shown below. We recommend correcting this table if necessary and ensuring that the correct value was used in the risk calculations.

$$\text{DA - adj} = \left(\frac{\text{ED}_{\text{adult}} \times \text{SA}_{\text{adult}} \times \text{AF}_{\text{adult}}}{\text{BW}_{\text{adult}}}\right) + \left(\frac{\text{ED}_{\text{child}} \times \text{SA}_{\text{child}} \times \text{AF}_{\text{child}}}{\text{BW}_{\text{child}}}\right)$$

$$\text{DA - adj} = \left(\frac{9\text{ years} \times 5700\text{cm}^2 \times 0.01\text{mg/cm}^2\text{ - day}}{70\text{ kg}}\right) + \left(\frac{6\text{ years} \times 2800\text{cm}^2 \times 0.04\text{mg/cm}^2\text{ - day}}{15\text{ kg}}\right)$$

$$\text{DA - adj} = 7.33\frac{\text{mg - year}}{\text{kg - day}} + 44.8\frac{\text{mg - year}}{\text{kg - day}} = 52.1\frac{\text{mg - year}}{\text{kg - day}}$$

b. Editorial. The units shown for the DA-adj in the last column of this table include a typographical error. Replace "kd" with "kg."

42. Appendix M. Table 4-6.CTE Values Used for Daily Intake Calculations, Scenario Timeframe: Future; Medium: Groundwater, Exposure Medium: Shallow Groundwater

a. The industrial worker IR (1 L/day) is different than the value recommended in reference (i) of 1.4 L/day.

b The construction worker EF for dermal contact with groundwater (219 days/year) is greater than the construction worker's EF for direct contact with soils (Table 4-5.CTE). We recommend using a consistent EF for contact with all media. Please ensure that the same EF is used in all the risk calculations for construction worker contact with shallow groundwater and soil.

c. There is no explanation for the derivation of the construction worker's skin SA available for contact with groundwater (3,300 cm^2). Since this is the same value that was used for the worker's contact with soil, it is assumed that this may represent contact by the head, hands, and forearms which seems conservative for groundwater. We recommend including a footnote to explain how this value was derived.

43. Appendix M. Table 4-7.CTE Values Used for Daily Intake Calculations, Scenario Timeframe: Future; Medium: Groundwater, Exposure Medium: Air

The construction worker's ET of 4 hours/day seems too low. We recommend evaluating this receptor based on an 8 hour work day. This update should also be made in the appropriate risk assessment calculations.

44. Appendix M. Table 5-1 Non-cancer Toxicity Data—Oral/Dermal

a. The combined uncertainty/modifying factors reported for cadmium are "10/2." The Integrated Risk Information System (IRIS) profile reports a MF of 1 for cadmium. We recommend updating the MF shown on this table so it is consistent with the information in IRIS.

b. This table does not include the subchronic oral RfD for dibenzofuran that was derived in the same PPRTV profile (dated 29 Jan 2007) as the chronic oral RfD. We recommend including information on the dibenzofuran subchronic RfD on this table. This change will also require the calculations for the construction worker direct contact with groundwater to be updated.

c. The target organ listed for trans-1,2-dichloroethylene is "blood." This is actually the critical effect rather than a target organ. This test is typically performed to diagnose liver disease or as part of a routine liver function test. Since the most sensitive effect (i.e., increased serum alkaline phosphatase) is typically used to test for liver function/disease, we recommend changing the target organ to "liver" on this table. Please note that this change should be incorporated into all the Table 9s where this chemical was included as a COPC.

d. The target organ listed for 1,3-dichloropropene is "chronic irritation." This is actually the critical effect rather than a target organ. As stated in the IRIS profile for this chemical, "*Of the two critical effects, body weight decrease and chronic irritation (as evidenced by the forestomach hyperplasia), data from the most sensitive effect, chronic irritation, were used to develop the RfD.*" Since the most sensitive effect (i.e., chronic irritation) was identified based on histopathology of stomach tissues, we recommend changing the target organ to "gastrointestinal" on this table. Please note that this change should be incorporated into all the Table 9s where this chemical was included as a COPC.

e. The target organ/critical effect and the subchronic RfD for 2,6-dinitrotoluene are missing from this table.

f. The combined uncertainty/modifying factor reported for iron is "1". The most current PPRTV profile for iron states the UF as 1.5. We recommend updating this to "1.5" so Table 5-1 is consistent with the PPRTV profile.

g. This table does not include the subchronic oral RfD for iron that was derived in the same PPRTV profile (dated 11 Sept 2006) as the chronic oral RfD. We recommend including information on the iron subchronic RfD on this table.

h. This table does not include the subchronic oral RfD for 2-methylnaphthalene that was derived by PPRTV (profile dated 18 Sept 2007). We recommend including information on the iron subchronic RfD on this table. Since the subchronic and chronic RfDs and target organ/critical effects are the same, this does not impact the construction worker calculations.

i. The combined uncertainty/modifying factors reported for nickel are "300" which only includes the uncertainty factor (UF). We recommend updating this to "300/1" so the MF is also clearly shown.

j. The target organ listed for 1,1,2-trichloroethane is "blood." This is how the critical effects were identified rather than a target organ. As stated in the IRIS profile for this chemical, "*Clinical chemistry indications of adverse effects on the liver occurred in both sexes at 2000 mg/L. Effects on the erythrocytes occurred only in females and depressed humoral immune status occurred in both sexes at 200 and 2000 mg/L.*" Given this explanation, the blood chemistry was used to identify impacts to the liver and immune system. We recommend changing the target organ to "liver and immune system" on this table. Please note that this change should be incorporated into all the Table 9s where this chemical was included as a COPC.

k. The combined uncertainty/modifying factors reported for zinc are "3/1." The IRIS profile does not list a MF for zinc. We recommend updating this to "3" so the table includes information consistent with the IRIS profile.

45. Appendix M. Table 5-2 Non-cancer Toxicity Data—Inhalation

a. Several COPCs are not shown on this table. We recommend updating this table so it includes toxicity information for all COPCs.

b. The reference concentration (RfC) shown for 1,4-dichlorobenzene (0.23 mg/m^3) does not concur with the information contained in the current IRIS profile for this chemical. According to IRIS, the RfC for 1,4-dichlorobenzene is 0.8 mg/m^3, which would correspond to an inhalation RfD of 0.229 mg/kg-day. We recommend updating the value in this table and in all calculations.

c. The source listed for the tetrachloroethene toxicity value is the EPA Region 3 RBC Table. This is not an appropriate reference since that table is a secondary source and does not include information such as target organs. The reference should be updated to correctly reflect that these toxicity values were obtained from the December 2007 version of the Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs). Additionally, likely due to rounding on the Region 3 RBC table, the RfC calculated on this table (0.28 mg/m^3) is incorrect. This value should be changed to 0.27 mg/m^3.

d. The primary target organs listed for tetrachloroethene are kidney and liver. This is not consistent with the December 2007 MRLs compiled by ATSDR. According to that table the critical endpoint is listed as neurological. This update should be made to this table and the corresponding target organ specific HQs.

46. Appendix M. Table 6-1 Cancer Toxicity Data—Oral/Dermal

a. The weight-of-evidence for cadmium should be updated from "NA" to "B1" so it is consistent with the IRIS profile for this chemical.

b. The weight-of-evidence for copper, dibenzofuran, and fluorene should be updated from "NA" to "D" so this table is consistent with the IRIS profiles for these chemicals.

c. The weight-of-evidence for 1,4-dichlorobenzene should be updated from "NA" to "C" so it is consistent with the information presented in reference (e).

d. The weight-of-evidence for 1,1-dichloroethene and 1,1,2-trichloroethane should be updated from "NA" to "C" so this table is consistent with the IRIS profiles for these chemicals.

e. The weight-of-evidence reported on this table for 2-methylnaphthalene and total xylenes is "D." However, since the carcinogenicity assessments for both chemicals were performed using the USEPA's updated draft cancer guidelines in reference (j), the "D" classification is no longer applicable. The IRIS profiles for both chemicals conclude that "data are inadequate to assess human carcinogenic potential." Since this may be too much text to enter in the table, we recommend documenting this conclusion in a footnote.

f. The weight-of-evidence reported on this table for naphthalene (D) is incorrect. This should be changed to "C" so it is consistent with the current IRIS profile.

g. Refer to General Comment #2 for recommendations regarding the TCE CSF.

h. This table does not include information for 1,1,2-trichloroethane. The following information is available from the IRIS profile for this substance and therefore should be included in this table:

- Oral CSF: 5.7E-02 $(mg/kg\text{-}day)^{-1}$
- Oral absorption efficiency: NA
- Absorbed CSF for dermal: 5.7E-02 $(mg/kg\text{-}day)^{-1}$
- Weight of Evidence/Cancer Guideline Description: C
- Source: IRIS 06/06/2008

Please note that any risk assessment calculations will also need to be updated so this chemical is also evaluated for carcinogenic effects.

i. The weight-of-evidence reported on this table for zinc is "NA." However, the IRIS profile was updated in 2005 so the carcinogenicity assessment was performed consistent with the USEPA's updated cancer guidelines in reference (k). The weight-of-evidence conclusion for zinc is that "there is inadequate information to assess carcinogenic potential." Since this may be too much text to enter in the table, we recommend documenting this conclusion in a footnote.

47. Appendix M. Table 6-2 Cancer Toxicity Data—Inhalation

a. The unit risk reported on this table for Aroclor-1260 (1.0E-04 $(\mu g/m^3)^{-1}$) is not consistent with the value reported in the IRIS profile for this substance. We recommend changing this value so it is consistent with the information in IRIS (5.7E-04 $(\mu g/m^3)^{-1}$).

b. The weight-of-evidence for copper, dibenzofuran, and fluorene should be updated from "NA" to "D" so this table is consistent with the IRIS profiles for these chemicals.

c. Some of the information on this table for 1,4-dichlorobenzene is not correct and should be corrected as follows:

- Unit Risk: 1.1E-05 $(\mu g/m^3)^{-1}$
- Weight of Evidence/Cancer Guideline Description: NA
- Source: OEHHA 2002 (per reference [c]).

d. The weight-of-evidence for 1,1-dichloroethene and 1,1,2-trichloroethane should be updated from "NA" to "C" so this table is consistent with the IRIS profiles for these chemicals.

e. The weight-of-evidence reported on this table for 2-methylnaphthalene and total xylenes is "D." However, since the carcinogenicity assessments for both chemicals were performed using the USEPA's updated draft cancer guidelines in reference (j), the "D" classification is no longer applicable. The IRIS profiles for both chemicals conclude that "data are inadequate to assess human carcinogenic potential." Since this may be too much text to enter in the table, we recommend documenting this conclusion in a footnote.

f. The weight-of-evidence reported on this table for naphthalene (D) is incorrect. This should be changed to "C" so it is consistent with the current IRIS profile.

g. Refer to General Comment #2 for recommendations regarding the TCE CSF.

h. This table does not include information for 1,1,2-trichloroethane. The following information is available from the IRIS profile for this substance and therefore should be included in this table:

- Unit Risk: 1.6E-05 $(\mu g/m^3)^{-1}$
- Inhalation CSF: 5.6E-02 $(mg/kg\text{-}day)^{-1}$
- Weight of Evidence/Cancer Guideline Description: C
- Source: IRIS 06/06/2008

Please note that any risk assessment calculations will also need to be updated so this chemical is also evaluated for carcinogenic effects.

i. The weight-of-evidence reported on this table for zinc is "NA." However, the IRIS profile was updated in 2005 so the carcinogenicity assessment was performed consistent with the USEPA's updated cancer guidelines in reference (k). The weight-of-evidence conclusion for zinc is that "there is inadequate information to assess carcinogenic potential." Since this may be too much text to enter in the table, we recommend documenting this conclusion in a footnote.

48. Appendix M. Tables 7.1.RME to 7.7.RME

These tables were missing from the hard copy of the report.

49. Appendix M. Tables 7.1.RME to 7.6.CTE
Appendix M. Tables 9.1.RME to 9.6.CTE

a. Based on several of the specific comments listed above regarding some of the suggested changes to exposure factors, toxicity values, and target organ/critical effects, as appropriate we recommend updating many of the calculations in these tables.

b. Per General Comment #6, we recommend performing a QC of these calculations before finalizing the report.