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COMMONWEALTH OF PUERTO RICO
Office of the Governor
Environmental Quality Board

Environmental Emergencies Response Area

September 11, 2009

Mr. Kevin Cloe, P.E.
Remedial Project Manager
Commander Atlantic Division
Naval Facilities Engineering Command
6506 Hampton Boulevard
Norfolk, VA 23508-1278

RE: Technical Evaluation of the Draft Master Standard Operating Procedures, Protocols, and Plans, Environmental Restoration Program, Vieques, Puerto Rico

Dear Mr. Cloe:

The Puerto Rico Environmental Quality Board (PREQB) has completed its review of the Draft Master Standard Operating Procedures, Protocols, and Plans, Environmental Restoration Program, Vieques, Puerto Rico, dated July 2009. Enclosed our comments.

Please contact me at (787) 767-8181 X.6141 if you have any questions or comments about our review.

Cordially,

Wilmarie Rivera
Federal Facilities Coordinator

cc: Daniel Rodríguez - EPA
Richard Henry - FWS
Daniel Hood - Navy
Christopher Penny - Navy

Cruz A. Matos Environmental Agencies Bldg., San José Industrial Park Urbanization
1375 Ponce de León Ave., San Juan, PR 00926-2604
PO Box 11488, San Juan, PR 00910
Tel. 787-767-8181 • Fax 787-766-0150

PREQB Technical Evaluation of the Draft Master Standard Operating Procedures, Protocols, and Plans, Environmental Restoration Program, Vieques, Puerto Rico

GENERAL COMMENT

1. Please submit the SOP entitled *Disposal of Waste Fluids and Soils*. This SOP is referenced in a few of the SOPs, but is not included in the draft document.

STANDARD OPERATING PROCEDURE COMMENTS

Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program

General Comments

1. Terminology. As previously agreed and incorporated into the protocol blueprint, please apply the term toxicity reference value (TRV) only to ingestion-based toxicity effects thresholds for wildlife receptors, such as birds and mammals. The term ecological screening value (ESV) should be applied exclusively to media-specific ecotoxicity benchmark criteria for surface soil, sediments, and surface water that are used to select chemicals of potential concern (COPCs) and calculate media-specific hazard quotients (HQs) for ambient COPC concentrations in abiotic media. Please make these changes in all text and tables.

2. Content Sequence. The presentation of content does not appear to follow the same sequence followed in the *Proposed Summary of ERA Protocol Modifications* ("protocol blueprint") developed jointly by Navy, USEPA and EQB, last revised by Navy on May 7, 2009. Although the Introduction summarizes the 8 step ERA process, the Approach and Methodology section begins with an Exposure Assessment subsection without first discussing the COPC screening process of Step 2 or the agreed hierarchy of media-specific ESVs to be used in COPC selection. Although ESVs are first applied in ERA Step 2, the default sources and priorities for applying ESVs now first appear in the Effects Assessment on page 12. While the wildlife TRVs should remain in the Effects Assessment subsection, the ESVs should be moved up to precede the Exposure Assessment discussion. Please reorganize the document to match the original content sequence of protocol blueprint so that the protocol more closely mirrors the 8 step Navy ERA process.

Page-Specific Comments

1. Table 2, Bioaccumulative Chemicals List. Please review and revise this table to add all of the chemicals that appear in Table 4-2 of the USEPA (2000) source document, such as dioxins, furans, nine pesticides noted by EPA as having BCFs > 1,000 and log Kow >

4.2, and tributyl tin. Please also add a footnote acknowledging that all PCB congeners are considered bioaccumulative.

2. Page 7, Exposure Point Concentrations. The last sentence of the 3rd paragraph states that "*If measured tissue concentrations are available, they will be used in place of modeled values*." However, if data are available from a limited number of tissue samples and/or COPC concentrations the tissue-associated physical media are not representative of the full range of COPC concentrations throughout a site, use of measured tissue burdens alone may introduce additional uncertainty. To address this scenario, please add a final sentence to this paragraph saying that "*Alternatively, where appropriate, tissue data may be used with paired data for physical media to derive BAFs/BCFs or algorithms that would then allow estimates of tissue burdens using all available media analytical data for a site*."

3. Page 7, Exposure Point Concentrations. In the last paragraph, it is stated that "*Average prey concentrations are most appropriately estimated using central tendency estimates of media concentrations and accumulation factors*." However, as stated on page 7 of the protocol blueprint, it was also agreed that during Step 3A the maximum detected concentrations would be replaced "with central tendency exposures (e.g., arithmetic means) and/or reasonable maximum exposures (i.e., 95th percentile upper confidence limit of the mean)." Please add a sentence confirming that the baseline ERA will evaluate exposures and calculate HQs for both the mean and RME (95% UCL) concentrations of COPCs.

4. Page 8, Terrestrial Plants and Tables 3 & 4. As agreed during development of the protocol blueprint, the default source of preferred BAFs or regression-based algorithms for plants will be those constant BAFs or equations presented/used in USEPA's development of Eco-SSLs, such as Attachment 4-1 of the Eco-SSL guidance or chemical-specific Eco-SSL derivation documents. However, as discussed in the text and presented in Tables 3 and 4, it is not sufficiently clear that the alternative values and approaches presented in Tables 3 and 4 may be used only in the absence of a plant BAF or uptake algorithm used by USEPA (2007) to develop wildlife Eco-SSLs. Please revise the text to indicate that the soil-concentration-based BAFs and algorithms published by USEPA (April 2007) in Tables 4a, 4b and 4c of the *EcoSSL Guidance Attachment 4-1* supersede those derived from other sources or methods. Please also edit the 3rd paragraph on page 8 to read as follows: "*For inorganic chemicals lacking chemical-specific BAFs or algorithms prescribed in the EcoSSL Guidance Attachment 4-1 (default value) or other literature based BAFs, a soil-to-plant BAF of 1.0 was used. For non-ionic organic chemicals without literature-based BAFs, soil-to-plant BAFs were estimated using the rinsed foliage algorithm provided in Figure 5 of USEPA (2007j)*:"

5. Tables 3 & 4, Terrestrial Plants. Plant BAFs and algorithms in Tables 3 and 4 are confusing because they appear to contradict each other. They should be revised to: (a) footnote the octanol-water partitioning-based BAFs in Table 3 to indicate that these alternative BAFs are to be used *only in the absence of Eco-SSL BAFs and algorithms* based on soil concentrations; (b) eliminate values calculated in Table 3 using the octanol-water partitioning equation from the Eco-SSL guidance for all chemicals for with a BAF or uptake algorithm for plants in the EcoSSL guidance Tables 4a, 4b and 4c that uses site-specific soil COPC concentrations; (c) include in Table 4 only the BAFs and equations from Tables 4a, 4b and 4c of the *EcoSSL Guidance Attachment 4-1* (USEPA, April 2007); (d) include in Table 4 the missing plant BAFs for chromium (0.041), cobalt (0.0075) and manganese (0.079) that are provided in Table 4a of the *EcoSSL Guidance Attachment 4-1*; and (e) replace the Bechtel Jacobs (1998a) plant equation for arsenic with the EcoSSL plant BAF of 0.03752 [Table 4a of *Attachment 4-1*].

6. Page 9, Soil Invertebrates (Earthworms) and Tables 4 & 5. As agreed during development of the protocol blueprint, the default source of preferred BAFs or regression-based algorithms for soil invertebrates should be those constant BAFs or equations presented and used in USEPA's development of Eco-SSLs, such as Attachment 4-1 of the Eco-SSL guidance or chemical-specific Eco-SSL derivation documents. However, as discussed in the text and presented in Tables 4 and 5, it is not sufficiently clear which of the alternative BAFs and equations in Tables 4 and 5 are the preferred default values/method and which are alternatives. Please revise the text for greater clarity about the hierarchy of BAFs/methods and add a sentence clearly stating that the soil-concentration-based earthworm BAFs and algorithms published by USEPA (April 2007) in Tables 4a, 4b and 4c of the *EcoSSL Guidance Attachment 4-1* are the default choices and supersede those derived from other sources or methods. Also, please revise Table 4 to: (a) replace the soil invertebrate equation for copper from Sample et al (1998a) with the BAF of 0.515 from the EcoSSL guidance [also used in Sample 1999]; and (b) add the missing earthworm BAFs for antimony (1.0), beryllium (0.045), chromium (0.306), and cobalt (0.122) that are provided in the EcoSSL documents.

7. Table 4, Plants, Soil Invertebrates and Mammals. Please review and revise Table 4 to add all of the missing inorganic and organic chemical BAFs for plants, soil invertebrates, and/or small mammals that were presented in Tables 4a, 4b, and 4c of the *EcoSSL Guidance Attachment 4-1*, such as barium, chromium, cobalt, manganese, silver, vanadium, RDX, TNT, PAHs (individual, LWM, HMW and Total), pentachlorophenol, dieldrin, DDT, and DDT metabolites. Please also cross check the small mammal BAF algorithms from Sample et al. (1998) against those from the Eco-SSL guidance and revise the table as needed to include and indicate that the Eco-SSL BAFs/equations supersede the Sample equations. Please revise text references to small mammal BAFs/equations in

Table 4 to clearly indicate that the preferred, default BAFs/algorithms are those presented in the Eco-SSL guidance.

8. Table 5, Soil Bioaccumulation Factors for Soil Invertebrates. BAFs and equations are available in Tables 4a, 4b and 4c of *EcoSSL Guidance Attachment 4-1*, but were not presented in Table 5, for 13 inorganics and several organics. Please revise and footnote Table 5 to replace or complement the invertebrate BAFs with all available BAFs or algorithms presented in these Eco-SSL guidance tables and state that these Eco-SSL derived BAFs supersede those derived from other sources or methods and represent the default choices for the Baseline ERA. For example, the median values for individual PAHs from Beyer & Stafford (1993) proposed for use in the Baseline ERA need to be replaced by the values used to derive Eco-SSLs. Please also: (a) replace the incorrect value of 11.2 applied to DDD, DDE and DDT with the chemical-specific algorithms for DDT, DDD, and DDE from Table 4b of the *EcoSSL Guidance Attachment 4-1*; (b) add an entry of 11.2 for "*DDT, DDD and DDE Combined*" from the same EcoSSL table; and (c) add missing BAFs/equations from the Eco-SSL tables for individual PAHs, including coronene and naphthalene (now missing from Table 5), as well as Totals MLW and HMW PAHs.

9. Page 9, Small Mammals. Please revise the text on small mammal BAFs/equations to clearly state that the preferred, default small mammal BAFs and uptake algorithms are those presented in the Eco-SSL guidance. Please insert new sentences after the 2nd sentence of the first paragraph stating: "*The soil-to-small mammal BAFs and equations provided in Tables 4a, 4b and 4c of Attachment 4-1 of the Eco-SSL Guidance (USEPA, 2007) will be the default choice for calculating small mammal COPC body burdens. For COPCs lacking small mammal BAFs and algorithms from the Eco-SSL guidance, the proposed BAF or uptake equation will be proposed in an Interim Technical Memorandum.*"

10. Table 6, Soil Bioaccumulation Factors for Small Mammals. As noted previously for Table 4, the preferred small mammal BAFs and uptake equations are those from Tables 4a, 4b and 4c of *EcoSSL Guidance Attachment 4-1*. Please footnote this table to indicate that these BAFs represent alternatives to be used only when the default, Eco-SSL derived BAFs/equations are not available. Please also discuss the intended use of the values in Table 6 at various steps in the ERA process and explain how and why these values differ from those in Table 4 for the same three small mammal feeding guilds. Also, please add a footnote to the Reference column entries of "See text" citing specific text sections and generically explaining the default method to be used for each chemical, such as a reported BAF, algorithm, etc.

11. Page 9, Benthic Invertebrates. Please add the following sentence to the end of the last paragraph on page 9: "*For COPCs lacking benthic invertebrate BAFs in Table 7, the*

proposed BAF or uptake equation will be proposed in an Interim Technical Memorandum."

12. Table 7, Sediment Bioaccumulation Factors for Benthic Invertebrates (Dry Weight). Based on a review of several source documents, it appears that the values presented in Table 7 are a combination of bulk sediment to invertebrate BAFs and sediment-TOC and invertebrate-lipid normalized biota-sediment accumulation factors (BSAFs). To clearly distinguish and segregate sediment BAFs from BSAFs for benthic invertebrates within the protocol, please include a separate table of TOC and lipid normalized BSAFs that will be used preferentially over the sediment-invertebrate BAFs presented in Table 7. Please note that the preferred BSAFs are TOC and lipid normalized values derived from the USEPA and/or Army Corps of Engineers online BSAF databases, such as those for DDD, DDE, DDT, dieldrin, endosulfan compounds and heptachlor compounds. As requested previously for Table 2, please also revise Table 7 to add BAFs for all of the bioaccumulative chemicals that appear in Table 4-2 of the USEPA (2000) sediment guidance, such as dioxins, furans, nine pesticides noted by EPA (2000) as having BCFs > 1,000 and log Kow > 4.2, pentachlorophenol, bis(2-ethylhexyl)phthalate, other phthalates and tributyl tin.

13. Table 7, Sediment Bioaccumulation Factors for Benthic Invertebrates (Dry Weight). Many of the BAFs or BSAFs provided in Table 7 are much lower than values for benthic macroinvertebrates available from the cited source or other sources of measured bioaccumulation factors for sediments. For example, all of the polychaete BSAFs from Maruya (1997) are listed in Table 7 as being maximum reported invertebrate BAFs; however, higher values are available in this source document. Please replace those polychaete values with the highest of the BSAFs reported by Maruya for two species of clams from his Tables 2 and 3 (e.g. acenaphthylene BSAF of 5.42 for the Asian clam rather than 2.04 for a polychaete worm). Some of the 90th percentile sediment BAFs chosen from Bechtel Jacobs (1998b) were for depurated invertebrates while others were based on all pooled data for depurated and non-depurated organisms, so that the highest BAFs were not consistently chosen (e.g. lowest depurated BAF of 0.21 was chosen for nickel rather than the non-depurated BAF of 3.15). Since BAFs are used to assess worst-case ingestion exposures of wildlife from eating invertebrates (including their gut content), please consistently use the highest of the BAFs available within this source document, unless more conservative/protective values are available from other sources. For example, several of the inorganic BAFs from Bechtel Jacobs (1998b) are much lower than empirical BAFs reported in other literature for marine bivalves, such as those reported for oysters and mussels under the NOAA Mussel Watch Program by Thomann et al. (1995). Please replace the lower values for these metals in Table 7 with the more conservative/protective mean values from Thomann et al. for arsenic (2.4), cadmium (35.6), copper (19.2) and selenium (8). Please clarify whether the most up-to-date values

and available references have been used from leading peer reviewed journals focused on ecological risk assessment, such as Environmental Toxicology and Chemistry (searchable online), including empirical values from the many studies published by Lawrence Burkhard of the USEPA. Also, since the basis/derivation of the proposed BAF of 0.18 for silver from Hirsch (1998) is unknown, please use a better documented value from another source or an assumed BAF of 1.0. Since BAFs are higher for methyl mercury than inorganic mercury, also please add a BAF and/or BSAF for methyl mercury.

14. Table 7, Sediment Bioaccumulation Factors for Benthic Invertebrates (Dry Weight). Please clarify whether the potential use of the BSAF regressions developed by Bechtel Jacobs (1998b) or other published sources was considered for some chemicals, and if so, why their potential use in the baseline ERA was not proposed.

15. Page 10, Fish. Please expand the discussion to more clearly and explicitly explain how and when the following three methods will be chosen and used to estimate whole body COPC concentrations in Trophic Level 3 (TL 3) fish: (a) biota:sediment bioaccumulation factors (BSAFs) that are normalized for TOC content in sediments and lipid content in fish [default 1st choice]; (b) bulk fish:sediment fish:sediment BAFs, such as those in Table 8 [2nd option]; and fish:surface water bioconcentration factors (BCFs)[last resort]. The use of TOC/lipid normalized BSAFs is the preferred approach and sources of fish BSAFs include USEPA and Army Corps of Engineers BSAF databases. Please compile a new table of available BSAFs, derived from the Army Corps and USEPA databases and other sources, that will serve as default BSAFs for TL 3 fish in future ERAs. Since there may be situations requiring the use of fish:surface water BCFs, please also discuss the approach to be used in that scenario, including how USEPA guidance will be applied to estimate whole fish COPC burdens (e.g., use of site-specific, national BAFs to derive fish-ingestion based human health and ecological ambient water quality criteria). Please compile available surface water:fish BCFs, such as those provided in Table 3 of Sample et al. (1996) and explain how they will be used in piscivorous food chain models. Please add the following sentence to the end of this section on page 10: "*For COPCs lacking fish:sediment BAFs in Table 8, the proposed fish:sediment BAF, fish:sediment BSAF, fish:water BCF, or other sediment/water based uptake equation will be proposed in an ERA Interim Technical Memorandum.*"

16. Table 8, Sediment Bioaccumulation Factors for Fish. Please clarify if the values presented in Table 8 are bulk sediment to fish BAFs or if they are sediment-TOC and fish-lipid normalized biota-sediment accumulation factors (BSAFs). The preferred values are TOC and lipid normalized BSAFs, but it appears from the footnote that only 3 of the values are normalized BSAFs. Therefore, if the majority of the values are BAFs, please include a separate table of TOC and lipid normalized BSAFs that will be used preferentially over the sediment-fish BAFs presented in this table. Also, since BAFs are

higher for methyl mercury than inorganic mercury, a BAF and/or BSAF needs to be added for methyl mercury.

17. Page 11 and Table 9. Please add footnotes to provide the allometric equations used to derive each food and water ingestion rate and provide a literature source citation for the equations. Please add notes to the table indicating the assumed age and sex of each species for which the body weights were chosen (e.g., red-tailed hawk weight of 0.957 kg is for an adult male). Please expand the text discussion on page 11 to explain the rationale for age and sex-based parameter choices. Please clarify why: (a) the spotted sandpiper body weight from Dunning (1993) was used instead of that from the Wildlife Exposure Factors Handbook (WEFH; USEPA 1993a); (b) the red-tailed hawk food ingestion rate from Sample and Suter (1994) was chosen rather than using the food ingestion rate from the WEFH or an allometric equation; and (c) why allometric equations are sometimes used rather than factors published in the WEFH (e.g., water ingestion rates for red-tailed hawk and spotted sandpiper).

18. Page 11 and Table 10. Please add footnotes to provide the allometric equations used to derive each food and water ingestion rate and provide a literature source citation for the equations. Please add notes to the table indicating the assumed age and sex of each species for which the body weights were chosen. Please expand the text discussion on page 11 to explain the rationale for age and sex-based parameter choices. Please also clarify why: (a) the spotted sandpiper body weight from Dunning (1993) was used instead of that from the WEFH (USEPA 1993a); and (b) the red-tailed hawk body weight, food ingestion rate, and home range from Sample and Suter (1994) were chosen rather than values from the WEFH.

19. Page 12, Effects Assessment, Uncertainty Factors and Table 11. An uncertainty factor (UF) of 10 needs to be used to derive a NOAEL/NOEC from a LOAEL/LOEC, rather than the UF of 5, as was listed in Table 11 and used to modify many of the TRVs from those originally derived and published by USEPA in the Eco-SSL documents and/or by Sample et al. (1996). Since the preferred choice of TRVs is those used to derive Eco-SSLs and the second option is usually the TRVs from Sample (1996), the UFs applied in those original TRV derivations need to be retained. The TRVs derived with a UF or 10 in the more recent Eco-SSL guidance documents not only passed a rigorous, scientific quality assurance review but also supersede the older UF of 5 published by Wentsel (1996) from a regulatory perspective under CERCLA.

20. Page 12, Medium-Specific TRVs. As noted in the general comments, only the ingestion based wildlife TRVs need to be included in this subsection of the Effects Assessment, whereas the medium-specific ESVs need to appear much earlier in the discussion of COPC screening during Step 2 of the ERA.

21. Page 16, Effects Assessment, Ingestion TRVs. Please insert an introductory paragraph in this subsection to explain that: (a) TRVs derived and applied by USEPA in developing wildlife EcoSSLs will be used preferentially as the default choice of TRVs for birds and mammals; and (b) the Eco-SSL TRVs and those from Sample et al. (1996) will be used without modifying or readjusting the LOAEL-to-NOAEL UF of 10 applied by the original authors of the TRVs.

22. Risk Characterization, page 17. Since a HQ equal to or greater than one indicates the potential for risk, please delete the phrase "*or equal to*" from the final sentence of the first paragraph so it states that: "*Following the same reasoning, HQs less than one indicate that unacceptable risks are unlikely, enabling a conclusion of negligible (acceptable) risk to be reached with high confidence.*"

23. Page 17, Risk Characterization. To distinguish ESVs from TRVs, please revise the sentence introducing the first set of bullets to state that: "*In addition to media concentrations or ingested doses of chemicals that respectively exceed ESVs or TRVs, based upon maximum detected concentrations, the following will also apply to COPC selection at Step 2:*" Also, since it is not appropriate to compare MDLs to ingestion-based TRVs, unless COPC concentrations are being measured in food items, please revise the first bullet here to replace the term "*TRV*" with the phrase "*ESV for that medium*".

24. Page 17, Risk Characterization, Step 3A. Please insert a subheading labeled Step 3A – Refinement of COPCs before the sentence introducing the 2nd set of bullets at the bottom of the page.

25. Page 18, Risk Characterization, Vieques-Wide Background Concentrations. Please add a statement to emphasize that refinement of COPCs using background comparisons is acceptable only for inorganic COPCs.

26. Page 18, Risk Characterization, Use of Background Data in CERCLA. Please insert a closing sentence before the Uncertainties section, to state that the use of background in ERA and other CERCLA documentation for Vieques sites will also conform to USEPA guidance on refining COPCs during ERA Step 3A (ECO-Update of June 2001: EPA 540/F-01/014) and on the Use of Background at CERCLA Sites (USEPA, September 2002: EPA 540-R-01-003).

27. Table 12, Fresh Surface Water TRVs. Please revise table title to say ESVs instead of TRVs and modify the entries for chromium and mercury to indicate they are for hexavalent chromium and inorganic mercury. Several available ESVs [e.g., PR WQS, NAWQC, etc.] are missing from the table, such as boron, trivalent chromium, molybdenum, tributyl tin and methyl mercury [Buchman 2008 Tier 2 SAV value of 0.0028 ug/L]. Please revise the ESVs to conform to the agreed hierarchy of ESVs, such

as cobalt and vanadium. USEPA (1996a) Ecotox Thresholds (ETs) are preferred over the values from Suter and Tsao (1996). Please use available PR WQS, NAWQC or ETs preferentially in Table 12. Examples where PR WQS, NAWQC or ETs are available but were not listed in the table or other values were used rather than values from these preferred sources include benzene, chlorpyrifos, coumaphos, demeton, malathion, mirex, DDT, DDD, DDE, heptachlor, heptachlor epoxide, toxaphene, and Total PCBs [NAWQC of 0.014 ug/L for Total PCBs supersede Suter & Tsao (1996) ESVs for individual Aroclors].

28. Table 13, Marine Surface Water TRVs. Please revise table title to say ESVs instead of TRVs, modify the entries for chromium and mercury to indicate they are for hexavalent chromium and inorganic mercury and add ESVs for many missing chemicals such as boron, cobalt, trivalent chromium, chlorpyrifos, coumaphos, demeton, fenthion, malathion, molybdenum, methyl mercury, and tributyl tin. Please recheck and replace other ESV choices for which PR WQS, NAWQC or ETs are available, including endrin [use endrin NAWQC and PRWQS for all 3 endrin compounds] and toxaphene. Please also add footnotes to define the acronym entries in the "Type" column of the table.

29. Table 14, Freshwater Sediment TRVs. Please revise table title to say ESVs instead of TRVs and add ESVs for missing chemicals such as values for heptachlor, methoxychlor, and toxaphene presented in from MacDonald et al. (2000), EPA (1996a), and Buchman (2008).

30. Table 15, Marine Sediment TRVs. Please revise table title to say ESVs instead of TRVs and add ESVs for missing chemicals such as TEC values for 3 of 4 BHC isomers (Buchman, 2008), 2 chlordane isomers, DDT, DDD and DDE combined (ERL of 1.58 ug/kg), 2 endrin compounds, and Total PCBs (ERL of 22.7 supersedes TECs listed in table for individual Aroclors). Please clarify whether all the values in the table conform to the agreed default ESV reference hierarchy. It appears that some deviate from the default hierarchy and some values that are available in the preferred references are not included in the table. For example, the preferred ESV for all Arochlors is an ERL of 22.7 ug/kg, which differs from what is presented in this table, the dieldrin ERL of 0.02 ug/kg is the preferred ESV, and the default value for three BHC isomers of 0.32 ug/kg (Buchman, 2008) is not included in the table. Please identify those that deviate from the agreed hierarchy and clarify why each of the alternative ESVs is proposed. Note that it is EQB's understanding that modifications to the agreed default ESVs would be presented in site-specific interim deliverables. Please apply surrogate ESVs for similar chemicals (e.g., ER-L for endrin to other endrin compounds, same for heptachlor). As agreed upon in the protocol blueprint, please also list in the comment field the test species for which the ESV was developed, such as the AETs listed in Buchman (2008) AETs (e.g., amphipod, *Neanthes*, echinoderms). This information is necessary to identify those receptors for which the ESV is protective.

31. Table 16, Freshwater Sediment Values Based on Equilibrium Partitioning. Please clarify whether all values presented in this table follow the preferred hierarchy and if not, provide the rationale for deviating from the agreed upon hierarchy. For example, numerous Washington State 1991 values were used even though values from USEPA 1996 are available. It is EQB's understanding that modifications to the agreed default ESVs would be presented in site-specific interim deliverables. Please provide additional information in the Comment field to note which water quality standard (e.g., PRWQS, AWQC or secondary chronic values) were used to derive the sediment ESVs. This information is needed to ensure that the most up-to-date values were used in the calculation of these values. Similarly, please note which of the USEPA (2008b) values were derived via conventional methods *versus* use of the narcosis model for EqP-based ESVs and clarify why the selected method was used.

32. Table 17, Marine Sediment Values Based on Equilibrium Partitioning. Please clarify whether all values presented in this table follow the preferred hierarchy and if not, provide the rationale for deviating from the agreed upon hierarchy. It is EQB's understanding that modifications to the agreed default ESVs would be presented in site-specific interim deliverables. For example, bulk sediment ETs of EPA (1996a) take precedence over bulk sediment ESVs in Jones et al. (1997) and the USEPA Region III BTAG values (which were not identified in the protocol blueprint), but these documents are sources of Eq-P based ESVs. Please explain why the Eq-P based sediment SQBs/SQC from USEPA (1996a) were not used preferentially instead of values such as those from Washington State (1991) or USEPA Region III BTAG (2000b). To assure adequate conservatism in the ERA, please revise the table to include the lower of these alternative EqP-based ESVs, from USEPA (1996a) and other sources. Please review the table against available ESV sources and add values now missing for some chemicals, such as bromophenyl ether and diazinon. Please add comments to the table to note which of the USEPA (2008b) values were derived via conventional methods *versus* use of the narcosis model for EqP-based ESVs and clarify why the selected method was used.

33. Table 17, Soil TRVs. Please rename the table as "Soil ESVs for Plants and Soil Invertebrates" and add missing entries of the Type/Receptor protected by ESVs where applicable, such as for the Beyer (1990) values. Please also clarify the meaning of "B value" [background as reported by Beyer, 1990?].

34. Table 20, Ingestion-Based TRVs for Mammals. Please clarify why the default Eco-SSL and/or Sample et al (1996) TRVs were modified using an uncertainty factor of 5 rather than the default value of 10, which is the LOAEL-to-NOAEL uncertainty factor used by the original authors of the agreed default values. Please include the TRV for Total PCBs of 0.01 mg/kgBW/day for reproductive effects in mink (Platonow & Karstad, 1973). Please update the table to include available TRVs, such as hexavalent chromium (value now presented needs to be renamed as trivalent chromium), inorganic mercury (mink

TRVs now presented are for methyl mercury and need to be so noted), tetrachloroethylene, thallium, tin, vinyl chloride, and xylene. Please include the full suite of effect endpoints that are protected by these TRVs, as presented in the USEPA Eco-SSL and/or Sample et al (1996) documents for each chemical (e.g., lowest TRV that is protective of reproduction, growth, and survival). This information is necessary to provide clarity on how broadly protective the TRVs are with respect to the range of potential affects on mammals.

35. Table 21, Ingestion-Based TRVs for Birds. Please clarify why the default Eco-SSL and/or Sample et al (1996) TRVs were modified using an uncertainty factor of 5 rather than the default LOAEL-to-NOAEL extrapolation factor of 10, which is the uncertainty factor used by the original authors of the agreed default values. Please include missing TRVs available from Sample et al. (1996) or other sources, such as dioxins, Total DDT metabolites (Eco-SSL TRV of 0.227 mg/kgBW/day), endrin, heptachlor (woodcock survival NOAEL of 0.13 mg/kgBW/day from Stickel, 1965), methyl mercury [TRV now in table should be noted as inorganic], phthalates, and tin.

References Cited

Thomann, Robert V., John D. Mahony, and Rosemarie Mueller. 1995. Steady-State Model of Biota Sediment Accumulation Factor for Metals in Two Marine Bivalves. *Environmental Toxicology and Chemistry* Volume 14, Issue 11 (November 1995), pp. 1989–1998.

Baseline Human Health Risk Assessment Protocol for Vieques Environmental Restoration Program

1. Page 1, paragraph 1. Please remove the word "conservative" from the first sentence, as the third sentence states that both conservative and realistic potential exposure scenarios will be evaluated.

2. Page 2, Risk Results Format and Interim Deliverables, paragraph 3. Please add the depths of the samples to the information that will be provided in the pre-interim deliverable.

3. Page 2, Risk Results Format and Interim Deliverables, paragraph 3. Suggest adding "if needed" or something similar to the end of the last sentence so that the conference call is not mandatory.

4. Page 2, Risk Results Format and Interim Deliverables, paragraph 4. Just a small typo in first sentence – add space after Tables 1-6.

5. Figure 1. Please add AOC and SMWU locations to this figure.

6. Figure 2. Please remove or define the label boxes on the figure and add AOC and SWMU locations.

7. Page 5, Data Collection and Evaluation. Please include a discussion on how nondetects will be evaluated. The ERA Protocol states that the reporting limit will be used to represent the concentration. Please ensure that a similar statement is included in this section.

8. Page 5, Data Collection and Evaluation, paragraph 2. Please clarify why the procedure for dealing with field duplicates in the HHRA protocol is different than that used in the ERA protocol and potentially less conservative. In the ERA protocol, the higher of the two results is used. In the HHRA protocol, the results from the original sample are always selected for use over the field duplicate results.

9. Page 6, Data Collection Summary and Evaluation paragraph 4. The following bullet discussing how soil samples will be screened using soil screening levels for the protection of the soil-to-groundwater migration pathway has been deleted. Although it is acceptable not to include this text in the HHRA Protocol, the process for conducting this screening was negotiated and agreed upon and should be included in a Master SOP. Please provide the reference to the SOP that now includes this information or please prepare a new SOP that contains this information:

> Surface and subsurface soils will also be screened against soil-to-groundwater protection criteria. This comparison will not be used to select the COPCs for the HHRA calculations, but will be used to help understand chemical transport potential. The leachability potential will be assessed by comparing site-specific concentrations to published EPA Soil Screening Levels (SSLs) based on a dilution/attenuation factor (DAF) of 1, or site-specific SSLs if site-specific data have been collected to permit their calculation. The site-specific SSL values will be calculated using the input factors from the data collected for each site. The site-specific DAF for SSL values will be calculated following the EPA guidance (EPA, 1996 and 2002b).

10. Page 6, Data Collection Summary and Evaluation, paragraph 5. Please provide more specificity on the methods and values that will be used in determining fish tissue concentrations, consistent with the approach agreed upon for SWMU 4. Please note the following:

    a. For bioaccumulation of contaminants in fish tissue from surface water, the following summarizes the methods agreed upon for SWMU 4 that should be presented in this section:

        i. Other COPCs may be evaluated on a site-specific basis, in addition to the general criteria presented (i.e., Kow > 3).

ii. Should the development of site-specific BAFs be required, EPA (2000a) guidance for deriving human health NRWQC will be followed.

iii. The Draft National BAFs for methyl mercury will be used.

iv. If national BAF cannot be derived, then may apply appropriate Trophic Level 4 BAFs/BCFs from Superfund Chemicals Data Matrix (SCDM)

v. Separate BAFs/BCFs for inorganic and methyl mercury will be provided. Note that the same is recommended for inorganic and organic lead, to address lead impacts from petroleum releases, if needed.

vi. A compilation of proposed BAFs/BCFs, including appropriate values from COC-specific NRWQC documents, related guidance, SCDM, etc. will be provided.

b. For bioaccumulation of contaminants in fish tissue from sediment, the following summarizes the methods agreed upon for SWMU 4 that should be presented in this section:

i. Other COPCs may be evaluated on a site-specific basis, in addition to the general criteria presented (i.e., Kow > 3 and list presented in EPA's 2000 sediment quality guidance.

ii. Biota-sediment accumulation factors (BSAFs) or list of BSAF sources will be presented.

iii. The use of BSAFs, normalized for sediment TOC and fish lipid content where possible, is the preferred approach.

iv. BSAFs will be developed following EPA guidance for human health NRWQC and national BAFs for Trophic Level 4 fish.

v. SCDM surface water BAFs/BCFs for Trophic Level 4 fish will be used to derive BSAFs only when infeasible to apply HH NRWQC or national BAF methods

vi. Default assumptions and methods to be used to derive BSAFs when site-specific data on sediment TOC and fish lipid content are not available will be presented.

11. Page 7, Data Collection Summary and Evaluation, paragraph 7. Please indicate that the qualitative evaluation of those chemicals without screening criteria will be included in the pre-interim deliverable.

12. Table 5, Exposure Factors for Fish Consumption Exposures Intakes. Please provide a similar set of tables for crab tissue ingestion.

13. Page 17, Calculation of Groundwater EPCs. The text has been changed from what was agreed upon in the Master QAPP HHRA Protocol. Please replace the first sentence with the following, taken from the Master QAPP HHRA protocol: "The groundwater EPCs will be calculated from the wells located in the apparent center of the plume per EPA guidance on EPCs in Groundwater (EPA, 1991a)."

14. Page 17, last paragraph. Please include a statement that use of the MDL when an SQL are not available is only applicable to historical data used in the HHRA, not current data.

15. Table 6. Please provide the full reference for the mean annual windspeed and clarify whether this new value represents the mean annual windspeed or a daily average and for what city/state or whether it represents a value for Puerto Rico.

Soil Sample Depth Selection Protocol

1. Page 1. Please modify Item 1 of the procedures for sampling the top 24 inches to read as follows: "*The site is near water and the land crab or burrowing reptiles (e.g., nesting sea turtles) are potential receptors of concern.*"

Master Waste Management Plan

1. Page 2-1, Section 2.3. Please expand the second sentence to "...the groundwater will be discharged to the ground surface *at least 25-feet from the well* in an area..."

2. Page 2-2, Section 2.3, Paragraph 1 and Step 1. Remove the procedure of returning purge water to the monitoring well. Water should not be introduced into a well as it may alter the representativeness of samples later collected from the well. Wells in which purge water is returned will need to be redeveloped such that three-times the volume of water is removed to ensure representativeness. The revised procedure should read "If purged groundwater does not meet these criteria (contaminated or potentially contaminated), it will be containerized for characterization and disposal, as described in Section 3 and 4."

3. Page 3-3, First, Second and Third Bullets. The three (3) labels should be expanded so that the location of waste source (e.g., SWMU 9, etc.) can be indentified on the label. This will assist with container management at the collection and storage area(s).

4. Page 3-4, Section 3.3. The procedure should be expanded to indicate that the inspection frequency is at least daily while containers are staged. This will ensure that container integrity is being closely monitored to avoid any leaks/spills.

5. Table 4-1, Page 4-1, Section 4. The word "liquid" should be deleted from 1 sample per 500 tons/bulk container. The words "and heterogeneous" should be removed from site characteristics for drums and other small containers since sampling 1 out of 10 drums is not appropriate for heterogeneous media. Table 4-1 should be expanded to include a

fourth option: Heterogeneous media, and the sampling frequency should be 1 sample for each drum. The table should include a foot note that clarifies that "soil or homogenized soil is not considered homogenous."

6. Page 5-1, Section 5. The use of the word "site" in the text should be reviewed and revised, if appropriate. It appears that the text is referring to the storage area and not the site (i.e., source of contaminated media).

SOP A-1, Soil Boring and Abandonment

1. Please include a requirement for utility and UXO clearance prior to intrusive activities in this SOP.

SOP A-2, Soil Sampling

1. Page 1, Section III (A). This section states that for VOC samples in jars, the jars should be completely filled to avoid headspace. Please do not use this procedure is obsolete as it is obsolete. If EnCore® samplers are not being used, then collect samples directly into pre-preserved vials in the field. Please detail this procedure in the SOP, including the number of vials used for both low-level and high-level VOC analyses and the anticipated preservatives.

2. Page 2, Section A, Paragraph 1. Please define the term "EIS" in the text.

3. Page 2, Section B, Paragraph 1. Please revise the first sentence to "Advance a boring to *just above* the sample depth…" Revise the final sentence to "Record the weight, blow count (number of blows required to advance 6 inches), and *penetrated length* into the boring log."

SOP A-4, Soil Sampling for VOCs Using the EnCore® Sampler

1. The May 2007 version of this SOP provided details on how many EnCore samplers to collect for low-level and high-level VOC analyses. Revise the current version of this SOP to also include this information.

2. Revise Section IIIA of the SOP to clarify that sediment samples which cannot be collected with an EnCore® samples will need to be collected in "pre-preserved" vials.

SOP A-5, Slide Hammer Soil Sampling

1. Please provide the attachments (lift evaluation form and self-assessment checklist for lifting) listed in the SOP.

SOP B-1, Groundwater Sampling Procedure Low Stress (Low Flow) Purging and Sampling

1. Page 3, Section V, Pre-Sampling Activities. The May 2007 version of this SOP included a step to measure VOCs with a PID or FID after removing the well cap. Please revise step #3 to put this step back in the procedure. It should also be noted that this step is required in the EPA Region 2 low flow sampling SOP.

2. Page 4, Section V, Pre-Sampling Activities. Please revise step #5 to include a reference to the SOP H-2, *Water-Level Measurements.*

3. Page 4, Section V, Sampling Procedures. The May 2007 version of this SOP included a step to record the depth to which the pump is lowered in the well. Please revise step #1 to put this step back in the procedure. It is critical that this information be recorded for data evaluation as well as future sampling events. Note that this step is required in the EPA Region 2 low flow sampling SOP.

4. Page 5, Section V. Step #4 allows for a possible exception to the 0.3' drawdown goal if it is going to take an unreasonable duration of time to fill the sample bottles and pumping rates are below 100 mL/min. Please clarify what is meant by "unreasonable duration." PREQB suggests a duration greater than 2 hours as unreasonable.

5. Page 5, Section V. Please explain why the step to measure the water level with the pump in the well prior to purging was eliminated in the current version of the SOP. This step was present in the May 2007 version and is also required in the EPA Region 2 low flow sampling SOP

6. Page 5, Section V. Please explain why the step to measure and record the well depth was eliminated in the current version of the SOP. This step was present in the May 2007 version and is also required in the EPA Region 2 low flow sampling SOP.

7. Please include the field log book requirements provided in the May 2007 version of this SOP in the current version of this SOP (B-1).

8. Please include a standard Groundwater Sample form as an attachment to the SOP, if such a form will be used.

SOP C-1, Calibration and Measurement with Field Instruments

1. The May 2007 version of this SOP provided specific details on how to calibrate for pH, conductivity, dissolved oxygen, turbidity, and oxidation-reduction potential. All of these details have been eliminated in the current version of the SOP and replaced with a simple reference to manufacturer's instructions. Many times, the calibration procedures used in the field vary from the manufacturer's instructions and the intent of the SOP is not to provide a single statement to refer to the manufacturer. Please include these details in this SOP.

2. Several sections of the SOP refer to compressed gas calibration standards. It is assumed that these would be used for the calibration of the PID and FID. Please include detailed procedures on the calibration of the PID and FID.

SOP D-1, Monitoring Well Installation

1. Page 1, Section IV, Procedures. Please discuss how the user will select the screen depth. For example, partially penetrating screens should be installed for water table wells.

2. Page 2, Section B, First Bullet. Please verify that the word "ID" should not be revised to "OD."

3. Please provide the attachments (monitoring well construction schematic diagram and schematic diagram of double-cased monitoring well construction) listed in the SOP.

SOP D-2, Monitoring Well Development

1. Please provide the attachment (well development form) listed in the SOP.

SOP G-1, Surface Water Sampling

1. Section IIIA states that measurements of percent oxygen saturation are collected. Please include the details on how this parameter is measured in this SOP. Also, please provide the attachment (surface water quality sampling field data form) listed in the SOP.

SOP G-2, Sediment Sampling

1. Please revise Section IV, Section D, step #4 of the SOP to clarify that samples for VOCs should be immediately placed in "pre-preserved" jars prior to homogenization. Please provide the details of this procedure in the SOP, including the number of vials used for both low-level and high-level VOC analyses and the anticipated preservatives.

SOP H-4, Chain-of-Custody

1. Please explain why details from the May 2007 version of this SOP regarding the notation of Federal Express in the "Received By" line as well as the recording of the air bill number were deleted from this version of the SOP.

SOP V-1, Vegetation Clearance SOP for Environmental Investigations

1. Page 1, Purpose and Scope. A threatened and endangered species protocol is cited that will be followed for "munitions areas." Please add a sentence to clarify if and how those survey methods might be applied to non-munitions areas.

2. Page 3, paragraph 2. This paragraph states that a "*Reasonable effort will be made to avoid cutting or damaging threatened and endangered plant species*." Please clarify what is meant by "reasonable effort." Please clarify if it is a reasonable effort to include a qualified botanist/biologist with knowledge of the local flora and of potential occurrences of protected plants to walk the corridors to be cleared and clear them for the presence of protected plant species.

3. Pages 3 and 4, Steps for Developing Site-specific Vegetation Clearance Process, Step 2. Please provide field guides and illustrations or photographs of protected plant species similar to the sheet done for protected snakes that can be provided to the clearing crews to improve chances that rare plants will be recognized and preserved.

4. Page 4, Steps for Developing Site-specific Vegetation Clearance Process, Step 3. Under Item 2c, it is stated that trees greater than 3 inches in diameter that cannot be avoided will be tagged. Please also document whether the trees are protected plant species and note whether they were preserved or removed.