DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, INDIANA 47522-5001

N00164.AR.000923
NSWC CRANE
5090.3a

IN REPLY REFER TO
5090/S4.7.1
Ser RP3/5040
2 FEB 2005

U.S. Environmental Protection Agency, Region V
Waste, Pesticides, & Toxics Division
Waste Management Branch
Corrective Action Section
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Ramanauskas:

Crane Division, Naval Surface Warfare Center submits the Final RCRA Facility Investigation (RFI) Report for the Old Jeep Trail Area and Little Sulphur Creek (OJT/LSC) at the Ammunition Burning Ground (ABG), Solid Waste Management Unit 03. The change pages and instructions for updating the October 2003 document are submitted as enclosure (1). Enclosure (2) is the response to comments concerning the Ecological Risk Assessments (RA) for the RFI. The permit required Certification Statement is provided as enclosure (2).

If you require any further information, my point of contact is Mr. Thomas J. Brent, Code RP3-TB, at 812-854-6160, email thomas.brent@navy.mil.

Sincerely,

James M. Hunsicker

JAMES M. HUNSICKER
Manager, Environmental Protection
By direction of the Commanding Officer

Enclosures: 1. Final ABG OJT/LSC RFI Change Pages
2. Ecological RA Response to Comments
3. Certification Statement

Copy to:
ADMINISTRATIVE RECORD
SOUTHNAVFACENGCOM (Code ES31) (w/o encl)
IDEM (Doug Griffin)
TTNUS (Ralph Basinski) (w/o encl)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

James M. Hanrahan

SIGNATURE

Manager, Environmental Protection

TITLE

2/2/05

DATE

SWMU 03 (JEEP TRAIL)
RESPONSES TO U.S. EPA COMMENTS DATED MARCH 19, 2004 AND RESPONSES TO COMMENTS ON OTHER ISSUES RELATED TO NSWC CRANE ECOLOGICAL RISK ASSESSMENTS

BACKGROUND

The Navy prepared ecological risk assessments (ERAs) for NSWC Crane SWMUs 1, 2, 3, 4, 5, 9, and 10 and submitted them to U.S. EPA Region 5 for review. U.S. EPA Region 5 reviewed the risk assessments and provided initial comments on several of the ERAs. The U.S. EPA then provided further comments on the ERAs. These more recent comments were transmitted to the Navy via e-mail on March 19, 2004 by Peter Ramanauskas. The following statements were contained in the e-mail.

"Attached please find an electronic copy of our comments on Crane's ecological risk assessments. These comments were generated by looking at SWMU 3 as the example case, but apply to the eco risk assessments done at the other SWMUs (1, 2, 4, 5, 9, 10) and those assessments should be revisited to make any corrections needed. Some comments specific to certain SWMUs are provided at the end of the document.

I will presume that we will be getting on a conference call at some point after you have had a chance to review these comments. At that time, I would like to revisit the topic of PBT upper trophic level dose modeling at the SWMUs and the Navy's rationale for not modeling."

U.S. EPA's comments of March 19, 2004 consisted of 5 general comments, 29 comments specific to SWMU 03 (Jeep Trail / Little Sulphur Creek), and 2 comments specific to SWMU 02 (Dye Burial Grounds. These comments were discussed in a meeting and various conference calls with U.S. EPA Region 5. A list of the teleconferences is provided below:

- April 1, 2004 conference call with the Navy, U.S. EPA, and TtNUS
- June 9, 2004 technical meeting with the Navy, TtNUS, U.S. EPA, and IDEM
- July 8, 2004 conference call with TtNUS and U.S. EPA
- July 15, 2004 conference call with TtNUS and U.S. EPA
- July 23, 2004 conference call with TtNUS and U.S. EPA
- September 9, 2004 conference call with the Navy, TtNUS, U.S. EPA

During the course of the meeting and conference call various other issues were identified. Based on the teleconferences identified above, the Navy consolidated the original comments specific to SWMUs 2 and 3 from March 19 into a consolidated and renumbered set of comments. Added to these renumbered comments were additional issues that were raised during the teleconferences and during other communications among Navy and U.S. EPA representatives. *These renumbered comments represent all outstanding U.S. EPA comments concerning ERAs conducted to date at NSWC Crane, including the ERA for SWMU 03.* Table 1 depicts the renumbering of the original March 19 U.S. EPA comments and it includes the additional issues that were raised in the teleconferences but were not included in the original March 19 U.S. EPA comments.

The revised general responses to the March 19, 2004 comments and other issues that were raised by U.S. EPA are provided in a separate document that was mailed to U.S. EPA on August 16, 2004. That general responses document also includes a description of a revised ERA process that will be used for

future ERAs but is not applicable to the SWMU 03 RFI. U.S. EPA's comments on the August 16, 2004 submittal were resolved in a conference call that was held among the Navy, TtNUS, and U.S. EPA Region 5 on September 9, 2004. This document reflects the resolution of all issues identified by U.S. EPA.

This Response to Comments (RTC) document addresses all unresolved March 19 comments and additional issues tabulated in Table 1. The comments are divided below, into four sections – five General Comments, 26 Specific Comments and 29 Specific Comments on the SWMU 03 ERA. Also, this RTC document addresses the 6 U.S. EPA comments (dated November 18, 2004) on the Risk Evaluation for Indiana Bats Consuming Insects Collected Along Little Sulphur Creek, that was included as Appendix J of the SWMU 03 RFI report. Each section of comments begins with the number 1. In several cases, the comments were subdivided (e.g., 1a, 1b, 1c, 1d, and 1e) to facilitate the generation and tracking of responses. U.S. EPA comments appear in **bold** text and responses appear in regular text. Text that has been incorporated word for word into the revised SWMU 10 ERA is presented in "italicized text". In addition, a revised Section 8 for the SWMU 03 RFI report is being submitted separately with other RFI report change pages. It will be necessary to have a copy of the revised Section 8.0 available when reviewing the responses below because several responses refer to the revised Section 8.0.

GENERAL COMMENTS FROM U.S. EPA'S 3/19/04 E-MAIL

1a. Comment: The use of alternate benchmarks for ecological risk needs to be based on a chronic no observed adverse effect level (NOAEL) threshold (see Section 1.3.1 of the 1997 ERA Guidance, EPA 540-R-97-006) for the most sensitive receptor likely to be exposed to contaminants at the site.

Response: The Navy agrees that screening levels for ecological risk assessment (ERA) need to be based on NOAELs for the most sensitive receptor likely to be exposed to contaminants at the site for the purposes of chemicals of potential concern (COPC) selection. For that reason, only Region 5 Ecological Data Quality Levels (EDQLs) were used as the screening levels to select COPCs (i.e., see Section 4.3 of the SWMU 03 RFI report).

The alternate benchmarks were only used in Step 3a to further evaluate the chemicals that were retained as COPCs for specific endpoints, not the most sensitive endpoint. For example, an alternate benchmark based on risks to plants was used to evaluate risks to plants in Step 3a. However, regardless of the risks to plants, that chemical was evaluated to determine risks to invertebrates (if toxicity data were available) and/or mammals/birds (if the chemical was bioaccumulative). Also, as agreed to in the July 23, 2004 and September 9, 2004 conference calls, alternate benchmarks based on lowest observable adverse effects levels (LOAELs) can be evaluated in Step 3a as long as the effects of the benchmark are clearly discussed.

For the SWMU 03 ERA, additional explanations of the alternate benchmarks are provided in the revised Section 8.6 of the SWMU 03 RFI report.

1b. Comment: A clarification statement must be made if the alternate benchmarks do not represent a chronic NOAEL for the most sensitive receptor or are being applied to flag serious (i.e., acute) ecological problems needing immediate action (e.g., interim measures) and the intended use is clear with respect to risk management.

Response: In many cases alternate benchmarks used to further evaluate potential risks from COPCs do not represent chronic NOAELs. As agreed to in the July 23, 2004 and September 9, 2004 conference calls, alternate benchmarks based on lowest observable adverse effects levels (LOAELs) can be

evaluated in Step 3a as long as the effects of the benchmark are clearly discussed. The Navy agrees to explain the basis of the alternate benchmarks so their intended use with respect to risk management in the ERA is clear.

For the SWMU 03 ERA, additional explanations of the alternate benchmarks are provided in the revised Section 8.6 of the SWMU 03 RFI report.

1c. Comment: Any alternate benchmark needs to provide supporting information that it will be protective of the most sensitive receptor and explain how it will refine conservative assumptions (as stated in the Navy Policy for Conducting Ecological Risk Assessments).

Response: The Navy does not agree that alternate benchmarks need to be protective of the most sensitive receptor because alternate benchmarks are developed for particular receptor groups, which are not necessarily the most sensitive receptor group. The alternate benchmarks were only used in Step 3a to further evaluate potential risks to specific receptor groups (i.e., plants, invertebrates) from the chemicals that were retained as COPCs. See above response to comment 1b.

No changes were made to the SWMU 03 RFI report ERA to address this comment.

1d. Comment: After reviewing the Navy Policy for Conducting Ecological Risk Assessments and revisiting the work plan for SWMU #3, no discussion is provided on developing an alternate benchmark that would deviate from a chronic no adverse effect level (NOAEL).

Response: Alternate benchmarks used in Step 3a were discussed in QAPPs and ERAs for the existing SWMUs [i.e., see Appendix D of the approved Quality Assurance Project Plan, Ammunition Burning Grounds, Little Sulphur Creek and Jeep Trail (TtNUS, April 2001)]. As agreed to in the July 23, 2004 and September 9, 2004 conference calls, alternate benchmarks based on LOAELs can be used in Step 3a as long as the effects of the benchmark are clearly discussed.

For the SWMU 03 ERA, the explanations of the alternate benchmarks are provided in the revised Section 8.6 of the SWMU 03 RFI report.

1e. Comment: For some chemicals, alternate benchmarks are appropriate when metal toxicity in surface water is controlled by water hardness and site water hardness is greater than 50 ppm. Likewise, sediment benchmarks that are developed using an equilibrium partitioning (EqP) equation (see footnote "s" in the Region 5, RCRA Ecological Screening Levels table) may be adjusted if site sediment data shows total organic carbon (TOC) is greater than one percent. Also a specific State water quality Criteria or Tier II value may be applied, as appropriate, for the site.

Response: The Navy agrees that hardness and TOC can be used to adjust alternate benchmarks, as appropriate, and also that Tier II values may be appropriate for sites. Hardness and TOC have been used in the Step 3a evaluation in some of the ERAs, as needed, and they will be used in future ERAs to adjust the screening levels if the water hardness is greater than 50 ppm and/or the TOC in the sediment is greater than 1%. In cases where alternate screening values are calculated (metal toxicity based on water hardness, adjusting sediment benchmarks to account for site specific-TOC, etc.), details on the basis for the adjustment will be provided. Tier II values also have been and will be used in some of the ERAs at Crane.

It was not necessary to adjust the water quality criteria (U.S. EPA, 2002) using water hardness at SWMU 03. The water quality values for some of the energetics presented in Section 8.6.1.3 were based on Tier

II methodology. Additionally, sediment screening levels were not adjusted for site-specific TOC for the SWMU 03 RFI report ERA.

2. Comment: Screening ecological risk benchmarks will be based on toxicity. *Therefore, background soil data will not be used as an alternate benchmark.* Specifically, the OSWER policy (Role of Background in the CERCLA Cleanup Program, April 26, 2002, OSWER 9285.6-07P) recommends that constituents that exceed risk-based screening concentrations be retained and addressed in the risk characterization. This OSWER policy is available at: http://www.epa.gov/superfund/programs/risk/tooltrad.htm and the above recommendation is found in the section on Consideration of Background in Risk Assessment.

Response: The Navy agrees that site-specific background soil data should not be used as an alternate benchmark. The soil background data was used to select chemicals as COPCs as was presented in the approved QAPP for SWMU 03 (TtNUS, April 2001). However, as discussed in the June 9, 2004 technical meeting at Crane, the Navy agreed that background will not be used to select chemicals as COPCs in future ERAs at Crane. In future ERAs, chemicals that were detected at concentrations greater than the screening levels but below background will be qualitatively discussed as the first part of the Step 3a evaluation. During the July 23, 2004 conference call, it was agreed that for the reports that have already been completed which used background to select COPCs, the Navy would just need to add a statement to the executive summary (ES) and the ERA to indicate that background was used to select the COPCs, however based on current U.S. EPA and Navy guidance, background will not be used to select COPCs in future ERAs.

Background (for soil) or upgradient (for surface water or sediment) data was discussed in Step 3a to indicate that a chemical was retained as a COPC because it was detected at concentrations that exceeded the screening level and background or upgradient concentrations. The background/upgradient data was also discussed for a few chemicals to show that the chemical concentrations in the site samples were only slightly greater than background. This was not done to indicate that there were no risks, only that there may be no site-related risks.

The background data used in the SWMU 03 Step 3a discussions include the base wide soil background data set. Inorganic chemicals detected in surface water and sediment were compared to the upgradient surface water or sediment samples collected at SWMU 03.

The following text was added to the revised SWMU 4, 5, 9, and 10 RFI report to address this comment:

- Executive Summary, page ES-4, end of ERA section: *"Several chemicals were eliminated as COPCs because they were not detected at concentrations greater than background concentrations. Therefore, risks to these chemicals were not evaluated in the ERA, however, any risks would be within background risks and not related to site activities. Note that the use of background concentrations to select chemicals as COPCs was done in accordance with the approved QAPP for SWMU 03 (TtNUS, April 2001); however, based on current U.S. EPA and Navy guidance, background will not be used to select chemicals as COPCs for future ERAs at NSWC Crane."*
- Section 8.6.1.1, end of first paragraph: *"As presented in Table 4-20, several chemicals were detected at concentrations exceeding screening levels (or screening levels were not available) but were eliminated as COPCs because they were not detected at concentrations greater than background concentrations. For soil, these chemicals included the detected metals aluminum, antimony, arsenic, cobalt, manganese, selenium, thallium, and vanadium. Therefore, risks to these chemicals were not evaluated in the ERA, however, any risks would be within background risks and not related to site activities."*
- Section 8.6.1.2, end of first paragraph: *"The summary of upgradient sediment comparisons is presented in Appendix F. As presented in Table 4-21 and Table 4-22, several chemicals were detected at concentrations exceeding screening levels (or screening levels were not available) but*

were eliminated as COPCs because they were not detected at concentrations greater than the upgradient sediment concentrations. For shallow sediment samples these included arsenic, beryllium, chromium, iron, manganese, mercury, nickel, selenium, silver, thallium and vanadium. For deep sediment samples these included arsenic, beryllium, chromium, iron, manganese, nickel, selenium, thallium, and vanadium. Any risks from these inorganic chemicals would be within background risks and not related to site activities. Background comparisons were not used as a COPC selection criterion for organics."

- Section 8.6.1.3, end of first paragraph: *"The summary of upgradient surface water comparisons is presented in Appendix F. As presented in Table 4-23 and Table 4-24, several chemicals were detected at concentrations exceeding screening levels (or screening levels were not available) but were eliminated as COPCs because they were not detected at concentrations greater than the upgradient surface water concentrations. Aluminum, iron, and manganese were eliminated as COPCs in total low-flow and high-flow surface water samples because site concentrations did not exceed background concentrations. Aluminum and manganese were also eliminated as COPCs in dissolved low-flow surface water samples and aluminum, copper, iron, manganese, and lead in the high-flow surface water samples because site concentrations did not exceed background concentrations. Risks from these chemicals were not evaluated in the ERA, however, any risks would be within background risks and not related to site activities."*

3a. Comment: Supporting information is needed to justify how "Magnitude of criterion exceedance" and "Frequency of chemical detection" can be used to determine there is no need for further site evaluation and/or chemical toxicity is of no concern.

Response: The "magnitude of exceedence" and the "frequency of detection" were used to further evaluate chemicals as COPCs because even if a chemical was detected in one sample at a concentration that slightly exceeded a screening level it was still retained as a COPC in the initial COPC selection. The "magnitude of exceedence" and the "frequency of detection" were used qualitatively to determine if it is likely that the chemical is causing a risk to ecological receptors. For example, if a chemical concentration in one sample is just slightly greater than a no effects level it is unlikely that the chemical is causing significant risks. Also, if a chemical is detected at relatively low concentrations in 1 of 15 samples (and not detected in the other samples), it is also unlikely that the chemical is causing a significant risk. Therefore, these two factors are applied using professional judgment, in consideration of the following factors (as examples):

- Number of samples that had chemical concentrations that were greater than an EDQL (or other benchmark/toxicity data)
- Area represented by samples that had chemical concentrations that were greater than an EDQL (or other benchmark/toxicity data)
- Is the EDQL (or other benchmark/toxicity data) a no-effects level or a low-effects level
- Chemical concentrations compared to detection limit
- Heterogeneity of chemicals across the site

During the September 9, 2004 conference call, it was agreed that the Navy would provide the rationale for using "magnitude of exceedence" and "frequency of detection" in the Step 3a evaluation, where appropriate, which could then be reviewed and commented on by U.S. EPA. However, frequency of detection alone would not be used to eliminate chemicals as COPCs. The context must be presented (FOD, area represented by samples, magnitude of exceedences, number of samples, etc.).

See the following sections of the revised SWMU 03 ERA , Section 8.6, regarding the use of "magnitude of exceedence" and the "frequency of detection" in the Step 3a evaluation:

- Section 8.6.1.1 for TNT, 2-nitrotoluene, barium, and zinc

- Section 8.6.1.2 for acenaphthene, RDX, HMX, 2,4-DNT, 2-ADNT, 4-ADNT, aluminum, antimony, tin, and zinc
- Section 8.6.1.3 for bis(2-ethylhexyl)phthalate

3b. Comment: If this is a procedure to address hot spots, the risk assessment will still need to delineate the area where the chemical concentration exceeds the chronic NOAEL for the most sensitive receptor.

Response: The procedure can be used to address hot spots, but it can also be used to show that the potential for risks are low, as discussed above. The Navy provides chemical tag maps that present the chemical concentrations at each sample location that exceed a screening level.

No changes were made to the SWMU 03 ERA to address this comment.

4. Comment: State what method(s) will be employed to determine metal bioavailability along with site specific field measurements that are being used (or reference a section of the report where this is discussed).

Response: The following methods may be used to evaluate metal bioavailability as part of the existing and future ERAs for Crane:

- In accordance with the new U.S. EPA Eco SSLs, the Eco SSLs for aluminum and iron are based on pH of the soil so if the soil pH is below a certain level, these metals are assumed to not be bioavailable and they will not be retained as COPCs.
- The hardness of surface water is used to adjust the water quality criteria for select metals using U.S. EPA equations.
- The form of the chemical that was used to conduct the toxicity tests that serve as the basis for the criteria was discussed. For example, many of the toxicity tests used to develop screening levels for metals use highly bioavailable forms of the metal, such as metal salts, which in many cases are much more toxic than equivalent concentrations of the metals in field collected soils[1].

Although soil samples at SWMU 03 were not analyzed for pH, the soil pH levels for samples collected across NSWC Crane were considered in determining iron toxicity in surface soil (see Section 8.6.1.1).

Metal bioavailability is discussed for cadmium and zinc in surface waters at SWMU 03 (see Section 8.6.1.3). Conclusions were based on a comparison of the filtered concentrations to screening levels because it is the dissolved portion that represents the most bioavailable portion of metals in the water column (U.S. EPA, 1992).

Metal bioavailability for the chromium alternate benchmark is discussed because the criteria is based on hexavalent chromium which is much more bioavailable than trivalent chromium (the most likely form of chromium present in soils at SMWU 03) (see Section 8.6.1.1).

5a. Comment: Only the maximum concentration (see Section 1.2.2 and Step 2 of the 1997 ERA Guidance, EPA 540-R-97-006) will be compared against the Region 5, RCRA ESLs to screen COPCs.

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[1] Allen, Herbert E. 2002. Bioavailability of Metals in Terrestrial Ecosystems: Importance of Partitioning for Bioavailability to Invertebrates, Microbes, and Plants. Society of Environmental Toxicology and Chemistry.

Response: Only the maximum concentrations were compared against the Region 5, RCRA EDQLs to select chemicals as COPCs in the existing ERAs [note the updated EDQLs (now referred to as ESLs) will be used for screening in future ERAs] (i.e., see Section 4.3 of the SWMU 03 RFI report).

No changes were made to the SWMU 03 ERA to address this comment.

5b. Comment: If used, alternate benchmarks need to be based on a chronic NOAEL for the most sensitive receptor likely to be present.

Response: As agreed to in the July 23, 2004 and September 9, 2004 conference calls, alternate benchmarks based on LOAELs can be evaluated in Step 3a as long as the effects of the benchmark are clearly discussed. The Navy agrees to explain the basis of the alternate benchmarks so their intended use with respect to risk management in the ERA is clear.

To address this comment, the basis of the alternate benchmarks was provided in the revised Section 8.6 (Step 3a Refinement) of the SWMU 03 ERA so their intended use with respect to risk management in the ERA is clear.

5c. Comment: Supporting information is needed to justify how an average concentration will apply to the most sensitive receptor likely. Average concentrations can be applied following Step 3a when a conceptual model, assessment endpoints, exposure areas and sampling frequency are clearly defined.

Response: Average concentrations were used in Step 3a for a few chemicals. As discussed in the July 23, 2004 and September 9, 2004 conference calls, average concentrations can be used as long as it is made clear how the average concentrations relate to the exposure area for the receptors that are being protected. When average concentrations are used, the conceptual model, assessment endpoints, exposure areas and sampling frequency will be clearly defined.

Average concentrations were used in the SWMU 03 Step 3a evaluation in the discussion of risks to terrestrial wildlife (Section 8.6.2.2).

GENERAL ISSUES FROM SPECIFIC COMMENTS IN U.S. EPA'S 3/19/04 E-MAIL, 6/19/04 MEETING, AND VARIOUS TELECONFERENCES

1. Comment: For chemicals that are known to be persistent bio-accumulative toxic chemicals, an earthworm is not an adequately sensitive receptor.

Response: The Navy agrees that for chemicals that are known to be persistent bio-accumulative toxic chemicals, an earthworm is likely not the most sensitive receptor, but the section of the report referenced by this comment was the Step 3a evaluation of risks to plants and invertebrates. The Step 3a evaluation of risks to wildlife was presented in a later section of the ERA and bioaccumulative chemicals are included in that evaluation.

Section 8.6 (Step 3 refinement) of the RFI Report for SWMU 03 has been revised and now clearly presents the process followed when conducting the ERA to indicate that bioaccumulative chemicals in soil are evaluated both for risks to plants and invertebrates and also for risks to wildlife. See Section 8.6.2 of the SWMU 03 ERA for the evaluation of bioaccumulative chemicals that were carried through the food chain model.

2. Comment: The Dutch "Indicative Levels" shows that plant and animal life is seriously impaired (i.e., 50% of the species experience negative effects) and does not represent a screening benchmark (i.e., chronic NOAEL) as described in general comment number one.

Response: As agreed to in the June 9, 2004 technical meeting, the Dutch numbers will not be used in the ERAs and all discussions related to the Dutch numbers will be removed from the existing ERAs. The only exceptions would be in a few instances when the ecological basis of the numbers can be justified; the justification will be included in the ERA.

References to the Dutch numbers were deleted from the SWMU 03 ERA.

3. Comment: The Canadian Soil Quality Guidelines does not clearly state that a Residential/Parkland value is a chronic NOAEL intended to protect sensitive receptors (see general comment # 1).

Response: The toxicological basis for the Canadian SQGs will be presented in the existing and future ERAs when they are used.

The toxicological basis for the naphthalene, chromium, copper, mercury, nickel, and zinc Canadian SQGs is presented in Section 8.6.1.1 of the SWMU 03 ERA.

4. Concerns with the Canadian protocol include the following:

a. not intended to protect all wild plants and animals as noted in the land use definition "parkland is defined as a buffer zone between areas of residency and campground areas and excludes wild lands such as national or provincial parks"

Response: The agricultural Canadian SQG indicates that the values must protect resident and transitory wildlife and native flora. The residential/parkland SQG indicates that like the agricultural land use, the values must ensure that the soil is capable of sustaining soil-dependent species and does not adversely affect wildlife from direct soil contact. Because the soil contact SQGs (based on protecting plants and invertebrates) are the same for the agricultural and residential/parkland land uses, they are designed to protect native flora. Regarding the protection of animals (i.e., mammals and birds), as indicated in response to Comment 4c, the Navy is not using the Canadian SQG to evaluate animals.

No changes were made to the SWMU 03 ERA to address this comment.

b. **the guideline uses a lowest observed effect concentration (LOEC) rather than a NOAEL. note, the "no potential effects range" (NPER) benchmark uses a LOEC**

Response: The Canadian SQGs use various uncertainty factors to approximate no effects levels, or low levels of potential effects. As discussed above, the toxicological basis for the Canadian SQG is now presented in the ERAs when they are used.

The toxicological basis for the naphthalene, chromium, copper, mercury, nickel, and zinc Canadian SQGs is presented in Section 8.6.1.1 of the SWMU 03 ERA.

c. **food web exposure to insectivores (e.g., shrew or robin) does not appear to be incorporated into the guideline. The Canadian soil value for naphthalene needs more documentation.**

Response: Food web exposure to insectivores (i.e., shrew or robin) is not incorporated into the Canadian SQG, but the SQGs were not used by the Navy to evaluate risks to food chain receptors in the ERAs. The SQGs were only used to evaluate risks to plants and invertebrates.

The toxicological basis for the naphthalene Canadian SQG is presented in Section 8.6.1.1 of the SWMU 03 ERA.

5. Comment: The recently released U.S. EPA report, Ecological Soil Screening Level (Eco-SSL) for the following chemicals will replace the Region 5, RCRA ESL and needs to be used as the soil screening benchmark: aluminum, antimony, barium, beryllium, cadmium, cobalt, iron, lead, and dieldrin.

Response: The Navy agrees to use the U.S. EPA Eco SSLs when selecting chemicals as COPCs in soil in future ERAs. The Eco SSLs will be discussed in Step 3a of the existing ERAs as agreed to in the July 23, 2004 conference call.

The Eco-SSLs were added to Section 8.6.1.1 (Step 3a refinement) of the SWMU 03 ERA for barium, beryllium, cadmium, iron, and lead.

6 Comment: The ORNL benchmarks are not chronic NOAELs and do not represent the most sensitive receptor (see general comment # 1).

Response: As presented in the response to comment No. 1, the ORNL benchmarks were not used as screening values to select chemicals as COPCs. The ORNL benchmarks were only used in Step 3a to further evaluate risks to plants and invertebrates. Therefore, they do not need to be chronic NOAELs or represent the most sensitive receptors. Also, as presented in the response to comment No. 1, the basis of the alternate benchmarks will be presented in the ERA so that its intended use with respect to risk management is described.

During the September 9, 2004 conference call, it was agreed that alternate benchmarks, which are effects levels for plants and invertebrates could be used as NOAELs, for purposes of COPC screening, if they correspond to an effect of 20 percent or less on the receptor population. The basis for the benchmark would have to be clearly presented. This is based on the fact that the U.S. EPA Ecological Soil Screening Levels for plants and invertebrates are based on geometric means of effects concentrations $(EC)_{20}$s, EC_{10}s, and/or Maximum Acceptable Toxicant Concentrations (MATCs). Chemical concentrations that are below these values will be eliminated as COPCs. Because a 20 percent

reduction in growth or yield (for plants) and 20 percent reduction in growth, reproduction, or activity (for earthworms), were used as the threshold for significant effects for the ORNL benchmarks, chemical concentrations that are less than the ORNL benchmarks will be eliminated as COPCs for that receptor.

The ORNL values were added to Section 8.6.1.1 (Step 3a refinement) of the SWMU 03 ERA for di-n-butyl phthalate, barium, beryllium, and copper.

7 Comment: Eco-SSLs for several chemicals are in development and will replace the Region 5, RCRA ESL. When available the Eco-SSLs need to be used as the soil screening benchmark.

Response: The Navy will use the Eco-SSLs for selecting chemicals as COPCs for future ERAs when they are available and when the ERA is prepared.

The Eco-SSLs were added to Section 8.6.1.1 (Step 3a refinement) of the SWMU 03 ERA for barium, beryllium, cadmium, iron, and lead.

8 Comment: The chemical values in the report "Preliminary Remediation Goals (PRG) for Ecological Endpoints" (ORNL ES/ER/TM-162/R2 August 1997) are not intended to be used for screening, but are thresholds for significant adverse effects.

Response: The Navy agrees that PRGs are not intended for screening, but as stated in the referenced PRG document, "PRGs are intended to correspond to minimal and acceptable levels of effects on the general ecological assessment endpoints as defined in the data quality objectives (DQO) process for ecological risk assessments on the Oak Ridge Reservation (Suter et al. 1994). In general, they correspond to small effects on individual organisms which would be expected to cause minimal effects on populations and communities." Therefore, concentrations below the PRGs are not expected to cause significant adverse effects.

No changes were made to the SWMU 03 ERA based on this comment.

9 Comment: The "effects range – low" (ERL) value is not an alternate benchmark for a chronic NOAEL, but it is a higher toxicity gradient than the threshold effects level (TEL) used in the EPA Region 5 ESL table. The ERL is the lower 10th percentile concentration of sediment toxicity data and a value where toxicity can be expected. The TEL (not the ERL as stated in the report) is the concentration below which adverse effects are expected rarely.

Response: The Navy agrees that the ER-L is not a chronic NOAEL, but neither is the TEL that is used in the U.S. EPA Region 5 ESL table. As cited in the Consensus-Based Sediment Quality Guidelines article by MacDonald et al., (2000), the ER-L "represents the chemical concentration below which adverse effects would rarely be expected." This definition is similar to that as the TEL which "represent the concentration below which adverse effects are expected to occur only rarely" (MacDonald et al., 2000). Also, note that the TEC value (i.e., not toxic), which is used as the revised Region 5 RCRA ESL, incorporates the Ontario lowest effect level (LEL), TEL and ER-L values.

As indicated by U.S. EPA in the July 23, 2004 conference call, although the TEC is more of a LOAEL than a NOAEL, it is acceptable for screening because U.S. EPA is trying to protect benthic invertebrate communities, not populations. Therefore, the values can be greater than no-effects levels. The Navy will clearly present the basis of those values in the ERAs (where used) and how they were used in the ERA.

The toxicological basis of the lower effects levels for COPCs in sediment at SWMU 03 has been added to and/or referenced in the SMWU 03 ERA (Section 8.6.1.2), specifically for acenaphthene, aluminum, antimony, cadmium, copper, lead, and zinc.

10 Comment: Likewise, the "effects range – median" will represent the 50th percentile of sediment toxicity data and "upper effects threshold" values will be a concentration where adverse impacts would always be expected.

Response: As discussed and agreed to by U.S. EPA in the June 9, 2004 technical meeting, the Navy will present one lower effects level and one higher effects level (such as the PEC) to show the range of the effects levels because the lower effects levels and higher effects levels provide probabilities of effect. The Navy will clearly present the basis of those values in the ERAs (where used) and how they were used in the ERA.

The toxicological basis of the upper effects levels for COPCs at SWMU 03 have been added to the SWMU 03 ERA (Section 8.6.1.2) for acenaphthene, antimony, barium, cadmium, copper, lead, and zinc.

11 Comment: The screen is a pass-fail process.

Response: The Navy agrees that the screen is a pass-fail process. However, the section of the SWMU 03 RFI report that the comment references (Section 8.6.1.2) is not the screening step. The COPC screens for SWMU 03 were presented in Section 4.3 of the SWMU 03 RFI report.

No changes were made to the SWMU 03 ERA based on this comment.

12 Comment: Sediment toxicity needs to be limited to freshwater species with reported chronic NOAELs. The LOEC and NOEC values for TNT, based on marine and estuarine organisms, are not acceptable as alternate benchmarks.

Response: Although freshwater toxicity data/benchmarks are preferred for evaluating risks to organisms in freshwater, marine benchmarks are often used as surrogates for chemicals that do not have freshwater toxicity data/benchmarks. As stated in the September 9, 2004 conference call, Chris Ingersoll from USGS indicated that although saltwater species are less sensitive to some chemicals than are freshwater species, it is acceptable to use saltwater sediment values for chemicals that do not have freshwater values. U.S. EPA therefore agreed that saltwater values could be used as long as the uncertainties are discussed in the ERA.

Marine benchmarks were used in the Step 3a discussion for antimony and barium because no freshwater sediment values are available to otherwise compare these COPCs.

The Navy agrees that the freshwater value cited in the text for TNT in Steevens et. al. (2002)[2] is not a valid value based on the information presented by U.S. EPA during the September 9, 2004 conference call. See response to Comment No. 24 in this attachment for information regarding the toxicity of TNT to sediment organisms.

The Steevens et al. (2002) freshwater values have been deleted from the Step 3a discussion for TNT in sediment at SMWU 3 (Section 8.6.1.2).

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[2] Steevens, Jeffrey A., B.M. Duke, G.R. Lotufo, and T.S. Bridges, 2002. "Toxicity of the Explosives 2,4,6-Trinitrotoluene, Hexahydro-1,3,5-Trinitro-1,3,5-Triazine, and Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine in Sediments to *Chironomus tentans* and *Hyallela azteca*: Low-Dose Hormesis and High-Dose Mortality" in Environmental Toxicology and Chemistry. 21:7:1475-1482.

13 Comment: The "probable effects concentration" (PEL) represents a level where adverse effects are frequently expected and is not an alternate benchmark for a chronic NOAEL. The lack of information on the toxicity (i.e., chronic NOAEL) for a chemical needs to result in a decision to continue with the ecological risk assessment process, Steps 3 through 7 (see Section 2.5 of the 1997 ERA Guidance, EPA 540-R-97-006).

Response: As discussed in the June 9, 2004 technical meeting, for chemicals where the only toxicity data available is an AET or some other higher effects level, it was agreed to carry the chemical through the ERA but it would not be quantitatively evaluated. It was noted during the meeting that this approach was acceptable because usually if there is a problem at the site, it would be caused by other chemicals that have toxicity data.

Barium was the only chemical retained as a COPC in sediment before the Step 3a evaluation that only had a higher effects level (i.e., the AET), but did not have a lower effects level. Barium concentrations were greater than the AET but was eliminated in Step 3a for further evaluation for risks to sediment invertebrates after consideration of other Step 3a factors.

No changes were made to the SWMU 03 ERA based on this specific comment.

14 Comment: The "effects range-low" (ER-L) for antimony represent the lower range of sediment toxicity (see specific comment #16) and the "effects range-median" (ER-M) is the median value of sediment toxicity. Neither the ER-L nor the ER-M is alternate benchmarks for a chronic NOAEL.

Response: Navy agrees that neither the ER-L nor the ER-M are chronic NOAELs, but neither is the TEL that is used in the U.S. EPA Region 5 ESL table. As indicated by U.S. EPA in the July 23, 2004 and September 9, 2004 conference calls, LOAELs are acceptable for screening benchmarks for sediment invertebrates because U.S. EPA is trying to protect benthic invertebrate communities, not populations. Therefore, the values can be greater than no-effects levels.

No changes were made to the SMWU 03 ERA to address this comment.

15 Comment: The "apparent effect thresholds" (AETs) were not developed to evaluate ecological risk and they represent a level where adverse biological impacts are always expected and adverse impacts are also known to occur at levels below the AET.

Response: The Navy agrees that the AET represents a level where adverse biological impacts are always expected and adverse impacts are also known to occur at levels below the AET.

The AET was used to evaluate risks to sediment dwelling invertebrates from barium because it is the only available benchmark. However, other factors also were presented in Step 3a to evaluate risks to sediment invertebrates from this metal.

Barium was the only chemical retained as a COPC in sediment before the Step 3a evaluation that only had a higher effects level (i.e., the AET), but did not have a lower effects level. Barium concentrations were greater than the AET but was eliminated in Step 3a for further evaluation for risks to sediment invertebrates after consideration of other Step 3a factors.

16 Comment: The lack of information on the toxicity (i.e., chronic NOAEL) of chemicals result in a decision to continue with the ecological risk assessment process, Steps 3 through 7 (see Section 2.5 of the 1997 ERA Guidance, EPA 540-R-97-006).

Response: The Navy agrees to carry a chemical through the ERA if there is no toxicity data for that chemical, unless other factors in Step 3a (i.e., frequency of detection) are used to eliminate it from further evaluation. However, the Navy does not agree that chemicals with only higher effects levels need to be evaluated in Steps 3 through 7 of the ERA process. Steps 3 through 7 are the BERA and typically include the collection of site-specific biological data (i.e., toxicity tests, biological surveys, etc.). Therefore, a site should not proceed to a BERA just because a chemical is lacking toxicity data. During the September 9, 2004 conference call, it was agreed that the information contained in Step 3a is consistent with the information presented in other ERAs that U.S. EPA has reviewed and the Navy can continue to conduct the further risk evaluation in Step 3a.

Toxicological data was not available for 1,3,5-trinitrobenzene, 2-nitrotoluene, and iron (for invertebrates) detected in surface soil; tin in sediment; and 4-amino-2,6-dinitrotoluene detected in surface water. Other Step 3a factors and/or toxicity data for surrogate chemicals were used to evaluate risks to sediment dwelling invertebrates from these chemicals. Chemicals were retained or eliminated as COPCs based on the other Step 3a factors considered.

17 Comment: It was not clear that the Step 3a evaluation was designed to eliminate chemicals as COPCs for certain groups of receptors and that chemicals that are screened out for one receptor group would still be evaluated for other receptor groups.

Response: The Navy agreed to add text to the beginning of the Step 3a evaluation to indicate the evaluation will consist of screening out chemicals for the various receptor groups, starting with plants/invertebrates, aquatic receptors, and ending with wildlife.

Several pages of text were added to the beginning of Section 8.6 of the SWMU 03 RFI report to explain the ERA process that was followed at SWMU 03.

18 Comment: The ERA should indicate the State designated water uses for the water bodies at Crane and if there are any threatened, endangered, or special concern species in the water bodies just off-site of Crane (i.e., outside the base boundaries)?

Response: The ERAs will present the recognized water uses as regulated by the State of Indiana and will determine if there may be threatened, endangered, or special concern species in the water bodies just off-site of Crane (i.e., outside the base boundaries).

- The following text was added to Section 8.2.1, end of "Aquatic Habitats" to address the comment regarding the state designated water uses:

  "The waterbodies at SWMU 03 discharge directly to Little Sulphur Creek. The Sulphur Creek-Little Sulphur Creek waterbody segment designated state water uses are aquatic life support, fish consumption, and primary contact. This waterbody segment was assessed as part of the 2004 Indiana Integrated Water Quality Monitoring and Assessment Report to determine if the waterbody was supporting those uses (IDEM, 2004). The Sulphur Creek-Little Sulphur Creek waterbody segment is fully supporting the aquatic life support and primary contact water uses; it was not assessed for the fish consumption water use (IDEM, 2004)."

- The following text was added to Section 8.2.1, end of "Threatened and Endangered Species" to address the comment regarding if there are any threatened, endangered, or special concern species in the water bodies just off-site of Crane (i.e., outside the base boundaries):

  "LSC flows southward for about two miles before it enters Sulphur Creek. Sulphur Creek discharges off-site to the East Fork of the White River. River otters, a state endangered species, are being reintroduced to Indiana. The otters are expanding from their original release sites into other watersheds including the East Fork of the White River (IDFW, 2000). Also, the East Fork of

the White River is the site for an ongoing study of lake sturgeon populations, another state endangered species (IDFW, 2000). Finally, spotted darters, a state endangered species, has been found in the East Fork of the White River (IDFW, 2000). Note that other threatened, endangered, or special concern species also may be present in the water bodies just off-site of Crane, as well."

19 Comment: If there is not a screening level for one of the receptors it may be possible to determine that the receptor is less sensitive to the chemical compared to a receptor for which a screening level was developed.

Response: As discussed and suggested by U.S. EPA in the June 9, 2004 technical meeting, if there is not a screening value for one of the receptors an attempt will be made to indicate that other receptors are less (or more) sensitive than the receptors for which a screening level was developed. U.S. EPA also stated during the September 9, 2004 conference call that they often only evaluate risks to wildlife in Step 3 because they are often the most sensitive receptors for many chemicals. If there are no unacceptable risks for the wildlife species then it is assumed that there are no unacceptable risks to plants or invertebrates. Therefore, a qualitative evaluation can be conducted to evaluate risks to the receptor that does not have a screening level or other toxicity data established for a particular chemical, or if toxicity data is limited for a particular receptor.

For surface soil, a comparison of 2-amino-4,6-dinitrotoluene concentrations to the ORNL microbial processes value for 2-amino-4,6-dinitrotoluene was conducted because an ORNL earthworm value is not available (see Section 8.6.1.1) for this chemical.

20 Comment: Need to develop list of chemicals that will be carried through the food chain model for herbivorous and invertivorous mammals and birds and carnivorous birds and mammals.

Response: As discussed at the June 9, technical meeting, U.S. EPA indicated that the fox and hawk models do not need to be conducted at most sites unless there is really a problem with bioaccumulative chemicals. Also, during the July 23, 2004 conference call, it was agreed that the chemicals that were carried through the food chain model in the ERAs conducted to date, which used the list of important bioaccumulative chemicals from U.S. EPA (2000), EPA/823/R-00/001 was acceptable for those ERAs and the food chain models would not need redone. Phthalates were not included in the food chain modeling because they were not included on the list of important bioaccumulative chemicals in U.S. EPA (2000). It was agreed that for future ERAs, TtNUS would generate a list of chemicals that would be carried through the food chain model for small mammals and birds and a separate list that would be used for higher trophic level carnivores such as hawks and foxes. At that time, phthalates could be included in that list for future ERAs.

Based on the discussions during the September 9, 2004 conference call, U.S. EPA confirmed that the chemicals that were carried through the food chain model for the existing ERAs were acceptable. The Navy will include a brief discussion in the ERA indicating that if the chemical is not accumulating in the food item, then the exposure of the small mammal or bird consuming the food item to the chemical is likely to be low. For that reason, only bioaccumulative chemicals are included in the food chain model.

- The following text was added to the end of the first paragraph in Section 8.6.2 of the SWMU 03 RFI report to address this comment:

  "Chemicals evaluated in the terrestrial food-chain model were limited to those identified by the U.S. EPA as bioaccumulative (U.S. EPA, February 2000). The primary reason for including only bioaccumulative chemicals in the food chain model is based on the assumption that although wildlife can be exposed to chemicals that do not accumulate in food items (i.e., plants, invertebrates), via

direct ingestion of the media (i.e., soil), the exposure of the animal consuming that chemical will be low if the chemical is not accumulating in the food item."

21 Comment: Chemicals with concentrations/doses greater than no-effects levels should be evaluated in Step 3a.

Response: Step 3a will include an evaluation of all chemicals with concentrations/doses greater than no-effects levels.

See Section 8.6 of the SWMU 03 ERA for the Step 3a evaluation. No additional chemicals were evaluated in Step 3a based on this comment because all chemicals that were retained as COPCs were evaluated in Step 3a.

22 Comment: The ERA should present more qualitative information of the potential for exposure to threatened and endangered (T&E) reptiles at the site (as one reptile species was identified as a T&E species). For example, the ecological risk assessment should include information detailing the likelihood of the presence of reptilian receptors, the mechanisms through which these receptors may be impacted, and possible individual and/or population level impacts to these receptors. Otherwise, without qualification, the sentence, "*...there are uncertainties in risks to reptiles because there is a lack of exposure factors for reptiles and a lack of reptile toxicity data for the detected chemicals*" is open to interpretation. Revise the document as requested.

Response: During the April 1, 2004 conference call, the Navy agreed to add qualitative information to both existing and future ERAs regarding the potential or likelihood that T&E reptiles (and other T&E species) are present based on the habitat such as the physical factors or site characteristics affecting exposure of reptiles (or other T&E species).

To address this comment, and other comments regarding T&E species at SWMU 03, the following text was added to various sections of the SWMU 03 RFI report:

- The fourteenth paragraph of Section 1.3.7 was deleted and the following two paragraphs were added:

  "There are numerous species of wildlife located throughout NSWC Crane. Of these species, some are listed as endangered and threatened species or species of special concern. The Indiana bat is listed as the only federal endangered mammal and is potentially present at SWMU 03. The bald eagle is listed as a federal threatened species. The presence of the bald eagle is also unlikely because the preferred hunting habitat for this bird of prey (i.e., vast expanses of open water) is absent at SWMU 03.The County Distribution of Indiana's Federally Threatened, Endangered, Proposed, and Candidate Species list (USFWS, 2002) was reviewed to verify that no change in status of these species had occurred since October 2000.

  NSWC Crane occupies three counties in Indiana (Greene, Lawrence, and Martin counties). The Indiana bat is listed as federally endangered in all three counties. The Fanshell pearly mussel, tubercled blossom, ring pink, and clubshell are listed as federally endangered species within Martin, Daviess and Lawrence counties. Additionally, the Northern riffleshell and rough pigtoe are listed as federally endangered species in Martin County. These invertebrate species are not likely to be present at SWMU 03 because they prefer medium to large rivers with moderate currents and gravel substrates as habitat. The preferred habitat that these species prefer is absent at NSWC Crane."

- The following text was added to the end of the last sentence in the second paragraph in Section 8.7.1 of the SWMU 03 RFI report: *"(see below for a discussion of potential risks to the timber rattlesnake)"*

- The following text was added as the last paragraph of Section 8.7.1 of the SWMU 03 RFI report:

  "Finally, there are uncertainties in risks to reptiles because there is a lack of exposure factors for reptiles and a lack of reptile toxicity data for the detected chemicals. As discussed in Section 1.3.7, one threatened reptilian species is listed as potentially present at NSWC Crane. Based on the preferred habitat of the timber rattlesnake and the ecology of SWMU 03, this species may potentially inhabit areas of SWMU 03. Risks to these species were not specifically calculated so uncertainties exist as to how this species would be affected if an exposure to site chemical concentrations occurred."

23 Comment: Surface soil exposures and sub-surface soil exposures should be examined (if applicable) for receptors at the site. In order to examine these exposures, soil sampling depth classes need to be developed. U.S. EPA has suggested the 0 to 0.5 foot below ground surface (ft bgs) as being reflective of surface soils exposure pathways, and 0.5 to 2 foot bgs as reflective of subsurface soil exposure pathways, based on best professional judgment and experience with other sites in the region and across the nation.

U.S. EPA clearly understands that earthworms, plants, and burrowing wildlife will not necessary restrict foraging or burrowing activities to these specific depth classes; however, it should be realized that these receptors of concern are representative species that are used to estimate risk for all of the potential receptors residing at, or otherwise using, the site.

It should also be noted that this recommendation has been provided to assist in the design of future sampling events. That is, it is not necessary to revise the ecological risk assessment based on collection of a new data set.

However, future sampling activities should be designed to incorporate this approach, or sound rationale should be provided for the Navy's selection of 0 to 1 ft bgs and 0 to 2 ft bgs for examining various soil exposures for receptors at the Site.

The rationale should clearly state why the Navy feels it is not necessary to separate surface soil and sub-surface exposure pathways, and why it is appropriate to use two different soil sampling depth classes depending on the analytes being examined (e.g., 0 to 1 ft bgs for inorganic parameters and 0 to 2 ft bgs for dye parameters at SWMU 2.)

Response: Generally at NSWC Crane surface soil samples are collected from a depth of 0 to 2 feet (excepting volatiles which are collected from a depth of 0.5 feet to 2 feet). Samples for each fraction are collected from the entire interval. In some cases historical information or the need for data to support a CMS may warrant collection of fractions from different depths.

The Navy does not agree that samples from two separate intervals within the top two feet need to be collected to evaluate ecological risk. Most ecological receptors will be exposed to contaminants in the top two feet of soil as they move through the soil column.

For future ERAs, surface soil intervals will be chosen on a site-specific basis and the rationale for the choice of the surface interval will be provided in the planning documents and in the ERA.

No changes were made to the SWMU 03 ERA based on this comment.

24 Comment: The paper by Steevens et. al., 2002. does not provide specific chronic NOAEL or LOAEL data. Steevens et. al. showed that TNT had a LC_{50} of 28.9 mg/kg with a 95% CI of 25.8 to 32.5 for survival of *Hyalella azteca* (an amphipod) which is a severe adverse effect. The alternate benchmark of 25 mg/kg for TNT is in the severe effects range and is misleading when presented as a refinement chronic NOAEL.

Response: As was discussed during the September 9, 2004 conference call, the TNT values from Steevens et. al., 2002 do not appear valid because the TNT degraded quickly in the sample so the measured concentrations were much less than the nominal concentrations. Therefore, because nominal concentrations were used to calculate the LC_{50} value, the calculated LC_{50} is not appropriate and would be much lower using measured concentrations. The Navy agreed not to use the TNT values from Steevens et. al., 2002 for the reason discussed above.

Based on a conference call between TtNUS, U.S. EPA Region 5, and the US Army Corps of Engineers (USACE) on October 6, 2004, Jeff Steevens from USACE indicated that NOECs and LOECs for nitroaromatic compounds were developed in a paper by Condor, et. al., 2004[3]. The study calculated NOECs and LOECs for nitroaromatic compounds and in order to convert the values from nmol/kg to mg/kg, an average molecular weight of 200 was used. The average molecular weight was based on the approximate average molecular weights of TNT, ANTs, and DNTs of 227, 197, and 167, respectively. Based on this study, the NOEC, LC50, and LOEC for survival of 112, 184 and 304 nmol/g, respectively, converted to 22.4, 36.8 and 60.8 mg/kg, respectively.

See Section 8.6.1.2 of the SWMU 03 ERA for the Step 3a evaluation of TNT in sediment.

25 Comment: Other tests by Steevens et. al. resulted in *Chironomous tenans* (a midge) growth being greater when RDX and HMX was present at all test concentrations with respect to the control. The RDX concentration of 711.2 mg/kg did have a significant increase in growth which was incorrectly stated in the risk assessment. All of the Steevens et. al. LOEC and NOEC are not acceptable as alternate benchmarks.

Response: As was discussed during the September 9, 2004 conference call, U.S. EPA indicated that they may consider the RDX and HMX values because they were based on measured concentrations but the Navy should try to locate other lines of evidence. The following additional of evidence were located regarding the toxicity of HMX and RDX to aquatic organisms:

- One study cited in Talmage et al., 1999 indicated that a sediment pore-water concentration at the limit of HMX solubility would not be acutely toxic to the three organisms that were tested (a midge, isopod, and amphipod).
- One study cited in Talmage et al., 1999 indicated that a sediment pore-water concentration of 15 mg/L of RDX would not be acutely toxic to the three organisms that were tested (a midge, isopod, and amphipod).

See Section 8.6.1.2 of the SWMU 03 ERA for the Step 3a evaluation of HMX and RDX in sediment.

26 Comment: The sediment quality benchmarks presented by Talmage (Talmage et. al. 1999. Reviews of Environmental Contamination and Toxicology, vol. 161, pages 1-156) needs to presented as alternate benchmarks: TNT = 0.09 mg/kg, RDX = 0.01 mg/kg and HMX = 0.005 mg/kg.

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[3] Conder, J.M., T.W. La Point, J.A. Steevens, and G.R. Lotufo. 2004. Recommendations for the Assessment of TNT Toxicity in Sediment. Environmental Toxicology and Chemistry. Vol. 23, No. 1. pp. 141-149.

Response: Talmage et al., 1999 indicated that the secondary chronic value (SCV) of 0.33 mg/L (which was used to calculate the sediment quality benchmark (SQB) using equilibrium) is overly conservative and a value of >3.3 mg/L is a more realistic interim value until additional toxicity tests are performed. If the more realistic value is used, the SQB increases from 0.005 mg/kg to 0.05 mg/kg, which is still low compared to the empirical data. Therefore, the Navy believes that the empirical data cited in Comments Nos. 24 and 25 above are more appropriate for use in determining if a chemical needs to be retained as a COPC after Step 3a of the ERA.

See Section 8.6.1.2 of the SWMU 03 ERA for the Step 3a evaluation of TNT, HMX, and RDX in sediment.

SPECIFIC COMMENTS FROM SWMU 03

1 Comment: Page 8-23, Section 8.6.1, Terrestrial Plants, Terrestrial and Aquatic Invertebrates and Fish; The basis for the ecological toxicity soil benchmark is not available in the MHSPE 2000 reference as noted in the second sentence (i.e., "Details explaining the origin and basis for the alternate benchmarks are provided in Appendix H.3."). The toxicity basis for the MHSPE benchmark needs to be presented in the report.

Response: The Dutch soil benchmarks have been removed from the report so the toxicity basis for the MHSPE benchmark is not presented in the report.

See response to general issues from specific comment No. 2.

2 Comment: Page 8-23, Section 8.6.1.1, Soil – Dioxins; Since dioxins are known to be a persistent bio-accumulative toxic chemical, an earthworm is not an adequately sensitive receptor. The Dutch "Indicative Levels" shows that plant and animal life is seriously impaired (i.e., 50% of the species experience negative effects) and does not represent a screening benchmark (i.e., chronic NOAEL) as described in general comment number one. The two alternate benchmarks are not acceptable and dioxins need to be retained for additional risk evaluation. A summary report on the development of the U.S. EPA, Region 5, RCRA, Ecological Screening Level (ESL) for dioxin in soil is attached.

Response:

See responses to general issues from specific comments Nos. 1 and 2.

3 Comment: Page 8-24, Section 8.6.1.1, Soil – Energetics; Screening benchmarks developed for mammalian wildlife species (Talmage et. al. 1999. Reviews of Environmental Contamination and Toxicology, vol. 161, pages 1-156) report values one to two magitudes lower than the alternate benchmarks presented using earthworm LOEC and NOEC values. The alternate benchmarks for TNT, RDX and HMX will not protect sensitive receptors (see general comment # 1) and are not acceptable as screening benchmarks. These energetics or nitroaromatic munition compounds need to be retained for additional risk evaluation. Only maximum values will be compared to screening benchmarks as noted in general comment # 5.

Response: The screening benchmarks for energetics in Talmage et al., 1999 are doses in mg/kg-day; they are not soil benchmarks. Therefore, the numbers cannot be directly compared to the LOEC and NOEC values which are concentrations in mg/kg. Note that although energetics are typically not considered very bioaccumulative chemicals, risks to mammals and birds from energetics were evaluated in Section 8.6.2 of the SWMU 03 RFI report ERA.

See responses to general comments Nos. 1a, 1b, and 1c, and 5a.

4 Comment: Page 8-25, Section 8.6.1.1, Soil - Di-n-Butyl Phthalate; For di-n-butyl phthalate, the bio-concentration factor (BCF) for soil to plant is three orders of magitude lower than the soil to earthworm BCF. The "Intermediate Value" is still regarded by the Dutch as contaminated and needing soil use restrictions. Neither the ORNL plant benchmark nor the Dutch Intermediate Value represent an alternate benchmark as described in general comment # 1. Since both the log K_{ow} and the BCF (soil to earthworm) are high, the earthworm is not a sensitive receptor and di-n-butyl phthalate needs to be retained for additional risk evaluation. Only maximum values will be compared to screening benchmarks as noted in general comment # 5.

Response: The source of the equation used to calculate the chemical-specific soil to earthworm bioconcentration factor (log BCF = 0.819 x log Kow - 1.146) is Bysshe, S.E. (1982), "Bioconcentration

Reactors in Aquatic Organisms" in the Handbook of Chemical Property Estimation Methods: Environmental Behavior of Organic Compounds. W.J. Lymon and others, editors. American Chemical Society. Washington, DC. After obtaining and reviewing the article, the Navy does not agree that it is an appropriate source of soil to earthworm bioconcentration factors because the equation is based on accumulation of organic chemicals into water fleas (*Daphnia pulex*) from surface water. The articles were e-mailed to U.S. EPA for their review but the Navy has not yet received comments from USEPA.

Di-n-butylphthalate was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for risks to plants and invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.1). Also, during the July 23, 2004 conference call, it was agreed that the chemicals that were carried through the food chain model in the ERAs conducted to date, which used the list of important bioaccumulative chemicals from USEPA (2000), EPA/823/R-00/001 was acceptable for those ERAs and the food chain models would not need redone. Phthalates were not included in the food chain modeling because they were not included on the list of important bioaccumulative chemicals in USEPA (2000). Therefore, food chain risks from phthalates were not evaluated in the SWMU 03 ERA.

See responses to general comments Nos. 1a, 1b, 1c, and 5a and responses to general issues from specific comments Nos. 2 and 6.

5 Comment: Page 8-25, Section 8.6.1.1, Soil – Naphthalene; The alternate benchmarks are not acceptable and naphthalene needs to be retained for additional risk evaluation. Since the contaminant is naphthalene, the use of the Dutch Total PAH values is not appropriate. In addition, the "Intermediate Value" and is regarded by the Dutch as contaminated and needing soil use restrictions. The Dutch have developed an ecotoxicological serious risk concentration (SRC_{eco}) of 17 mg/kg for naphthalene in soil (RIVM report 711701 023 Technical Evaluation of the Intervention Values for Soil/sediment and Groundwater, February 2001) that may be applied to evaluate serious contamination (see general comment # 1). Only maximum values will be compared to screening benchmarks as noted in general comment # 5.

The Canadian Soil Quality Guidelines does not clearly state that a Residential/Parkland value is a chronic NOAEL intended to protect sensitive receptors (see general comment # 1). Concerns with the Canadian protocol include the following:

a. not intended to protect all wild plants and animals as noted in the land use definition "parkland is defined as a buffer zone between areas of residency and campground areas and excludes wild lands such as national or provincial parks"
b. the guideline uses a lowest observed effect concentration (LOEC) rather than a NOAEL. note, the "no potential effects range" (NPER) benchmark uses a LOEC
c. food web exposure to insectivores (e.g., shrew or robin) does not appear to be incorporated into the guideline. The Canadian soil value for naphthalene needs more documentation.

Response: Naphthalene was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for risks to plants and invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.1).

See response to general comment No. 5a and responses to general issues from specific comment Nos. 2, 3, and 4.

6 Comment: Page 8-26, Section 8.6.1.1, Soil – Barium; The recently released U.S. EPA report, Ecological Soil Screening Level (Eco-SSL) for Barium (0.33 mg/kg soil invertebrates) will replace the Region 5, RCRA ESL and needs to be used as the soil screening benchmark. The alternate benchmarks are not acceptable and barium needs to be retained for additional risk evaluation. Dutch Target Values for metals are based on Netherland soil background levels rather than

toxicity and are not acceptable to use for a risk assessment. The "Intermediate Value" and is regarded by the Dutch as contaminated and needing soil use restrictions. The ORNL plant value is known to be a subchronic LOAEL (38% adverse effect on growth), not a chronic NOAEL and does not represent the most sensitive receptor (see general comment # 1). Only maximum values will be compared to screening benchmarks as noted in general comment # 5.

Response: Barium was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for risks to plants and invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.1).

See responses to general comment Nos. 1a, 1b, 1c, and 5a and responses to general issues from specific comments Nos. 2, 5, 6, and 7.

7 Comment: Page 8-27, Section 8.6.1.1, Soil – Beryllium; The recently released Eco-SSL for beryllium (36 mg/kg mammal) will replace the Region 5, RCRA ESL and needs to be used as the soil screening benchmark. The alternate benchmarks are not acceptable since the Dutch Target Values for metals are based on Netherland soil background levels rather than toxicity and are not acceptable to use for a risk assessment. The "Intermediate Value" and is regarded by the Dutch as contaminated and needing soil use restrictions. The ORNL plant value does not represent the most sensitive receptor (see general comment # 1). Only maximum values will be compared to screening benchmarks as noted in general comment # 5.

Response: See responses to general comments Nos. 1a, 1b, 1c, and 5a and responses to general issues from specific comments Nos. 2, 5, 6, and 7.

8 Comment: Page 8-27, Section 8.6.1.1, Soil – Cadmium; The recently released Eco-SSL for cadmium (0.38 mg/kg soil invertebrates) will replace the Region 5, RCRA ESL and needs to be used as the soil screening benchmark. The alternate benchmarks are not acceptable and cadmium needs to be retained for additional risk evaluation. Dutch Target Values for metals are based on Netherland soil background levels rather than toxicity and are not acceptable to use for a risk assessment. The "Intermediate Value" and is regarded by the Dutch as contaminated and needing soil use restrictions. Plant and earthworm screening levels (e.g., ORNL benchmarks) were not identified as most sensitive receptor (see general comment # 1) benchmarks in the Eco-SSL report for cadmium. Only maximum values will be compared to screening benchmarks as noted in general comment # 5.

Response: Cadmium was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for risks to plants and invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.1). Risks to birds and mammals from exposure to cadmium through the food chain were evaluated in Section 8.6.2 of the SWMU 03 RFI report ERA.

See responses to general comment Nos. 1a, 1b, 1c, and 5a and response to general issues from specific comments Nos. 2, 5, 6, and 7.

9 Comment: Page 8-28, Section 8.6.1.1, Soil – Chromium; An Eco-SSL for chromium is in development and will replace the Region 5, RCRA ESL. When available the Eco-SSL for chromium needs to be used as the soil screening benchmark. The alternate Dutch and Canadian benchmarks are not acceptable and chromium needs to be retained for additional risk evaluation. Dutch Target Values for metals are based on Netherland soil background levels rather than toxicity and are not acceptable to use for a risk assessment. The "Intermediate Value" and is regarded by the Dutch as contaminated and needing soil use restrictions. The Canadian benchmark for chromium is in question (see specific comment # 5 naphthalene) and needs more documentation to support its use.

The U.S. EPA, Region 5, RCRA, Ecological Screening Level (ESL) for dioxin in soil is based on an invertebrate TRV of 10 ppm for soil exposure route is based on a subchronic LOAEL study of earthworms (Soni and Abbasi 1981, as cited in Eisler, 2000) using hexavalent chromium data. An ESL summary report for Chromium in soil is attached.

Response: Chromium was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for risks to plants and invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.1). Risks to birds and mammals from exposure to chromium through the food chain were evaluated in Section 8.6.2 of the SWMU 03 RFI report ERA.

See response to general comment No. 5a and response to general issues from specific comments Nos. 2, 5, and 6.

10 Comment: Page 8-29, Section 8.6.1.1, Soil – Copper; An Eco-SSL for copper is in development and will replace the Region 5, RCRA ESL. When available the Eco-SSL for copper needs to be used as the soil screening benchmark. Since copper is bio-accumulative, an earthworm is not an adequately sensitive receptor. Dutch Target Values for metals are based on Netherland soil background levels rather than toxicity and are not acceptable to use for a risk assessment. The "Intermediate Value" and is regarded by the Dutch as contaminated and needing soil use restrictions. The Canadian benchmark for copper is in question (see specific comment # 5 naphthalene) and needs more documentation to support its use. The chemical values in the report "Preliminary Remediation Goals (PRG) for Ecological Endpoints" (ORNL ES/ER/TM-162/R2 August 1997) are not intended to be used for screening, but are thresholds for significant adverse effects. The PRG for copper is 60 mg/kg for an earthworm. The alternate benchmarks are not acceptable and copper needs to be retained for additional risk evaluation. Only maximum values will be compared to screening benchmarks as noted in general comment # 5.

Response: Copper was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for risks to plants and invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.1). Risks to birds and mammals from exposure to copper through the food chain were evaluated in Section 8.6.2 of the SWMU 03 RFI report ERA.

See response to general comment No. 5a and responses to general issues from specific comments Nos. 1, 2, 3, 4, 5, and 8.

11 Comment: Page 8-29, Section 8.6.1.1, Soil – Iron; The recently released information in the Eco-SSL report for iron needs to be used for soil screening.

Response: See response to general comment No. 5a and responses to general issues from specific comments Nos. 5 and 6.

12 Comment: Page 8-29, Section 8.6.1.1, Soil – Lead; The recently released Eco-SSL for lead (16 mg/kg avian wildlife) will replace the Region 5, RCRA ESL and needs to be used as the soil screening benchmark. The alternate benchmarks are not acceptable and lead needs to be retained for additional risk evaluation. Dutch Target Values for metals are based on Netherland soil background levels rather than toxicity and are not acceptable to use for a risk assessment. The "Intermediate Value" and is regarded by the Dutch as contaminated and needing soil use restrictions. Since the PRG (see related discussion in specific comment # 10) for lead is 40.5 mg/kg for a woodcock the remaining alternate benchmarks are not acceptable and lead needs to be retained for additional risk evaluation. Only maximum values will be compared to screening benchmarks as noted in general comment # 5.

The frequency of detection for lead at SWMU 03 was 32 out of 32 soil samples, which appears to indicate that lead is ubiquitous at the site. Dose modeling resulted in a majority of lead

based HQ exceedances (i.e., above 1) for the bobwhite quail, American robin, raccoon, and kingfisher, based on both conservative and less conservative dose modeling assumptions, which denotes a possible lead concern at SWMU 03. In addition, the highest detection of lead (10,200 mg/kg), was the *only* (emphasis added) sample taken within the apparent burn pit areas (Figure 5-2, sample 03SB24), and no information has been provided to demonstrate that one sample in one of the two burn pits is representative of potential exposures and contaminant distribution associated with that burn pit. Furthermore, this sample was removed from lead dose modeling for the American robin because it was felt that the sample was "biasing" the results; however, the outcome of removing this data point is that risk management decision will be made for the site based on data unrelated to the actual site (i.e., the burn put area). Finally, the average exposure point concentration has been "diluted" due to the inclusion of numerous samples that do not appear to be part of the actual area of concern.

Response: Lead was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for risks to plants and invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.1). Risks to birds and mammals from exposure to lead through the food chain were evaluated in Section 8.6.2 of the SWMU 03 RFI report ERA.

Samples were collected surrounding the burn pit and ash as was noted in the boring from 03SB22, which indicates that the size of the burn pit area is just approximated on Figure 5-2. The lead concentration in the surface soil sample from 03SB022 (adjacent to 03SB022) was only 27.6 mg/kg indicating that the extent of elevated lead levels is small. In Section 8.6.2.2, risks from lead were calculated two ways: 1) using average concentrations including the maximum detection and 2) using average concentrations excluding the maximum detection. This was done to show the effects of the one sample on risks to wildlife. This is important because 03SB024 (where the sample with the maximum lead concentration was detected) is located along the fringe of the road in an area with hardpacked sand and gravel, thus limiting the numbers of earthworms that would be exposed to the lead in this area. Therefore, the Navy believes that is it appropriate to remove the sample from 03SB024 from the risk calculation. This information is discussed in Section 8.6.2.2 of the SWMU 03 RFI report ERA. It is not clear which samples the U.S. EPA are referring to that are not within the actual area of concern.

See response to general comment No. 5a and responses to general issues from specific comments Nos. 2, 5, and 7.

13 Comment: Page 8-30, Section 8.6.1.1, Soil – Mercury; Since mercury is known to be a persistent bio-accumulative toxic chemical, an earthworm is not an adequately sensitive receptor and the ORNL benchmarks will not be protective of the more sensitive receptor (see general comment # 1). Dutch Target Values for metals are based on Netherlands soil background levels rather than toxicity and are not acceptable to use for a risk assessment. The "Intermediate Value" and is regarded by the Dutch as contaminated and needing soil use restrictions. Since the PRG (see related discussion in specific comment # 10) for mercury is 0.51 mg/kg for a woodcock the Canadian SQG alternate benchmarks is not acceptable and lead needs to be retained for additional risk evaluation. Only maximum values will be compared to screening benchmarks as noted in general comment # 5.

Response: Mercury was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for risks to plants and invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.1). Risks to birds and mammals from exposure to mercury through the food chain were evaluated in Section 8.6.2 of the SWMU 03 RFI report ERA.

See response to general comment No. 5a and responses to general issues from specific comments Nos. 1, 2, 3, 4, 6, and 8..

14 Comment: Page 8-31, Section 8.6.1.1, Soil – Nickel; An Eco-SSL for nickel is in development and will replace the Region 5, RCRA ESL. When available the Eco-SSL for nickel needs to be used as the soil screening benchmark. Dutch Target Values for metals are based on Netherlands soil background levels rather than toxicity and are not acceptable to use for a risk assessment. The "Intermediate Value" and is regarded by the Dutch as contaminated and needing soil use restrictions. Since the PRG (see related discussion in specific comment # 10) for nickel is 30 mg/kg for a plant the ORNL alternate earthworm benchmark is not acceptable and nickel needs to be retained for additional risk evaluation. Only maximum values will be compared to screening benchmarks as noted in general comment # 5.

Response: Nickel was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for risks to plants and invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.1). Risks to birds and mammals from exposure to nickel through the food chain were evaluated in Section 8.6.2 of the SWMU 03 RFI report ERA.

See response to general comment No. 5a and responses to general issues from specific comments Nos. 2, 5, 6 and 8.

15 Comment: Page 8-31, Section 8.6.1.1, Soil – Zinc; An Eco-SSL for zinc is in development and will replace the Region 5, RCRA ESL. When available the Eco-SSL for zinc needs to be used as the soil screening benchmark. Dutch Target Values for metals are based on Netherlands soil background levels rather than toxicity and are not acceptable to use for a risk assessment. The "Intermediate Value" and is regarded by the Dutch as contaminated and needing soil use restrictions. Since the PRG (see related discussion in specific comment # 10) for zinc is 8.5 mg/kg for a woodcock the ORNL and Canadian SQG alternate benchmarks are not acceptable and zinc needs to be retained for additional risk evaluation. Only maximum values will be compared to screening benchmarks as noted in general comment # 5.

Response: Zinc was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for risks to plants and invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.1). Risks to birds and mammals from exposure to zinc through the food chain were evaluated in Section 8.6.2 of the SWMU 03 RFI report ERA.

See response to general comment No. 5a and responses to general issues from specific comments Nos. 2, 3, 4, 5, 6 and 8.

16 Comment: Page 8-32, Section 8.6.1.2 Sediment – Acenaphthene; The "effects range - low" (ERL) value is not an alternate benchmark for a chronic NOAEL, but it is a higher toxicity gradient than the threshold effects level (TEL) used in the EPA Region 5 ESL table. The ERL is the lower 10th percentile concentration of sediment toxicity data and a value where toxicity can be expected. The TEL (not the ERL as stated in the report) is the concentration below which adverse effects are expected rarely. Likewise, the "effects range - median" will represent the 50th percentile of sediment toxicity data and "upper effects threshold" values will be a concentration where adverse impacts would always be expected. The alternate benchmarks are not acceptable and risk from acenaphthene needs to be retained for additional risk evaluation.

Response: Acenaphthene was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for sediment invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.2). Risks to birds and mammal from exposure to acenaphthene through the food chain were evaluated in Section 8.6.2 of the SWMU 03 RFI report ERA.

See response to general issues from specific comments No. 9.

17 Comment: Page 8-33, Section 8.6.1.2 Sediment - Di-n-butyl phthalate; Since the maximum concentrations are less than the current sediment ESL of 1114 ug/kg this compound no longer needs to be retained.

Response: Comment noted. Di-n-butyl phthalate was eliminated as a COPC during the Step 3a evaluation (Section 8.6.1.2) of the SWMU 03 RFI report ERA.

18 Comment: Page 8-33, Section 8.6.1.2 Sediment – Diphenylamine; The screen is a pass-fail process and no benchmark refinement is provided. Diphenylamine needs to be retained for those samples that exceeded the sediment ESL and attention needs to be given to the high value near Spring C (i.e., source of contaminated ground water?).

Response: Diphenylamine was eliminated as a COPC in the Step 3a evaluation after the consideration of other Step 3a factors as presented in Section 8.6.1.2 of the SWMU 03 ERA.

See response to general issues from specific comments No. 11.

19 Comment: Page 8-33, Section 8.6.1.2 Sediment – Energetics; Sediment toxicity needs to be limited to freshwater species with reported chronic NOAELs. The LOEC and NOEC values for TNT, based on marine and estuarine organisms, are not acceptable as alternate benchmarks.

The paper by Steevens et. al., 2002. does not provide specific chronic NOAEL or LOAEL data. Steevens et. al. showed that TNT had a LC_{50} of 28.9 mg/kg with a 95% CI of 25.8 to 32.5 for survival of *Hyalella azteca* (an amphipod) which is a severe adverse effect. The alternate benchmark of 25 mg/kg for TNT is in the severe effects range and is misleading when presented as a refinement chronic NOAEL. Other tests by Steevens et. al. resulted in *Chironomous tenans* (a midge) growth being greater when RDX and HMX was present at all test concentrations with respect to the control. The RDX concentration of 711.2 mg/kg did have a significant increase in growth which was incorrectly stated in the risk assessment. All of the Steevens et. al. LOEC and NOEC are not acceptable as alternate benchmarks.

The sediment quality benchmarks presented by Talmage (Talmage et. al. 1999. Reviews of Environmental Contamination and Toxicology, vol. 161, pages 1-156) needs to presented as alternate benchmarks: TNT = 0.09 mg/kg, RDX = 0.01 mg/kg and HMX = 0.005 mg/kg. Sediment concentrations for TNT, RDX and HMX that exceed the above benchmarks by Talmage need to be retained.

Response: See responses to general issues from specific comments Nos. 12, 24, 25, and 26.

20 Comment: Page 8-35, Section 8.6.1.2 Sediment – Methoxychlor; The revised sediment ESL of 13.6 ug/kg was developed using the same EqP method as the Ecotox Threshold presented in this report and it is based upon an improved water quality Tier II value. Since the Ecotox Threshold value of ... for methoxychlor was in effect when this work plan was approved, the maximum concentration is less than this value and methoxychlor no longer needs to be retained.

Response: Comment noted. Methoxychlor was eliminated as a COPC in the Step 3a refinement (Section 8.6.1.2) of the SWMU 03 RFI report ERA.

21 Comment: Page 8-35, Section 8.6.1.2 Sediment - 2,4-D; Since the maximum concentrations are less than the current sediment ESL of 1273 ug/kg this compound no longer needs to be retained.

Response: Comment noted. 2,4-D was eliminated as a COPC in the Step 3a refinement (Section 8.6.1.2) of the SWMU 03 RFI report ERA.

22 Comment: Page 8-36, Section 8.6.1.2 Sediment – Aluminum; The "probable effects concentration" (PEL) for aluminum represents a level where adverse effects are frequently expected and is not an alternate benchmark for a chronic NOAEL. The lack of information on the toxicity (i.e., chronic NOAEL) of aluminum needs to result in a decision to continue with the ecological risk assessment process, Steps 3 through 7 (see Section 2.5 of the 1997 ERA Guidance, EPA 540-R-97-006). Aluminum needs to be retained.

Response: Aluminum was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for sediment invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.2) of the SWMU 03 RFI report ERA. Note that the PEL was eliminated from the Step 3a evaluation of aluminum.

See responses to general issues from specific comments Nos. 10 and 13.

23 Comment: Page 8-36, Section 8.6.1.2 Sediment – Antimony; The "effects range-low" (ER-L) for antimony represent the lower range of sediment toxicity (see specific comment #16) and the "effects range-median" (ER-M) is the median value of sediment toxicity. Neither the ER-L nor the ER-M are alternate benchmarks for a chronic NOAEL. The "apparent effect thresholds" (AETs) were not developed to evaluate ecological risk and they represent a level where adverse biological impacts are always expected and adverse impacts are also known to occur at levels below the AET. Only maximum values will be compared to screening benchmarks as noted in general comment # 5. The alternate benchmarks are not acceptable and risk from antimony needs to be retained for additional risk evaluation.

Response: Antimony was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for sediment invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.2) of the SWMU 03 RFI report ERA. Note that the AET was eliminated from the Step 3a evaluation of antimony.

See responses to general issues from specific comments Nos. 9, 10 and 13.

24 Comment: Page 8-36, Section 8.6.1.2 Sediment – Barium; This section needs to clarify what a AET value represents (see specific comment # 23) in terms of toxicity. Since the maximum value exceeds a level where adverse biological impacts are always expected, barium needs to be retained.

Response: Barium was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for sediment invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.2) of the SWMU 03 RFI report ERA. Note that the toxicological basis for the AET for barium has been added to the SWMU 03 ERA (Section 8.6.1.2)

See response to general issues from specific comments No. 15.

25 Comment: Page 8-37, Section 8.6.1.2 Sediment – Cadmium; The revised Region 5 RCRA ESL (see footnote "u" on the ESL table) of 0.99 mg/kg needs to be used which is the consensus-based sediment threshold effect concentration (TEC). This TEC value (i.e., not toxic) incorporates the Ontario lowest effect level (LEL), TEL and ER-L values. Similarly, the consensus-based sediment probable effect concentration (PEC) will identify toxic hot spots and incorporates the Ontario severe effect level (SEL), PEL and ER-M values. The alternate benchmarks need to be deleted as they have been replaced by the revised ESL (i.e., TEC) and PEC benchmarks. Since the maximum concentrations exceed the ESL value, cadmium needs to be retained.

Response: Cadmium was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for sediment invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.2) of the SWMU 03 RFI report ERA.

See responses to general issues from specific comments Nos. 9, 10 and 13.

26 Comment: Page 8-38, Section 8.6.1.2 Sediment – Copper; The revised Region 5 RCRA ESL of 31.6 mg/kg needs to be used and the alternate benchmarks need to be deleted as discussed in specific comment #25. Also note that the Ecotox Threshold value is the same as the ER-L. Since both the maximum and average values exceed the ESL copper needs to be retained.

Response: Chromium was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for sediment invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.2) of the SWMU 03 RFI report ERA.

See response to general issues from specific comments No. 9.

27 Comment: Page 8-38, Section 8.6.1.2 Sediment – Lead; The revised Region 5 RCRA ESL of 35.8 mg/kg needs to be used and the alternate benchmarks need to be deleted as discussed in specific comments #25 and #26. Since the maximum concentrations exceed the ESL value, lead needs to be retained as recommended.

Response: Lead was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for sediment invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.2) of the SWMU 03 RFI report ERA.

See response to general issues from specific comments No. 9.

28 Comment: Page 8-39, Section 8.6.1.2 Sediment – Tin; The lack of information on the toxicity (i.e., chronic NOAEL) of tin needs to result in a decision to continue with the ecological risk assessment process, Steps 3 through 7 (see Section 2.5 of the 1997 ERA Guidance, EPA 540-R-97-006). Tin needs to be retained.

Response: Tin was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for sediment invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.2) of the SWMU 03 RFI report ERA.

See response to general issues from specific comments No. 16.

29 Comment: Page 8-39, Section 8.6.1.2 Sediment – Zinc; The revised Region 5 RCRA ESL of 121 mg/kg needs to be used and the alternate benchmarks need to be deleted as discussed in specific comments #25 and #26. Since the maximum concentrations exceed the ESL value, zinc needs to be retained as recommended.

Response: Zinc was retained for additional risk evaluation in Step 3a of the SWMU 03 RFI report ERA. However, it was eliminated as a COPC for sediment invertebrates based on the additional risks evaluation in Step 3a (Section 8.6.1.2) of the SWMU 03 RFI report ERA.

See response to general issues from specific comments No. 9.

U.S. EPA COMMENTS DATED 11/18/04 ON BAT MEMO

1 Comment: Section 1.0 Introduction, 4th sentence; The term "mobilizing" is unclear since contaminants were present (i.e., transported) in insect tissue. The term mobilizing implies a condition exists where contaminants have accrued, but a trigger for transport or availability of contaminants has not yet occurred. The term "mobilizing" needs to be deleted and replaced with "transported."

Response: Comment noted. The term has been replaced with "transported" as suggested.

2 Comment: Section 1.1 Objective, 1st Paragraph; Insert the management goal previously developed (see e-mail from Bernhardt to Mazur dated 3-10-2003 with attached file, specifically the response to general comment #2) as stated in the following sentence. "The goal of this risk evaluation is to determine if there will be a decrease in reproduction or survival of individual Indiana Bats."

Response: Comment noted. The following sentence was added after the first sentence of the first paragraph in Section 1.1:

"The goal of this risk evaluation memorandum is to determine if there will be a decrease in reproduction or survival of individual Indiana bats."

3 Comment: Section 2.3 Potential Exposure Pathways, 3rd and 4th Paragraphs; No information is provided regarding effect levels for the juvenile bats. Provide a statement regarding what type of effect data exists and if it is appropriate to apply to juvenile bats.

Response: The following sentences were added to the end of Section 2.2 to indicate that no data were found regarding effects levels for juvenile bats:

"No data were located regarding the effects levels for metals for juvenile bats. However, as discussed in the next section, juvenile bats are expected to have a similar or lower exposure dose of chemicals than its mother."

4 Comment: Section 4 Risk Characterization

a. Section 2.4.2 established growth and reproduction as the measurement endpoints. Since available effects data is limited as shown in Table 2, the Risk Characterization section needs to discuss what endpoints where actually evaluated. Please note that the recently released Ecological Soil Screening Levels (Eco-SSLs) include both toxicity reference values (TRVs) for growth and reproduction. If used, these TRVs from the Eco-SSLs are not expected to generate NOAEL and LOAEL values that the bat exposure data will exceed.

b. 4th Paragraph: Please state where the sediment pH data can be found and provide a reference for pH influence on aluminum solubility in sediment. Although aluminum was measured in insects the discussion states it was not expected to be site related (uptake by aquatic organisms influenced by aluminum solubility in sediment). The evidence supports a sediment to insect transport pathway for aluminum. Please explain how insects are accumulating aluminum.

Response:

a. The following paragraph was added before the last paragraph in Section 4.0:

"Note that although the measurement endpoint focused on decreases in growth and reproduction of the Indiana bat, most of the TRVs were based on reproductive endpoints, with a few based on survival; only

one TRV was based on growth. Therefore, risks to the Indiana bat were based primarily on reproductive effects."

b. The fifth sentence of the referenced paragraph will be changed as follows, and additional sentences will be added (the text in bold was added and text in strikeout was deleted):

"Also, the pH in the sediment samples (not including the background samples) ranged from 6.8 to 8.1 standard units ***(see Tables 4-21 and 4-22). Although no data were specifically located regarding the bioavailability of aluminum at various sediment pH levels, aluminum is only sparingly soluble in water between pH 6 and pH 8 (ASTDR, 1999). The pH levels in the surface water of LSC ranged from 6.6 to 8.7 with average pH levels of 7.5 and 7.8 (see Tables 4-23 and 4-24).*** ~~*At these pH levels,*~~ ***Therefore, it is not likely that*** *aluminum is not expected to be soluble and therefore not bioavailable for uptake into aquatic organisms."*

It is not clear what evidence that U.S. EPA believes supports a sediment to insect transport pathway for aluminum. Most organisms contain background levels of metals, including aluminum so just because it was detected in the tissue does not mean that it is being accumulated from the sediment. Aluminum is not considered an important bioaccumulative chemical according to U.S. EPA (2000), therefore, the Navy does not believe that insects are accumulating aluminum for the sediment.

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological Profile for Aluminum. U. S. Department of Health and Human Services, Public Health Service. July.

U. S. EPA 2000. Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment, Status and Needs. Office of Water, Office of Solid Waste. EPA 823-R-00-001. February.

5 Comment: Section 6 Summary/ Conclusions/ Recommendations, 3rd paragraph, last sentence; See comment 4b regarding evidence that aluminum was measured in insect tissue. The discussion on solubility needs to be removed or revised.

Response: See response to comment 4b. No changes were made to the memo based on this comment.

6 Comment: Table 2 Endpoints and Sources for Toxicity Reference Values for Mammals

a. Insert missing information for the following chemicals: beryllium, cobalt, cyanide, iron, selenium, thallium and vanadium.

b. Please correct the endpoint for silver to show it is a LOAEL. Based on the reference cited for silver the effect is neurological (not systemic) and needs to be corrected.

Response:

a. The information for beryllium, cobalt, cyanide, iron, selenium, thallium, and vanadium does not need added to Table 2. These chemicals were not included in the food chain model because they were not detected or analyzed for in the insect samples. The chemicals were deleted from Table 1.

b. The endpoint and effect for silver have been corrected in Table 2 as requested. The NOAEL TRV will be changed to 0.181 mg/kg-day and the LOAEL will be changed to 1.81 mg/kg-day. Note that the chromium value in Table 2 will be changed to 131.4 mg/kg-day which is the subchronic LOAEL value. The correct level was used in the food chain model.

TABLE 1

CROSSWALK TABLE RELATING MARCH 19, 2004 COMMENTS FROM U.S. EPA AND GENERAL ISSUES TO CONSOLIDATED AND RENUMBERED COMMENTS

Original Comment Number from March 19, 2004 E-Mail	Consolidated Comment Number for General Comments	Consolidated Comment Number for Specific Comments/Other Issues
General Comments		
1	1a,1b,1c,1d,1e	
2	2	
3	3a,3b	
4	4	
5	5a,5b,5c	
Specific Comments for SWMU 3		
1		2
2		1,2
3	1a, 5a	
4	5a	1,2,6
5	5a	2,3,4
6	5a	2,5,6
7	5a	2,5,6
8	5a	2,5,6
9		2,3,4,7
10	5a	1,2,3,4,6,7,8
11		5
12	5a	2,5,8
13	5a	1,2,4,8
14	5a	2,6,7,8
15	5a	2,4,6,7,8
16		9,14
17		17
18		11
19		12,24
20		20
21		21
22		10,13,16
23	5a	9,10,15
24		15
25		9,10
26		9
27		9
28		16
29		9
Specific Comments for SWMU 2		
1		22
2		23
Other Issues		
Not applicable[2]		17,18,19,20,21,24,25,26

1 - The comment was specific for a chemical that was not detected in sediment at SWMU 3. No general issue was identified for the comment.

2 - The specific comments in this row are based on other issues that were discussed with with U.S. EPA and were not specifically identified in the March 19, 2004 e-mail from U.S. EPA.

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Ser RP3/5040

2 Feb 2005

The letter Ser RP3/5040 was for replacement pages and response to comments for the Final RCRA Facility Investigation (RFI) Report for the Old Jeep Trail Area and Little Sulphur Creek (OJT/LSC) at the Ammunition Burning Ground (ABG) for SWMU 3. Replacement pages added to report dated 11/27//02.