



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

N00164.AR 000913  
NSWC CRANE  
5090.3a

IN REPLY REFER TO  
5090/S4.7.1  
Ser RP3/4367

17 DEC 78

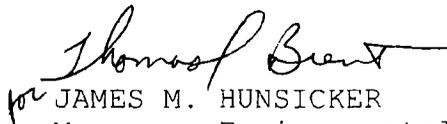
U.S. Environmental Protection Agency, Region V  
Waste, Pesticides, & Toxics Division  
Waste Management Branch  
Corrective Action Section  
77 West Jackson Blvd.  
Chicago, IL 60604

Dear Mr. Ramanauskas:

Crane Division, Naval Surface Warfare Center (NAVSURFWARCENDIV Crane) submits two copies of the responses to comments and change pages for the Final Report for Risk Assessment at Solid Waste Management Units (SWMUs) 4, 5, 9, and 10 as enclosures (1) and (2), respectively. The permit required Certification Statement is provided as enclosure (3).

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,

Handwritten signature of James M. Hunsicker in cursive script.

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

Enclosures: 1. Responses to EPA Comments  
2. Final SWMUs 4, 5, 9, & 10 Risk Assessment Report  
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.

Thomas J. Best, acting  
SIGNATURE

Manager, Environmental Protection  
TITLE

17 DEC 1991  
DATE

5090

Ser 095/0153

17 JUL 2000

The letter Ser 095/0153 was for the  
submittal of the Draft Basewide Background  
Soil Investigation Report. A Final Report  
was submitted 01/29/01 and therefore  
replaced this Draft Report.

RESPONSE TO EPA COMMENTS  
ON THE  
RISK ASSESSMENT  
FOR  
SWMUs 4, 5, 9, & 10

**ATTACHMENT 1**

**SWMU 4 RESPONSES TO U.S. EPA COMMENTS**

**SWMU 4 (McCOMISH GORGE)**  
**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 3 (Jeep Trail / Little Sulphur Creek), and 2 comments specific to SWMU 2 (Dye Burial Grounds). These comments were discussed in a meeting and various conference calls with 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 4.* 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 4 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 EPA Region 5 on September 9, 2004. This document reflects the resolution of all issues identified by 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 two sections – five General Comments and 26 Specific Comments. 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 4 ERA is presented in “italicized text”. In addition, a revised Section 4 (including the ERA) for the SWMU 4 RFI report is being submitted separately with other RFI report change pages. *It will be necessary to have a copy of the revised Section 4.7 available when reviewing the responses below because several responses refer to the revised Section 4.7.*

#### **GENERAL COMMENTS FROM 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 4.7.4 of the SWMU 4 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 4 ERA, additional explanations of the alternate benchmarks are provided in the revised Sections 4.7.6.1 of the SWMU 4, 5, 9, and 10 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 4 ERA, additional explanations of the alternate benchmarks are provided in the revised Section 4.7.6.1 of the SWMU 4, 5, 9, and 10 RFI.

**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 4, 5, 9, and 10 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 Section 11.2.3 of the approved SWMU 4 work plan (TtNUS, August 2000)]. 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 4 ERA, the explanations of the alternate benchmarks are provided in the revised Section 4.7.6.1 of the SWMU 4, 5, 9, and 10 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 use hardness or TOC to adjust the screening values at SWMU 4.

The Tier II values were used in the SWMU 4 RFI report ERA for manganese, because a water quality criteria value was not available for manganese. The revised Section 4.7.6.1.3 of the ERA presents more details regarding the Tier II value.

**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 QAPPs. 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 4 Step 3a discussions include the base wide soil background data set and upgradient surface water and sediment samples. Note that all of the metals in the downgradient sediment samples were detected at concentrations that were greater than the upgradient samples.

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 WP for SWMUs 4, 5, 9, and 10 (TtNUS, August 2000); 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 4.7.6.1.1, end of first paragraph: *“As presented in Table 4-24 several chemicals were detected at concentrations exceeding screening levels but were eliminated as COPCs because they were not detected at concentrations greater than background concentrations. For soil, these chemicals included aluminum, arsenic, barium, chromium, cobalt, iron, lead, manganese, mercury, nickel, 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 4.7.6.1.3, second sentence of first paragraph: *"The upgradient surface water concentrations are provided in Table 4-26. Iron was eliminated as a COPC for surface water because site concentrations did not exceed background concentrations. Risks to iron was 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 exceedance" 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 exceedance" 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 exceedance" 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 exceedances, number of samples, etc.).

See the following sections of the revised SWMU 4 ERA, Section 4.0, regarding the use of "magnitude of exceedance" and the "frequency of detection" in the Step 3a evaluation:

- Section 4.7.6.1.1 for benzo(a)pyrene, 4,4'-DDT, cyanide, and zinc
- Section 4.7.6.2.1 throughout

**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 4 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 method was used to evaluate metal bioavailability as part of the SWMU 4 ERA for Crane:

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<sup>1</sup>.

See revised Sections 4.7.6.1.1 (for copper, cyanide, and zinc) and 4.7.6.2.1 (for cadmium and zinc) of the SWMU 4 RFI report ERA for how bioavailability was qualitatively discussed in the SWMU 4 ERA.

**5a. Comment: Only the maximum concentration (see Section 1.2.2 and Step2 of the 1997 ERA Guidance, EPA 540-R-97-006) will be compared against the Region 5, RCRA ESLs to screen COPCs.**

**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 4.7.4 of the SWMU 4 RFI report).

No changes were made to the SWMU 4 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 revised Section 4.7.6 (Step 3a Refinement) of the SWMU 4 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.

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<sup>1</sup> 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.

Average concentrations were used in the SWMU 4 Step 3a evaluation in the discussion of risks to terrestrial wildlife (Section 4.7.6.2).

**GENERAL ISSUES FROM SPECIFIC COMMENTS IN 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 3.4.4 of the RFI Report for SWMUs 4, 5, 9, and 10 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 revised Section 4.7.6.2 of the SWMU 4 RFI report 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 4 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:** Information regarding the toxicological basis for the Residential/Parkland Canadian SQGs for all COPCs is presented in Section 4.7.6.1.1 of the SWMU 4 ERA for benzo(a)pyrene, 4,4'-DDT, pentachlorophenol, copper, cyanide, and zinc.

**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 4 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 Canadian SQGs was added to Section 4.7.6.1.1 of the SWMU 4 RFI report ERA for benzo(a)pyrene, 4,4'-DDT, pentachlorophenol, copper, cyanide, and zinc.

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.

Naphthalene was not a COPC in soil for the SWMU 4 ERA.

No changes were made to the SWMU 4 RFI report ERA to address this comment.

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 for cadmium were added to the SWMU 4 ERA in Section 4.7.6.1.1.

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)<sub>20s</sub>, EC<sub>10s</sub>, and/or Maximum Acceptable Toxicant Concentrations. 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 toxicological basis for the ORNL benchmarks was added to the SWMU 4 ERA for pentachlorophenol, copper, tin, and zinc in surface soil (Section 4.7.6.1.1).

**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.

No changes were made to the SMWU 4 ERA based on this comment.

**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 4 ERA based on this comment.

**9 Comment: The "effects range – low" (ER-L) 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 10<sup>th</sup> 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 at SWMU 4 has been added to the SWMU 4 ERA (Section 4.7.6.1.2) for PAHs, aluminum, antimony, iron, and manganese.

**10 Comment: Likewise, the “effects range – median” will represent the 50<sup>th</sup> 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 4 have been added to the SWMU 4 RFI report ERA (Section 4.7.6.1.2) for barium and vanadium.

**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 3 RFI report that the comment references (Section 8.6.1.2) is not the screening step. The COPC screens for SWMU 4 were presented in Section 4.7.4 of the SWMU 4 ERA.

No changes were made to the SWMU 4 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, barium and vanadium 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)<sup>2</sup> 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.

This comment is not applicable to the SWMU 4 ERA because explosives are not a concern at SWMU 4.

No changes were made to the SWMU 4 RFI report ERA based on this comment.

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<sup>2</sup> 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 and vanadium were the only chemicals retained as COPCs 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. However, barium and vanadium were not retained as COPCs after the Step 3a evaluation for reasons presented in Section 4.7.6.1.2 of the SWMU 4 ERA.

No changes were made to the SWMU 4 ERA based on this 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 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 4 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 and vanadium because it is the only available benchmark. However, other factors also were presented in Step 3a to evaluate risks to sediment invertebrates from these metals.

**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 available for all chemicals retained as COPCs at SWMU 4.

No changes were made to the SWMU 4 ERA based on this comment although changes were made to Section 4.7.6.1 based on other comments.

**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 3.4.4 of the SWMUs 4,5,9, and 10 RFI report to explain the ERA process that was followed at SWMU 4.

**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 the end of the new third paragraph in Section 4.7.1 of the SWMU 4 ERA to address the comment regarding the state designated water uses:

*"The Culpepper Branch Creek waterbody segment designated state water uses are aquatic life support and primary contact. The Furst Creek waterbody segment designated state water use is aquatic life support; the Furst Creek waterbody segment does not support primary contact. Neither of these waterbody segments were assessed as part of the 2004 Indiana Integrated Water Quality Monitoring and Assessment Report to determine if they support fish consumption (IDEM, 2004)."*

The following text was added as the new fifth paragraph in Section 4.7.1 of the SWMU 4 ERA, 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):

*"Furst Creek discharges off-site to the West Fork of the White River. The Nongame and Endangered Wildlife Program of the Indiana DNR Division of Fish and Wildlife has reported the occurrence of some species of special concern in the West Fork White River (IDFW, Annual Report, August 2003). Historic information indicates that the eastern sand darter (Ammocrypta pellucida), a species of special concern in Indiana, is present in the West Fork White River. A statewide survey for this species was initiated in 2001 and is currently underway. Additionally, surveys for freshwater mussels are also underway for most of Indiana's major drainage basins. A statewide survey for these species was also initiated in 2001 and a previously unknown reproducing population of Obovaria subrotunda (round hickorynut), a state species of special concern, was located in the West Fork White River drainage (IDFW, August 2003). Note that other threatened, endangered, or special concern species also may be present in the water bodies just off-site of Crane, as well."*

See response to Comment No. 22 below for the revised Section 4.7.1, "Threatened and Endangered Species."

**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.

This type of evaluation was added to the SWMU 4 ERA for tin in Section 4.7.6.1.1.

**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 new Section 3.4.4.5 for the SWMUs 4, 5, 9, and 10 RFI report (at the end of the first paragraph) to address this comment:

*"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 4.7.6 of the SWMU 4 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 SWMUs 5, 9, and 10, the following text was added to various sections of the SWMUs 4, 5, 9, 10 RFI report:

- The last two sentences were deleted from the fourth paragraph of Section 1.3.7 and the following text was added after the fourth paragraph in Section 1.3.7 of the SWMUs 4, 5, 9, and 10 RFI report: *"An Endangered Species Management Plan for NSWCrane was prepared in October 2000 (Comarco Systems, Inc., 2000). As part of this plan, the federal and state endangered and threatened species and species of special concern for the facility were identified. This was accomplished by the compilation of a large amount of information on species present at NSWCrane. Information included in the Endangered Species Management Plan (Comarco Systems, Inc., 2000) was obtained from studies and surveys conducted by the Navy and other agencies and groups (such as research institutions). A small subset of these studies include the Inventory of Neotropical Migratory Birds, Mist Net and Radiotelemetry Surveys for the Indiana bat, Bobcat Trapping, Rattlesnake Survey, Purdue University Wildlife Studies, and several fish surveys and bird counts. These studies and others that were used in compiling a list of endangered species present at NSWCrane are described in more detail in the Endangered Species Management Plan (Comarco Systems, Inc., 2000).*

*Numerous wildlife species are present throughout NSWCrane. Of these species, some are listed as endangered and threatened species or species of special concern. NSWCrane occupies Daviess, Greene, Lawrence, and Martin counties in Indiana, although only a very small portion of NSWCrane is in Daviess, Greene, and Lawrence 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 SWMUs 4, 5, 9, and 10 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 NSWCrane. Additionally, none of these species was identified in Comarco Systems Inc., 2000 as observed at NSWCrane. The Indiana bat is listed as federally*

endangered in Greene, Lawrence, and Martin counties but not in Daviess County. There are no records of any other species at NSWC that are federally listed as endangered or threatened. Some species that are listed as Federal species of concern in Comarco Systems, Inc. (2000) are also state endangered species (IDNR, 2002). These include the Northern Harrier (Daviess County), American bittern (Greene County), and sedge wren (Lawrence County). These species are not endangered in Martin County, where the majority of NSWC Crane occupies and so it is unlikely that operations at NSWC Crane are affecting these species' populations significantly.

Ten species listed as endangered by the Indiana Department of Natural Resources have been recorded at NSWC and include the Indiana bat, bobcat, timber rattlesnake, bald eagle, osprey, loggerhead shrike, yellow crowned night heron, Virginia rail, king rail, and Henslow's sparrow (Comarco Systems Inc., 2000). No state-listed threatened species have been recorded at NSWC Crane.

The Rare Animals of Indiana list (Indiana DNR, 2002) was reviewed to verify that no change in status of these species had occurred since October 2000. This list is much larger than that presented in Comarco Systems, Inc. (2000) and is not reiterated here. It was verified that the species listed above did not experience a change in status. Also, 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."

- The following text has been added at the end of Section 4.7.1, Threatened and Endangered Species: "Bald eagles (as discussed in Section 1.3.7) and ospreys are not expected to occur at SWMU 4 due to the absence of preferred foraging habitat (large open waters). Similarly, the Virginia rail and king rail are found in marshes and mudflats, the Henslow's sparrow is found in damp fields, and the yellow crowned night heron is primarily a bird of swamps. These habitats are present at SWMU 4 so the presence of these species can not be ruled out. The loggerhead shrike prefers open fields with scattered trees, but is occasionally found in open woodlands. Thus, use of the site by the loggerhead shrike would be occasional at most. The prime timber rattlesnake habitat is forested land on higher dry ridges with a south or southwestern exposure. SWMU 4 is not located on a high dry ridge, so it is unlikely that the timber rattlesnake is present at the SWMU."

Furst Creek discharges off-site to the West Fork of the White River. The Nongame and Endangered Wildlife Program of the Indiana DNR Division of Fish and Wildlife has reported the occurrence of some species of special concern in the West Fork White River (IDFW, Annual Report, August 2003). Historic information indicates that the eastern sand darter (*Ammocrypta pellucida*), a species of special concern in Indiana, is present in the West Fork White River. A statewide survey for this species was initiated in 2001 and is currently underway. Additionally, surveys for freshwater mussels are also underway for most of Indiana's major drainage basins. A statewide survey for these species was also initiated in 2001 and a previously unknown reproducing population of *Obovaria subrotunda* (round hickorynut), a state species of special concern, was located in the West Fork White River drainage (IDFW, August 2003). Note that other threatened, endangered, or special concern species also may be present in the water bodies just off-site of Crane, as well."

- The following text was added to the end of the last sentence in the second paragraph in Section 4.7.7.1 of the SWMU 4 ERA: "(see below for a discussion of potential risks to the timber rattlesnake)"
- The following text was added as the last paragraph of Section 4.7.7.1 of the SWMU 4 ERA: "As discussed in Section 1.3.7, several endangered and threatened species or

*species of special concern are present at NSWC Crane, and potentially may inhabit SWMU 4. Risks to these species were not specifically calculated so the uncertainties of not calculating risks to these species are presented here. As discussed above, risks to large carnivorous mammals and birds are expected to be negligible so risks to the bobcat, bald eagle, Northern harrier, and osprey are expected to be negligible, as are risks to carnivorous reptiles such as the timber rattlesnake. Loggerhead shrikes and the sedge wren consume mostly aboveground insects such as caterpillars, beetles, spiders, and flies, as opposed to the worms that are consumed by the American robin in the food-chain model. Because worms are in direct contact with exposure to the soil, it is expected that they would have greater levels of contaminants at SWMU 4 than aboveground insects; therefore, risks to the robin from consuming worms are expected to be greater than risks to the loggerhead shrike and sedge wren from consuming aboveground insects. Risks to the worm eating American robin from chemicals in the surface soil and surface water were determined to be acceptable, therefore, risks to the loggerhead shrike and sedge wren also are expected to be even lower than risks to robins. The American bittern is a marshland loving bird that feeds on fish, frogs, eels, insects, and water snakes. Although there is some aquatic habitat that may be suitable for the bittern, risks to the belted kingfisher were acceptable. Therefore, risks which to the American bittern, if present at SMWU 4, would also be acceptable.*

*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 4, this species may potentially inhabit areas of SWMU 4. 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 necessarily 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 4 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<sub>50</sub> 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<sub>50</sub> value, the calculated LC<sub>50</sub> 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 Conder, et. al., 2004<sup>3</sup>. 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.

Note that TNT was not a COPC at SWMU 4.

No changes were made to the SWMU 4 ERA to address this comment.

**25 Comment: Other tests by Steevens et. al. resulted in *Chironomus 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, EPA indicated that they may consider the RDX and HMX values because they were based on measured

<sup>3</sup> 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.

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).

Explosives were not managed at SWMU 4 and were not considered in the RFI.

No changes were made to the SWMU 4 ERA to address this comment.

**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.**

**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 presented above. 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.

Explosives were not managed at SWMU 4 and were not considered in the RFI.

No changes were made to the SWMU 4 ERA to address this comment.

**TABLE 1  
CROSSWALK TABLE RELATING MARCH 19, 2004 COMMENTS FROM  
U.S. EPA AND GENERAL ISSUES TO CONSOLIDATED AND RENUMBERED COMMENTS**

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

1 - The comment was specific for a chemical that was not detected in sediment at SWMU 4. 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.

**ATTACHMENT 2**

**SWMU 5 RESPONSES TO U.S. EPA COMMENTS**

**SWMU 5 (OLD BURN PIT)**  
**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 3 (Jeep Trail / Little Sulphur Creek), and 2 comments specific to SWMU 2 (Dye Burial Grounds). These comments were discussed in a meeting and various conference calls with 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 5.* 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 4, 5, 9, and 10 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 EPA Region 5 on September 9, 2004. This document reflects the resolution of all issues identified by 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 two sections – five General Comments and 26 Specific Comments. 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. Comments appear in **bold** text and responses appear in regular text. Text that has been incorporated word for word into the revised SWMU 5 ERA is presented in “italicized text”. In addition, a revised section 5 (including the ERA) for the SWMU 4, 5, 9, and 10 RFI report is being submitted separately with other RFI report change pages. *It will be necessary to have a copy of the revised Section 5.7 available when reviewing the responses below because several responses refer to the revised Section 5.7.*

#### **GENERAL COMMENTS FROM 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 5.7.4 of the SWMU 4, 5, 9, and 10 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 5 ERA, additional explanations of the alternate benchmarks are provided in the revised Sections 5.7.6.1 of the SWMU 4, 5, 9, and 10 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 5 ERA, additional explanations of the alternate benchmarks are provided in the revised Section 5.7.6.1 of the SWMU 4, 5, 9, and 10 RFI.

**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 4, 5, 9, and 10 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 Section 11.2.3 of the approved SWMUs 4, 5, 9, and 10 work plan (TINUS, August 2000)]. 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 5 ERA, the explanations of the alternate benchmarks are provided in the revised Section 5.7.6.1 of the SWMU 4, 5, 9, and 10 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.

For the SWMU 5 ERA, it was not necessary to use hardness or TOC to adjust the screening values at SWMU 5.

The Tier II values were used in the SWMU 5 ERA for manganese because a water quality criteria value was not available for this COPC. The revised Section 5.7.6.1.3 of the ERA presents more details regarding the Tier II value.

**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 QAPPs. 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 5 Step 3a discussions include the base wide soil background data set and upgradient surface water and sediment samples. Note that all of the metals in the downgradient sediment samples were detected at concentrations that were greater than the upgradient samples.

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

- Executive Summary, page ES-3, 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 WP for SWMUs 4, 5, 9, and 10 (TtNUS, August 2000); 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 5.7.6.1.1, end of first paragraph: *“As presented in Table 5-24, 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 background concentrations. For soil, these chemicals included aluminum, arsenic, cobalt, manganese, nickel, 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 5.7.6.1.2, after first sentence of first paragraph: *"As discussed in the following narrative, several inorganic chemicals were not detected in site samples at concentrations greater than the upgradient concentrations (background comparisons were not used as a COPC selection criterion for organics). For sediment, these included arsenic, iron, and nickel. Any risks from these chemicals 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 exceedance" 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 exceedance" 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 exceedance" 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 exceedances, number of samples, etc.).

See the following sections of the revised SWMU 5 ERA , Section 5.7, regarding the use of "magnitude of exceedance" and the "frequency of detection" in the Step 3a evaluation:

- Section 5.7.6.1.1 for lead
- Section 5.7.6.1.2 for antimony and cadmium

**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 5 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 were used to evaluate metal bioavailability as part of the SWMU 5 ERA for Crane:

In accordance with the new U.S. EPA Eco SSLs for iron, which is based on pH of the soil, if the soil pH is below a certain level, iron is assumed to not be bioavailable and is not retained as a COPC. See Section 5.7.6.1.1 for a discussion of the soil pH and iron at SWMU 5.

Bioavailability of the metal debris (i.e., surface debris and metal shavings in sample 05SB060002) at SWMU 5 is discussed in Section 5.7.6.1.1 and Section 5.7.6.2.1.

**5a. Comment: Only the maximum concentration (see Section 1.2.2 and Step2 of the 1997 ERA Guidance, EPA 540-R-97-006) will be compared against the Region 5, RCRA ESLs to screen COPCs.**

**Response:** Only the maximum concentrations were compared against the Region 5, RCRA EDQLs to select chemicals as COPCs in the existing ERAs [note the ESLs will be used for screening in future ERAs] (i.e., see Section 5.7.4 of the SWMU 4, 5, 9, and 10 RFI report).

No changes were made to the SWMU 5 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 revised Section 5.7.6 (Step 3a Refinement) of the SWMU 5 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 5 Step 3a evaluation in the discussion of risks to terrestrial wildlife (Section 5.7.6.2).

**GENERAL ISSUES FROM SPECIFIC COMMENTS IN 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 3.4.4 of the RFI Report for SWMUs 4, 5, 9, and 10 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 5.7.6.2 of the SWMU 5 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 5 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:** Information regarding the toxicological bases for the Canadian SQGs for all COPCs is presented in Section 5.7.6.1.1 of the SWMU 9 ERA for naphthalene, chromium, copper, mercury, and zinc.

**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 5 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 Canadian SQGs was added to Section 5.7.6.1.1 of the SWMU 5 ERA for naphthalene, chromium, copper, mercury, and zinc.

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.

Additional information regarding the derivation of the Canadian SQG for naphthalene was added to Section 5.7.6.1.1 of the SWMU 5 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 for antimony, barium, cadmium, iron, and lead, were added to the SWMU 5 ERA (Section 5.7.6.1.1).

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)<sub>20S</sub>, EC<sub>10S</sub>, and/or Maximum Acceptable Toxicant Concentrations. 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 toxicological basis for the ORNL benchmarks was added to the SWMU 5 ERA for bis(2-ethylhexyl) phthalate, antimony, barium, copper, silver and tin in surface soil (Section 5.7.6.1.1).

**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 for antimony, barium, cadmium, iron, and lead, were added to the SWMU 5 ERA (Section 5.7.6.1.1).

**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 5 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 10<sup>th</sup> 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 5 has been added to the SMWU 5 ERA (Section 5.7.6.1.2) for PAHs, Aroclor-1260, aluminum, antimony, cadmium, copper, lead, manganese, and zinc.

**10 Comment: Likewise, the “effects range – median” will represent the 50<sup>th</sup> 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 5 have been added to the SWMU 5 ERA (Section 5.7.6.1.2) for Aroclor-1260, barium, cadmium, copper, lead, manganese, vanadium, 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 3 RFI report that the comment references (Section 8.6.1.2) is not the screening step. The COPC screens for SWMU 5 were presented in Section 5.7.4 of the SWMU 4, 5, 9, and 10 RFI report.

No changes were made to the SWMU 5 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 by U.S. EPA 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, barium and vanadium 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)<sup>3</sup> 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.

This comment is not applicable to the SWMU 5 ERA because explosives are not a concern at SWMU 5.

No changes were made to the SWMU 5 ERA based on this comment.

**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 and vanadium were the only chemicals retained as COPCs 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. However, barium and vanadium were not retained as COPCs after the Step 3a evaluation for other reasons as presented in Section 5.7.6.1.2 of the SWMU 5 ERA.

No changes were made to the SWMU 5 ERA based on this 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 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 5 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 and vanadium because it is the only available benchmark. However, other factors also were presented in Step 3a to evaluate risks to sediment invertebrates from these metals.

Barium and vanadium were the only chemicals retained as COPCs 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. However, barium and vanadium were not retained as COPCs after the Step 3a evaluation for other reasons as presented in Section 5.7.6.1.2 of the SWMU 5 ERA.

**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 available for all chemicals retained as COPCs at SWMU 5.

No changes were made to the SWMU 5 ERA based on this comment.

**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 3.4.4 of the SWMU 4, 5, 9, and 10 RFI report to explain the ERA process that was followed at SWMUs 4, 5, 9, and 10.

**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 as the new fourth paragraph of Section 5.7.1 of the SWMU 5 ERA report to address the comment regarding the state designated water uses:

*"The Culpepper Branch Creek waterbody segment designated state water uses are aquatic life support and primary contact. The Furst Creek waterbody segment designated state water use is aquatic life support; the Furst Creek waterbody segment does not support primary contact. Neither of these waterbody segments were assessed as part of the 2004 Indiana Integrated Water Quality Monitoring and Assessment Report to determine if they support fish consumption (IDEM, 2004)."*

See response to Comment No. 22 below for the revised Section 1.3.7, "Threatened and Endangered Species" and additional text that was added in Section 5.7.1.

**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.

This type of evaluation was not necessary for any of the COPCs initially selected at SMWU 5.

**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 Section 3.4.4.5 of the SWMU 4, 5, 9, and 10 RFI report (at the end of the first paragraph) to address this comment:

*"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 5.7.6 of the SWMU 5 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 SWMUs 4, 5, 9, and 10, the following text was added to various sections of the SWMUs 4, 5, 9, 10 RFI report:

- The last two sentences were deleted from the fourth paragraph of Section 1.3.7 and the following text was added after the fourth paragraph in Section 1.3.7 of the SWMUs 4, 5, 9, and 10 RFI report: *“An Endangered Species Management Plan for NSWC Crane was prepared in October 2000 (Comarco Systems, Inc., 2000). As part of this plan, the federal and state endangered and threatened species and species of special concern for the facility were identified. This was accomplished by the compilation of a large amount of information on species present at NSWC Crane. Information included in the Endangered Species Management Plan (Comarco Systems, Inc., 2000) was obtained from studies and surveys conducted by the Navy and other agencies and groups (such as research institutions). A small subset of these studies include the Inventory of Neotropical Migratory Birds, Mist Net and Radiotelemetry Surveys for the Indiana bat, Bobcat Trapping, Rattlesnake Survey, Purdue University Wildlife Studies, and several fish surveys and bird counts. These studies and others that were used in compiling a list of endangered species present at NSWC Crane are described in more detail in the Endangered Species Management Plan (Comarco Systems, Inc., 2000).*

*Numerous wildlife species are present throughout NSWC Crane. Of these species, some are listed as endangered and threatened species or species of special concern. NSWC Crane occupies Daviess, Greene, Lawrence, and Martin counties in Indiana, although only a very small portion of NSWC Crane is in Daviess, Greene, and Lawrence 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 SWMUs 4, 5, 9, and 10 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. Additionally, none of these species was identified in Comarco Systems Inc., 2000 as observed at NSWC Crane. The Indiana bat is listed as federally endangered in Greene, Lawrence, and Martin counties but not in Daviess County. There are no records of any other species at NSWC that are federally listed as endangered or threatened. Some species that are listed as Federal species of concern in Comarco Systems, Inc. (2000) are also state endangered species (IDNR, 2002). These include the Northern Harrier (Daviess County), American bittern (Greene County), and sedge wren (Lawrence County). These species are not endangered in Martin County, where the majority of NSWC Crane occupies and so it is unlikely that operations at NSWC Crane are affecting these species' populations significantly.*

*Ten species listed as endangered by the Indiana Department of Natural Resources have been recorded at NSWC and include the Indiana bat, bobcat, timber rattlesnake, bald eagle, osprey, loggerhead shrike, yellow crowned night heron, Virginia rail, king rail, and Henslow's sparrow (Comarco Systems Inc., 2000). No state-listed threatened species have been recorded at NSWC Crane.*

*The Rare Animals of Indiana list (Indiana DNR, 2002) was reviewed to verify that no change in status of these species had occurred since October 2000. This list is much*

larger than that presented in Comarco Systems, Inc. (2000) and is not reiterated here. It was verified that the species listed above did not experience a change in status. Also, 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."

- The following text was added to the end of the last sentence in the second paragraph in Section 5.7.7.1 of the SWMU 5 ERA: "(see below for a discussion of potential risks to the timber rattlesnake)"
- The following text was added as the last two paragraphs of Section 5.7.7.1 of the SWMU 5 ERA: "As discussed in Section 1.3.7, several endangered and threatened species or species of special concern are present at NSWC Crane, and potentially may inhabit SWMU 5. Risks to these species were not specifically calculated so the uncertainties of not calculating risks to these species are presented here. As discussed above, risks to large carnivorous mammals and birds are expected to be negligible so risks to the bobcat, bald eagle, Northern harrier, and osprey are expected to be negligible, as are risks to carnivorous reptiles such as the timber rattlesnake. Loggerhead shrikes and the sedge wren consume mostly aboveground insects such as caterpillars, beetles, spiders, and flies, as opposed to the worms that are consumed by the American robin in the food-chain model. Because worms are in direct contact with exposure to the soil, it is expected that they would have greater levels of contaminants at SWMU 5 than aboveground insects; therefore, risks to the robin from consuming worms are expected to be greater than risks to the loggerhead shrike and sedge wren from consuming aboveground insects. Risks to the worm eating American robin from chemicals in the surface soil and surface water were unacceptable; therefore, risks to the loggerhead shrike and sedge wren are possible if present at SWMU 5. The American bittern is a marshland loving bird that feeds on fish, frogs, eels, insects, and water snakes. Although there is some aquatic habitat, it is not suitable for the bittern. Additionally, risks to the belted kingfisher were low; therefore, risks to the American bittern, if present at SMWU 5, would also be low.

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 5, this species may potentially inhabit areas of SWMU 5. 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 necessarily 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 5 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<sub>50</sub> 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<sub>50</sub> value, the calculated LC<sub>50</sub> 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 Conder, et. al., 2004<sup>1</sup>. 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.

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<sup>1</sup> 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.

Note that TNT was not a COPC at SWMU 5.

No changes were made to the SWMU 5 ERA to address this comment.

**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, 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).

Explosives were not managed at SWMU 5 and were not considered in the SWMU 5 ERA.

No changes were made to the SWMU 5 ERA to address this comment.

**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.**

**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.

Explosives were not managed at SWMU 5 and were not considered in the SWMU 5 ERA.

No changes were made to the SWMU 5 ERA to address this comment.

**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
<b>General Comments</b>		
1	1a,1b,1c,1d,1e	
2	2	
3	3a,3b	
4	4	
5	5a,5b,5c	
<b>Specific Comments for SWMU 3</b>		
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	Not applicable <sup>(1)</sup>	
18		11
19		12,24
20	Not applicable <sup>(1)</sup>	
21	Not applicable <sup>(1)</sup>	
22		10,13,16
23	5a	9,10,15
24		15
25		9,10
26		9
27		9
28		16
29		9
<b>Specific Comments for SWMU 2</b>		
1		22
2		23
<b>Other Issues</b>		
Not applicable <sup>(2)</sup>		17,18,19,20,21,24,25,26

1 - The comment was specific for a chemical that was not detected in sediment at SWMU 5. No general issue was identified for the comment.

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

**ATTACHMENT 3**  
**SWMU 9 RESPONSES TO U.S. EPA COMMENTS**

**SWMU 9 (PESTICIDE CONTROL/R-150 TANK AREA)  
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 3 (Jeep Trail / Little Sulphur Creek), and 2 comments specific to SWMU 2 (Dye Burial Grounds). These comments were discussed in a meeting and various conference calls with 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 9.* 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 4, 5, 9, and 10 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 EPA Region 5 on September 9, 2004. This document reflects the resolution of all issues identified by 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 two sections – five General Comments and 26 Specific Comments. 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 9 ERA is presented in “italicized text”. In addition, a revised section 6 (including the ERA) for the SWMU 4, 5, 9, and 10 RFI report is being submitted separately with other RFI report change pages. *It will be necessary to have a copy of the revised Section 6.7 available when reviewing the responses below because several responses refer to the revised Section 6.7.*

#### **GENERAL COMMENTS FROM 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 6.7.4 of the SWMU 4, 5, 9, and 10 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 9 ERA, additional explanations of the alternate benchmarks are provided in the revised Sections 6.7.6.1 of the SWMU 4, 5, 9, and 10 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 9 ERA, additional explanations of the alternate benchmarks are provided in the revised Section 6.7.6.1 of the SWMU 4, 5, 9, and 10 RFI.

**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 4, 5, 9, and 10 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 Section 11.2.3 of the approved SWMUs 4, 5, 9, and 10 work plan (TiNUS, August 2000)]. 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 9 ERA, the explanations of the alternate benchmarks are provided in the revised Section 6.7.6.1 of the SWMU 4, 5, 9, and 10 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.

For the SWMU 9 ERA, U.S. EPA water quality criteria (See Section 6.7.6.1.3 of the SWMU 4, 5, 9, and 10 RFI) were adjusted using the average hardness concentrations for copper and lead.

The Tier II values were used in the SWMU 9 ERA for manganese, because a water quality criteria value was not available for manganese. The revised Section 6.7.6.1.3 of the ERA presents more details regarding the Tier II value.

**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 QAPPs. 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 9 Step 3a discussions include the base wide soil background data set and upgradient surface water and sediment samples. Note that all of the metals in the downgradient sediment samples were detected at concentrations that were greater than the upgradient samples.

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 WP for SWMUs 4, 5, 9, and 10 (TiNUS, August 2000); 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 6.7.6.1.1, end of first paragraph: *“As presented in Table 6-24, 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 background concentrations. For soil, these chemicals included aluminum, arsenic, barium, cadmium, chromium, cobalt, iron, manganese, mercury, nickel, 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 6.7.6.1.3, after first sentence of first paragraph: *"The upgradient surface water concentrations are presented in Table 6-26. Several inorganics in unfiltered surface water samples (aluminum, cobalt, copper, iron, lead, and manganese) were not detected in site samples at concentrations greater than the upgradient concentrations (background comparisons were not used as a COPC selection criterion for organics). Any risks to these inorganics would be within background risks and not related to site activities. No chemicals were eliminated as COPCs in filtered surface water samples due to background comparisons solely."*

**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 exceedance" 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 exceedance" 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 exceedance" 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 exceedances, number of samples, etc.).

See the following sections of the revised SWMU 9 ERA, Section 6.0, regarding the use of "magnitude of exceedance" and the "frequency of detection" in the Step 3a evaluation:

- Section 6.7.6.1.1 for di-n-butyl phthalate, naphthalene, and methoxychlor
- Section 6.7.6.1.2 for Aroclor-1248

**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 9 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 method may be used to evaluate metal bioavailability as part of the existing and future ERAs for Crane:

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<sup>1</sup>.

It was not necessary to discuss metal bioavailability for any metals detected in media at SMWU 9.

**5a. Comment: Only the maximum concentration (see Section 1.2.2 and Step2 of the 1997 ERA Guidance, EPA 540-R-97-006) will be compared against the Region 5, RCRA ESLs to screen COPCs.**

**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 6.7.4 of the SWMU 4, 5, 9, and 10 RFI report).

No changes were made to the SWMU 9 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 revised Section 6.7.6 (Step 3a Refinement) of the SWMU 9 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.

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<sup>1</sup> 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.

Average concentrations were used in the SWMU 9 Step 3a evaluation in the discussion of risks to terrestrial wildlife (Section 6.7.6.2).

**GENERAL ISSUES FROM SPECIFIC COMMENTS IN 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 3.4.4 of the RFI Report for SWMUs 4, 5, 9, and 10 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 6.7.6.2 of the SWMU 9 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 9 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:** Information regarding the toxicological bases for the Canadian SQGs for all COPCs is presented in Section 6.7.6.1.1 of the SWMU 9 ERA for naphthalene, copper, and zinc.

**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 9 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 Canadian SQGs was added to Section 6.7.6.1.1 of the SWMU 9 ERA for naphthalene, copper, and zinc.

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.

Additional information regarding the derivation of the Canadian SQG for naphthalene was added to Section 6.7.6.1.1 of the SWMU 9 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 for antimony and lead were added to the SWMU 9 ERA in Section 6.7.6.1.1.

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 ( $EC_{20S}$ ,  $EC_{10S}$ , and/or Maximum Acceptable Toxicant Concentrations. 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 toxicological basis for the ORNL benchmarks was added to the SWMU 9 ERA for antimony and di-n-butyl phthalate in surface soil (Section 6.7.6.1.1).

**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 for antimony and lead were added to the SWMU 9 ERA in Section 6.7.6.1.1.

**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 9 ERA based on this comment.

**9 Comment: The "effects range – low" (ER-L) 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 10<sup>th</sup> 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 9 has been added to the SMWU 9 ERA (Section 6.7.6.1.2) for Aroclor-1248, aluminum, antimony, arsenic, copper, iron, and manganese.

**10 Comment: Likewise, the “effects range – median” will represent the 50<sup>th</sup> 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 9 have been added to the SWMU 9 ERA for barium and vanadium in Section 6.7.6.1.2.

**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 3 RFI report that the comment references (Section 8.6.1.2) is not the screening step. The COPC screens for SWMU 9 were presented in Section 6.7.4 of the SWMU 9 ERA.

No changes were made to the SWMU 9 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, barium and vanadium 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)<sup>2</sup> 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.

This comment is not applicable to the SWMU 9 ERA because explosives are not a concern at SWMU 9.

No changes were made to the SWMU 9 ERA based on this comment.

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<sup>2</sup> 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 and vanadium were the only chemicals retained as COPCs 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. However, barium and vanadium were not retained as COPCs after the Step 3a evaluation for other reasons as presented in Section 6.7.6.1.2 of the SWMU 9 ERA.

No changes were made to the SWMU 9 ERA based on this 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 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 9 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 and vanadium because it is the only available benchmark. However, other factors also were presented in Step 3a to evaluate risks to sediment invertebrates from these metals.

Barium and vanadium were the only chemicals retained as COPCs 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. However, barium and vanadium were not retained as COPCs after the Step 3a evaluation for other reasons as presented in Section 6.7.6.1.2 of the SWMU 9 ERA.

**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 methoxychlor detected in surface soil; however methoxychlor was not retained as a COPC after other Step 3a considerations (Section 6.7.6.1.2).

**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 3.4.4 of the SWMU 4, 5, 9, and 10 RFI report to explain the ERA process that was followed at SWMU 9.

**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 the end of Section 6.7.1 of the SWMU 9 ERA report to address the comment regarding the state designated water uses and 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):

*"The drainage ditches at SWMU 9 eventually discharge to Boggs Creek. The Boggs Creek-Goldsberry Hollow waterbody segment designated state water uses are aquatic life support, fish consumption, and primary contact. This waterbody segment was not 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). However, the Boggs Creek-Buzzard Run waterbody segment, located downstream of the Boggs Creek-Goldsberry Hollow 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).*

*"Boggs 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."*

See response to Comment No. 22 below for the revised Section 1.3.7, "Threatened and Endangered Species."

**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.

This type of evaluation was not necessary for any of the COPCs initially selected at SMWU 9.

**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 new Section 3.4.4.5 for the SWMU 4, 5, 9, and 10 RFI report (at the end of the first paragraph) to address this comment:

*"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 6.7.6 of the SWMU 9 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 SWMUs 5, 9, and 10, the following text was added to various sections of the SWMUs 4, 5, 9, 10 RFI report:

- The last two sentences were deleted from the fourth paragraph of Section 1.3.7 and the following text was added after the fourth paragraph in Section 1.3.7 of the SWMUs 4, 5, 9, and 10 RFI report: *“An Endangered Species Management Plan for NSWCrane was prepared in October 2000 (Comarco Systems, Inc., 2000). As part of this plan, the federal and state endangered and threatened species and species of special concern for the facility were identified. This was accomplished by the compilation of a large amount of information on species present at NSWCrane. Information included in the Endangered Species Management Plan (Comarco Systems, Inc., 2000) was obtained from studies and surveys conducted by the Navy and other agencies and groups (such as research institutions). A small subset of these studies include the Inventory of Neotropical Migratory Birds, Mist Net and Radiotelemetry Surveys for the Indiana bat, Bobcat Trapping, Rattlesnake Survey, Purdue University Wildlife Studies, and several fish surveys and bird counts. These studies and others that were used in compiling a list of endangered species present at NSWCrane are described in more detail in the Endangered Species Management Plan (Comarco Systems, Inc., 2000).*

*Numerous wildlife species are present throughout NSWCrane. Of these species, some are listed as endangered and threatened species or species of special concern. NSWCrane occupies Daviess, Greene, Lawrence, and Martin counties in Indiana, although only a very small portion of NSWCrane is in Daviess, Greene, and Lawrence 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 SWMUs 4, 5, 9, and 10 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 NSWCrane. Additionally, none of these species was identified in Comarco Systems Inc., 2000 as observed at NSWCrane. The Indiana bat is listed as federally endangered in Greene, Lawrence, and Martin counties but not in Daviess County. There are no records of any other species at NSWCrane that are federally listed as endangered or*

threatened. Some species that are listed as Federal species of concern in Comarco Systems, Inc. (2000) are also state endangered species (IDNR, 2002). These include the Northern Harrier (Daviess County), American bittern (Greene County), and sedge wren (Lawrence County). These species are not endangered in Martin County, where the majority of NSWC Crane occupies and so it is unlikely that operations at NSWC Crane are affecting these species' populations significantly.

Ten species listed as endangered by the Indiana Department of Natural Resources have been recorded at NSWC and include the Indiana bat, bobcat, timber rattlesnake, bald eagle, osprey, loggerhead shrike, yellow crowned night heron, Virginia rail, king rail, and Henslow's sparrow (Comarco Systems Inc., 2000). No state-listed threatened species have been recorded at NSWC Crane.

The Rare Animals of Indiana list (Indiana DNR, 2002) was reviewed to verify that no change in status of these species had occurred since October 2000. This list is much larger than that presented in Comarco Systems, Inc. (2000) and is not reiterated here. It was verified that the species listed above did not experience a change in status. Also, 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."

- The following text was added to the end of the last sentence in the second paragraph in Section 6.7.7.1 of the SWMU 9 ERA: "(see below for a discussion of potential risks to the timber rattlesnake)"
- The following text was added as the last two paragraphs of Section 6.7.7.1 of the SWMU 9 ERA: "As discussed in Section 1.3.7, several endangered and threatened species or species of special concern are present at NSWC Crane, and potentially may inhabit SWMU 9. Risks to these species were not specifically calculated so the uncertainties of not calculating risks to these species are presented here. As discussed above, risks to large carnivorous mammals and birds are expected to be negligible so risks to the bobcat, bald eagle, Northern harrier, and osprey are expected to be negligible, as are risks to carnivorous reptiles such as the timber rattlesnake. Loggerhead shrikes and the sedge wren consume mostly aboveground insects such as caterpillars, beetles, spiders, and flies, as opposed to the worms that are consumed by the American robin in the food-chain model. Because worms are in direct contact with exposure to the soil, it is expected that they would have greater levels of contaminants at SWMU 9 than aboveground insects; therefore, risks to the robin from consuming worms are expected to be greater than risks to the loggerhead shrike and sedge wren from consuming aboveground insects. Risks to the worm eating American robin from chemicals in the surface soil and surface water were determined to be acceptable; therefore, risks to the loggerhead shrike and sedge wren also are expected to be even lower than risks to robins. The American bittern is a marshland loving bird that feeds on fish, frogs, eels, insects, and water snakes. Although there is some aquatic habitat that may be suitable for the bittern, the presence of the bittern is unlikely at SWMU 9 and risks to the belted kingfisher were acceptable. Therefore, risks which to the American bittern, if present at SWMU 9, also would be acceptable.

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 9, this species may potentially inhabit areas of SWMU 9. 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 necessarily 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 9 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<sub>50</sub> 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<sub>50</sub> value, the calculated LC<sub>50</sub> 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 Conder, et. al., 2004<sup>3</sup>. 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.

Note that TNT was not a COPC at SWMU 9.

No changes were made to the SWMU 9 ERA to address this comment.

**25 Comment: Other tests by Steevens et. al. resulted in *Chironomus 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, 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).

Explosives were not managed at SWMU 9 and were not considered in the SWMU 9 ERA.

No changes were made to the SWMU 9 ERA to address this comment.

**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.**

**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.

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<sup>3</sup> 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.

Explosives were not managed at SWMU 9 and were not considered in the SWMU 9 ERA.

No changes were made to the SWMU 9 ERA to address this comment.

**TABLE 1  
CROSSWALK TABLE RELATING MARCH 19, 2004 COMMENTS FROM  
U.S. EPA AND GENERAL ISSUES TO CONSOLIDATED AND RENUMBERED COMMENTS**

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

1 - The comment was specific for a chemical that was not detected in sediment at SWMU 9. 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.

**ATTACHMENT 4**

**SWMU 10 RESPONSES TO U.S. EPA COMMENTS**

**SWMU 10 (ROCKEYE)**  
**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 3 (Jeep Trail / Little Sulphur Creek), and 2 comments specific to SWMU 2 (Dye Burial Grounds). These comments were discussed in a meeting and various conference calls with 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 10.* 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 4, 5, 9, and 10 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 EPA Region 5 on September 9, 2004. This document reflects the resolution of all issues identified by 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 two sections – five General Comments and 26 Specific Comments. 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 7 (including the ERA) for the SWMU 4, 5, 9, and 10 RFI report is being submitted separately with other RFI report change pages. *It will be necessary to have a copy of the revised Section 7.7 available when reviewing the responses below because several responses refer to the revised Section 7.7.*

#### **GENERAL COMMENTS FROM 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 7.7.4 of the SWMU 4, 5, 9, and 10 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 10 ERA, additional explanations of the alternate benchmarks are provided in the revised Sections 7.7.6.1 of the SWMU 4, 5, 9, and 10 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 10 ERA, additional explanations of the alternate benchmarks are provided in the revised Section 7.7.6.1 of the SWMU 4, 5, 9, and 10 RFI.

**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 4, 5, 9, and 10 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 Section 11.2.3 of the approved SWMUs 4, 5, 9, and 10 work plan (TINUS, August 2000)]. 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 10 ERA, the explanations of the alternate benchmarks are provided in the revised Section 7.7.6.1 of the SWMU 4, 5, 9, and 10 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.

The Tier II values were used in the SWMU 10 ERA for manganese, because a water quality criteria value was not available for manganese. Also, the water quality criteria for zinc was adjusted for hardness in Step 3a. The revised Section 7.7.6.1.3 of the ERA presents more details regarding the Tier II value and the adjustment for hardness.

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 QAPPs. 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 10 Step 3a discussions include the base wide soil background data set. No upgradient surface water or sediment samples were collected at this SWMU So a background comparison was not conducted at SWMU 10 for surface water or sediment.

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 WP for SWMUs 4, 5, 9, and 10 (TtNUS, August 2000); however, based on current U.S. EPA and Navy guidance, background will not be used to select chemicals as COPCs for future ERAs at NSW Crane.”*
- Section 7.7.6.1.1, end of first paragraph: *“As presented in Table 7-24, 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 background concentrations. For soil, these chemicals included the detected metals (aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, vanadium, and zinc). 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.”*

**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 exceedance" 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 exceedance" 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 exceedance" 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 exceedances, number of samples, etc.).

See the following section of the revised SWMU 10 ERA , Section 7.0, regarding the use of "magnitude of exceedance" and the "frequency of detection" in the Step 3a evaluation:

- Section 7.7.6.1.2 for antimony and cobalt

**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 10 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:

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<sup>1</sup>.

Metal bioavailability is discussed for metals in surface waters at SWMU 10 (Section 7.7.6.1.3). Conclusions were based on a comparison of the filtered concentrations to benchmarks because it is the dissolved portion that represents the most bioavailable portion of metals in the water column (U.S. EPA, 1992).

**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.**

**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 7.7.4 of the SWMU 4, 5, 9, and 10 RFI report).

No changes were made to the SWMU 10 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 revised Section 7.7.6 (Step 3a Refinement) of the SWMU 10 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 10 Step 3a evaluation in the discussion of risks to terrestrial wildlife (Section 7.7.6.2).

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<sup>1</sup> 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.

**GENERAL ISSUES FROM SPECIFIC COMMENTS IN 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 3.4.4 of the RFI Report for SWMUs 4, 5, 9, and 10 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 7.7.6.2 of the SWMU 10 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 10 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 Canadian Soil Quality Guidelines were not used in the SMWU 10 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 10 ERA to address this comment. Note the Canadian SQGs were not used in the SWMU 10 ERA.

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.

Note the Canadian SQGs were not used in the SWMU 10 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.

Naphthalene was not a COPC in soil for the SWMU 10 ERA.

Note the Canadian SQGs were not used in the SWMU 10 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.

Note the Eco-SSLs were not used in the SWMU 10 ERA.

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 ( $EC_{20S}$ ,  $EC_{10S}$ , and/or Maximum Acceptable Toxicant Concentrations. 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.

Note the ORNL values were not used in the SWMU 10 ERA. However, alternate toxicity data that do not represent chronic NOAELs were used in Step 3a and the toxicological basis of those values is presented in Section 7.7.6.1.1. of the SWMU 10 ERA.

**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.

Note the Eco-SSLs were not used in the SWMU 10 ERA.

**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 10 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 10<sup>th</sup> 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 10 has been added to the SMWU 10 ERA (Section 7.7.6.1.2), specifically for aluminum, antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, and zinc.

**10 Comment: Likewise, the “effects range – median” will represent the 50<sup>th</sup> 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 10 have been added to the SWMU 10 ERA (Section 7.7.6.1.2) for arsenic, barium, cadmium, chromium, iron, manganese, nickel,, vanadium, 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 3 RFI report that the comment references (Section 8.6.1.2) is not the screening step. The COPC screens for SWMU 10 were presented in Section 7.7.4 of the SWMU 10 ERA.

No changes were made to the SWMU 10 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, barium and vanadium 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)<sup>2</sup> 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. Note that TNT was not detected in sediment at SWMU 10.

No changes were made to the SWMU 10 ERA based on this comment.

**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**

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<sup>2</sup> 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.

**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 and vanadium were the only chemicals retained as COPCs 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. However, barium and vanadium were not retained as COPCs after the Step 3a evaluation for other reasons as presented in Section 7.7.6.1.2 of the SWMU 10 ERA.

No changes were made to the SWMU 10 ERA based on this 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 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 10 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 and vanadium because it is the only available benchmark. However, other factors also were presented in Step 3a to evaluate risks to sediment invertebrates from these metals.

Barium and vanadium were the only chemicals retained as COPCs 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. However, barium and vanadium were not retained as COPCs after the Step 3a evaluation for other reasons as presented in Section 7.7.6.1.2 of the SWMU 10 ERA.

**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 beryllium detected in surface soil; however beryllium was not retained as a COPC after other Step 3a considerations (Section 7.7.6.1.2).

**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 3.4.4 of the SWMU 4, 5, 9, and 10 RFI report to explain the ERA process that was followed at SWMUs 4, 5, 9, and 10.

**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 the end of Section 7.7.1 of the SWMU 10 ERA report to address the comment regarding the state designated water uses and 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):

*"The waterbodies at SWMU 10 eventually discharge to either Sulphur Creek or Turkey Creek because SWMU 10 is located atop a ridge. 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 Turkey Creek waterbody segment was included in the IDEM Assessment Report but was not assessed because insufficient data or no data was available to determine a designated use.*

*Sulphur Creek discharges off-site to the East Fork of the White River. Turkey Creek discharges to Boggs Creek which also 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."*

See response to Comment No. 22 below for the revised Section 1.3.7, "Threatened and Endangered Species."

**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.

This type of evaluation was not necessary for any of the COPCs initially selected at SMWU 10.

**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 new Section 3.4.4.2.2 for the SWMU 4, 5, 9, and 10 RFI report (at the end of the first paragraph) to address this comment:

*"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 7.7.6 of the SWMU 10 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 SWMUs 4, 5, and 10, the following text was added to various sections of the SWMUs 4, 5, 9, 10 RFI report:

- The last two sentences were deleted from the fourth paragraph of Section 1.3.7 and the following text was added after the fourth paragraph in Section 1.3.7 of the SWMUs 4, 5, 9, and 10 RFI report: *“An Endangered Species Management Plan for NSWC Crane was prepared in October 2000 (Comarco Systems, Inc., 2000). As part of this plan, the federal and state endangered and threatened species and species of special concern for the facility were identified. This was accomplished by the compilation of a large amount of information on species present at NSWC Crane. Information included in the Endangered Species Management Plan (Comarco Systems, Inc., 2000) was obtained from studies and surveys conducted by the Navy and other agencies and groups (such as research institutions). A small subset of these studies include the Inventory of Neotropical Migratory Birds, Mist Net and Radiotelemetry Surveys for the Indiana bat, Bobcat Trapping, Rattlesnake Survey, Purdue University Wildlife Studies, and several fish surveys and bird counts. These studies and others that were used in compiling a list of endangered species present at NSWC Crane are described in more detail in the Endangered Species Management Plan (Comarco Systems, Inc., 2000).*

*Numerous wildlife species are present throughout NSWC Crane. Of these species, some are listed as endangered and threatened species or species of special concern. NSWC Crane occupies Daviess, Greene, Lawrence, and Martin counties in Indiana, although only a very small portion of NSWC Crane is in Daviess, Greene, and Lawrence 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 SWMUs 4, 5, 9, and 10 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. Additionally, none of these species was identified in Comarco Systems Inc., 2000 as observed at NSWC Crane. The Indiana bat is listed as federally endangered in Greene, Lawrence, and Martin counties but not in Daviess County. There are no records of any other species at NSWC that are federally listed as endangered or*

threatened. Some species that are listed as Federal species of concern in Comarco Systems, Inc. (2000) are also state endangered species (IDNR, 2002). These include the Northern Harrier (Daviss County), American bittern (Greene County), and sedge wren (Lawrence County). These species are not endangered in Martin County, where the majority of NSWC Crane occupies and so it is unlikely that operations at NSWC Crane are affecting these species' populations significantly.

Ten species listed as endangered by the Indiana Department of Natural Resources have been recorded at NSWC and include the Indiana bat, bobcat, timber rattlesnake, bald eagle, osprey, loggerhead shrike, yellow crowned night heron, Virginia rail, king rail, and Henslow's sparrow (Comarco Systems Inc., 2000). No state-listed threatened species have been recorded at NSWC Crane.

The Rare Animals of Indiana list (Indiana DNR, 2002) was reviewed to verify that no change in status of these species had occurred since October 2000. This list is much larger than that presented in Comarco Systems, Inc. (2000) and is not reiterated here. It was verified that the species listed above did not experience a change in status. Also, 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."

- The following text was added to the end of the last sentence in the second paragraph in Section 7.7.7.1 of the SWMU 10 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 7.7.7.1 of the SWMU 10 RFI report: "As discussed in Section 1.3.7, several endangered and threatened species or species of special concern are present at NSWC Crane, and potentially may inhabit SWMU 10. Risks to these species were not specifically calculated so the uncertainties of not calculating risks to these species are presented here. As discussed above, risks to large carnivorous mammals and birds are expected to be negligible so risks to the bobcat, bald eagle, Northern harrier, and osprey are expected to be negligible, as are risks to carnivorous reptiles such as the timber rattlesnake. Loggerhead shrikes and the sedge wren consume mostly aboveground insects such as caterpillars, beetles, spiders, and flies, as opposed to the worms that are consumed by the American robin in the food-chain model. Because worms are in direct contact with exposure to the soil, it is expected that they would have greater levels of contaminants at SWMU 10 than aboveground insects; therefore, risks to the robin from consuming worms are expected to be greater than risks to the loggerhead shrike and sedge wren from consuming aboveground insects. Risks to the worm eating American robin from chemicals in the surface soil and surface water were acceptable; therefore, risks to the loggerhead shrike and sedge wren are also considered acceptable if these species are present at SWMU 10. The American bittern is a marshland loving bird that feeds on fish, frogs, eels, insects, and water snakes. Although there is some aquatic habitat, it is not suitable for the bittern. Additionally, risks to the belted kingfisher were acceptable; therefore, risks to the American bittern, if present at SMWU 10, would also be acceptable.

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 10, this species may potentially inhabit areas of SWMU 10. 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 necessarily 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 10 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<sub>50</sub> 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<sub>50</sub> value, the calculated LC<sub>50</sub> 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 Conder, et. al., 2004<sup>3</sup>. 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.

Note that TNT was not detected in sediment at SWMU 10.

No changes were made to the SWMU 10 ERA to address this comment.

**25 Comment: Other tests by Steevens et. al. resulted in *Chironomus 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, 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).

RDX was not detected in the sediment at SWMU 10.

See Section 7.7.6.1.2 of the SWMU 10 ERA for the Step 3a evaluation of HMX 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.**

**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.

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<sup>3</sup> 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.

Neither TNT nor RDX was detected in the sediment at SWMU 10.

See Section 7.7.6.1.2 of the SWMU 10 ERA for the Step 3a evaluation of HMX in sediment.

**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
<b>General Comments</b>		
1	1a,1b,1c,1d,1e	
2	2	
3	3a,3b	
4	4	
5	5a,5b,5c	
<b>Specific Comments for SWMU 3</b>		
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	Not applicable <sup>(1)</sup>	
18		11
19		12,24
20	Not applicable <sup>(1)</sup>	
21	Not applicable <sup>(1)</sup>	
22		10,13,16
23	5a	9,10,15
24		15
25		9,10
26		9
27		9
28		16
29		9
<b>Specific Comments for SWMU 2</b>		
1		22
2		23
<b>Other Issues</b>		
Not applicable <sup>(2)</sup>		17,18,19,20,21,24,25,26

1 - The comment was specific for a chemical that was not detected in sediment at SWMU 10. 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.