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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
JOHN F. KENNEDY FEDERAL BUILDING
BOSTON, MASSACHUSETTS 02203-0001

January 16, 1997

Mr. Philip Otis
U.S. Department of the Navy
Northern Division - NAVFAC
10 Industrial Highway
Code 1811/PO - Mail Stop 82
Lester, PA 19113-2090

Re: Technical Memoranda and Responses to EPA's Comments on the Draft Soil and Related Ecological Risk Evaluations at Sites 6,10 & 11 (TM), dated 6 December 1996, Former Naval Construction Battalion Center, Davisville, RI

Dear Mr. Otis:

Pursuant to § 7.6 of the NCBC Federal Facility Agreement (FFA), the Environmental Protection Agency's (EPA) has reviewed the above referenced documents. Please find our comments enclosed.

Overall, the Navy has been unresponsive to EPA's major concerns that the risks are evaluated on a chemical-by-chemical basis; that a hazard quotient of >10 is used as the risk threshold for individual COCs; and that it is uncertain if the benchmark screening values used in the risk-based assessment are appropriate for the site. The Navy has not adequately addressed these concerns that challenge the general validity of the risk-based assessments. The Navy must adequately document the conclusions of no-risk at these sites. The enclosed comments provide more specifics.

I have also enclosed a recent copy of the EPA, Region 1, Risk Updates for your information. In this newsletter the EPA home page address is listed and the newest draft of the Framework for Ecological Risk Assessment is discussed. If you are interested in getting on the mailing list please contact me at (617) 573-5736.

Sincerely,

Christine A.P. Williams
Remedial Project Manager
Federal Facilities Superfund Section

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Enclosures

cc: Richard Gottlieb, RIDEM
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Jim Shultz, EA
Greg Tracey, SAIC
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EPA Review of TM and RTC on Soil and Related Ecological Risk Evaluation at NCBC Sites 06, 10, and 11

A. General Comments

In the Technical Memoranda and Responses to Comments on Soil and Related Ecological Risk Evaluations at NCBC Sites 06, 10, and 11, the Navy has provided site-specific risk-based assessments for the surface soil at Site 6 (Hall Creek watershed), Site 10 (Hunt River/Frenchtown Brook watershed), and Site 11 (Mill Creek watershed). The Navy has also responded to the comments about the Site 11 demonstration assessment, and to outstanding issues in the ERA that pertain to the Hall Creek, Hunt River, and Mill Creek watersheds.

Although many questions were raised by EPA, FWS, RIDEM, and NOAA during their review of the risk-based assessment demonstration for Site 11, the most serious concerns are similar: that risks are evaluated on a chemical-by-chemical basis; that a hazard quotient of >10 is used as the risk threshold for individual COCs; and that it is uncertain if the benchmark screening values used in the risk-based assessment are appropriate for the site. The Navy has not adequately addressed these concerns that challenge the general validity of the risk-based assessments. The Navy must adequately document the conclusions of no-risk.

The concern that will be most difficult to resolve in the risk-based assessment process is that hazards are evaluated on a chemical-by-chemical basis. There is no consideration of the possible additive/synergistic effects of chemicals that have similar target organs or modes of action. Toxicologists have demonstrated that many chemicals act in concert in the body and there is growing concern in health agencies that there has not been sufficient attention paid to this issue. Individual chemicals that may be present at a site in insufficient quantity to present a hazard may contribute to toxic responses in combination with other chemicals at the site. With these risk-based assessments, the Navy is seeking a quantitative yes/no approach to evaluating potential hazards. They believe that it is sufficient to demonstrate that individual chemicals produce no unacceptable risk, and that adding Hazard Quotients (HQs) together to produce Hazard Indices (HIs) will confound the evaluation process because there are no available toxicological benchmarks for multiple chemicals. They are correct that no benchmarks exist for chemical mixtures. There is unfortunately no simple approach to risk assessment at complex sites; the specialist must consider all data and data sources for a site before rendering a subjective weight-of-evidence decision. Except in the most simple cases where very few COCs are identified at the site or where the identified COCs do not have similar target organs/modes of action, it is unlikely that the risk-based assessment approach proposed by the Navy will be acceptable. There is concern that the Navy considered hazard quotients (HQs) of <10 as posing no unacceptable ecological risk. The Navy bases their decision on risk threshold levels described by Menzie et al. (1993). In this paper, an HQ of 1 to 10 is described as indicating that a chronic NOAEL has been exceeded and some potential for environmental effects exists, and numerous qualifiers are listed that should be used when interpreting HQs. When the HQ is in the 1 to 10 range, it becomes important to consider other factors at the site when assessing risks, including the potential of the

COC to bioaccumulate and the presence of COCs with the same target organ/mode of action. By raising the risk threshold level from 1 (which is standard) to 10, most COCs drop from consideration as hazards. Several COCs having HQs near but not equal to 10 and the same target organ/mode of action would not be considered a hazard using the Navy's approach, but could produce detrimental effects on an ecosystem.

A concern that can be resolved with additional work on the part of the Navy is that it could not be determined from the information provided whether the screening values cited for individual chemicals in the demonstration document were appropriate to the site. In the review of the Site 11 demonstration, the EPA review questioned the validity of the Region III BTAG values and all reviewers questions the validity of using maximum US background values. The Navy has removed these two sources of data from the screen in the current submission, missing the point that ALL of the sources were in question. For a screening value to be used, the site and/or situation from which the value was generated must be comparable to the situation being evaluated. Many of the values cited by the Navy were obtained from previously compiled lists rather than original sources. These lists are generally accompanied by a statement that the original source of each screening value should be consulted to insure that the value is applicable to the situation. The Region III BTAG values are unacceptable as a whole because the validity of each screening value has not been confirmed by Region I scientists (in fact, Region III BTAG values are considered draft within Region III because their scientists have not yet confirmed all data in the list). If the Navy had wanted to use a specific value for a COC listed in the Region III BTAG list, it would have been acceptable to cite the original source of the data. Screening values should be accompanied by the source citation and a brief description of the basis of the value (i.e., NOAEL from an acute oral toxicity study in rabbits; LOAEL from a 2-year oncogenicity study in rats; concentrations in sandy loam soil supporting a healthy complex forested ecosystem in British Columbia; concentrations in a loam soil used for agriculture in Iowa). No reviewer is familiar with all data on all lists, and it is the responsibility of the submitting organization to provide the necessary data to support the validity of the screening value.

These issues must be resolved by the agencies involved before the risk-based assessments proposed by the Navy are accepted. In reviewing the risk-based assessments for Sites 6, 10, and 11, potential risks from chemical interactions and from chemicals with a hazard quotient of <10 that were not considered by the Navy were considered. Also, the benchmark screening values cited by the Navy for each COC were not given equal value but were weighted according to their apparent appropriateness to the Site under review.

The Navy may provide a benchmark discussion as an appendix to the ERA rather than include that discussion each time a TM is provided for an NCBC site. The Navy should re-examine the inputs to the food chain modeling effort as a method of determining if the over estimation of risks, that the Navy cites in this TM, could be reduced.

EPA Review of TM and RTC on Soil and Related Ecological Risk Evaluation at NCBC Sites 06, 10, and 11

In addition to the above concerns about the validity of the risk-based assessment, the Navy has in these Technical Memoranda (TM) submitted new screening tables for Hunt River, Mill Creek, and Hall Creek inorganic chemicals. Within each watershed, a total of four to six chemicals were newly classified as COCs in the soil, sediment, and surface water. The HQs/HIs provided by the Navy, and upon which the risk-based assessments are based, do not include these newly classified compounds. Because of time limitations, the HQs were not recalculated by this reviewer prior to submission of this review. In reviewing the risk-based assessments for Sites 6, 10, and 11, an attempt was made to predict the impact of the new COCs on the overall risk at the respective sites.

B. Technical Memorandum on Soil-Based Remediation Evaluation at Site 06 [Hall Creek Watershed]

General problems

The Site 6 risk-based assessment has the same basic problems as all of the risk-based assessments: risks are evaluated on a chemical-by-chemical basis; a hazard quotient of >10 is used as the risk threshold for individual COCs; it is uncertain if all benchmark screening values are appropriate for the site; and HQs were not recalculated to reflect inorganics newly classified as COCs. These issues have been detailed in Section A of this review.

In addition, the TM for Site 6 was cumbersome to review because much of the discussion centers on data from tables that appear in the ERA. It would not be possible for someone without access to the ERA to evaluate this TM. Also, the source of some of the data transcribed from the ERA is not identified. We are not questioning that these numbers appear in the ERA and were transcribed correctly, but the original location of all data from the ERA should be clearly identified. Any necessary tables should have been duplicated from the ERA and appended to the TM so the TM could serve as a stand-alone document.

Step 1 - Conduct the ERA

The Freshwater/Terrestrial ERA is on file and was available for use in this review. Outstanding questions concerning the ERA which are applicable to Site 6 are discussed in Section F of this review. One significant change to the ERA that has been made by the Navy in response to previous EPA comments impacts the "no action" decision at Site 6. During the requested reassessment of COCs at the Hall Creek Watershed, aluminum, chromium, and lead were newly characterized as COCs in the sediment, and arsenic and manganese were newly characterized as COCs in the surface soil. HQs and HIs were not recalculated for these compounds, and they were not included in roll-up tables. Neither aluminum nor chromium are included in the current HQ/HI tables for the Hall Creek site. Lead currently has a HQ of >1 for all receptors of concern (ROC) considered. The existing HQs for the arsenic/shrew, manganese/robin, and

manganese/hawk combinations are range from 3.2 to 5.3. HQs/HIs should be recalculated using these COCs, and they should be subject to the risk based assessment.

Step 2 - Select a Risk Threshold

A HQ risk threshold of 10 was selected. The problems associated with using a threshold of 10 rather than the more typical threshold of 1 is discussed at length in Section A of this review.

Step 3 - Identify Watershed-Specific Risk Drivers

By selecting a risk threshold of 10 rather than 1, the Navy has reduced the number of COC/ROC HQs of concern from 49 to 17 (Table 6-9 in the ERA). Several of the watershed COCs that were eliminated have similar target organs or modes of action and, if summed, would result in a HI greater than 10. From a brief examination of the surface soil data, it appears that none of these watershed COCs with additive/synergistic effects are found in the soil at Site 6 in sufficient quantity to cause concern. This should, however, be investigated more carefully with detailed toxicological effects data. Ten COCs remain under consideration: Aroclor 1248; Aroclor 1254; Aroclor 1260; cadmium; fluorene; DDT; DDE; dieldrin; endrin; and endrin ketone.

Step 4 - Determine if Risk Drivers Occur at Site Being Evaluated and, if so, Validate Risk Drivers

Of the remaining ten COCs, only cadmium was identified in the surface soil at Site 6. The COC/ROC HQ for cadmium/shrew in the watershed is 28.3. At Site 6, the maximum measured concentration in the surface soil is 0.75 mg/kg. The reference mean for cadmium is 0.27 mg/kg, and the benchmark criteria used in the ERA is 5 mg/kg (Quebec MOE, 1988). Cadmium was not identified as a COC in the soil during the ERA screening. There are five IR sites in the Hall Creek watershed. Watershed mean and maximum concentrations for cadmium are 0.40 and 2.00 mg/kg, respectively.

The Navy presents five benchmark values for cadmium: the Rhode Island background range (0.22-3.5 mg/kg); the NOAA Canada background (1 mg/kg); the Oak Ridge plant screen (3 mg/kg); the Beyer (Dutch) screen (5 mg/kg); and the Oak Ridge earthworm screen (20 mg/kg). As has been discussed in Section A of this review, these benchmark values are presented out of context and are difficult to interpret. The most valid benchmark for this site out of the presented list is the Rhode Island background range. However the Navy has on record a background range for the NCBC Site and should use the site specific range (Table 9-3D, Phase II RI dated July 1994). The maximum concentration of cadmium in the soil at Site 6 (0.75 mg/kg) falls within the lower end of the RI range, but is above the NCBC maximum value of 0.46 mg/kg. There are 6 out of 15 sample locations where cadmium is above the maximum NCBC background, a frequency of 40%, but still within the lower end of the RI range. Therefore, based on the

available information, cadmium in the surface soil at Site 6 may present an environmental hazard and may be a contributor to the watershed cadmium HQ.

Conclusion

Based on the available information, a decision of no action still appears to be appropriate for this site. However, a final decision should be withheld until the HQs/HIs for the site are recalculated to include the newly classified COCs, COCs at the site are grouped according to target organ/mode of action and their potential to bioaccumulate, and the HQ 10 and bench mark concerns discussed in Section A are addressed.

C. Technical Memorandum on Soil-Based Remediation Evaluation at Site 10 [Hunt River/Frenchtown Brook Watershed]

General problems

The Site 10 risk-based assessment has the same basic problems as all of the risk-based assessments: risks are evaluated on a chemical-by-chemical basis; a hazard quotient of >10 is used as the risk threshold for individual COCs; it is uncertain if all benchmark screening values are appropriate for the site; and HQs were not recalculated to reflect inorganics newly classified as COCs. These issues have been detailed in Section A of this review.

In addition all surface soils in the disposal area have been removed in accordance with a State lead solid waste removal action. No confirmatory sampling was performed.

Step 1 - Conduct the ERA

The Freshwater/Terrestrial ERA is on file and was available for use in this review. Outstanding questions concerning the ERA which are applicable to Site 10 are discussed in Section F of this review. One significant change to the ERA that has been made by the Navy in response to previous EPA comments impacts the "no action" decision at Site 10. During the requested reassessment of COCs in the Hunt River Watershed, aluminum, barium, lead, and vanadium were newly characterized as COCs in the sediment. No new COCs were identified in either the surface soil or the surface water. HQs and HIs were not recalculated for these compounds, and they were not included in roll-up tables. Aluminum, barium, and vanadium are not included in the current HQ/HI tables for the Hunt River site. Lead currently has a HQ of >1 for all ROBS considered. HQs/HIs should be recalculated using these COCs, and they should be subject to the risk based assessment.

Step 2 - Select a Risk Threshold

A HQ risk threshold of 10 was selected. The problems associated with using a threshold of 10 rather than the more typical threshold of 1 is discussed at length in Section A of this review.

Step 3 - Identify Watershed-Specific Risk Drivers

By selecting a risk threshold of 10 rather than 1, the Navy has reduced the number of COC/ROC HQs of concern from 12 to 1 (Table 6-9 in the ERA). From a brief examination of the surface soil data, it appears that none of the eliminated COCs with additive/synergistic effects are found in the soil at Site 10 in sufficient quantity to cause concern. This should, however, be investigated more carefully with detailed toxicological effects data. One COC remains under consideration: antimony.

Step 4 - Determine if Risk Drivers Occur at Site Being Evaluated and, if so, Validate Risk Drivers

Antimony was identified in the surface soil at Site 10. The COC/ROC HQ for antimony/shrew in the watershed is 19.87. At Site 10, which is the only IR site in the Hunt River/Frenchtown Brook watershed, the maximum measured concentration of antimony is 35.8 mg/kg. The reference mean for antimony is 4.57 mg/kg, and the benchmark criteria used in the ERA is 8.80 mg/kg (Shackette and Boerngen, 1984). The watershed mean concentration for antimony is 4.75 mg/kg.

The Navy presents three benchmark values for antimony: the NOAA US background (0.48 mg/kg), the Oak Ridge plant screen (5.0 mg/kg), and the Rhode Island maximum background (5.9 mg/kg). As has been previously discussed, these values are presented out of context and are difficult to interpret. The most valid benchmark from these presented for this site is the Rhode Island maximum background, however as previously pointed out the NCBC background concentrations should be used. The maximum concentration of antimony in the soil at Site 10 (35.8 mg/kg) is six times greater than the Rhode Island maximum background, which is the highest screening value presented, and 7.5 times greater than the watershed mean. The maximum NCBC background value is ND with a reported estimated maximum detection limit of 13.7 mg/kg. Therefore, based on the available information, antimony in the surface soil at Site 10 presents a potential environmental hazard. The surface soil at Site 10 is the most significant source contributing to the watershed antimony HQ.

Step 5

No graphical display of the data were provided.

Steps 9-10

The Navy believes that no remediation of the surface soil at Site 10 is warranted. Their argument is based on the facts that antimony was detected in only five of 27 soil samples analyzed from the Hunt River/Frenchtown Brook watershed; of those five samples only 1 is not "J" qualified; the 35.8 mg/kg maximum is "J" qualified; and the only confirmed concentration in the soil is 9.2 mg/kg. The 9.2 mg/kg value was the second highest concentration of antimony measured at Site 10. A map of the sampling locations at Site 10 is provided in the TM. The map would be more useful if the specific locations and the respective concentrations of the five antimony detections had been indicated.

Conclusion

Based on the available information, a decision of no action appears to be appropriate for this site. Antimony was detected in the surface soil at Site 10 at only 18% of the sampling locations and was greater than approximately twice the background reference mean of 4.57 mg/kg at only one sampling location. Relatively little weight was placed on the fact that four of five detections are "J" values and on the fact that the previously sampled soils were removed. However, a final decision should be withheld until the HQs/HIs for the site are recalculated to include the newly classified COCs, COCs at the site are grouped according to target organ/mode of action and their potential to bioaccumulate, and the HQ 10 and bench mark concerns discussed in Section A are addressed.

D. Technical Memorandum on Soil-Based Remediation Evaluation at Site 11 [Mill Creek Watershed]

General Comments

The Site 11 risk-based assessment has the same basic problems as all of the risk-based assessments: risks are evaluated on a chemical-by-chemical basis; a hazard quotient of >10 is used as the risk threshold for individual COCs; it is uncertain if all benchmark screening values are appropriate for the site; and HQs were not recalculated to reflect inorganics newly classified as COCs. These issues have been detailed in Section A of this review.

The Freshwater/Terrestrial ERA is on file and was available for use in this review. Outstanding questions concerning the ERA which are applicable to Site 11 are discussed in Section F of this review. One significant change to the ERA that has been made by the Navy in response to previous EPA comments impacts the "no action" decision at Site 11. During the requested reassessment of COCs in the Mill Creek Watershed, aluminum, chromium, copper, and nickel were newly characterized as COCs in the sediment, and beryllium and manganese were newly characterized in the surface soil. HQs and HIs were not recalculated for these compounds, and they were not included in roll-up tables. Aluminum, chromium, copper, and nickel are not included in the current HQ/HI tables for the Mill Creek site. Beryllium has a HQ <1 for ROCs; manganese has a HQ of approximately 3 for both the robin and hawk. HQs/HIs should be

recalculated using these COCs, and they should be subject to the risk-based assessment.

Step 2 - Select a Risk Threshold

A HQ risk threshold of 10 was selected. The problems associated with using a threshold of 10 rather than the more typical threshold of 1 is discussed at length in Section A of this review.

Step 3 - Identify Watershed-Specific Risk Drivers

By selecting a risk threshold of 10 rather than 1, the Navy has reduced the number of COC/ROC HQs of concern from 11 to 3 (Table 6-9 in the ERA). From a brief examination of the surface soil data, it appears that none of the eliminated COCs with additive/synergistic effects are found in the soil at Site 11 in sufficient quantity to cause concern. DDE and DDD are present in very low concentrations that would have minimal impact on the HI for the DDT/DDE/DDD combination. Additive/synergistic effects should be investigated more carefully with detailed toxicological effects data. It does not appear that the eliminated COCs have similar target organs or modes of action. Two COCs remain under consideration: selenium and DDT.

Step 4 - Determine if Risk Drivers Occur at Site Being Evaluated and, if so, Validate Risk Drivers

Both selenium and DDT were identified in the surface soil at Site 11. The COC/ROC HQ for selenium/shrew in the watershed is 16.9, for DDT/robin is 55.3, and for DDT/hawk is 71.9. At Site 11, which is the only IR site in the Mill Creek watershed, the maximum measured concentration of selenium is 1.1 mg/kg. The reference mean is 0.53 mg/kg, and the benchmark criteria used in the ERA is 2 mg/kg (Environment Ontario 1989). The watershed mean concentration for selenium is 0.34 mg/kg. The Navy presents three benchmark values for selenium: the Oak Ridge earthworm screen (70 mg/kg), the Environment Ontario screening concentration (2 mg/kg), and the Rhode Island maximum background (1.1 mg/kg). As has been previously discussed, these values are presented out of context and are difficult to interpret. The Region III BTAG screening value for soil, which was not used by the Navy in this discussion but is derived from OHMTADS and appears to be valid for the selenium/shrew combination, is 1.8 mg/kg. The most valid benchmark of the ones presented for this site is the Rhode Island background range, however the Navy should have used the NCBC background range. The maximum concentration of selenium in the soil at Site 11 (1.1 mg/kg * noted in the ERA) is equal to the Rhode Island maximum background, approximately twice the watershed mean, and above the maximum NCBC site background of 0.77 mg/kg. (According to the Phase II RI dated July 1994, Selenium was only detected, at 0.72 mg/kg, in 1 out of 26 samples in Phase II and ND in Phase I.) Therefore, based on the available information, selenium in the surface soil at Site 11 may present an environmental hazard since it is the most significant source contributing to the watershed selenium HQ.

At Site 11 the maximum measured concentration of DDT is 0.31 mg/kg. The Navy presents two benchmark values for DDT: the British Columbia target concentration (2 mg/kg) and the Dutch (Beyer) screen concentration (0.5 mg/kg). There is no evidence that these benchmark values are applicable to Site 11. The Region III BTAG screening value for soil, which was not presented by the Navy in this discussion but may be equally valid, is <0.1 mg/kg based on the 96-hour LC50 for sowbugs. DDT and related compounds bioaccumulate and persist in fatty tissues in the body, and can have significant detrimental effects on avian reproduction at relatively low soil concentrations that cause no other adverse effects on adults. Species sensitivity to DDT varies widely. The real and potential impact of DDT on the entire ecosystem at Site 11 cannot be determined by comparing the maximum concentration of DDT at the site to two screening values of uncertain applicability. (As a note, the NCBC background sampling detected DDT at a range of ND to 0.610 mg/kg with all except 1 of the background sample values below the Site 11 maximum. The rest of the samples were clustered around 0.2 ppm)

Conclusion

Based on the available information, a decision of no action may still be appropriate for Site 11 at this time, however, although the concentrations of selenium at the site do not appear to pose an environmental risk, DDT is present in the soil in sufficient quantities to insist that the risk assessment uncertainties must be more detailed than that provided by the Navy in this TM. In addition, a final decision should be withheld until the HQs/HIs for the site are recalculated to include the newly classified COCs, COCs at the site are grouped according to target organ/mode of action and their potential to bioaccumulate, and the HQ 10 and bench mark concerns discussed in Section A are addressed.

E. Review of the Navy's Response to Review Comments of Site 11 Demonstration

This section of the TM addresses the Navy's responses to specific technical review comments from the EPA, FWS, RIDEM, and NOAA on the Site 11 demonstration entitled "Use of Ecological Risk Assessment Results to Support Remedial Decision-Making: An Example at the NCBC Davisville". In general, the Navy's response to many of the review comments on the Site 11 demonstration are inadequate and fail to respond to concerns about the validity of these proposed risk-based assessments. The most serious concerns identified by the reviewers were discussed at length in Section A of this review. These concerns are that risks are evaluated on a chemical-by-chemical basis, that a hazard quotient of >10 is used as the risk threshold for individual COCs, and that the sources from which screening benchmarks were obtained of uncertain validity.

EPA General Comments

EPA Comment No. 1. The EPA states that the risk-based assessment approach is only suitable

for sites at which the ERA risk characterization suggests that remedial action is not necessary. The EPA suggests that a risk-based assessment might be used in lieu of a feasibility study at such sites to provide the documentation needed to support a no-action decision. The Navy does not agree with the EPA's opinion of the limitations of the risk-based assessment, and states that Step 6 of the risk-based assessment procedure is directed at selecting a remedial action goal. The EPA is correct that the value of the risk-based assessment is limited to supporting no-action decisions for relatively simple sites such as Sites 6 and 10. Although a risk-based assessment could be prepared for any site, the outcome of the assessment for the majority of sites would be that the risk assessor would request the submission of additional data, most likely in the form of a Feasibility Study, prior to establishing Remedial Action Objectives and Remedial Goals. Therefore, submittal of a risk-based assessment for most sites would serve only to delay remediation decisions.

EPA Comment No. 2. The EPA states that many of the concepts presented in the risk-based assessment should have been dealt with in appropriate section of the ERA, and cites the elimination of selenium as a COC in the soil because of background levels as an example. The risk-based assessment is described as an additional extraneous document. The Navy has responded that the ERA focused on the watershed and EEZ level, not the site level, and that selenium was identified as a watershed COC because of sediment and surface water concentrations, not because of surface soil concentrations. EPA continues to believe that it would have been appropriate to discuss risks at a site level in the ERA, but since this was not done, the risk-based assessment is an attempt to rectify that omission. Resolved.

EPA Comment No. 4. The EPA states that documentation should be provided to confirm that the benchmark values used in the risk-based assessment are valid for comparison with the site under consideration. The benchmark values should be representative of surface soil samples from an uncontaminated site that sustains a healthy ecosystem. The Navy's response is that the benchmark values cited in the risk-based assessment are soil-screening benchmark values available to the EPA and other agencies. The Navy must document that these screening values are appropriate to the site. Many of the values cited by the Navy were obtained from previously compiled lists rather than original sources. These lists are generally accompanied by a statement that the original source of each screening value should be consulted to insure that the value is applicable to the situation. It is the responsibility of the Navy, not the reviewing agency, to research the original source of screening values. This issue is discussed in greater detail in Section A.

EPA Comment No. 5. The EPA states that the Navy must identify possible sources of the contamination in the sediment in Mill Creek watershed. The EPA accepts the Navy's conclusions that the contamination does not result from the surface soil. The Navy has responded that it is willing to discussion the elevated HQs in Mill Creek, but does not believe that the risk-based assessment for the surface soil at Site 11 is the appropriate document for such a discussion.

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Resolved.

EPA Comment No. 6. The EPA states that it concurs with the FWS review, and that the Navy should respond in writing to the FWS comments. The Navy's responses to the FWS review follow their response to the EPA review.

EPA Specific Comments

EPA Comment No. 8. The EPA states that a HQ of 10 is not acceptable as an assumed cutoff for establishing a risk threshold. Individual chemicals that may be present at a site in insufficient quantity to present a hazard may contribute to toxic responses in combination with other chemicals at the site. It is standard practice in Region I that Hazard Indices are calculated for contaminants with the same target organ or mode of action. The Navy has responded that it had demonstrated that individual chemical HQs in excess of 10 pose no unacceptable ecological risk, and that adding Hazard Quotients (HQs) together to produce Hazard Indices (HIs) will confound the evaluation process because there are no available toxicological benchmarks for multiple chemicals. The Navy has presented HIs for all chemicals in each watershed in Tables 6-7 through 6-11 of the ERA. EPA maintains its position that an HQ of 10 cannot be considered an absolute for individual chemicals, because the additive/synergistic effects of chemicals that have similar target organs or modes of action must be addressed when assessing risk. This issue is discussed in greater detail in Section A.

EPA Comment No. 9. The EPA stated that HQs should not be compared to benchmarks at this late stage in the risk assessment process; that appropriate benchmarks should have been used at the risk screening stage or during the discussion of uncertainty in the risk characterization. The EPA is further questioning why the original benchmarks failed to adequately screen these chemicals from consideration as risk prior to this step, and whether these additional benchmark screening values are more appropriate than those used in the ERA. The Navy responded that benchmarks were used for screening earlier in the process. The EPA's comment and the Navy's response suggest a partial misunderstanding of the issue on both sides. The Navy did use benchmarks during the screening process. The ERA focused on the watershed and EEZ level, not the site level, in discussing risk. In these risk-based assessments of specific sites, the Navy is presenting additional benchmarks for each chemical identified as of concern within the watershed and arguing that the chemical is of no risk because its concentration falls below some or all of these newly presented benchmarks. The problem with these new comparative benchmark screening values is that the Navy has demonstrated only that a range of screening values exists; it has offered no proof that all of these values are applicable to the site. This issue is discussed in greater detail in Section A And in EPA Comment 4 of this section.

EPA Comment No. 12. The EPA states that it would be more informative to the decision-making process if both mean and maximum HQs were presented for each site. Only

maximum HQs were presented in the risk-based assessments. The Navy has responded that it believes that is the maximum HQ is shown not to present unacceptable risk, the mean HQ is unnecessary. If the maximum HQ presents a risk, than other information should be considered. EPA continues to believe that mean values are useful in assessing the significance of the maximum. It should be noted that mean and maximum concentrations of inorganics in the surface soil were presented in tables in the Navy's Responses to Outstanding Issues on the NCBC Facility-wide Freshwater/Terrestrial Ecological Risk Assessment section of this TM, and that these values were used in reviewing the risk-based assessments for Sites 6, 10, and 11. Resolved.

EPA Comment No. 13. The EPA states that many of the benchmark values used by the Navy are inappropriate. The Navy has removed the maximum U.S. background soils data set and the Region III BTAG screening values. EPA maintains its belief that the Navy must document that these screening values are appropriate to the site. It is the responsibility of the Navy, not the reviewing agency, to research the original source of screening values. This issue is discussed in greater detail in Section A And in EPA Comment 4 of this section.

EPA Comment No. 15.. The EPA has requested that the Navy provide the average values for the HQs with a mapped representation of the distribution of values. The Navy has asked for additional guidance. This request is similar to that in EPA Comment 10. A map of soil sampling locations and the associated HQs values for chemicals under review at each location would be useful in assessing risk. The ERA was adequate although unwieldy in assessing the risks for the surface soil at Sites 6, 10, or 11; maps such as those requested would have been a useful tool in the review process.

<u>Fish & Wildlife Service (FWS) Comments</u>

FWS Comment No. 3.. The FWS states that the risk-based assessments will not address the potential effects of several PAH's to avian receptor guilds because these values were not estimated in the ERA. The Navy states that the FWS is correct that most PAH compounds could not be modeled for birds because of a lack of compound-specific toxicology reference values (TRVs) in the literature reviewed. The Navy states that "schedules do not permit additional modeling exercises at this late date" using surrogate TRVs. The Navy further states that nearly 90% of the HQs for PAHs were less than 1 and none exceeded 7 for avian receptors, and PAHs were not a concern with the shrew. The FWS is correct that the potential effect of all PAHs should be addressed in the assessment. Also, since PAHs have the same target organ/mode of action, they should not be addressed as separate chemicals when assessing risk. The HI for all PAHs within the watershed must be determined. This issue is discussed in greater detail in Section A.

FWS Comment No. 5. The FWS states that the process of evaluating site-specific risks has the potential of overlooking the effects of individual or group COC/ROC pairings from multiple sites

within a watershed. The Navy states that averaging the dose within the watershed would have the effect of lowering the estimated potential risk. By estimating risks for individual sites, risks are more accurately identified. The Navy is correct about estimating watershed average and site-specific risks for individual chemicals; that the risk-based assessment more accurately identifies potential risks from a site. However, the FWS is correct that the risk-based assessment does not consider watershed-wide risks presented by chemicals with the same target organ/mode of action. A chemical that is present at concentrations too low to cause concern at one specific site within a watershed may pose a risk when coupled with chemicals found at other sites within the watershed. The issues of chemicals with additive/synergistic effects is discussed in greater detail in Section A.

NOAA Comments

NOAA Comments Nos. 3 and 4. NOAA states that the risk-based assessment is overly simplistic, and does not consider the potential risk from multiple chemicals. This issue is discussed in detail in Section A And EPA Comment 8.

F. Review of the Navy's Responses to Outstanding Issues on the NCBC Facility-wide Freshwater/Terrestrial Ecological Risk Assessment

This section of the TM addresses the Navy's most recent responses to EPA's technical review comments on the Draft Final Reports for the Facility-Wide Freshwater/Terrestrial Ecological Risk Assessment and the Allen Harbor and Calf Pasture Point Marine Ecological Risk Assessment for the Davisville site. Some outstanding issues with the ERA remain unresolved. The responses are, in general, limited to providing information needed to evaluate the Proposed No Action Plans for NCBC Sites 6, 10, and 11. Issues that do not concern Sites 6, 10, or 11 are not addressed in the Navy's responses, and no information is provided for the Sandhill Brook and Allen Harbor Watersheds. Information pertaining to these sites must be provided in future submissions. One new issue has been identified. Although the Navy has now correctly screened for potential COCs by comparing the site maximum against the background mean, thereby identifying several additional COCs, HQs/HIs have not been recalculated to include these new chemicals. The HQs/HIs must be updated.

Comments Pertaining to the Freshwater/Terrestrial ERA

EPA Comment No. 2. The Navy has submitted tables for Hunt River, Mill Creek, and Hall Creek in which potential COCs (PCOCs) have been selected by comparing the maximum site concentration against the mean background concentration for all media. In the same table, these PCOCs were compared to a benchmark screen in which the on-site maximum was be compared against an appropriate ecotoxicity benchmark for each medium, in order to select actual COCs.

EPA Review of TM and RTC on Soil and Related Ecological Risk Evaluation at NCBC Sites 06, 10, and 11

For Hunt River Watershed: No new COCs were identified in either the surface soil or the surface water. Four new COCs were identified in the sediment--aluminum, barium, lead, and vanadium.

For Mill Creek Watershed: No new COCs were identified in the surface water. Four new COCs were identified in the sediment--aluminum, chromium, copper, and nickel; and two were identified in the surface soil--beryllium and manganese.

For Hall Creek Watershed: No new COCs were identified in the surface water. Three new COCs were identified in the sediment--aluminum, chromium, and lead; and two were identified in the surface soil--arsenic and manganese.

According to the Navy, these newly identified COCs have not been incorporated into Hazard Indice calculations for each site (Comments 6-10). Also, revised COC screening tables have not been provided for Sandhill Brook and Allen Harbor Watersheds. It is assumed that these were not provided since this document does not concern sites within the Sandhill Brook and Allen Harbor Watersheds. The revised tables for these two sites must be provided in future submissions. No revised COC screening tables were provided for Sandhill Brook and Allen Harbor Watersheds; these must be provided in future submissions to complete the RI.

EPA Comment No. 5. The Navy has submitted maps of the Hall Creek, Hunt River, and Mill Creek watersheds on which benthic bioassessment scores, associated habitat ratings, and maximum watershed COCs and associated HQs (rather than an average across watersheds) are plotted for sampling stations. Based on these maps, there is no apparent correlation between COCs/HQs in adjacent areas, and none between benthic bioassessment scores and COCs/HQs. A very low rating at Hunt River (8/111) is due more to natural stresses from drying than from chemical contamination. Determination of a correlation is less than absolute because of the small number (3-4) of benthic community evaluations done within each watershed.

No maps were provided for Sandhill Brook and Allen Harbor Watersheds; these must be provided in future submissions in order to complete the RI.

EPA Comment No. 6. Watershed and ecological exposure zone (EEZ) roll-up risk calculation tables have been provided for Hall Creek, Hunt River, and Mill Creek watersheds. However, the newly identified COCs (Comment 2) have not been incorporated into Hazard Indice calculations for each site. Therefore, the HIs reported in the roll-up tables underestimate the hazard in these watersheds. Also, roll-up tables have not been provided for Sandhill Brook and Allen Harbor Watersheds. These tables must be provided in future submissions in order to complete the RI.

EPA Comment No. 12a.. Aluminum has been included in the COC screening, but not in the roll-up tables.

EPA Review of TM and RTC on Soil and Related Ecological Risk Evaluation at NCBC Sites 06, 10, and 11

EPA Comment No. 14. The Navy states that the iron and aluminum content of sediments was used as a surrogate for a grain size analysis in normalizing the sediment data. They believe this is appropriate since a) iron staining such as that observed at Hall Creek can result from natural processes, b) the normalized aluminum values are fairly consistent throughout the stream, c) if iron staining was due to an unnatural process, the normalized aluminum values would be variable. However, the Navy's position is based on three assumptions that were not supported by evidence. While it is true that GENERALLY the fine materials in sediment contain the bulk of the iron and aluminum, this is dependent on the geology of the area. There is no evidence that iron/aluminum content is an accurate surrogate for grain size at Hall Creek. It was assumed that a natural process that may be causing the iron staining along Hall creek; no process was identified. The VOC contamination migrating from the NIKE/Site 3 may be a partial cause of this staining. It was assumed that aluminum values are consistent along the stream and not impacted by contamination from the site. It was assumed that the concentrations of all normalized contaminants are related to particle size. Normalization of this type of data is not typical in ecological risk assessments. The impact of normalizing the data (how many COCs drop from the assessment) should be further addressed.

EPA Comment No. 18. For sites 6, 10, and 11, all chemicals eliminated from consideration as COCs because they are common laboratory contaminants were, in fact, present at levels below screening values and would not be identified as COCs in the screening process. This re-evaluation must be provided for the Sandhill Brook and Allen Harbor Watersheds in future submissions in order to complete the RI.

EPA Comment No. 20. The Navy has provided additional project-specific technical justification for the use of only 500 iterations of the stochastic model. The 500 iterations result from the use of a restricted model; only abiotic media distributions and feeding fractions were allowed to vary, and feeding fractions were allowed to vary by only 25%. Statistically, the argument appears valid. This discussion should be included in the final ERA. Resolved.

EPA Comment No. 21a. The Navy acknowledges that chemicals from Table 5-7 (Terrestrial Exposure Parameters) were not carried into the COC selection, and refers to Appendix B.1.1 for the correct data. The Navy has stated that they will correct Table 4-17. The correct information should be presented in the final ERA. Resolved.

EPA Comment No. 22d. Tables 4-6 through 4-14 in the draft ERA list the maximum concentration in the watershed ("Impacted concentration"), maximum HQs ("Benchmark Screening Index"), and the location of the maximum concentration of each COC within each watershed matrix. The Navy believes that this is satisfactory. However, since Tables 4-6, 4-8, and 4-9 will not exist in the final ERA because all of the data have been folded into the amended COC screening tables (Tables 4-1, 4-3, and 4-4 in this Technical Report) EXCEPT the location of the maximum concentration of each COC within each watershed matrix, the Navy can satisfy

EPA's request by including the locations in the amended COC screening tables.

EPA Comment No. 24. This comment was not addressed because it regards Site 9. It must be addressed in later submissions in order to complete the RI.

Comments Pertaining to the Allan Harbor/Calf Pasture Point ERA

The only issue from the Marine ERA that was addressed in the TM was in response to Comments 9 and 10, in which the Navy was directed to use non-normalized sediment to biota BAFs in the food chain models. The Navy has responded that non-normalized sediment to biota BAFs were used in the food chain models in the terrestrial ERA. Benthos and fish BSAFs obtained from the Marine ERA were converted back to non-normalized BAFs before use in the food web modeling. Resolved.

Other issues remaining with the Marine ERA were not addressed in the TM because they were not pertinent to Sites 06, 10, and 11.

G. Summary Conclusions

The use of risk-based assessments similar to those presented in this document is inappropriate for the more highly contaminated sites at NCBC. In the risk-base assessment, risks are evaluated on a chemical-by-chemical basis; there is no mechanism to address the potential for additive/cumulative toxic effects caused by chemicals with similar target organs or modes of action. The review of the Sites 6, 10, and 11 risk-based assessments was possible only because this reviewer had the ERA available and could consider if potential risks were presented by chemical interactions and chemicals with a hazard quotient of <10 that had not been addressed by the Navy in the risk-based assessment. The surface soils at Sites 6 and 10 contain relatively few chemicals and could be evaluated with some confidence using the risk-based assessment/ERA coupling. The risk-based assessment/ERA coupling does not work with Site 11 because of the complex behavior of DDT in the environment.

A decision of no action appears to be appropriate for the surface soil at Sites 6 and 10. The inorganic compounds at these sites (selenium and antimony, respectively) present minimal risks to the environment when judged against watershed-specific and Rhode Island soil background concentrations. A decision of no action is not appropriate for the surface soil at Site 11 at this time. Although selenium at this site presents minimal risks to the environment when judged against watershed-specific and Rhode Island soil background concentrations, DDT is present in the soil in sufficient quantities to mandate that a more comprehensive discussion about the potential risks from DDT and related compounds be provided. For all sites, a final decision on no action should be withheld until the HQs/HIs for the site are recalculated to include the newly classified COCs, COCs at the site are grouped according to target organ/mode of action and their

potential to bioaccumulate, and EPA scientists have the opportunity to evaluate the new information.