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FISC WILLIAMSBURG
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U S NAVY ADDITIONAL RESPONSE TO U S EPA REGION III COMMENTS TO DRAFT SITE
INSPECTION REPORT AREAS OF CONCERN 1, 2, 6, 7 AND 8 NWS FISC WILLIAMSBURG

VA
1/3/2012
U S NAVY

Additional Response To Comments

Draft Site Inspection Report

Areas of Concern 1, 2, 6, 7, and 8

**Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA**

January 3, 2012

Initial and additional comments were received by email on August 15, 2011 and December 2, 2011, respectively, from John Burchette, U. S. Environmental Protection Agency (USEPA) Region 3. The Navy's initial and additional responses were provided October 4, 2011 and January 3, 2012, respectively.

Comment provided via email (8/15/11): I have a number of issues with this. Although the general HH Risk screening process provided in appendix A is generally an acceptable and common approach, the document doesn't necessarily follow the process. Many of the chemicals are screened out based on inappropriate screening techniques (inconsistent with EPA Guidance) or judgment calls and not based on scientific evidence. While judgement call may be an acceptable way of proceeding as a site progresses through the CERCLA process, the high level of uncertainty (limited sample coverage) associated with a PA/SI makes these decisions premature.

Response (10/4/11): The human health and ecological risk screenings conducted were carried out under the current USEPA and/or Navy ERA guidance. Based on a review of the available SI analytical data, the proposed paths forward for the various AOCs followed a logical scientific decision analysis and were not based on opinion. While there will always be a certain amount of uncertainty associated with any PA/SI, the Navy believes that the proposed recommendations were made based on sound scientific evidence; for those AOCs where uncertainty exists, further investigation has been proposed.

EPA Email Response (12/2/11): Noted

EPA RPM General Comment 1 (8/15/11): There are a multiple instances in this document that are inconsistent with EPA Guidance and some revisions will need to be made or an explanation should be provided as to why they would be appropriate. Examples would be: averaging groundwater samples, applying dilution attenuation factors directly to groundwater samples (typically DAFs are used for and applied to soil migration to groundwater), screening risks from individual chemical against the 5×10^{-5} cancer and 0.5 HQ screening level (should be cumulative risk for the site not on a per chemical basis), and taking the mean HQ of soil samples and screening them out.

Further, much of the above is not consistent with the Human Health Screening Methodology (A.2) in Appendix A of this document.

Response (10/4/11): The ecological risk screening methodology was outlined in Appendix B, Section B.2, on which there were no comments. Three of the four examples provided in the comment appear to apply to the ecological screenings. The rationale for using mean groundwater concentrations and dilution factors (not DAFs) in the refined step of the ecological groundwater screenings, and mean soil concentrations in the refined step of the ecological soil screenings, are provided in Appendix B, Section B.2. None of the methods used are known to be precluded in EPA or Navy ERA guidance.

In terms of the HHRA, the only time the average groundwater (or soil) concentration is used is when considering lead. This is because the method used to evaluate lead (the IEUBK model) uses the average concentration of lead as the input value for the model. The identification of the potential for carcinogenic risk or hazard is based on the cumulative risk and cumulative hazard (per target organ). However, to understand which constituents contribute the most to these cumulative risks or hazards, we do point out if individual constituents exceed these levels or not, but it is not used to identify if the site may pose an unacceptable risk or hazard or not. These discussions are presented to supply further information about the site and potential contamination detected at the site.

EPA General Comment 1 Response (12/2/11): EPA's initial belief was that the sole purpose of the report was to determine whether further action would be needed at these AOCs. EPA BTAG will now be reviewing the document and appendices due to the potential ramifications of the report (eliminating COPC etc...).

Additional Response (1/3/12): Noted. Also, please note that the draft final document reflects items (e.g., no longer comparing results to maximum background values; explaining the substitute values used when a constituent does not have an ecological screening value; etc.) from the October 26, 2011 and November 7, 2011 conference calls and the November 2011 Partnering meeting discussion. While a refinement of the COPCs (Step 2b) is presented in the report, the recommendations for each AOC (Step 3) are adequate. For example, Step 2b for AOC 8 surface soil did not retain chromium and arsenic as COPCs, based on the argument that chromium was evaluated as hexavalent but is likely in the trivalent form; however, an RI is the recommend path for AOC 8, including collecting soil samples for inorganic analysis.

EPA RPM General Comment 2 (8/15/11): *A number of chemicals which did not have screening values were screened out by being compared to screening values of other similar explosives. Please provide the actual compound they were compared to, the actual screening value used, and how that number was developed. Please revise each instance of this in the document for transparency purposes (note that not all instances of this are noted in the comments).*

Response (10/4/11): For the ecological screenings, there were five instances (all in soil) where this occurred. In these cases, the soil concentrations for the explosives without a screening value were compared with the range of screening values for all other explosives with such values. These values, which are provided in Table B-1, ranged from 2,260 to 80,000 µg/kg (not including perchlorate, which is not technically an explosive). This explanation will be added to the bullets for the five relevant occurrences.

EPA General Comment 2 Response (12/2/11): See EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1. In addition, the explanations have been added to the draft final.

EPA RPM General Comment 3 (8/15/11): *Please include risk screening tables similar to the Example Risk Screening tables (attached) at the end of each Section for transparency purposes. These tables should include all COPCs that passed through the screening process.*

Response (10/4/11): Summary tables listing the COPCs that passed through the screening process at each AOC are included as the final table in each AOC section of the report. Specifically, these COPCs are included in the Decision Summary tables, which include Tables 3-7, 4-4, 5-12, 6-4, and 7-4.

The Decision Summary tables were prepared to consolidate the results of the human health and ecological risk screenings steps. Detailed tables listing the risk screening calculations are included in Appendices A and B.

Since all of the COPCs that passed through the screening process are included in the general Decision Summary tables, as well as in detail within Appendices A and B, the Navy believes that no revision of the risk screening tables is necessary.

EPA RPM General Comment 3 Response (12/2/11): ok

Section 2

EPA RPM Comment 1 (8/15/11): *Page 2-1. Although the investigation methodology etc... from the previous investigation are not included in the report, I assuming all sample data are. Correct?*

Response (10/4/11): The available historical sample data from previous investigations at AOC 1, AOC 2, AOC 6, and AOC 8 are included in Appendix G, Historical Analytical Data. For clarification, the text on page 3-3 will be revised to state:

“With the exception of arsenic (7.4 mg/kg) in sediment, only low, estimated levels of phthalates, ethylbenzene and xylenes near reporting limits were detected in historical surface water and sediment samples (**Tables G-3 and G-4, Appendix G**).”

EPA RPM Comment 1 Response (12/2/11): Please indicate whether the data was included in the risk evaluation.

Additional Response (1/3/12): The report text has been revised to identify the data that was included in the risk evaluations by adding the following sentence to the end of the 3rd paragraph on page 2-1:

“With the exception of the AOC 2 historical data, only the 2008 SI analytical data were used in the human health and ecological risk screenings conducted for AOCs 1, 6, 7, and 8.”

Section 3

EPA RPM Comment 2 (8/15/11): Page 3-13. *This is an incorrect application of dilution attenuation factors. DAF are utilized the project what we may see in groundwater from a soil sample value. Applying a DAF directly to a groundwater sample makes no sense and is not consistent with EPA guidance. Please revise.*

Response (10/4/11): These are dilution factors, not DAFs, as described in Appendix B, Section B.2. Please see the response to General Comment 1.

EPA RPM Comment 2 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1.

EPA RPM Comment 3 (8/15/11): Page 3-15. *Groundwater. It is unclear as to why we would average groundwater samples. Wells should be evaluated on a per well basis.*

Response (10/4/11): The rationale is provided in Appendix B, Section B.2. Please see the response to General Comment 1.

EPA RPM Comment 3 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1.

EPA RPM Comment 4 (8/15/11): Page 3-17. *Eco Risk Evaluation. Eco Risks should be calculated for these sites. Although the size of the sites may be small, they are essentially all habitat (forested cover etc... not a parking lot).*

Response (10/4/11): Potential ecological risks were evaluated for these sites, as provided in Section 3.2.4 and Appendix B. The page referenced in the comment provides a summary of the results. The small size of the sites was included as a factor explaining why the risks are likely to be low (i.e., they would be limited, spatially). Consideration of such factors is consistent with the ecological risk screening methodology provided in Appendix B, Section B.2.

EPA RPM Comment 4 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please note that the Step 3 recommendation does include sampling for inorganics, which covers all of the COPCs for ecological risk at AOC 1, except two - endrin and endrin aldehyde. The highest detections of endrin (3.3J µg/kg) and endrin aldehyde (3.1J µg/kg) in the AOC 1 surface soil are slightly above the ecological screening value (1.95 µg/kg for both) and are well below 50 µg/kg, indicating normal pesticide application.

EPA RPM Comment 5 (8/15/11): Page 3-17. *It is highly unlikely that an Arsenic hit of nearly 50ppm at CAA01-SO04 from Table 3-1 is attributed to background. This is almost an order of magnitude above our background number. Please carry Arsenic through as a COPC.*

Response (10/4/11): While the maximum arsenic concentration of 47.5 L mg/kg in surface soil at CAA01-SO04 exceeded the respective base background UTL for arsenic (6.36 mg/kg) by almost an order of magnitude, the maximum arsenic concentration in this sample did not exceed the maximum base background for arsenic (63.9 mg/kg). As such, the maximum concentration detected in surface soil is likely attributable to natural background conditions, as documented in the first bullet on page 3-5. Based on this information, arsenic was not carried through as a COPC during the risk screening process.

EPA RPM Comment 5 Response (12/2/11): EPA does not agree with eliminating Arsenic as a COPC as part of a SI risk screening process. Please carry through arsenic as a COPC or elevate the issue to tier 2.

Additional Response (1/3/12): As agreed to by the Partnering Team on Nov. 16, 2011, the SI analytical data will not be compared against the maximum background UTLs. The text in Sections 3.2.4, 3.3.2 and 3.3.3 has been revised to remove the former maximum background argument, and arsenic and chromium are now identified as COPCs.

(NOTE: Comment 6 was not provided by the USEPA. Comments proceeded from Comment 5 to Comment 7)

Section 4

EPA RPM Comment 7 (8/15/11): *AOC 2 should be considered a solid waste landfill which would be subject to Virginia State regulations.*

Response (10/4/11): AOC 2 is excluded from regulation under 9 VAC 20-81 by 9 VAC 20-81-35(E) and 9 VAC 20-81 45(B)(2)(f) since it is being remediated under CERCLA and ceased disposal operations prior to regulation.

EPA RPM Comment 7 Response (12/2/11): Noted.

EPA RPM Comment 8 (8/15/11): Page 4-3. *A number of drums were found in the area of AOC2TT05-AOC2TT10, AOC2TT13 and AOC2TT14, yet no samples were collected in this area according to Figures 4-4, 4-5, and 4-6. Please collect samples from this area.*

Response (10/4/11): As documented in Attachment B of the *Final Trenching Letter Report, Site 1, Site 4, and AOC 2* (Baker, 2002), empty 55-gallon drums were observed only in test

trenches AOC2TT13 and AOC2TT14; no drums were observed in test trenches AOC2TT05 through AOC2TT10. No samples were collected during the most recent AOC 2 field investigation in 2001.

Test trenches AOC2TT13 and AOC2TT14 are located within Area 2 (Figures 4-4 and 4-5). Prior to finalization of the Final SI Work Plan, during a phone conversation with CH2M HILL, the Navy RPM, and USEPA on September 12, 2008, the USEPA agreed that no additional sampling at AOC 2 was required during the SI as long as the respirator cartridges were removed. The Navy agreed, and as documented in the Response to Comments on the Draft Final Work Plan submitted to the WPNSTA Yorktown/CAX Partnering Team, "...the Navy plans on conducting a removal action to address the existing respirator cartridges, ...".

Test trenches AOC2TT13 and AOC2TT14 are located within Area 2 that contains the respirator cartridges (Figures 4-4 and 4-5) that will be removed during an EE/CA that will be performed at AOC 2. Since confirmation sampling is planned as part of the EE/CA, the Navy believes sampling of the area where the drums were observed is not necessary.

EPA RPM Comment 8 Response (12/2/11): The text currently states, "In eight of these trenches (AOC2TT05 through AOC2TT10, AOC2TT13, and AOC2TT14) dextrose bottles, some clothing, metal debris, and empty 55-gallon tar coated drums were observed". If drums were only found in two locations, please revise the text. Soil samples should be collected beneath the location of the drums. This can be done as part of the confirmation samples following the removal action discussed on page 4-12.

Additional Response (1/3/12): The drums were only found at two of the test trench locations, AOC2TT13 and AOC2TT14. The text has been revised as follows:

"In six of these trenches (AOC2TT05 through AOC2TT10) dextrose bottles, some clothing, and metal debris were observed and empty 55-gallon tar-coated drums were observed in trenches AOC2TT13 and AOC2TT14."

The locations of test trenches AOC2TT13 and AOC2TT14 are within Area 2 recommended for an interim removal action. As requested, confirmation sampling will be conducted beneath the two locations where the empty drums were observed.

EPA RPM Comment 9 (8/15/11): Page 4-5. "Not considered a CERCLA Source". This is still improper disposal which would be subject to Virginia State regulations.

Response (10/4/11): The debris in Area 1b and Area 3 consists of dextrose bottles, deer carcasses, and military clothes and are not CERCLA-related wastes. Under 9VAC20-81-45(B)(2)(f), the open dump criteria does not apply to sites that are undergoing remediation per the requirements of CERCLA or the RCRA Corrective Action Program and are doing so with the department's and/or the Environmental Protection Agency's oversight. At this time, the Navy believes that the CERCLA action being taken at AOC 2 constitutes sufficient remedial action for the non-CERCLA wastes that were disposed of at the site.

EPA RPM Comment 9 Response (12/2/11): ok

***EPA RPM Comment 10 (8/15/11):** Page 4-6. The PCB discussion states that PCBs were detected above residential screening at the duplicate of A2-TP01, but then goes on to say that Aroclor 1260 was not detected in the soil at A2-TP01. Presumably the original A2-TP01 and its' duplicate were taken from the same location and not separate samples correct? I do realize it is possible for an original sample and a dup. to have different detections, but the paragraph implies one sample was within the waste and one was from the native soil below the waste. Also, it appears an interim removal action will be prepared to remove the waste from Area 2. This should be used as the rationale as to why the Aroclor 1260 detection is not of concern. Confirmation samples following the removal should include PCB analysis due to a high degree of uncertainty associated with the contaminants distribution.*

Response (10/4/11): The report text will be revised to clarify the PCB detection as follows:

“One PCB (Aroclor-1260) was detected in only one subsurface soil sample (310 µg/kg in the duplicate A2-TP01F **at Test Pit TP01**), slightly above the residential RSL (220 µg/kg) (Figure 4-7). However, the primary sample from this location was below screening criteria. **Both of these subsurface soil samples, A2-TP01F and its duplicate,** were collected within the debris zone at approximately 3.5 feet bgs. **However,** Aroclor-1260 was not detected in the native soil sample (A2-TP01N) collected from the bottom of Test Pit TP01 at 5 feet bgs. Therefore, Aroclor-1260 is likely a localized occurrence and not migrating from the debris material. PCBs tend to bind to soil and are not readily mobile.”

While the interim removal action at AOC 2 precludes the Aroclor 1260 detection from being a concern, the interim removal action for AOC 2 is not introduced in the report until p. 4-12. Since mention of this removal action on p. 4-6 would disrupt the logical progression of information being presented in Section 4, this rationale has not been included on p. 4-6.

EPA RPM Comment 10 Response (12/2/11): ok

(NOTE: Comment 11 was not provided by the USEPA. Comments proceeded from Comment 10 to Comment 12)

***EPA RPM Comment 12 (8/15/11):** According to Figure 4-3 there is a “Significant Geophysical Anomaly” in the North West corner of the site that was not investigated.*

Response (10/4/11): Noted. During the 1998 geophysical investigation, a significant metallic response was identified in the EM-61 data in the northwest corner of the AOC 2 geophysical investigation area, as shown in Figure 4-3 of the SI report. However, as documented in Appendix A of the Final Field Investigation Report, Site 1 and AOC 2 (Baker, 1999), this anomaly was not identified as an anomaly that could not be explained by a surface object. Furthermore, the EM-31 quadrature data for AOC 2, also collected during the 1998 geophysical investigation, complemented most of the EM-61 and in-phase responses, but with less resolution. Based on review of the EM-31 data, “increases in terrain conductivity can be seen along the entire western edge of the grid. Although there are no metallic anomalies corresponding to this feature it was

suggested by Baker personnel on site that this is the possible location of an abandoned railroad. The changes in terrain conductivity may be due to a nonmetallic but relatively conductive material that was used for the railroad bed” (Baker, 1999). While the Final Field Investigation Report does not state specifically why this northwest area was not investigated, it is assumed that the northwest anomaly was likely associated with the abandoned railroad bed.

EPA RPM Comment 12 Response (12/2/11): ok

***EPA RPM Comment 13 (8/15/11):** Areas 1b and Area 3 are dumps that don't appear to have to have been sampled according to the figures. Please provide rationale in a RTC as to why this would be acceptable. Presumably the response would be the types of materials disposed would not be expected to create contamination, however, it is highly that any disposing that occurred was an orderly disposal of specific material. Environmental sampling should be conducted to ensure there was no disposal of hazardous materials.*

Response (10/4/11): Based on the AOC 2 test pit and test trenching logs, the debris in Area 1b and Area 3 consists of dextrose bottles, deer carcasses, and military clothes, which are not CERCLA-related wastes. No debris or waste was observed during the trenching activities to propose that hazardous materials were disposed at AOC 2. As such, the Navy does not believe that environmental sampling is necessary.

EPA RPM Comment 13 Response (12/2/11): ok

Section 5

***EPA RPM Comment 14 (8/15/11):** Page 5-4. 1918 Drum Storage Area. EPA suggests samples are collected and analyzed for VOCs, PCBs and Pesticides.*

Response (10/4/11): The constituents sampled for and analyzed during the CAX AOC SI, as listed in the Final SI Work Plan agreed to by the WPNSTA Yorktown/CAX Partnering Team, were based on the review of constituents detected during Weston's 1999 Site Inspection. As documented in the WPNSTA Yorktown/CAX Partnering Team Final 15 November 2007 Meeting Minutes, Rob Thomson (USEPA) requested that phthalates be added to the list of analytes to be sampled at AOC 6 during the SI. As such, SVOCs were added to the Final SI Work Plan. Based on the re-review of the 1999 and current AOC 6 SI analytical data, the Navy believes that no additional sampling and analysis for VOCs, PCBs, and Pesticides at the 1918 Drum Storage Area is necessary.

EPA RPM Comment 14 Response (12/2/11): Is there any historical evidence that suggests no drums or barrels containing any VOCs, PCBs, or Pesticides were not stored in this area (or is there any historical evidence to suggest what was stored onsite)?

Additional Response (1/3/12): Presently, no historical evidence has been found documenting the contents of the drums or barrels in the 1918 Drum Storage Area. Based on a power point presentation dated January 2004 (“Cheatham Annex Penniman AOC Desk Top Study & Discussion Update”, unknown author), a review of a 1918 photograph indicates that wooden kegs, stacked on sides and

empty, are observed. Additionally, the kegs were stored while the shell loading area was active and “Amatol records similar kegs used for storing Ammonium Nitrate”.

No documentation has been found verifying whether or not ammonium nitrate was originally stored in the wooden barrels observed in the 1918 Drum Storage Area. However, explosives were not detected in any of the surface soil, subsurface soil, or groundwater samples collected and analyzed during the 2008 SI.

EPA RPM Comment 15 (8/15/11): Page 5-10. Bis(2-ethylhexyl)phthalate. If the contaminant was likely attributed lab contamination, was it detected in the blanks?

Response (10/4/11): The SVOC Bis(2-ethylhexyl)phthalate was not detected in any of the blanks and was inadvertently identified as exceeding the ecological screening value in the pre-Draft report, which listed the Screening Level Concentration (SLC) screening values as the ecological screening criteria for sediment. The organic chemicals in sediment were actually screened against both SCL screening values and Equilibrium Partitioning (EqP) screening values (adjusted based upon the mean site-specific total organic carbon concentration), if available, as listed in Appendix B, Table B-3. While the pre-draft tables included the SLC as the ecological screening value, the EqP was the actual screening value used for bis(2-Ethylhexyl)phthalate detected in the AOC 6 sediment samples, as listed in Table 5-11.

Specifically, as documented in Appendix B, pp. B-12 through B-13, Bis(2-ethylhexyl)phthalate exceeded the SLC screening value, but not the EqP screening value, based upon the maximum detected concentration. However, neither of these screening values was exceeded in the field duplicate of the one sample that exceeded the SLC screening value (the chemical was not detected in the field duplicate at a reporting limit less than the SLC screening value). Because the EqP screening value accounts for site-specific bioavailability and was not exceeded, this chemical was not identified as an initial COPC.

The text on p. 5-10, carried over from the pre-draft, inadvertently includes the SCL instead of the EqP. Based on this information, Bis(2-ethylhexyl)phthalate was not an initial COPC. Only one SVOC, 2,6-Dinitrotoluene, initially exceeded the ecological screening criteria. The text will be revised to state the following:

“SVOCs and Explosives

One SVOC, **2,6-Dinitrotoluene**, exceeded the **Equilibrium Partitioning (EqP) value of 187 µg/kg** in one **subsurface** sediment sample (**SD02**, near the **Ammonia Settling Pits**) at a concentration of **260 µg/kg**. However, **since the mean HQ for 2,6-Dinitrotoluene was less than one, this constituent was not identified as a refined COPC during the ecological risk screening**. No other SVOCs or explosives exceeded their respective screening criterion in surface and --subsurface sediment samples.”

EPA RPM Comment 15 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1.

EPA RPM Comment 16 (8/15/11): Page 5-12 Ammonia Settling Pits. Check with Rob to make sure the correct chemicals were analyzed for.

Response (10/4/11): No response necessary. As instructed by the USEPA via email on August 23, 2011, this comment was a note by the USEPA reviewer and should be disregarded.

EPA RPM Comment 16 Response (12/2/11): ok

EPA RPM Comment 17 (8/15/11): Page 5-13. Ammonia Settling Pit. Groundwater Discussion. Averaging groundwater samples is not acceptable. See RPM General Comment.

Response (10/4/11): The methodology used to screen and evaluate lead in the HHRS was described in Appendix A, page A-3, as follows “Lead is not evaluated in the same manner as the other COPCs, but is regulated by USEPA based on blood-lead uptake using a physiologically based pharmacokinetic model called the Integrated Exposure Uptake Biokinetic (IEUBK) Model. As a screening tool, lead is screened at 400 mg/kg in soil based on residential exposure. The model uses the average lead concentration, not the maximum detected lead concentration. If the average lead concentration is greater than 400 mg/kg, it is retained as a COPC for the AOC. For groundwater, the maximum detected concentration of lead is screened at 15 µg/L in groundwater based on the federal action level (USEPA, 2009a). If the lead concentrations are greater than the action level, it is retained as a COPC for the AOC.” The use of the average lead concentration is consistent with EPA guidance, as the average concentration is the concentration that is used when lead is evaluated using the IEUBK model.

EPA RPM Comment 17 Response (12/2/11): The maximum detect of lead in groundwater of 22 ug/L exceeds the federal action level. If the detection of lead was from a total metals analysis (and either not detected in the dissolved analysis or detected below the action level), then the case can be made for not carrying lead through as a COPC. However, this case is not presented above.

Additional Response (1/3/12): Lead was not detected in the dissolved phase and a sentence to clarify this has been added to the referenced section. Regardless, the recommended path forward for the Ammonia Settling Pit is to conduct an ESI for groundwater, to include permanent monitoring wells and inorganics analysis, so lead will be evaluated again.

EPA RPM Comment 18 (8/15/11): Page 5-17. Mean HQ for Aluminum and Lead. See RPM General Comment.

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 18 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1. *EPA RPM Comment 19 (8/15/11):* Page 5-17. DAF applied directly to groundwater sample. See EPA RPM General Comment.

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 19 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1.

EPA RPM Comment 20 (8/15/11): Page 5-18. Mean HQ for HMX and Mercury. See EPA RPM General Comment.

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 20 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1.

EPA RPM Comment 21 (8/15/11): Page 5-18. Groundwater discussion. Please see EPA RPM General Comment 1.

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 21 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1.

EPA RPM Comment 22 (8/15/11): Page 5-19. Surface Soil. Bullets 1,2, and 3. See EPA RPM General Comments.

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 22 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1.

EPA RPM Comment 23 (8/15/11): Penniman Lake Surface Water Discussion. The argument that the screening level of 4ppb for barium is conservative should be overcome by the fact that we exceeded it by nearly 5x as well as it being detected at multiple locations. Please refine Barium as a COPC in surface water.

Response (10/4/11): The surface water screening value for barium (4 µg/L) is conservative because it is based upon a form of barium (barium ion) that is relatively uncommon in natural

water bodies but very toxic, while the surface water sample was measured for total barium. For comparison, the USEPA Region 5 freshwater screening value for total barium is 200 µ/L, which is much higher than the concentrations found in the lake (which ranged from about 15 to 20 µ/L). This explanation will be added to the text of the SI and barium will not be identified as a COPC.

EPA RPM Comment 23 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1. Also, please note, an RI for Penniman Lake is planned; therefore, any future surface water or sediment work would be conducted under that project and not as part of any follow-up investigation for AOC 6. The Partnering Team discussed and agreed to this approach during November 2011 Partnering.

Section 6

EPA RPM Comment 24 (8/15/11): Page 6-5. Lead 984ppm. See EPA RPM General Comments.

Response (10/4/11): Please see the response to Comment 17.

EPA RPM Comment 24 Response (12/2/11): Additional sampling should take place in the NW portion of the site near CAA07-SO03.

Additional Response (1/3/12): A removal action to address surface soil inorganic contamination around location SO03 is recommended. Confirmation samples will be collected.

EPA RPM Comment 25 (8/15/11): Page 6-6. Groundwater. Lead. See RPM General Comments.

Response (10/4/11): Please see the response to Comment 17.

EPA RPM Comment 25 Response (12/2/11): The maximum detect of lead in groundwater is 31 ug/L which exceeds EPAs screening value for lead. Typically the argument can be made that lead wasn't detected in the dissolved metals analysis. However, it doesn't appear dissolved lead was analyzed (?). Please carry through lead as a COPC, resample the wells for dissolved lead, or elevate the issue to tier 2.

Additional Response (1/3/12): The AOC 7 groundwater samples were analyzed for dissolved lead; however, the concentrations of dissolved lead were all “B” qualified, indicating that lead was not detected above the level reported in the blanks. Based on the average concentration of total lead, 10 ug/L, which is below the 15 ug/L lead screening level, lead was not carried through as a COPC in groundwater at AOC 7. Nonetheless, the recommended path forward for AOC 7 groundwater is an ESI, including the installation of permanent monitoring wells and inorganic analysis, so lead will be evaluated again.

EPA RPM Comment 26 (8/15/11): Page 6-7. Subsurface Soil. See RPM General Comments.

Response (10/4/11): Please see the response to General Comment 2.

EPA RPM Comment 26 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1.

EPA RPM Comment 27 (8/15/11): Page 6-8. Groundwater. See EPA RPM General Comment.

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 27 Response (12/2/11): Please see EPA General Comment 1 Response

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1.

EPA RPM Comment 28 (8/15/11): Page 6-8. Second to last word. Typo.

Response (10/4/11): Corrected. The second to last word in the final sentence on p. 6-8, “work”, has been revised to “word”.

EPA RPM Comment 28 Response (12/2/11): Thank you.

EPA RPM Comment 29 (8/15/11): Former Drum Pile. Was GPR performed on this AOC (I may have missed it)?

Response (10/4/11): No, GPR has not been conducted in the vicinity of the Former Drum Disposal Area.

EPA RPM Comment 29 (12/2/11): ok

EPA RPM Comment 30 (8/15/11): Figure 6-4. From Figure 6-4 it does not appear that the actual nature of the pit has been characterized (although extent appears to have been defined). Since the path forward for the Site is a removal action, the only comment would be to analyze for a full suite of analytes during confirmation samples.

Response (10/4/11): An expanded SI is recommended for AOC 7 (Drum Disposal and Can Pit Area) in order to verify the groundwater flow directions and to verify and characterize the extent of inorganic contamination. As indicated by the current SI analytical data, no VOCs, SVOCs, pesticides, PCBs, or explosives were detected above screening criteria in soil, and no SVOCs, pesticides, PCBs, or explosives were detected above screening criteria in groundwater. Only one VOC exceeded screening criteria in groundwater.

Prior to preparing the expanded SI work plan, the current SI analytical data will be reviewed and a focused list of analytes will be recommended based on the recent detections.

EPA RPM Comment 30 Response (12/2/11): The “current analytical data” consists of what appears to be only 1 sample within the actual footprint of the can pit. Constituents should not be eliminated based on 1 sample.

Additional Response (1/3/12): Sorry that the previous response discussed the path forward for the AOC 7 groundwater and did not address Comment 30. Yes, there was one sample location within the can pit, from which two soil samples (surface and subsurface) were collected. The footprint of the can pit is rather small (~30 feet long and 20 feet wide); therefore, the sample is representative of conditions and can be considered “worst case scenario.” The recommendation for the can pit is a removal action with confirmation sampling. The recommended confirmation sampling is for inorganic constituents, not full suite. The Navy feels it is acceptable to leave the SI recommendations as they are and let the Partnering Team discuss the confirmation sample analyte list during the EE/CA preparation.

Section 7

EPA RPM Comment 31 (8/15/11): Page 7-7. Mean Zinc. See RPM General Comments.

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 30 Response (12/2/11): Please see EPA General Comment 1 Response

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1.

EPA RPM Comment 32 (8/15/11): Page 7-8. Groundwater. See RPM General Comments.

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 32 Response (12/2/11): see the response to General Comment 1.

Additional Response (1/3/12): Noted. Also, please see the “Additional Response” to EPA General Comment 1.

Appendix A

EPA RPM Comment 33 (8/15/11): Page A-5. AOC 1 South. Lead 698ppm. See EPA RPM General Comment.

Response (10/4/11): Please see the response to Comment 17.

EPA RPM Comment Response 33 (12/2/11): Lead should be stepped out to the East.

Additional Response (1/3/12): The recommended path forward for AOC 1 South is an ESI to further verify and characterize the extent of SVOC (PAHs) and inorganic contamination “hot spot” areas; therefore, lead will be evaluated again. As far as sample locations are concerned, those details will be worked out during the ESI scoping session and included in the ESI UFP-SAP. The Navy feels it is acceptable to leave the SI recommendations as they are and let the Partnering Team discuss the sample locations during the ESI scoping session.**EPA RPM Comment 34 (8/15/11):** Page A-7. Iron discussion. This doesn’t make sense. Although Iron is an essential human nutrient, there is some science that went in to the development HQ and screening values developed. If a chemical is exceeding the screening values we can’t say “it is likely that exposure to iron at the concentrations present on the site would not result in any adverse health

effects”. That is essentially questioning the science that went in to the development of the risk numbers. Please revise.

Response (10/4/11): We will revise the paragraph discussing iron as follows to indicate that the maximum detected iron concentration would not result in an intake above the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population. The following text will be added to Page A-7:

“Iron, the only contributor to the potential noncarcinogenic hazard is considered an essential human nutrient, and although the concentrations indicate a potential unacceptable hazard, it is likely that exposure to iron at the concentrations present on site would not result in any adverse health effects. The potential unacceptable hazard is primarily associated with the iron concentration detected in sample CAA02-A2-DPB03-00-1098. Ingestion of soil at the maximum detected concentration of iron [44,000 mg/kg, which would result in ingestion of 8.8 mg/day iron for an adult (44,000 mg/kg x ingestion rate of 200 mg/day x conversion factor of kg/10⁶ mg)], is below the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 18 mg/day iron (44,000 mg/kg x ingestion rate of 400 mg/day x conversion factor of kg/10⁶ mg), which is below the UL of 40 mg/day for children.”

EPA RPM Comment 34 Response (12/2/11): ok

Additional Response (1/3/12): Also note that although the main text may state the exposure to iron is not likely to have adverse effects, iron is carried through as a COPC.

EPA RPM Comment 35 (8/15/11): Page A-7. Doesn't the RAGs Guidance caution against screening something out (Thallium) because it doesn't have a screening criteria? I believe it should be carried through.

Response (10/4/11): Thallium was not carried through the screening tables because it was not possible to estimate any contribution to the cumulative hazard/risk associated with thallium. Between the draft and draft final document, the latest RSL update (June 2011) became available, and there are now RSLs for thallium. The thallium detections for all media for all AOCs were compared (not risk screened) to the new thallium RSLs:

- Res. Soil RSL: listed as .78 mg/kg, adjusted value .078 mg/kg
- Ind. Soil RSL: listed as 10 mg/kg, adjusted value 1 mg/kg
- GW Tapwater RSL: listed as .37 µg/L, adjusted value .037 µg/L
- SW RSL: listed as 3.7 µg/L, adjusted value 0.37 µg/L

The thallium concentrations exceeded the respective RSL for these AOCs and media and could potentially be a COPC:

AOC 2:

- Thallium in **SB** - sample CAA02-A2-TP02-N-1999 (0.84 L mg/kg)
- Total thallium in **GW** - samples CAA02-A2DPW01-1098 (1.2 L µg/L) and CAA02-A2DPW02-1098 (2 J µg/L)

AOC 6 – 1918 Drum Storage Area:

- Total thallium in **SB** - sample CAA06-SB16-1108 (0.08 J mg/kg)
- Total thallium in **GW** - samples CAA06-DW09-1108 (2.1 J UG/L), CAA06-DW10P-1108 (1.7 J µg/L), CAA06-DW11-1108 (2.2 J µg/L)
- Dissolved thallium in **GW** - sample CAA06-DW09-1108 (2 J µg/L)
-

AOC 6 TNT Areas:

- Thallium in **SS** – sample CAA06-SS03-1008 (0.18 J mg/kg)
- Thallium in **SW** - sample CAA06-SW01-1008 (1.7 J µg/L)

AOC 8:

- Thallium in **SS** - sample CAA08-SS01-1008 (0.08 J mg/kg)
- Dissolved thallium in **GW** - sample CAA08-DW04-1008 (1.9 J µg/L)

For AOC 2, thallium was not detected in the dissolved metals fraction in groundwater, thus the total results are likely attributable to suspended solids. The subsurface soil location where thallium exceeded the RSL is within the removal area that will be in the interim removal action area. Therefore, no change to the recommendations for AOC 2 is necessary.

For the AOC 6 – 1918 Drum Storage Area, since the SI recommendation was no further action, the human health risk screening for this area was re-run using the June 2011 RSLs (for all constituents, including thallium). Results of the updated risk screening continue to indicate that exposure to surface and subsurface soil within the 1918 Drum Storage Area would not result in any unacceptable risks. While exposure to groundwater could result in potential unacceptable human health risks, associated with exposure to metals, this potential risks is based on total inorganics detected in the groundwater; however, the DPT method generally results in higher total inorganic concentrations from the higher turbidity. Aluminum was the only inorganic detected in the dissolved fraction and is likely attributable to background; therefore, no unacceptable human health risk above background is expected for groundwater. The no further action recommendation is still appropriate and no change to the SI report is necessary.

For the AOC 6 – TNT Areas surface soil, an RI is the recommended path forward for the AOC; thus, thallium will be evaluated as part of the HH risk assessment. Regarding the surface water sample, the total thallium concentration exceeds the surface water screening level (adjusted tap water RSL times ten, 0.37 µg/L), but does not exceed the unadjusted screening level (tap water RSL times ten, 3.7 µg/L). In addition, thallium was not detected in the dissolved fraction. No change to the SI report is necessary.

For AOC 8, the surface soil sample thallium concentration listed above was within the range of the residential RSL (considering significant figures). Regarding the AOC 8 groundwater, an RI is the recommended path forward; thus, thallium will be evaluated as part of the HH risk assessment and no change to the SI report is necessary.

The text in the individual AOC sections and Appendix A (the HH risk screen) will be revised, as appropriate, to reflect that there are now RSLs for thallium and the comparison to them and conclusions presented above. For the AOC 6 Drum Storage Area, the text, tables, and figures will be updated to reflect the revised HH risk screen.

EPA RPM Comment 36 (8/15/11): Page A-7. Aroclor-1260. Should be cumulative risk. See EPA RPM General Comments.

Response (10/4/11): Agree. However, the point of this paragraph is to show that the risk is primarily associated with chromium, based on the assumption that all of the chromium is in the hexavalent form, and to identify the relative contribution from each of the carcinogenic COPCs.

EPA RPM Comment 36 Response (12/2/11): Page A-7 Subsurface soil. I do not understand the point of the final paragraph on page A-7. The prior paragraph states Aroclor 1260, arsenic, chromium, copper and iron were retained as COPCs (which is fine). However, the following paragraph goes on to discuss the individual risk associated with each individual compound stating they are within the acceptable level. (I do not believe the cumulative risk was within the acceptable range? That is the primary issue). For clarification, were Aroclor 1260, arsenic, chromium, copper and iron retained as COPCs?

Additional Response (1/3/12): Yes, they are retained as COPCs (see main text, page 4-12).

EPA RPM Comment 37 (8/15/11): Page A-10. Ammonia Settling Pit Area. Lead. See RPM General Comments.

Response (10/4/11): Please see the response to Comment 17.

EPA RPM Comment 37 Response (12/2/11): Please see the Comment 17 Response.

Additional Response (1/3/12): Please see the additional response provided to the Comment 17 Response.

EPA Tox Comment 1 (8/15/11): *In Section 2.4 of the report, the text should confirm that surface and subsurface soil samples were collected from original soil (not fill material), where contamination, if any, would likely be found.*

Response (10/4/11): For clarification, the report text in Section 2.4 will be revised as follows:

“Surface soil samples were collected from **native soil** 0 to 6 inches below ground surface (bgs) and shallow subsurface samples were collected from 6 to 24 inches bgs. In addition, **non-native** deep subsurface soil samples were collected at AOCs 7 and 8 from the bottom of test pits considered to be most impacted by debris. The purpose of these additional subsurface samples was to determine the potential for vertical migration of contaminants from buried debris.”

EPA Tox Comment 1 Response (12/2/11): Thank you, the response to comment is acceptable.

Additional Response (1/3/12): The above text revision indicates non-native deep subsurface soil samples were collected at AOC 7 and that is not the case, as the vertical extent of waste was delineated at AOC 7. Therefore, the above revision has been further refined as follows:

“Surface soil samples were collected from native soil 0 to 6 inches below ground surface (bgs) and shallow subsurface samples were collected from 6 to 24 inches bgs. In addition, deep subsurface soil samples were collected at AOC 7 (native subsurface soil samples CAA07-SBTP04-1008, CAA07-SBTP06-1008, and CAA07-SBTO05-1008) and AOC 8 (native subsurface soil samples CAA08-SBTP14-1008 and CAA08-SBTP24-1008; non-native soil sample CAA08-SBTP19-1008) from the bottom of test pits considered to be potentially impacted by debris. The purpose of these additional subsurface samples was to determine the potential for vertical migration of contaminants from buried debris.”

EPA Tox Comment 2 (8/15/11): *According to Table 2-1, in terms of organics, only TCL SVOCs were considered at AOC 6. Why wasn't the full TCL suite considered? This could represent a data gap. Fortunately, most of the subareas in AOC 6 will move forward for additional investigation; however, the 1918 Drum Storage Area dropped out. Unless strong justification can be provided for this omission, consideration should be given to collecting additional samples from the 1918 Drum Storage Area to rule out the presence of VOCs, PCBs and pesticides in soil.*

Response (10/4/11): Please see the response to Comment 14.

EPA Tox Comment 2 Response (12/2/11): Thank you, the response to comment is acceptable.

EPA Tox General Comment (12/2/11): As we've discussed (both in-house and on a conference call with the Navy), there seems to be a protocol in place for evaluating Cheatham sites at the SI stage. That's fine, assuming that all partners agree with the established decision tree. However, it seems that when sites fail the screening, the Navy introduces additional (and not necessarily scientifically-sound) screening parameters to justify NFA. I understand that no one wants to unnecessarily propel sites into an RI, but we also can't allow sites that pose potentially significant risks to slip through the cracks. Further, if data gaps exist, they need to be filled (perhaps through an Extended SI) before a final conclusion can be drawn. Bottom line, risk

management calls should primarily be reserved for situations where a site is well characterized and informed decisions can be made.

Response to New EPA Tox General Comment (1/3/12): From the start of this project, the CAX Partnering Team has discussed and agreed upon the course of action for investigating these AOCs. Along the way, there have been three different Navy RPMs and three different EPA RPMs. It's possible successors did not have a clear understanding of past decisions, but the Navy has not acted as a sole decision agent. This SI evaluates five AOCs, which includes two subareas for one AOC (AOC 1) and four subareas for another (AOC 6). In total, eight areas are evaluated. Of these eight, only two have an NFA recommendation – AOC 2 (groundwater portion only) and AOC 6 1918 Drum Storage subarea (soil and groundwater). We feel sufficient data and scientifically-sound reasons for NFA do exist. In addition, at the November 2011 Partnering meeting, the Team discussed and agreed to conducting a risk assessment using existing data to demonstrate that NFA is appropriate; if there is a data gap, it will be presented and resolved. The SI recommendations are appropriate, and the details of the follow-on work can be ironed out later.

TABLE ES-1

Summary of Conclusions and Recommendations

Site Inspection Report: CAX AOCs 1, 2, 6, 7, and 8

Cheatham Annex, Williamsburg, Virginia

Site Name	Site Description	Site History	Potential Source(s)	Potential Release Mechanism(s)	Site-specific Data Collected	Results of 3-step Decision Analysis	Recommendations
AOC 1	Scrap Metal Dump	Unpermitted disposal area reportedly used for the disposal of scrap metal, some debris dating back to the WWI era. During 1998 site visits, two corroded, empty cylinders were observed, labeled "The Liquid Carbonic Co" (cylinders were removed from AOC 1 in April 2000).	Surficial and buried debris within two ravines denoted as AOC 1 North and AOC 1 South in this Site Inspection (SI) Report	Leaching of constituents from surficial and buried debris into soil and groundwater	11 surface soil, 10 subsurface soil, and 3 groundwater samples were collected from AOC 1 North, and 8 surface soil, 8 subsurface soil, and 4 groundwater samples were collected from AOC 1 South	The data suggest the extent of debris has been sufficiently characterized at AOC 1. Exposure to PAHs and zinc in surface soil and inorganics in groundwater may result in potential unacceptable risk to human health and the environment at AOC 1 North. Exposure to PAH's and inorganics in surface soil and inorganics in subsurface soil and groundwater may result in potential unacceptable risk to human health and the environment at AOC 1 South. Additional soil samples at AOC 1 will need to be collected to further characterize the extent of PAH and inorganic contamination in localized "hot spot" areas, as well as collection of surface water and sediment samples at AOC 1 South to determine if PAHs and inorganics have impacted these media. In addition, additional groundwater data is needed to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction.	Conduct an Expanded Site Inspection (ESI) at AOC 1 to further characterize the extent of PAHs and inorganics in soil within localized "hot spot" areas, as well as to determine if PAHs and inorganics have impacted surface water and sediment at AOC 1 South. In addition, permanent monitoring wells are recommended to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction.
AOC 2	Dextrose Dump	Unpermitted disposal area containing foundation piers associated with the former Penniman Shell Loading Plant (PSLP) Shipping House. Buried dextrose bottles, respirator cartridges, several unlabeled, empty 55-gallon drums, and military clothing present.	Surficial and buried debris including drums, respirator cartridges, and dextrose bottles	Leaching of constituents from surficial and buried debris into soil and groundwater	10 surface soil, 18 subsurface soil, and 4 groundwater samples were collected from AOC 2 during historical investigations	The data suggest the extent of debris and groundwater contamination have been sufficiently characterized at AOC 2. Exposure to 4,4'-DDT, mercury, and iron in surface soil, and mercury in subsurface soil, may result in potential unacceptable risks to the environment (potential ecological receptors). Thallium exceeded human health screening criteria in one subsurface sample location; however, this location is within the proposed removal action Area 2. Additional soil samples will need to be collected to further characterize the extent of mercury in surface and subsurface soil.	Conduct an Interim Removal Action to remove debris in Area 2. In addition, collect surface and subsurface soil samples and analyze for hexavalent chromium to determine if the removal action should include arsenic and chromium "hot spots" (if chromium is in the trivalent form, neither chromium nor arsenic would be HH COPCs). Also, collect surface and subsurface soil samples and analyze for mercury to determine if the concentrations are background or a laboratory artifact and if the removal action should include mercury "hot spots." Lastly, collect surface soil samples and analyzed for pH to determine if iron does pose a potential ecological risk. NFA for groundwater.
AOC 6	1918 Drum Storage Subarea	This subarea was formerly used for the storage of wooden barrels and 55-gallon drums when the shell loading facility was active; however, documentation regarding the contents of these barrels and drums is unknown.	Wooden barrels and/or 55-gallon drums, formerly stored at this subarea	Discharge to ground surface; leaching from soil into groundwater; surface runoff into Penniman Lake	6 co-located surface and subsurface soil samples, and 3 groundwater samples were collected from this subarea	The data suggest the extent of soil and groundwater contamination have been characterized within the 1918 Drum Storage Subarea. Exposure to surface soil, subsurface soil, and groundwater does not pose any potential unacceptable risk to human health or the environment above background conditions and no additional sampling is required.	NFA for all media (soil and groundwater).
	Ammonia Settling Pits Subarea	This subarea is comprised of three buildings associated with the former PSLP; ammonia settling occurred in Building 123, ammonia evaporating occurred in Building 124, and ammonia finishing occurred in Building 125. Documentation listing the specific details of these processes as well as the date(s) these processes were conducted in these buildings is unknown.	Operations formerly conducted in this subarea	Discharge to ground surface; leaching from soil into groundwater; surface runoff into Penniman Lake	5 co-located surface and subsurface soil samples and 3 groundwater samples were collected from this subarea. 1 co-located surface water and sediment samples were collected from Penniman Lake, adjacent to this subarea.	The data suggest the extent of soil, surface water, and sediment contamination have been characterized within the Ammonia Settling Pits Subarea. Exposure to inorganics in groundwater may result in potential unacceptable risk to human health and the environment. Additional groundwater data is needed to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction.	Conduct an Expanded Site Inspection (ESI) to install permanent monitoring wells to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction. Since no potential unacceptable risk were identified for exposure to surface water and sediment, no additional sampling of Penniman Lake will be conducted.
	TNT Graining House Sump and Catch Box Ruins Subarea	The TNT Graining House Sump and Catch Box Ruins were formerly used as a sump and for settling out TNT particles from wastewater associated with the TNT Graining House (Building 121). Documentation listing the specific details of these processes as well as the date(s) these processes were conducted in Building 121 is unknown.	Operations formerly conducted in this subarea	Discharge to ground surface; leaching from soil into groundwater; surface runoff into Penniman Lake	7 co-located surface and subsurface soil samples and 4 groundwater samples were collected from this subarea. 1 co-located surface water and sediment samples were collected from Penniman Lake, adjacent to this subarea	The data suggest the extent of surface water and sediment contamination have been sufficiently characterized within the TNT Graining House Sump and TNT Catch Box Ruins Subareas. Exposure to SVOCs, explosives, and inorganics in soil, and inorganics in groundwater, may result in potential unacceptable risks to human health and the environment. Since the extent of SVOCs, explosives and inorganic contamination in soil and inorganic contamination in groundwater have not been sufficiently characterized, additional samples will need to be collected to characterize the nature and extent of SVOCs, explosives, and inorganics in these media.	Conduct an RI to characterize the nature and extent of contamination within soil (SVOCs, explosives and inorganics) and groundwater (inorganics - total and dissolved) and to quantify the risk associated with these media. Since no potential unacceptable risk was identified for exposure to surface water and sediment, sampling of Penniman Lake as part of the RI will not be conducted.
AOC 7	Drum Disposal and Can Pit Areas	Two unlined, nonpermitted disposal areas whose date(s) of debris disposal is unknown. Debris identified within the former Drum Disposal Area included empty 55-gallon drums, while debris identified within the Can Pit included amber glass Clorox bottles and 4-inch tall clear bottles buried below the 5-gallon rusted cans. The can labeling contained the word "tetrachloroethane."	A former surficial 55-gallon drum and buried 5-gallon cans	Discharge to the ground surface from the former 55-gallon drum and 5-gallon cans to ground surface; leaching from soil to groundwater	10 test pits were installed to determine the vertical and horizontal extent of debris; 7 co-located surface and subsurface soil samples and 4 groundwater samples were collected	The data suggest the extent of debris has been sufficiently characterized at AOC 7. Exposure to lead, manganese, and zinc in surface soil may result in potential risks to the environment (ecological receptors) and exposure to ethylbenzene and inorganics in groundwater may result in potential unacceptable risks to human health at AOC 7. Additional groundwater data is needed to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction.	Conduct an Expanded Site Inspection (ESI) to install permanent monitoring wells to confirm the results of elevated ethylbenzene and inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction. In addition, conduct an Interim Removal Action to remove buried debris and to mitigate surface soil inorganic contamination in the Can Pit and to mitigate surface soil inorganic contamination at a localized hot spot within the former Drum Disposal Area.

TABLE ES-1

Summary of Conclusions and Recommendations

Site Inspection Report: CAX AOCs 1, 2, 6, 7, and 8

Cheatham Annex, Williamsburg, Virginia

Site Name	Site Description	Site History	Potential Source(s)	Potential Release Mechanism(s)	Site-specific Data Collected	Results of 3-step Decision Analysis	Recommendations
AOC 8	Unnamed AOC south of Site 7	An unlined, nonpermitted disposal area whose date(s) of debris disposal are unknown. Debris identified at AOC 8 during the SI includes wood, concrete, glass, plexiglass, various metal debris (wire, piping, fencing, bars, rods, chains), construction debris (bricks, burned and unburned wood, nails, burlap, plexiglass shards), a chalky, blue powder, steel cylinders, a metal container, and cable.	Surficial and buried debris	Leaching of constituents from surficial and buried debris into soil and groundwater	26 test pits were installed to determine the vertical and horizontal extent of debris; 9 co-located surface and shallow subsurface soil samples and 4 groundwater samples were collected throughout the site; 3 deep subsurface soil samples were collected from the 3 test pits with the most extensive debris	The data suggest the extent of buried debris, soil and groundwater have not sufficiently been characterized at AOC 8. Exposure to surface and buried debris, benzo(b)fluoranthene and Aroclor-1260 in soil and PCE in groundwater may result in potential unacceptable risks to human health. Since the extent of buried debris has not been characterized, additional test pitting activities are needed to characterize its extent. In addition, additional samples will need to be collected to characterize the nature and extent of benzo(b)fluoranthene and Aroclor-1260 in soil and additional samples will need to be collected to characterize the nature and extent of PCE and arsenic in groundwater.	Conduct an RI to characterize the nature and extent of contamination within soil (PAHs, PCBs, and inorganics) and groundwater (VOCs and inorganics - total and dissolved), quantify the risks associated with these media, and verify groundwater flow direction. Additional test pitting is recommended to determine the horizontal extent of buried debris at AOC 8 (due to the depth of debris, vertical delineation may not be possible) and to verify the presence/absence of buried debris outside the bermed area. Since the extent of the southern area of buried debris was not delineated, collection of additional soil samples is recommended in this area.

TABLE 3-7
AOC 1 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Step 1			Step 2a Exceedances of Comparison Criteria?	Step 2b Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3 Is Further Investigation or Action Required?
	Site Potentially CERCLA-eligible?	Inorganics Above Background or Non-inorganics Detected?	Potentially Attributable to CERCLA Release?			
AOC 1 North Surface Soil	Yes	VOCs	Yes	No	N/A	Yes - an Expanded SI for AOC 1 North is recommended to further verify and characterize the extent of SVOC (PAH) and inorganic contamination in the localized surface soil "hot spot" areas. Specifically: 1. Collect surface soil and analyze for SVOCs (PAHs), inorganics, and hexavalent chromium. 2. Install permanent monitoring wells, collect groundwater, and analyze for total and dissolved inorganics. Additionally, verify the groundwater flow direction. Note: No further investigation of subsurface soil is recommended.
		SVOCs	Yes	Yes - 5 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, ideno(1,2,3-cd)pyrene - potential HH risks only). Also, benzaldehyde was identified as an initial eco COPC since it did not have an available screening value.	Yes - 5 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, ideno(1,2,3-cd)pyrene - potential HH risks only)	
		Pesticides	Yes	Yes - 2 pesticides (endrin, endrin aldehyde - potential eco risks only)	No (concentrations below 50 ppb)	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
AOC 1 North Subsurface Soil	Yes	VOCs	Yes	No; however, 2-butanone was identified as an initial eco COPC since no screening value was available	N/A	
		SVOCs	Yes	No	N/A	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	No	N/A	
		Explosives	No (no detections)	No	N/A	
Inorganics	Yes	Yes - 3 inorganics (Al [potential HH and eco risks]; As, Co [potential HH risks])	No, based on results of HH and eco risk screenings			
AOC 1 North Groundwater	Yes	VOCs	Yes	No	N/A	
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	No (no detections)	N/A	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 13 total inorganics (Al, Fe, Mn, As, Ba, Be, Cr, Co, Cu, Pb, Ni, Se, V [potential HH risks]) and 3 dissolved inorganics (Al, Fe, Mn [potential eco risks])	Yes - 12 total inorganics (Al, As, Ba, Be, Cr, Co, Cu, Fe, Pb, Mn, Se, V - potential HH risks only)	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

TABLE 3-7
AOC 1 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and t
Cheatham Annex
Williamsburg, Virginia

Medium	Step 1			Step 2a Exceedances of Comparison Criteria?	Step 2b Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3 Is Further Investigation or Action Required?
	Site Potentially CERCLA-eligible?	Inorganics Above Background or Non-inorganics Detected?	Potentially Attributable to CERCLA Release?			
AOC 1 South Surface Soil	Yes	VOCs	Yes	No; however, 2 VOCs (2-butanone, acetone) were identified as initial eco COPCs since no screening values were available	No, based on results of eco risk screening	Yes - an Expanded SI of AOC 1 South is recommended to further verify and characterize the extent of SVOC (PAH) and inorganic contamination in the localized surface and subsurface "hot spot" areas. Specifically: 1. Collect surface and subsurface soil and analyze for SVOCs (PAHs) and inorganics. Include hexavalent chromium as part of the surface soil analyses. 2. Install permanent monitoring wells, collect groundwater, and analyze for total and dissolved inorganics. Additionally, verify the groundwater flow direction. 3. Collect surface water and sediment and analyze for SVOCs (PAHs) and inorganics to determine if there has been an impact to these media.
		SVOCs	Yes	Yes - 5 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, ideno(1,2,3-cd)pyrene - potential HH risks only). Also, carbazole was identified as an initial eco COPC since it did not have an available screening value.	Yes - 5 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, ideno(1,2,3-cd)pyrene - potential HH risks only)	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 9 inorganics (As, Mn [potential HH and eco risks]; Al, Cr, Fe [potential HH risks]; Cu, Pb, Hg, Zn [potential eco risks])	Yes - 3 inorganics (Pb, Mn, Zn - potential eco risks only)	
AOC 1 South Subsurface Soil	Yes	VOCs	Yes	No; however, 3 VOCs (2-butanone, carbon disulfide, acetone) were identified as initial eco COPCs since no screening values were available	No, based on results of eco risk screening	
		SVOCs	Yes	Yes - 3 SVOCs (benzo(a)pyrene, benzo(b)fluoranthene, ideno(1,2,3-cd)pyrene - potential HH risks only)	No, based on results of HH risk screening	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 9 inorganics (Fe, Pb, Mn [potential HH and eco risks]; Al, Sb, As, Co [potential HH risks]; Cu, Zn [potential eco risks])	Yes - 3 inorganics (Sb, Pb - potential HH risks only; Zn - potential eco risk only)	
AOC 1 South Groundwater	Yes	VOCs	Yes	No	N/A	
		SVOCs	Yes	No	N/A	
		Pesticides	No (no detections)	N/A	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 7 total inorganics (Al, Fe, Pb, Mn, As, Cr, V [potential HH risks]) and 5 dissolved inorganics (Al, Ba, Fe, Pb, Mn [potential eco risks])	Yes - 7 total inorganics (Al, As, Cr, Fe, Pb, Mn, V - potential HH risks) and 1 dissolved inorganic (Fe - potential eco risk)	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

TABLE 4-4

AOC 2 Decision Summary

Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8

Cheatham Annex

Williamsburg, Virginia

Medium	Site Potentially CERCLA-eligible?	Step 1		Step 2a Exceedances of Comparison Criteria?	Step 2b Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3 Is Further Investigation or Action Required?
		Inorganics Above Background or Non-inorganics Detected?	Potentially Attributable to CERCLA Release?			
AOC 2 Surface Soil	Yes	VOCs	No (no detections)	N/A	N/A	Yes - conduct an interim removal action to remove the Area 2 waste (drums and respiratory cartridges) and collect post removal soil samples. Collect surface and subsurface soil samples and analyze for hexavalent chromium to determine if the removal action should include arsenic and chromium "hot spots" (if chromium is in the trivalent form, neither chromium nor arsenic would be HH COPCs). Collect surface and subsurface soil samples and analyze for mercury to determine if the concentrations are background or a laboratory artifact and if the removal action should include mercury "hot spots."
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	Yes	Yes - 2 pesticides (4,4'-DDE and 4,4'-DDT - potential eco risks only)	Yes - 4,4'-DDT (potential eco risk only)	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 6 inorganics (As [potential HH and eco risks]; Cr, Fe, V [potential HH risks]; Hg, Se [potential eco risks]). Also, Fe was identified as an initial eco COPC since no pH data was available	Yes - 1 inorganic (Hg - potential eco risk only). Additionally, Fe was retained as an eco COPC since pH data was not available.	
AOC 2 Subsurface Soil	Yes	VOCs	No	N/A	N/A	Collect surface and subsurface soil samples and analyze for mercury to determine if the concentrations are background or a laboratory artifact and if the removal action should include mercury "hot spots."
		SVOCs	No	N/A	N/A	
		Pesticides	Yes	Yes - 1 pesticide (4,4'-DDE - potential eco risk only)	No, based on eco risk screening	
		PCBs	Yes	Yes - 1 PCB (Aroclor-1260 - potential HH risk only)	No, based on HH risk screening	
		Explosives	No	N/A	N/A	
		Inorganics	Yes	Yes - 11 inorganics (As, Fe [potential HH and eco risks]; Al, Cd, Cr, Co, Cu, Th, V [potential HH risks]; Hg, Se [potential eco risk])	Yes - 2 inorganics (Hg - potential eco risk only; Th - potential HH risk only)	
AOC 2 Groundwater	Yes	VOCs	No	N/A	N/A	Collect surface soil samples and analyzed for pH to determine if iron does pose a potential ecological risk. NFA for groundwater. Note: The one exceeding detection of 4,4'-DDT in surface soil and the HH COPCs in surface and subsurface soil, except for arsenic and chromium, are located in Area 2, where the proposed removal action will be conducted.
		SVOCs	No	N/A	N/A	
		Pesticides	No	N/A	N/A	
		PCBs	No	N/A	N/A	
		Explosives	No	N/A	N/A	
		Inorganics	Yes	Yes - 12 total inorganics (Al, As, Be, Cd, Cr, Co, Fe, Pb, Mn, Ni, Th, V - potential HH risks only)	No - 2 total inorganics (As and Mn) exceed the HH risk value, but can risk manage	

Notes:

N/A - Not applicable

HH - human health

eco - ecological

COPC - constituent of potential concern

TABLE 5-12
AOC 6 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Site Potentially CERCLA-eligible?	Step 1		Step 2a Exceedances of Comparison Criteria?	Step 2b Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3 Is Further Investigation or Action Required?
		Inorganics Above Background or Non-Inorganics Detected?	Potentially Attributable to CERCLA Release?			
AOC 6 - 1918 Drum Storage Area Surface Soil	Yes	SVOCs	No (no detections)	N/A	N/A	No
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 2 inorganics (Al [potential HH and eco risks]; Pb [potential eco risk])	No, based on results of HH and eco risk screenings	
AOC 6 - 1918 Drum Storage Area Subsurface Soil	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 2 inorganic (Al, Th - potential HH risks only)	No, based on results of HH risk screening	
AOC 6 - 1918 Drum Storage Area Groundwater	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 12 total inorganics (Al, As, Be, Cd, Cr, Co, Fe, Pb, Mn, Ni, Th, V - potential HH risks) and 1 dissolved inorganic (Al - potential eco risk)	No, based on the results of the HH and eco risk screenings	
AOC 6 - Ammonia Settling Pits Surface Soil	Yes	SVOCs	Yes	Yes - 3 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene - potential HH risks only)	No, based on results of HH risk screening	Yes - An ESI is recommended to install permanent monitoring wells and confirm potential groundwater inorganic constituent contamination and verify the groundwater flow direction.
		Explosives	Yes	Yes - 1 explosive (HMX - potential eco risk only). Also, 1,3,5-trinitrobenzene and 1,3-dinitrobenzene were identified as initial eco COPCs since no screening values were available	No, based on results of eco risk screening	
		Inorganics	Yes	Yes - 1 inorganic (Hg - potential eco risk only)	No, based on results of eco risk screening	
AOC 6 - Ammonia Settling Pits Subsurface Soil	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	Yes	No; however, 1,3,5-trinitrobenzene was identified as an initial eco COPC since no screening value was available	No, based on results of eco risk screening	
		Inorganics	Yes	Yes - 1 inorganic (Al - potential HH and eco risk)	No, based on results of HH and eco risk screenings	
AOC 6 - Ammonia Settling Pits Groundwater	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 8 total inorganics (Al, As, Cr, Co, Fe, Pb, Mn, V - potential HH risks) and 3 dissolved inorganics (Co, Fe, Mn - potential eco risks)	Yes - 6 total inorganics (Al, As, Cr, Co, Fe, Mn - potential HH risks) and 2 dissolved inorganics (Fe, Mn - potential eco risks)	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

TABLE 5-12
AOC 6 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Site Potentially CERCLA-eligible?	Step 1		Step 2a	Step 2b	Step 3
		Inorganics Above Background or Non-Inorganics Detected?	Potentially Attributable to CERCLA Release?	Exceedances of Comparison Criteria?	Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Is Further Investigation or Action Required?
AOC 6 - TNT Graining House Sump and Catch Box Ruins Surface Soil	Yes	SVOCs	Yes	Yes - 1 SVOC (2,4-dinitrotoluene - potential HH risk only).	Yes - 1 SVOC (2,4-dinitrotoluene - potential HH risk only)	Yes - An RI is recommended to characterize the nature and extent of contamination and conduct quantitative risk assessments. Permanent monitoring wells are recommended to verify the groundwater flow direction and to confirm the results of the DPT groundwater samples at the site. It is recommended soil samples are analyzed for SVOCs, explosives and inorganics, plus include hexavalent chromium as part of the surface soil analyses. It is recommended groundwater samples are analyzed for inorganics (total and dissolved).
		Explosives	Yes	Yes - 6 explosives (1,3-dinitrobenzene, 2-amino-4,6-dinitrotoluene, 2-nitrotoluene, 3,5-dinitroaniline, 4-amino-2,6-dinitrotoluene [potential HH risks]; 2,4,6-trinitrotoluene [potential HH and eco risks]). Also, 1,3-dinitrobenzene, 1,3,5-trinitrobenzene, 2-nitrotoluene, and 3,5-dinitroaniline were identified as initial eco COPCs since no screening values were available	Yes - 2 explosives (2,4,6-trinitrotoluene, 2-nitrotoluene - potential HH and eco risks)	
		Inorganics	Yes	Yes - 10 inorganics (Al, Fe, Pb [potential HH and eco risks]; As, Cr, Th, V [potential HH risks]; Hg, Se, Zn [potential eco risks])	Yes - 3 inorganics (As, Cr - potential HH risks only; Se - potential eco risk only)	
AOC 6 - TNT Graining House Sump and Catch Box Ruins Subsurface Soil	Yes	SVOCs	Yes	Yes - 1 SVOC (2,4-dinitrotoluene - potential HH and eco risks)	Yes - 1 SVOC (2,4-dinitrotoluene - potential HH risk only)	
		Explosives	Yes	Yes - 3 explosives (1,3-dinitrobenzene, 4-amino-2,6-dinitrotoluene [potential HH risk only]; 2,4,6-trinitrotoluene [potential HH and eco risks]) Also, 1,3-dinitrobenzene and 3,5-dinitroaniline were identified as initial eco COPCs since no screening values were available	Yes - 1 explosive (2,4,6-trinitrotoluene - potential HH and eco risks)	
		Inorganics	Yes	Yes - 6 inorganics (Al, As [potential HH and eco risks]; Cr, Fe, V [potential HH risk only]; Se [potential eco risk only])	Yes - 3 inorganics (As, Cr - potential HH risk only; Se - potential eco risk only)	
AOC 6 - TNT Graining House Sump and Catch Box Ruins Groundwater	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 9 total inorganics (Al, As, Be, Cr, Co, Fr, Pb, Mn, V [potential HH risks]) and 7 dissolved inorganics (Al, Cr, Cu, Fe, Pb, Mn, Ag [potential eco risks])	Yes - 9 total inorganics (Al, As, Be, Cr, Co, Fr, Pb, Mn, V - potential HH risks) and 2 dissolved inorganics (Al, Fe - potential eco risks)	
Penniman Lake Surface Water Adjacent to AOC 6	Yes	SVOCs	Yes	No; however, di-n-octylphthalate was identified as an initial HH COPC since no screening value was available	No, based on results of HH risk screening	No
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 1 inorganic (Ba - potential eco risk only)	No, based on results of eco risk screening	
Penniman Lake Sediment Adjacent to AOC 6	Yes	SVOCs	Yes	Yes - 1 SVOC (2,6-dinitrotoluene - potential eco risk only). Also, di-n-octylphthalate was identified as an initial HH COPC since no screening value was available	No, based on results of HH and eco risk screenings	No
		Explosives	Yes	Yes - 1 explosive (4-amino-2,6-dinitrotoluene - potential eco risk only)	No, based on results of eco risk screening	
		Inorganics	Yes	Yes - 2 inorganics (As [potential HH and eco risks], Cr [potential HH risk]). Also, Be was identified as an initial eco COPC since no screening value was available	No, based on results of eco risk screening	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

TABLE 6-4
AOC 7 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Site Potentially CERCLA-eligible?	Step 1 Inorganics Above Background or Non-inorganics Detected?	Potentially Attributable to CERCLA Release?	Step 2a Exceedances of Comparison Criteria?	Step 2b Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3 Is Further Investigation or Action Required?
AOC 7 Surface Soil	Yes	VOCs	No (no detections)	N/A	N/A	Yes - An interim removal action is recommended to remove buried debris and mitigate surface soil inorganic contamination in the Can Pit and to mitigate inorganic contamination at a localized "hot spot" within the former Drum Disposal Area surface soil. Post removal samples should be collected and analyzed for inorganics.
		SVOCs	Yes	No	N/A	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 9 inorganics (As, Cr, Pb, Mn [potential HH and eco risks]; Al, Co, Fe [potential HH risks]; Cu, Zn [potential eco risks])	Yes - 3 inorganics (Pb, Mn, Zn - potential eco risks only).	
AOC 7 Subsurface Soil	Yes	VOCs	Yes	No; however, 2-butanone was identified as an initial eco COPC since no screening value was available	No, based on eco risk screening	An expanded SI for groundwater is recommended to verify groundwater flow direction and to verify and characterize the extent of ethylbenzene (VOC) and inorganic contamination. Permanent monitoring wells are recommended.
		SVOCs	Yes	No	N/A	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	Yes	No; however, nitroguanidine was identified as an initial eco COPC since no screening value was available	No, based on eco risk screening	
Inorganics	Yes	Yes - 6 inorganics (Al, Mn [potential HH and eco risks]; As [potential HH risk]; Pb, Se, Zn [potential eco risks])	No, based on HH and eco risk screenings			
AOC 7 Groundwater	Yes	VOC	Yes	Yes - 1 VOC (ethylbenzene - potential HH risk only)	Yes - 1 VOC (ethylbenzene - potential HH risk only)	Note: The removal action would mitigate the potential unacceptable HH risk associated with As, Cr, and Fe in surface soil that was identified in Step 2a and eliminated in Step 2b.
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	No (no detections)	N/A	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics (total)	Yes	Yes - 9 total inorganics (Al, As, Cr, Fe, Pb, Mn, Ni, Se, V - potential HH risks) and 3 dissolved inorganics (Al, Fe, Ag - potential eco risks)	Yes - 7 total inorganics (Al, As, Cr, Fe, Pb, Mn, V - potential HH risks only)	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

TABLE 7-4

AOC 8 Decision Summary
 Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
 Cheatham Annex
 Williamsburg, Virginia

Medium	Site Potentially CERCLA-eligible?	Step 1		Step 2a Exceedances of Comparison Criteria?	Step 2b Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3 Is Further Investigation or Action Required?
		Inorganics Above Background or Non-inorganics Detected?	Potentially Attributable to CERCLA Release?			
AOC 8 Surface Soil	Yes	VOCs	Yes	No; however, 1 VOC (acetone) was identified as an initial eco COPC since no screening value was available	No, based on eco risk screening	Yes - an RI is recommended to characterize the nature and extent of contamination within soil and groundwater and quantify the associated risk. Monitoring wells are recommended to verify the groundwater flow direction and to confirm the results of the DPT groundwater samples at the site. It is recommended soil samples are analyzed for PAHs, PCBs, and inorganics, plus include hexavalent chromium as part of the surface soil analyses. It is recommended groundwater samples are analyzed for VOCs and inorganics (total and dissolved). Additional test pitting is recommended to verify the presence/absence of buried debris outside the bermed area. Since the extent of the debris was not delineated to the south, additional soil samples are recommended in this area.
		SVOCs	Yes	Yes - 1 SVOC (benzo(b)fluoranthene - potential HH risk only). Also, benzaldehyde was identified as an initial eco COPC since no screening value was available	Yes - 1 SVOC (benzo(b)fluoranthene - potential HH risk only)	
		Pesticides	Yes	Yes - 1 pesticide (endrin aldehyde - potential eco risk only)	No (concentrations below 50 ppb)	
		PCBs	Yes	Yes - 1 PCB (Aroclor-1260 - potential HH risk only)	Yes - 1 PCB (Aroclor-1260 - potential HH risk only)	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 5 inorganics (As, Cr, Th [potential HH risks]; Se, Zn [potential eco risks])	No, based on HH and eco risk screenings	
AOC 8 Subsurface Soil	Yes	VOCs	Yes	No; however, 1 VOC (2-butanone) was identified as an initial eco COPC since no screening value was available	No, based on eco risk screening	Additional test pitting is recommended to verify the presence/absence of buried debris outside the bermed area. Since the extent of the debris was not delineated to the south, additional soil samples are recommended in this area.
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	Yes	Yes - 1 pesticide (endrin aldehyde - potential eco risk only)	No (concentrations below 50 ppb)	
		PCBs	Yes	Yes - 1 PCB (Aroclor-1260 - potential HH risk only)	No, based on HH risk screening	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 1 inorganic (As - potential HH risk only)	No, based on HH risk screening	
AOC 8 Groundwater	Yes	VOCs	Yes	Yes - 1 VOC (tetrachloroethene - potential HH risk only)	Yes - 1 VOC (tetrachloroethene - potential HH risk only)	Since debris was encountered to a depth of 20 feet bgs, additional activities are recommended.
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	No (no detections)	N/A	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 3 total inorganics (As, Fe, Mn - potential HH risks) and 3 dissolved inorganics (Al, Fe, Mn - potential eco risks)	Yes - 1 inorganic (As - potential HH risk only)	

Notes:
 N/A - Not applicable
 HH - human health
 eco - ecological
 COPC - constituent of potential concern