UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
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BOSTON, MASSACHUSETTS 02114-2023

May 1, 2000

Mr. John Burleson
BRAC Environmental Coordinator
Stratford Army Engine Plant
550 Main Street
Stratford, CT 06615

Re: Draft Final Pre-Design Investigation Report
OU2 Groundwater NCRA
Stratford Army Engine Plant

Dear John.

The United States Environmental Protection Agency (EPA) has reviewed the document entitled "Draft Final Pre-Design Investigation Report, OU2 Groundwater NCRA, Stratford Army Engine Plant" This document is dated March 2000.

EPA's comments on the above-mentioned document are provided in Attachment I to this letter.

If you have any questions regarding these comments, please contact me at (617)918-1387.

Sincerely,

Meghan F. Cassidy

Meghan F Cassidy
Remedial Project Manager

Enclosure

cc: Ken Feathers/CT DEP
Michelle Brock/US Army Corps of Engineers
Scott Richmond/Gannett-Fleming Inc
RAB Members

ATTACHMENT I

The following are the United States Environmental Protection Agency's comments on the document entitled "Draft Final Pre-Design Investigation Report, OU2 Groundwater NCRA, Stratford Army Engine Plant". This document is dated March 2000.

The review of this document focused on the completeness of the investigation summary, the technical accuracy of the information presented, and identification of apparent inconsistencies within the document discovered during the review. The General and Specific comments on the referenced document are presented below.

GENERAL COMMENTS

1. OU-2 appears to have been thoroughly evaluated.

2. Based on the discussion in Section 1.0, it would appear that the pilot-scale treatability results will be considered for the EE/CA for VOC and hexavalent chromium contamination in the groundwater operable unit (OU-2). However, the schedules presented in this report indicate that the pilot-scale treatability report will not be submitted until the summer of 2000 (see page 4-17) while the draft EE/CA is due March 2000. Based on the schedules it appears that the pilot-scale treatability results are not pertinent to development of the EE/CA. Please clarify this apparent conflict.

3. The Army should discuss and consider the need whether mor work is needed to develop a sound conceptual understanding of the factors controlling the fate and transport of hexavalent chromium in the system. In particular, it is recommend that further Cr work include some deeper soil sampling and analysis in the core of the plume. While the summary (sec. 7.3) notes correctly that Cr(VI) in soils has not generally exceeded the I/C DEC of 100 mg/kg, soil sampling has been limited to shallow soils in the vadose zone and immediately below the water table, while maximum dissolved Cr(VI) hits within the plume are tens of feet below ground surface. Possible Cr(VI) in solid phases should be characterized; for example, sulfates may be present (e.g., gypsum, jarosite, etc.) in which chromium substitutes for sulfer. This could represent a continuing source to the dissolved Cr(VI) in groundwater, both at present and following remedial action. The possible presence of sulfates containing Cr(VI) should be evaluated prior to initiating remedial schemes that involve, for example, the use of ferrous sulfate as a reductant. Addition of more sulfate may result in retention of Cr(VI)-containing sulfate phases in the system that could serve as a source of soluble Cr(VI) in the future as groundwater conditions at the site evolve.

4. Further work to explore for DNAPL at the site is warranted. As acknowledged in the report, concentrations of chlorinated VOCs in groundwater are extremely high, approaching the solubility limit for TCE, and a large fraction of the solubility limit for 1,1,1-TCA, strongly suggesting the presence of free-phase solvents, at least at some time in the past. High concentrations of chlorinated VOCs in groundwater have been found at depth (to the bottom of the overburden) at two key locations: WC2-3D (TCE at 3,100 µg/L) and CP-99-08 (VOCs at >

100,000 µg/L) The latter is on a relatively steep bedrock-surface slope identified by the seismic refraction work, trending toward a subsurface topographic low mapped to the northwestern corner of building B-2. This area has been explored at depth for chlorinated VOCs only minimally, and further characterization is called for. For example, it is noted that boring WP-99-72, which is close to the center of the mapped bedrock low (Figure 6-9), showed non-detects for TCE at 6-10 ft bgs and 16-20 ft bgs, but a low-level hit of 28 µg/L at 30-34 ft bgs. This may well be the uppermost fringe of deep, dissolved TCE that emanates from DNAPL that followed the bedrock trough, and still resides at depth.

5. This document does not address previous detections of chlorinated VOCs in wells to the southwest of the main portion of the site. While these lower-level detections may not exceed the (rather high) criteria that delineate exceedances for the site, they may be significant indicators of transport processes at the site. In the past, this contamination was interpreted to be due to an off-site source and transport from the south and west. However, the conceptual model for the site has evolved considerably since that time (e.g., with the discovery of very high concentrations of chlorinated VOCs beneath building B-2), and the detections to the southwest should be revisited in this light. EPA understands that the Army has obtained additional information regarding an potential offsite source. It is important that this report indicate where this information will be discussed since there is information in this report to indicate that a least some groundwater flow from beneath Building B-2 likely flow towards the south and west.

SPECIFIC COMMENTS

1. Table of Contents: Some of the Table of Contents titles do not correspond with the titles used in the text of the report. Please make the necessary corrections.

2. Section 1.3, page 1-3: The last sentence in this section states that an EE/CA will be written based on the data presented in the Pre-Design Investigation Report. Will the EE/CA also consider the results of the In Situ Treatability Testing, which is not summarized in this Pre-Design Investigation Report? If so, please mention that here, if not, please explain.

3. Section 3.3.1, page 3-2: This section does not say whether or not the referenced permit is expected to be required for NCRA activities after March 18, 2000. Neither does it say that the permit will be renewed. Please clarify these issues

4. Section 3.3.2, page 3-3: Regarding the first bullet, there is no table in Section 6.0 that compares soil data to CTDEP DEC and PMC for VOCs. Will this data comparison be presented in the RI? Please add this data or clarify in the report why this data is not presented.

5. Section 4.0, page 4-1: It appears that the last sentence in the second paragraph should reference activity items 7 through 11, not 7 through 10 Please correct as necessary

6. Section 4.1.2, page 4-2: Comparison of the analyte list in the third paragraph of the text with the data in Table 6-3 appears to indicate that the analyte list in the text is incomplete. The table also includes TCLP analytical results. Please correct as necessary so the text and table data lists correlate properly.

7. Section 4.1.2, page 4-2: The fourth paragraph of the text refers to Tables 4-1 and 4-2 for summaries of Geoprobe soil and groundwater explorations. It appears that the reference should be to Tables 4-2 and 4-3. Please correct as necessary.

8. Section 4.1.2, page 4-2: The fifth paragraph of the text discusses two dust samples that were collected, however, the analyte list for these samples was not provided Please add the analyte list to the text for these samples.

9. Section 4.2, page 4-3: The last sentence in the second paragraph discusses the CTDEP guidance value for carcinogenic risk, stating that the value is $1x10^{-6}$. Isn't the cumulative excess cancer risk value the pertinent one for comparison and isn't that value $1x10^{-5}$? Please clarify in the text and edit as necessary.

10. Section 4.3.1.1, page 4-4: The first sentence in this section refers to 21 sample locations and contains a parenthetical list of the sample locations The list should include SP-99-01 through SP-99-20 (rather than SP-99-02), excluding four locations where soil samples were not collected. Please make the necessary corrections.

11. Section 4.3.1.1, page 4-4: The second and third sentences in the second paragraph in this section refer to the analyte list This list is not consistent with Tables 4-2 and 6-3. Please edit the text and tables to make the analyte list consistent among them.

12. Section 4.3.1.2, page 4-5: The partial paragraph at the top of the page discusses the drag technique for collecting groundwater samples The text needs to describe this technique better to clarify how water from a lower interval was not carried up to the next interval. After the sample was collected from the lower interval, was the screen covered and the well casing purged dry before the screen was dragged up to the next interval? Please edit the text to clarify the procedure which may alleviate the concern about sample contamination.

13. Section 4.3.1.3, page 4-6: Table 4-5 does not include PZ-99-01A through PZ-99-05A. It is not clear from the text whether or not they should have been included Please review and correct as necessary

14. Section 4.4, page 4-9: The second sentence in this section lists the activities conducted for the OU-2 NCRA. However, the subsections of this section discuss several additional activities not listed in this sentence Please review the text and correct as necessary

15. Section 4.4.8, page 4-17: The sentence at the top of this page discusses the submittal schedule for the pilot-scale treatability study report. This report will apparently not be submitted until well after the draft EE/CA has been submitted (spring 2000; see page 1-1, last sentence in first paragraph) Are the results of the pilot-scale treatability study not relevant to the EE/CA?

Please explain and confirm that these schedules from the Pre-Design Investigation Report are correct.

16. Section 4.5.1, page 4-18: There are apparent errors in the formulas presented on the center of this page. For X_i, i (not I) should vary from 1 to 48, not 49. For Y_j, the numerator term should be $X_{(i+j)}$, not X_i+j.

17. Section 4.5.1, page 4-17, para. 3: The text states, "The net effect of these fluctuations on groundwater flow can be determined by using the mean hydraulic gradient..." While this is certainly important for assessing the mean flow through the site, the fluctuations themselves might be significant in driving transport in this system via dispersion. The usual dispersion model (i.e., dispersion proportional to the groundwater velocity) is not applicable in a tidally fluctuating system, because the cumulative dispersive effect of the tidal velocity fluctuations could, in principle, far exceed dispersion driven by the mean motion of the groundwater. Given that the mean groundwater velocity across the site is very small, tidally driven dispersion could be predominant. This process may prove to be significant in developing a conceptual model for transport of contaminants at the site. The possibility of dispersion from the source beneath Building 2 toward the south should be further discussed. If this information will be included in another report, this should be stated in the text

18. Section 4.5.3.2, page 4-22: In the fourth sentence of the first paragraph, "...TAL VOCs, ..." should apparently be " ..TCL VOCs, ...". Please correct as necessary.

19. Section 4.5.4, page 4-23: In the summary of conditions for which the Bouwer-Rice slug test analysis is valid, it is stated that the flow is steady Presumably, this is in reference to the ambient flow (i e , unperturbed by the slug test), as the slug test itself is inherently transient. Please clarify the text to distinguish between the ambient flow and the local flow associated with the slug test

20. Section 5.1, page 5-1: For identification numbers beginning with WP, the text description uses the letters GP Please change GP to WP to be consistent with the rest of the document.

21. Section 5.3.2.1, page 5-4: Regarding the analyte list presented in this section, Table 6-3 appears to indicate that TCLP analyses rather than SPLP analyses were performed. Please confirm and correct as necessary.

22. Section 6.2, page 6-3: The Site Hydrogeology section should include a summary of what is known at present about the role of tidal fluctuations at the site. How far from the estuary are measurable fluctuations in water levels recorded? What are the amplitudes? This may prove to be critical information for understanding the predominant transport processes at the site, particularly dispersion The standard model of dispersivity proportional to the mean velocity fails to capture the effect of periodic fluctuations, which may drive much greater dispersion than does the mean flow, particularly given the very low mean velocity at this site.

23. Section 6.2.3, page 6-5: The text states, "Groundwater flow is interpreted to be generally from west to east/northeast toward the Housatonic River..." and also notes that "... from the central portion of Building B-2 toward the northwest, ... groundwater flow ... [is] ... more northerly..." However, it should be noted that Figure 6-10 indicates a local groundwater divide passing through the site. This is particularly noteworthy because of historic detections of chlorinated VOCs in explorations in the West parking lot, which have been ascribed in the past to a likely off-site source to the south and/or west. While EPA is aware that the Army is in receipt of information indicated that in fact an offsite source exists, that fact that information also indicates the potential for some contribution of VOC migration towards the West parking lot should not be ignored.

24. Section 6.2.4, page 6-6 This section again fails to mention the possibility of flow from the contaminated area back toward the west, at least at times. Also, a discussion of tidal influences at the site should be included in this section.

25. Section 6.3, page 6-6: The summary notes that exceedances of cleanup standards were identified by the wipe sampling, but does not indicate the subsequent or planned action(s) in response to this finding. What has been done, or will be done, to address these exceedances?

26. Section 6.4.2, page 6-8: In the second full paragraph on this page, the discussion of the lack of hexavalent chromium between the two plume suggests this may be due to anaerobic conditions. Is there evidence of trivalent chromium in this area, as suggested in this discussion? Please edit the text to clarify the hypothesis presented.

27. Section 6.4.2, page 6-8: The limited spread of Cr(VI) in the system is ascribed to the hydrology (i.e., very small net groundwater velocity). However, another significant limiting factor may be the chemistry of the system. The Cr(VI) may be reduced before it is transported very far from its source, as it oxidizes other compounds present (e g., organic carbon, chlorinated VOCs, etc.), and precipitates to relatively insoluble solid phases. This aspect of the Cr transport should be discussed.

28. Section 6.4.3.3, page 6-12, para. 1: The text states that the extent of TCE exceedance shown in Figure 6-28 is "conservative," but acknowledges that the extent could be "... larger than depicted." The term "conservative" is somewhat ambiguous in this context. The area as drawn is "conservative" in the sense that it does not include areas that are not fully characterized. However, from the point of view of remedial design or regulatory oversight, it would be "conservative" to *over*estimate the extent of the exceedance. The description of the mapped area as "conservative" should be deleted or further clarified.

29. Section 6.4.3.4, page 6-13: The last sentence in the second paragraph discusses the suspected former locations of degreasing operations that used 1,1,1-TCA in Building B-2. Is this sentence suggesting that degreasing took place near CP-99-08 and near WP-99-48, so that both might be potential source areas based on past operations in these areas? Please clarify the meaning of this sentence.

30. Section 6.4.5, page 6-15: The last bullet on this page discusses the screening level risk evaluation, stating that it met the CTDEP criteria of $1x10^{-5}$. The meaning of this statement is not clear; please edit this text to state whether or not the CTDEP criterion of $1x10^{-5}$ was exceeded.

31. Section 7.4.2, page 7-5: The second bullet on this page states that "The estimated extent is conservative...." However, if the area of the plume could be larger than depicted, as stated in the text, then "conservative" appears to be an inappropriate description of the estimated extent of contamination. Please edit the text as appropriate.

32. Section 7.4.1, page 7-4: This summary should also note that the concentrations of 1,1,1-TCA; 1,1-DCE; PCE; and vinyl chloride were all estimated to be 100,000 µg/L (see Table 6-3) at the point where the greatest TCE concentration was found (WP-99-33).

33. Section 7.4.2, page 7-4: The overall summary of VOC Hot-Spot No. 2 should also mention that concentrations of four additional chlorinated VOCs were detected within the Hot-Spot.

34. Section 7.4.3, page 7-5: The overall summary of VOC Hot-Spot No. 3 should also mention that concentrations of four additional chlorinated VOCs were detected within the Hot-Spot

35. Table 4-2: The analytical list is not complete for the SP-98 samples because TCLP analyses were also done for cyanide and total chromium.

Also, the fifth column header has a typographical error Total cCr should be Total Cr.
For the SP-PILOT explorations, ferrous iron was also an analyte.

36. Table 4-3: In the fifth column header, delete the comma between Hex and Cr. Only hexavalent chromium was an analyte, not chromium In the sixth column header, add alkalinity which was also an analyte

37. Table 4-5: PZ-99-01A to PZ-99-05A are not included in this table. Was that omission intentional, because groundwater samples were collected during piezometer installation, or is that an oversight that needs to be corrected. Please make the necessary corrections and include an explanation for the action taken.

38. Table 6-3 It is noted that, for soils from SP-99-11, and SP-99-12, Cr(VI) is greater than the *total* Cr by factors of about 2 Is this simply laboratory uncertainty? Please discuss.

39. Table 6-5: The TCE analytical results for WP9945030 and WP9945040 are shown as 4,000 and 6,000 µg/L, respectively. However, Figure 6-29 shows these sample results as 264,000 µg/L and 246,000 µg/L, respectively Also, the table shows concentrations of zero for the other four chlorinated VOCs, but Figure 6-29 suggests the values may be much greater, showing them as <100,000 µg/L. Please correct these discrepancies.

40. Table 6-5: Beginning with page 43 of 58 through page 48 of 58, the column containing the top row descriptors and the SWPC criterion for each parameter is missing. Please correct these pages as appropriate.

41. Table 6-7: This table should include the CTDEP VC criterion for each parameter. Please make the necessary edits.

42. Figure 6-10: This figure shows interpreted groundwater level contours for July 20-23, based on an averaging scheme. The figure actually shows the West parking lot to be *downgradient* from Building B-2 This should be discussed with respect to implications for chlorinated VOC hits found in previous explorations in the West parking lot.

43. Figures 6-26 and 6-27: These figures do not include the other chlorinated VOCs detected at Hot-Spot No. 1, as was done in Figures 6-29 to 6-32 for Hot-Spots Nos. 2 and 3 It may be appropriate to include these concentrations, especially since the concentration of each of four additional chlorinated VOCs was estimated at 100,000 µg/L at the point of the greatest TCE concentration (see Table 6-3)

44. Figure 6-27: The eastern-most exploration should be WP-99-50, not WP-99-05 Please correct this typographical error.

45. Figure 6-29: The title of this figure is misleading because the figure presents concentrations of several VOCs, not just TCE, although the contours are drawn only for TCE If this title is not what was intended, please make the necessary correction.

46. Figure 6-29 to 6-32: These figures do not depict the groundwater surface elevation (although there is a legend symbol for it) If the groundwater surface elevation information is available for these figures, please add it, if not, delete the legend symbol