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LETTER OF TRANSMITTAL AND U S EPA REGION IV COMMENTS ON DRAFT GROUNDWATER REMEDIAL DESIGN FOR SOURCE AREA AT OPERABLE UNIT 7 (OU 7) SITE 16 NAS CECIL FIELD FL
1/7/1999
U S EPA REGION IV

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

January 7, 1999

4WD-FFB

Commanding Officer
Attn: Scott Glass
BRAC Environmental Coordinator
Dept. of Navy, Southern Division
Naval Facilities Engineering Command
Mail Code 18B12
P.O. Box 190010
North Charleston, South Carolina 20419-9010

SUBJECT: Comments on the Draft Groundwater Remedial design for Source Area, Operable Unit 7, Site 16. Naval Air Station Cecil Field, Jacksonville, Florida

Dear Mr. Glass:

The Environmental Protection Agency (EPA) has completed its review of the draft document. Attached are our comments.

Thank you for the opportunity to review the subject document. If you have any questions, please feel free to contact me at 404/562-8539.

Sincerely,

Deborah A. Vaughn-Wright

Deborah A. Vaughn-Wright
Remedial Project Manager

cc: Mike Deliz, FDEP
Mark Davidson, SOUTHDIV, Mail Code 1879
Dave Kruzicki, NAS NAS Cecil Field, Environmental Director
Mark Speranza, TTNUS
Norman Hatch, CH2M Hill

U. S. Environmental Protection Agency, Region IV, Comments on:

Groundwater Remedial Design for Source Area
Operable Unit 7, Site 16 for Naval Air Station Cecil Field,
Jacksonville, Florida, dated November 1998.

General Comments

1. The selected remedial alternative of air sparging was discussed and concurred upon by the EPA during earlier BCT meetings. The two points below have been brought to my attention as potentially negative aspects related to the use of air sparging with respect to the subject site and should be noted.

- Air sparging involves pumping compressed oxygen into the aquifer to volatilize organic contaminants and transport the contaminants to the surface for collection and treatment. The pumping of air into the aquifer is disruptive to the subsurface environment and, without the proper controls, has the potential to increase the distribution of the contaminants in the aquifer. Because the subject site is suspected to include dense non-aqueous phase liquids (DNAPLs), the injection of forced air into the aquifer has the potential to disperse concentrated DNAPLs which would increase the overall concentrations of the solvents, possibly beyond the influence of the air sparging wells and capture zone of the extraction wells. The injection may also release a slug of contaminants from the source area into the zone of natural attenuation proposed as part of the remedy. Depending on the stratigraphy of the aquifer, a ring of shallow and intermediate air injection wells around the source area may serve to control the distribution of the COCs in the subsurface The impact of air sparging on the distribution of the COCs at the site should be thoroughly evaluated and addressed in the report.

- The natural attenuation processes documented in the subject report and proposed as part of the remedy is primarily reductive dechlorination which requires low dissolved oxygen in the aquifer. Injecting air into the aquifer to volatilize the contaminants would increase dissolved oxygen concentrations and create an aerobic environment. The impact of air injection on the natural attenuation process should be considered. It would be expected that as groundwater moves downgradient from the air injection wells, geochemical conditions would re-acclimate to the natural anaerobic condition, however this distance is not known at this time. Furthermore, the attenuation process within this zone of increased oxygenation is not known. It could be speculated that natural attenuation would be suspended within the aerobic zone; therefore, modeling efforts would need to be refined to account for this period of decreased biodegredation. It must also be noted that the original remedy for the site included using air injection wells and

nutrient enhancements to stimulate aerobic biodegredation in the downgradient areas. If the active remedial action serves to create aerobic conditions it may be logical and cost effective to reconsider the original strategy for natural attenuation.

2. The design of the system is highly dependent upon a thorough understanding of subsurface hydrogeologic conditions. From the information presented in the report, the description of subsurface conditions is not sufficiently described to allow a determination of whether the proposed locations and depths of the wells are adequate. Of primary importance to the remedial design is the location and distribution of DNAPLs. It is inferred that the source area is underlain by a clay layer at a depth of approximately 100 feet. The nature of this layer (continuity, thickness, dip) is not presented nor is a discussion of any other clay lenses or subsurface features that could impact the distribution or migration of subsurface contaminants. It is recommended that the report be revised to include a detailed description of the subsurface strata. Of particular interest is the disposition of DNAPLs within the aquifer and an explanation of why a discontinuous area of shallow contamination (Flightline Portion of Plume on Figure 5-1) is present downgradient from the source area. This discussion will support a more detailed evaluation of the proposed remedial design and the long term monitoring plan.

Specific Comments

1. **Section 3.1 Pilot Test Summary, Page 3-1**. The vapor extraction tests and air injection tests were performed separately to determine the capture zone and zone of influence for each type of well. Based on these tests, design parameters (including well spacing, well construction, and vapor extraction flow rates) were established and carried through into the design phase. Because the testing was performed separately it is not known whether the influence of air injection was considered with respect to the design of the extraction wells. Two potentially significant issues regarding the design of the system are noted.

   - The injection of air into the groundwater from air sparging (AS) increases the volume of air in the pore spaces in vadose zone creating a positive supply of available air along the surface of the water table. The increased volume of air may decrease the zone of influence created by the vapor extraction (VE) well, thus reducing the area of soil that can be effectively remediated in the vadose zone. Assuming constant vapor extraction flow rates, the recharging air from the air injection wells would serve to reduce the horizontal capture zone of each VE well. The effect of the air injection wells on the size of the capture zone should be quantified at this stage to ensure that optimization measures implemented during system start up can adequately compensate for the increased available air within the vadose zone.

- The screened interval for the proposed extraction wells will be installed with three feet of screen in the vadose zone and one foot of screen below the water table. During the pilot testing of the injection wells it was observed that the groundwater table was elevated over one foot in at least one well. This increased groundwater elevation has the potential to negatively impact the performance of the extraction wells by reducing the area of the screened interval of the well in the vadose zone and thus decreasing the zone of influence. Furthermore, the pilot study was performed in September which is typically the dry season in Florida. If the groundwater elevation increases significantly it could cover the VE well screen resulting in an inoperable well. It is not known if seasonal variations of the groundwater table were considered when designing the size of the well screen or in the placement of the screened interval with respect to the water table. It is recommended that water table fluctuations relating to the air injection and seasonal variations be considered during the design of the extraction well network.

2. **Section 3.1.1 TCE Solubility Testing, Page 3-4**. The purpose of the trichloroethylene (TCE) solubility testing should be provided in the report. Up to this point in the document there is no indication that the existence of dense non-aqueous phase liquids are suspected at the site. The intended use of the solubility testing results should also be presented.

3. **Section 3.2 Air Sparging/Vapor Extraction Well Layout and Construction, Page 3-5 and 3-6, Figure 3-1**. As discussed in Specific Comment No. 1, it is recommended that the proposed configuration of the extraction wells be reevaluated to compensate for the impact of the active air sparging wells. The following are other issues that should be considered with respect to the configuration of the extraction wells.

   - The presence of storm water lines, utilities, building foundations, leaching fields and other manmade or natural subsurface features may act as preferential flow pathways that could negatively impact the performance of the extraction wells. It is recommended that a discussion regarding the known or potential existence of subsurface features be provided in the report, and that mitigation plans, in the event that such features are identified be included in the design.

   - The zone of influence for all of the extraction wells, as presented on Figure 3-1 (primarily those wells situated on the southern and southeastern edges of the system), do not appear to provide sufficient overlap. Particularly with respect to the Specific Comment No. 1 and the previous bullet, the zone of influence of the extraction wells may be affected by several factors. While it is acknowledged that the zones of influence may be greater in these areas due to structures (building and parking lot) creating impermeable layers to reduce air flow from the surface, it is recommended that the extraction well spacing be reduced to ensure adequate

coverage.

4. **Section 3.2 Air Sparging/Vapor Extraction Well Layout and Construction, Page 3-5 and 3-6**. The means for managing the drill cuttings should be discussed in this section. If this discussion is a component of a master work plan or future construction work plan, the appropriate document should be cited.

5. **Section 3.2 Air Sparging/Vapor Extraction Well Layout and Construction, Page 3-6, Last Paragraph**. It is stated that three piezometers will be installed in the vicinity of Building 313 to verify the presence of vacuum or to sample vapors. While the placement of these piezometers is not disputed, it is not clear why additional piezometers were not proposed around the entire source area to evaluate the overall effectiveness of the system. Without these additional data points it may not be known whether the assumed zone of influence for the extraction wells has been achieved or if the zone of influence remains constant over time. It is recommended that a series of piezometers be installed around the perimeter of the proposed air sparging/vapor extraction system for the purpose of performance monitoring.

6. **Section 3.2 Air Sparging/Vapor Extraction Well Layout and Construction, Page 3-6, Last Paragraph**. It is recommended that placement of the screened portion of the piezometers (e.g., length of well screen and elevation) with respect to the water table be presented in the report. As stated above the influence of seasonal variations and the air sparging wells on the water table should be considered to avoid potential problems where increased groundwater levels submerge the screened interval of the VE well.

7. **Section 4.3 Remedial Cleanup Time, pages 4-7 and 4-8**. Several issues were identified during the review of this section that require further consideration, explanation or data.

   - The first paragraph states that the assumed cleanup goal for the AS/VE system is 1 mg/l. The basis for this number should be provided. It is unclear if this clean up goal was derived through the modeling efforts or is based on technology limitations.

   - Maximum TCE concentrations at the site are cited as being 1,500 mg/l and 408 mg/l. Throughout most of the report the 408 mg/l value has been used. The difference between the two values is highly significant and should be more clearly discussed. Unless strong rationale is presented to support the lower value, the 1,500 mg/l value should be used consistently throughout the report, models and calculations.

   - The cited model "Air Sparging Model for Estimating Groundwater Cleanup Time and Rate" assumes that no DNAPL is present at the site. Based on the concentrations detected during previous investigations and statements presented

in the subject report, the presence of DNAPL at the site is probable. As a result, the utility of the model to predict cleanup times is questionable.

- The third paragraph cites a minimum duration for the cleanup time based on an average of 83 mg/l TCE. The basis for this figure should be provided.

- The third paragraph applies the same assumptions to the model using 408 mg/l as the initial concentration. As stated above, the more conservative value of 1,500 mg/l should be used in all of the calculations.

- Modeling efforts were performed (documented in Appendix B and discussed in Section 4.3) to determine cleanup times at two exposure points: the source area and Sal Taylor Creek. The stated Remedial Action Objective (RAO) for the subject site is to remediate groundwater at the site to the remedial action goal of 3 ug/l to be protective of hypothetical future residential groundwater users. It is not clearly presented therefore, why Sal Taylor Creek (located 3,500 feet from the source area) was identified as an exposure point and used as an endpoint in the groundwater models. The models factored in the natural attenuation process from the source area to Sal Taylor Creek to render conclusions regarding remedial time frames. It would be more appropriate to use the groundwater models to evaluate the impact of contaminated groundwater on surface water. Because groundwater drinking wells could presumably be installed at any location at the site, it is recommended that a series of endpoints be used in the model at specific distances along the downgradient migration pathway to determine the time frame required to remediate the entire plume of contaminants as it moves through the subsurface.

Based on the above comments, it appears the duration of the remedial time frame has been underestimated. It is recommended that the models be reconfigured to attempt to determine a more realistic estimate. Because Cecil Field is a Base Realignment and Closure (BRAC) site, the cleanup of the site in an expeditious manner should be a primary consideration. If the modeling determines that the remedial action goals will not be achieved for 40 or more years, it may be worthwhile to consider a separate alternative.

8. **Section 5.0 Long-term Groundwater Monitoring, Page 5-1**. One intended objective of the long term monitoring program is to evaluate the performance of the AS/VE system. As stated above the installation of additional piezometers around the active portion of the system is recommended to monitor the vacuum induced by the extraction wells and vapors.

9. **Section 5.2 Recent Monitoring Well Installation, Page 5-1**. Based on the configuration of the wells proposed for the long term monitoring program presented on Figure 5-1, it does not appear that sufficient data points are proposed with respect to the boundaries of

the plume. The following comments support this statement.

> The proposed scheme does not provide any intermediate or deep wells downgradient of the known boundaries of the plume. The furthermost downgradient intermediate well is located in an area of known contamination. An effective long term monitoring network should include wells outside the known boundaries. It is recommended that additional intermediate wells be included downgradient of the known boundaries of the intermediate plume. It is also recommended that one or more deep wells be included in the network to ensure contamination is not migrating to the deeper aquifer.
>
> The northeastern and southeastern edges of the plume also do not appear to be adequately covered under the proposed plan. It is recommended that at least one cluster of shallow and intermediate wells be included in the proposed plan to monitor the edges of the plume.

10. **Table 5-1, Monitoring Well Locations and Rationale, Page 5-8.** Monitoring well CEF-16-23D is considered a deep well: however, the total depth and screened interval included on the table indicate that the well is shallow. It is recommended that the well depth be verified and the table corrected.

11. Table 2-1 requires revision to the Federal primary MCL column and Florida primary standard column for 1,1-dichloroethene and 1,2-dichloroethene.

12. In Section 2.2, the second sentence states that 1,1-DCE was found in concentrations in excess of regulatory criteria. If Table 2-1 concentration data are correct, this statement is incorrect. Either this sentence or the table requires revision.

13. Figure 2-3 plume contours need to be specific as to whether the plume outlines shown represent detections of contaminants at any concentration or detections above specific remedial levels.

14. On page 2-26, the third paragraph under the heading **Oxidation Reduction Potential** is poorly written and requires revision. In the first sentence of the paragraph, the word "there" apparently should be "then". In the third sentence, the text states "...current sampling results indicate that has been a change in the metabolic pathways ..." That phrasing structure requires revision. Also, the text should state the nature of the change.

15. In the second paragraph of the discussion under the heading **Ferrous Iron/Total Iron** on page 2-27, the text indicates that a supply of iron available to act as a potential electron receptor is evidence that anaerobic degradation of chlorinated hydrocarbons is occurring. If iron is reduced in the reaction, then chlorinated hydrocarbons are oxidized. This may be significant with respect to the less chlorinated compounds, but is not a significant

process with respect to more chlorinated compounds such as TCE. This discussion requires revision to more precisely define the nature of any reactions that would occur between chlorinated hydrocarbons and iron. This paragraph should also be consistent with the previous paragraph. That paragraph states that iron reduction was not a primary biodegradation mechanism.

16. In the page 2-27 discussion under the heading **Total Manganese**, the last sentence discusses anaerobic degradation of chlorinated hydrocarbons by a manganese reduction pathway. A similar discussion is found on page 2-28 in the first paragraph under the heading **Sulfate, Sulfide, and Hydrogen Sulfide**. The comments above concerning an iron reduction pathway also apply to manganese and sulfate.

17. As a generalized comment, the discussion of biodegradation indicators on pages 2-26 to pages 2-32 makes several statements that are much too definitive, given the nature of ground-water contaminant plumes and analytical results reported in the document. As one example, the discussion on page 2-29 about carbon dioxide states that the increase in measured carbon dioxide between well CEF-16-32S and well CEF-16-35S is an indication that biodegradation of chlorinated hydrocarbons is occurring in that area. The observed increase in carbon dioxide is from 82 to 90 mg/L. This change is likely within or close to the range of uncertainty in analysis of carbon dioxide or the potential inaccuracy of the analysis, given the potential variability in sampling technique. Additionally, as noted in Section 2.3.2, CEF-16-35S is considered a background well. Thus, a higher carbon dioxide concentration in that well would, if anything, mean that biodegradation around CEF-16-32S is not occurring. A valid carbon dioxide comparison to indicate potential biodegradation of chlorinated hydrocarbons (not necessarily definitive, nor an indicator of the significance of a biodegradation process) is to compare analytical data for wells inside a plume with data for background wells, or wells outside a plume. Considering small scale variations of indicator constituents inside a plume as evidence of biodegradation zones or biodegradation rates is inappropriate.

18. In Section 2.3.3, the second paragraph needs to define Type 2 behavior. The fourth paragraph needs to define Type 3 plume behavior.

19. At the top of page 2-38, the discussion needs revision to better define the processes that are occurring to the chlorinated hydrocarbons that result in production of less chlorinated byproducts. The discussion implies or indicates that carbon dioxide and ferric iron are involved in a reaction whereby they are electron acceptors and chlorinated hydrocarbons are being degraded to produce less chlorinated byproducts. Such a process is inconsistent with the type 2 behavior discussed elsewhere in Section 2.3.3.

20. In the first sentence of the second paragraph of Section 2.3.4.2, the report should either list the wells that were recently sampled, or reference another section of the report where those wells are listed.

21. Section 2.3.4.2, paragraph 2 proposes wells CEF-16-13S and CEF-16-14D as background wells. A review of Figure 2-2, monitoring well locations indicates the proposed background wells are not shown on the figure. Either the wells need to be included on the figure, or a separate figure that includes the location of those wells is required.

22. In the second paragraph of Section 2.3.4.2, well CEF-16-35S is identified as a downgradient well. In Section 2.3.2, page 2-33, CEF-16-35S "...is a cross-gradient well...assumed to represent background concentrations." These inconsistencies must be corrected.

23. Two corrections are needed to the last sentence in the third paragraph of Section 2.3.4.2:

    The sentence should define the specific sampling event that is mentioned.

    The sentence needs rewording. The following language is suggested: "Based on the ____ sampling event, nitrate and orthophosphate concentrations are insignificant with respect to biodegradation."

24. On page 2-41, the discussion of air sparging implies that source area air sparging will be performed to some unspecified point, shut off, and replaced by natural attenuation of residual TCE levels. This process would be inconsistent with the process suggested in the third sentence of the first paragraph on page 2-41, where the text implies that air sparging and vapor extraction would be used to remediate source area ground water. If the last sentence under the page 2-41 heading <u>In-situ Air Sparging</u>...is intended to mean that natural attenuation will be used to remediate TCE contamination downgradient of the source area, the text should state that is the case.

25. Section 4.3, paragraph 3 lists an average 83 mg/L TCE for the source area. A source for this value (or calculations that produce such an average) need to be included in the report. Additionally, the assumed cleanup goal of 1 mg/L is arbitrary, and is not based on either Appendix B modeling scenario where degradation of TCE is or is not occurring. One could have as easily selected a remedial goal of 10 mg/L, 0.2 mg/L, or any other number between the two extremes calculated for the decay and no decay Appendix B modeling scenarios. The use of a 1 mg/L value is not a problem, as long as the report clearly states that the selection of 1 mg/L is based on no established criterion, and a 1 mg/L residual in the source area does not necessarily define the source area concentration that would be protective of potential downgradient receptors.

26. On page 5-6, the text proposes that the criterion for selection of wells for sampling would be the indicators of natural attenuation (locations where indications of natural attenuation are strongest from the previous sampling round). Since the goal of monitoring is to determine the effectiveness of natural attenuation and source area air sparging-soil vapor

extraction in reducing contaminant concentrations, the proposed criterion is unacceptable. Any criterion needs to be based (or partly based) on contaminant concentrations, not natural attenuation indicator variables. It would be valid to propose a reduction in sampling locations where monitoring shows that both natural attenuation indicators are weak and contaminant concentrations are low (i.e. do not contribute much to the understanding of plume concentration changes over time or effectiveness of the remedial action in reducing contaminant concentrations).

27. Regarding Section 5.5, page 5-15, the evaluation of the selected remedy should not be simply based on the natural attenuation scoring criteria, but also on the change in plume contaminant concentrations over time. If the scoring criteria are favorable and plume contaminant concentrations are increasing, there is a potential problem that may require alternative remedial measures. Conversely, if plume concentrations are showing decreases over time that appear favorable with respect to remedial goals, such conditions should be the focus of remedy evaluation, regardless of the status of natural attenuation variables. Section 5.5 requires revision, consistent with these concepts of contaminant concentration evaluations.

28. In Appendix A, the figure showing the pilot-scale AS/SVE layout identifies air sparging wells with an × symbol. The symbol seems to appear on the figure six times. It appears that the line of × symbols on the right side of the figure represent another feature (part of a fence line designation?) However, to avoid potential confusion about the number and location of the air sparging wells, the symbol on this figure used to represent an air sparging well should probably be changed.

29. In Appendix B, page B-7, the text states "Typically, concentrations of organic chemicals will reach their peak concentrations at the exposure point earlier than inorganic chemicals." It is unclear how this statement relates to the heading (**Modeling Time Frame**). The basis for this generalization is also unspecified, and the statement would have to be better qualified in order to be valid (i.e. the statement is likely valid when one compares volatile organic compounds to metals, but invalid if one compares pesticides to nitrate or sulfate). If this statement has some relevance to the modeling time frame it needs revision. Otherwise it should be deleted.

30. The Appendix B discussion of the ECTran modeling needs to qualify the analysis by explaining that the model does not account for DNAPL present in the aquifer. The second paragraph of report Section 4.3 discusses the probable presence of DNAPL in the source area. Depending on the magnitude of TCE DNAPL in the source area, the washout time may be much longer than that predicted by the model. Since the remedial action involves mass removal via air sparging and vapor collection, an additional complexity is added to the calculation of TCE mass removal from the aquifer. In short, the model does not account for two conditions that may substantially influence the

duration of TCE ground-water contamination in the source area. If this model was initially used as part of a natural attenuation evaluation of Site 16, the Remedial Design Report needs to note that is the case.

31. Appendix B modeling related to Task 1 (defined on page B-1) is based on the assumption that the ground-water exposure point is downgradient of the source, at a point where ground-water enters a drainage ditch. This exposure point does not coincide with areas where the risk assessment for the site would consider a future use ground-water exposure scenario. The modeling has some utility, but given the site conditions, it does not define the source area RGO(s) that would apply to other "fence line" locations within the TCE plume. I therefore recommend that the limitations of the modeling, as it is presented in Appendix B, be fully defined.