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**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
CARIBBEAN ENVIRONMENTAL PROTECTION DIVISION  
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SAN JUAN, PR 00907-4127

August 25, 2009

Mr. Kevin Cloe  
Project Manager  
Commander Atlantic Division  
Naval Facilities Engineering Command  
6506 Hampton Boulevard  
Norfolk, VA 23508-1278

Re: Review of the Draft In-Situ Remediation Pilot Studies (AOC E and AOC I Sites)  
Sampling and Analysis Plan, Former Naval Ammunition Support Detachment  
Vieques, Puerto Rico

Dear Mr. Cloe:

The U.S. Environmental Protection Agency (EPA) completed the review of the Draft In-Situ Remediation Pilot Studies (AOC E and AOC I Sites) Sampling and Analysis Plan, Former Naval Ammunition Support Detachment Vieques, Puerto Rico, dated June 2009. Enclosed you will find our comments.

If you have any questions or comments, please contact me at (787) 741-5201.

Sincerely,

A handwritten signature in blue ink, appearing to read "Daniel Rodríguez".

Daniel Rodríguez  
Remedial Project Manager  
Response and Remediation Branch

Enclosure

cc: Wilmarie Rivera, EQB, w/ encl.  
Richard Henry, FWS, w/encl.  
Brett Doerr, CH2M Hill, w/ encl.

**EPA COMMENTS**  
**DRAFT IN-SITU REMEDIATION PILOT STUDIES (AOC E AND AOC I SITES)**  
**SAMPLING AND ANALYSIS PLAN**  
**FORMER NAVAL AMMUNITION SUPPORT DETACHMENT**  
**VIEQUES, PUERTO RICO**  
**JUNE 2009**

**GENERAL COMMENTS**

1. The *Draft In-Situ Remediation Pilot Studies (AOC E and AOC I Sites), Sampling and Analysis Plan, Former Naval Ammunition Support Detachment, Vieques, Puerto Rico*, dated June 2009 (Pilot Studies SAP) does not provide complete information regarding implementation of the proposed technologies. Issues that should be considered and evaluated in a complete work plan include:

- appropriate technical documentation of the specific products to be used, including application procedures, and documentation supporting suitability for the current site conditions; and
- identification of potential risks associated with these remedial technologies (e.g. potential interferences among the remedies) and how they will be prevented or identified and resolved.

Provide additional technical documentation of the proposed products to document their suitability at the proposed sites and allow for management of risks associated with the proposed activities.

2. The AOC E SAP does not describe any measurements of the oxidant demand, and whether the oxidant demand is solely due to the hydrocarbon release or if there is background oxidant demand that will restore the saturated zone to anaerobic conditions. Depending on the amount of non-aqueous phase liquid (NAPL) present and the extent of hydrocarbon weathering (loss of soluble and volatile constituents), the oxidative treatment may be moot if constituents subsequently dissolve into anaerobic groundwater.
3. In accordance with EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final* dated October 1988, a SAP should address health and safety issues in a site-specific health and safety plan (HASP). It does not appear that the Pilot Studies SAP references a HASP. Ensure that a HASP is included or referenced in the Pilot Studies SAP.
4. The sampling rationale presented in the Pilot Studies SAP is incomplete. For example, Worksheet #10a states that five split spoon samples will be collected from two soil borings (SB-22 and SB-23). However, Worksheet #14a states that five continuous split spoon soil samples will be collected for the post-injection unsaturated soil sampling and that of those five samples, two confirmatory

samples will be selected and sent for laboratory analysis. From the information provided, it is unclear what will be done with the other sample intervals or why five samples will address the study questions. Further, it is unclear why only two rounds of post-injection data are deemed sufficient to establish trends in groundwater and soil contaminant concentrations (i.e., soil heterogeneity alone may account for the differences in concentrations). Finally, the rationale for including the majority of analyses has not been provided (i.e., Worksheet #11 states that sulfate, nitrate, total organic carbon (TOC), soluble iron, soluble manganese, phospholipids fatty acids, and quantitative polymerase chain reaction for naphthalene dioxygenase and benzylsuccinate synthase in groundwater will also be analyzed). Revise the SAP to provide more detailed sample rationale for these items.

5. The corrective action information presented in the SAP is insufficient. Revise the SAP to specify that EPA will be notified when significant corrective actions or changes occur. In addition, revise the SAP to provide the notification timing for the potential corrective actions identified in Worksheet #6 and #32.
6. The SAP does not discuss manual integrations. If manual integration is required, ensure that supporting information for manual integrations (i.e., chromatograms before and after manual integration as well as a brief explanation for the manual integration) will be included in the data package deliverables and evaluated during data validation.
7. It is unclear what percentage of the data will go under full validation. For example, Worksheet #34 states that all received data packages will be verified externally by a third party validator. However, Worksheets #11 and #35 state that 10% of the raw data will be reviewed to confirm laboratory calculations. Revise the SAP to indicate what percent of data will be validated, at what level, and how samples will be chosen for each validation level.
8. The historical analytical results provided in the SAP are insufficiently detailed. For example, reporting limits have not been included in Tables ES-1 and ES-2. Without the reporting limits it is difficult to evaluate the data (i.e., results for naphthalene show results at 4.8 ug/L as being detected with no qualifiers and results at 5.4 ug/L as not detected). Further, historical results to be used as the soil baseline concentrations are not presented. Finally, it is unclear if the soil and groundwater data have been validated, or if validation qualifiers are included with the results. Revise the SAP to provide reporting limits, soil baseline results including if the results are dry weight corrected, and indicate what if any validation qualifiers should be associated with the results. If the historical samples have not been validated, the SAP should also be revised to indicate that fact.

## SPECIFIC COMMENTS

- 1. SAP Worksheet #10a – AOC E Problem Definition, Page 29:** The first paragraph on Page 29 references the floating product observed on the water table in the past and the fluctuation of the groundwater surface that has likely created a “smear zone”. From the February 26, 2009 Telephone Conversation Record discussed in SAP Worksheet #9b – Project Scoping Session Participants Sheet, Page 26, the consensus agreement stipulated that visual monitoring be performed for potentially re-occurring sheen due to non-aqueous phase liquid (NAPL) that was present in the past and the relatively high-magnitude groundwater fluctuations. Discuss the approach that will be taken in the event NAPL is encountered and the impact it may have on the effectiveness of the selected treatment methodologies.
- 2. Worksheet #10a- AOC E Problem Definition, Page 29:** In the Summary of Baseline Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ER), it states that benzene, naphthalene, and MTBE exceeded the pilot study preliminary remediation goals (PRGs) in July 2008 for Area of Concern (AOC) E. However, Table ES-1: COC Concentration Trends, AOC E, does not include benzene. Revise the SAP to clarify this apparent discrepancy. If benzene was analyzed in AOC E, revise Table ES-1 to include the associated analytical results.
- 3. Worksheet #10a- AOC E Problem Definition, Page 31:** This section indicates that the July 2008 soil sample results (SB-20 and SB-21) will be used as the baseline. However, from the information presented, it is not clear if the proposed soil samples will produce data that can be compared to the 2008 results. Since only limited soil sampling is proposed, the SAP should clearly document why the proposed data and historic data should be comparable. Revise the SAP to clarify if the July 2008 samples were analyzed by the same laboratory that will analyze the new soil samples. In addition, revise the SAP clarify if the proposed sample collection, preparation and analytical procedures were also used with the 2008 soil samples. If any of these have changed, it is suggested that new baseline samples be collected using the SAP procedures.
- 4. Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements, Page 44:** This section states that the maximum naphthalene concentration measured in July 2008 at MW-05 was 33 ug/L. However, Table ES-1 shows that the maximum concentration is 35 ug/L. If the maximum concentration is 35 ug/L, the dilution factor changes to approximately 2.1, and the associated soil PAL presented in Table 2 changes from 11.5 ug/L to 10.5 ug/L. Revise the SAP to address this discrepancy.
- 5. Worksheet #12 - Measurement Performance Criteria, Pages 51-53, 56-58:** The tables for FMETAL, MICRO, and WCHEM analyses only include temperature blanks. Revise the SAP to clarify why other QC samples (e.g., field duplicates, matrix spike/matrix spike duplicates [MS/MSD]) are not included for these analyses.

6. **Worksheet #13 – Secondary Data Criteria and Limitations Table, Page 59:** This table does not indicate if there are limitations on the July 2008 soil sample results. Since these results will be used to establish baseline soil concentrations, this information should be presented in the table. Revise the table to include any limitations or QC issues related to the July 2008 data.
  
7. **SAP Worksheet #14a – Summary of Project Tasks for AOC E, Nitrate Injection in Unsaturated Zone Soil, Page 63:** The first paragraph, Nitrate DPT Injection, states that the seven temporary injection points (IP-1 through IP-7) will be hydraulically pushed to the targeted treatment depth of 26 feet below ground surface (bgs) and will be fitted with an injection screen of one- to five-foot length. It is unclear whether the nitrate solution will reach the full boring interval or simply the base of the boring and how the injected nitrate solution will then be delivered to the entire targeted treatment zone of 16 to 26 feet bgs. In addition, the paragraph states that if the required quantity of nitrate solution can be delivered through the single injection event, then the borehole will be grouted. The second paragraph, Nitrate Gravity Trickle Feeding Via Temporary Injection Points (Contingency), states that if the required quantity of nitrate solution cannot be injected in a single “slug” due to low permeability subsurface conditions (which are expected) then the boreholes will be converted to temporary injection points by installing a one-inch diameter PVC riser with a 10-foot screen. Given the uncertainty of the effectiveness of the single slug injection process, the low permeability of the formation, and the inability of performing additional injections, if necessary, consideration should be given to installing the seven injection points using the PVC riser and 10-foot screen lengths as a first step.
  
8. **SAP Worksheet #14a – Summary of Project Tasks for AOC E, Persulfate Injection in Groundwater (ISCO), Page 65:** The second paragraph on Page 65, Oxidant Demand, describes the amount of persulfate required for an approximately 50-foot by 25-foot treatment area. The data or assumptions used to determine the lateral and vertical extent of the treatment area are not provided in the Pilot Studies SAP. Provide information on how the treatment area was estimated.
  
9. **SAP Worksheet #14a – Summary of Project Tasks for AOC E, Installation of ORC Socks (EISB), Page 66:** Oxygen Release Compound (ORC) socks are to be installed into the four existing monitoring wells that will be treated with in-situ chemical oxidation (ISCO), including MW-04 which is located side-gradient or down-gradient of the likely release, but has not had contaminant concentrations greater than the PRGs. Explain why MW-04 is proposed for inclusion in the EISB implementation.
  
10. **SAP Worksheet #14a – Summary of Project Tasks for AOC E, Soil and Groundwater Sampling (for Offsite Laboratory Analysis), Page 66:** The first paragraph of this section states that post-injection unsaturated zone soil sampling will be collected at month 26 or month 29. It appears that post-injection sampling and analysis of unsaturated zone soils should occur during an earlier sampling event to

evaluate the effectiveness of this treatment, especially with respect to the presence of potential NAPL. Consideration should be given to conducting post-injection sampling sooner than months 26 or 29.

- 11. SAP Worksheet #14b – Summary of Project Tasks for AOC I, Persulfate Injection in Groundwater (ISCO), Page 69:** The third paragraph of this section, Oxidant Demand, describes the amount of persulfate required for an approximately 25-foot by 25-foot treatment area and a 10-foot treatment thickness. Given the depth of the screened intervals from 24 to 43 feet bgs and the range of depths to groundwater (17 to 25 feet bgs), the vertical extent of the treatment zone appears to be greater than the estimated treatment thickness. Provide the data or assumptions used to determine the size and thickness of the treatment area. Ensure the treatment zone includes sufficient area to achieve the remediation goals.
- 12. Worksheets #15-1 and 15-2, Reference Limits and Evaluation Tables, Pages 73 and 74:** These tables do not indicate if the action limits and quantitation limits are dry weight corrected. Revise the tables to indicate this in a footnote, or explain why wet weight results will be used.
- 13. Worksheet #16a-1 – AOC E Project Schedule/Timeline Table (2 ISCO Injection Events):** This timetable does not include the date that pre-injection sampling will occur. Revise the timetable to include this.
- 14. Worksheet #16b – AOC I Project Schedule/Timeline Table:** This timetable does not include the date that pre-injection sampling will occur. Revise the timetable to include this.
- 15. SAP Worksheet #21 – Project Sampling SOP Reference Table:** It does not appear that a project standard operating procedure (SOP) has been developed for the installation of the temporary injection points. Develop and include an injection point SOP as an Attachment to the SAP.
- 16. Worksheet #22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table, Pages 99- 100:** This table does not include the maintenance activity and/or testing/inspection activity for all the field equipment. Revise the table to include the maintenance and testing/inspection activities for all field equipment.
- 17. Worksheet #27 – Sample Custody Requirements Table, Pages 113:** This section does not include an example of sample numbering system to be used. Revise the worksheet to include an example of the sample numbering system.
- 18. Worksheet #29 – Project Documents and Records Table, Page 131:** This table does not specify the length of time documents will be stored, nor does it provide the address or contact information for the document storage location. Revise the SAP to provide this information.

- 19. Worksheet #31 – Planned Project Assessments Table, Page 135:** This table does not include laboratory audits. Clarify if any laboratory audits will be conducted.
- 20. Worksheet #37: Usability Assessment, Page 87:** This section does not provide a completeness goal for the field and laboratory. In addition, it is unclear if completeness will be calculated on a per sample or per analyte basis. Revise the SAP to provide this information. If completeness will be calculated on a per sample basis, revise the SAP to indicate when a sample will be considered as rejected (e.g., if one compound is rejected, if 5 results are rejected, etc.).