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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

June 16, 2011

Colonel Robert L. Maness
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Kirtland AFB, NM 87117-5606

Mr. John Pike
Director, Environmental Management Section
377 MSG/CEANR
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RE: QUARTERLY REMEDIATION AND SITE INVESTIGATION REPORT, OCTOBER 2010 THROUGH DECEMBER 2010, BULK FUELS FACILITY SPILL, FEBRUARY 2011
KIRTLAND AIR FORCE BASE, EPA ID# NM9570024423
HWB-KAFB-11-003

Dear Colonel Maness and Mr. Pike:

The New Mexico Environment Department (NMED) has reviewed the document *Quarterly Remediation and Site Investigation Report, October 2010 through December 2010, Bulk Fuels Facility Spill*, dated February 2011 (hereinafter referred to as the Quarterly Report), concerning Solid Waste Management Units ST-106 and SS-111. The NMED has determined that the Quarterly Report is deficient. NMED will not require the U. S. Air Force (Permittee) to correct or augment the Quarterly Report; however, the deficiencies noted herein must be corrected in future submittals of such reports. The next quarterly report is due August 29, 2011.

By letter on June 4, 2010, NMED required quarterly reports to be submitted for the investigation and remediation of the Bulk Fuels Facility Spill. The pertinent part of that letter states:

> *Each quarterly report shall provide detailed information on all characterization and remediation activities that took place during the period covered by the report, including, but not limited to, as applicable for the reporting period, field and laboratory analytical results for groundwater, soil, and soil gas; graphs showing trends of major contaminants versus time, a table of surveyed well locations; descriptions of the installation of groundwater and soil-gas monitoring wells; measurements of light non-aqueous phase*

> *liquid (LNAPL); table of water levels; water-level map; plume contaminant maps and cross-sections; and geologic and geophysical logs of wells and boreholes. Each quarterly report shall also describe the operation, maintenance, and performance of the four soil-vapor extraction (SVE) systems. Each quarterly report shall also include all field and laboratory quality control data for the reporting period and a discussion of data quality as it relates to accuracy, precision, representativeness, and completeness for each analytical parameter that is to be reported.*

NMED is dissatisfied with the contents of the Quarterly Report. Although progress is being made towards obtaining new characterization data, existing data are not being utilized to maximum benefit. More specifically, the Quarterly Report does not adequately convey the information that is necessary to facilitate a detailed understanding of the geologic, hydrologic, and contaminated conditions of the vadose zone and groundwater, and the degree of success of the soil-vapor extraction (SVE) units in removing contamination from the vadose zone. In particular, the graphical representations of data that normally would be produced to support a conceptual site model for such a complex investigation have not been prepared or have not been adequately prepared based on the figures provided in the Quarterly Report. Geologic, hydrologic, hydrochemical, and contaminant concentration models are key components of a conceptual site model. NMED staff have met with the Permittee and its contractors on several occasions (the last on April 21, 2011) to discuss ways to improve the quality of future quarterly reports with respect to preparing and improving the geologic and contaminant concentration models. NMED, again, offers to meet with the Permittee and its contractors to discuss geologic and geophysical interpretations and other technical issues that may pertain to preparation of the conceptual site model.

The following comments are intended to convey deficiencies in the Quarterly Report that have been identified by the NMED.

Major Comments on Soil-Vapor Extraction

1. The Quarterly Report does not provide adequate information to evaluate the effectiveness of the SVE units. While NMED can discern how much contaminant mass is being removed from the vadose zone during a reporting period and how much mass has been removed cumulatively since initiation of SVE, NMED cannot easily evaluate possible trends or determine if the SVE system is pulling increasing or decreasing amounts of contaminants with time, or monitor if system maintenance or optimization is successful. NMED also cannot determine how much propane is being consumed, or monitor the ratio of propane use versus contaminant extraction. To correct this problem, data tables (in MSExcel™ format) and graphical representations of the data must be prepared showing by each quarterly period and cumulatively since SVE has commenced for a given area, hours of operation (by engine and by unit), propane used, and mass of contaminants extracted (separate from biodegradation) and treated.

2. The Quarterly Report does not describe in detail what optimization was conducted for the SVE system during the reporting period. The Permittee is reminded that maintenance is not optimization.

Major Comments on the Geologic Model

3. The Quarterly Report does not present cross-sections representing a *coherent* three-dimensional geologic model. A coherent geologic model is vital to the investigation and remediation of the Bulk Fuels Facility Spill, and must make full use of available geologic data. It must also be updated as new information becomes available. In the Quarterly Report, NMED notes cases where the mapped geologic units shown in a specific area of a given geologic cross-section do not match those shown on other cross-sections that intersect the same area. For example, at the intersection of geologic cross-section A-A' (Figure 4-6) with B-B' (Figure 4-7), on B-B' there is a coarse-grained unit at about 110 feet depth that does not appear on A-A'. Note that cross-sections are not fence diagrams. Structure contour maps depicting the top and bottom contacts of the mapped units have not been provided in the Quarterly Report; however, these types of maps must be prepared in order to construct a coherent three-dimensional model for the Bulk Fuels Facility Spill.

   Additionally, various data need to be shown on the geologic cross-sections that were not shown on those included in the Quarterly Report. These data are:

   a. Unified Soil Classification codes (from the geologic logs);
   b. Graphical representations of the lithologic units (from the geologic logs);
   c. Geophysical logs (see also Comment #5);
   d. Orientation of cross-sections (i.e., north-south, east-west, northwest-southeast; the orientation which should be appropriately denoted at the two ends of each cross section).

   Also, the cross-sections indicate that borehole/wells are "offset" by various distances. Although distance is specified, it is not clear what direction a given borehole/well has been offset from the cross-section line.

   NMED also notes that the geologic units shown on the cross-sections in the Quarterly Report are depicted in shades of yellow and brown. NMED prefers that the geologic units not be denoted by colors. Contacts of the units should be depicted simply using lines, and the unit labeled by its name or abbreviation.

   Additionally, the location maps showing geologic cross-sections do not show all wells/borings in the area. NMED also prefers that aerial photographs are not used as a background on such maps as they make it difficult to see the information that is intended to be presented. Instead, major roads and features can be shown as line drawings on the maps, and the coordinate system added along the margins of the map for reference. It would also be helpful if the wells/borings used to construct cross-sections were differentiated from those not used. The wells/borings can be differentiated on the location map by different symbols and/or colors. Text, boring/well labels, and other annotations such as isocontour labels, need to be legible. For example, the isocontours shown on Figure 4-3 are in part not legible.

4. The Quarterly Report does not provide paper copies of geophysical logs.

5. Because no geophysical logs of any type are shown on the geologic cross-sections and there is no discussion of results of the geophysical logs or discussion of comparison of geophysical logs with geologic logs, there appears to have been no attempt to correlate geophysical data with geologic data. This must be done to generate the best possible geologic model. In NMED's opinion, the induction-logs are the best geophysical logs for graphical inclusion on geologic cross-sections, but information from the other log types needs to be included in the interpretation of the geology as appropriate. For example, in many gamma logs there appears to be marker units distributed across the site which may be useful in the geologic correlation/interpretation. Significant neutron trends, if any, should also be considered in the interpretation of the geologic units.

   The gamma logs submitted for monitoring wells KAFB-10625 and KAFB-10626 (on the computer disc) are identical; thus, one or both logs are in error. The same problem likely exists for the gamma logs for wells KAFB-1061 and KAFB-1063. Other concerns, such as the unrealistic trace of the short induction log on KAFB-10618, also exist and should be evaluated and corrected, if appropriate.

   For a given boring, both the neutron and induction tools have an associated gamma log, but the two gamma logs do not appear to be consistent with each other. Explain why they are different and justify which of the gamma logs is the correct one.

Major Comments on Contaminant Concentration and LNAPL Models

6. For groundwater, contaminant concentration maps at shallow, intermediate, and deep depths within the saturated zone need to be prepared (albeit for the Quarterly Report, only data at shallow depths were available). For soil and soil vapor, contaminant concentration maps at the various sampling and monitoring depths need to be prepared, as appropriate. Also, the data used to construct the concentration maps need to be posted on the maps.

   Similar to the problem raised in Comment #3 for the geologic model, the Quarterly Report does not present maps or cross-sections representing *coherent* three-dimensional models of contaminant concentrations in the vadose zone, groundwater, and for floating LNAPL. As an example of an incoherent contaminant model for soil vapor, cross-section A-A' (Figure 4-6) depicts a TPH concentration of about 30,000 ppmv at 250 feet at the intersection with cross section D-D' (Figure 4-9), while D-D' shows a TPH concentration of < 10,000 ppmv at the same location.

   Furthermore, the Quarterly Report does not contain any graphical representations of soil contamination in the form of maps and cross-sections. NMED also notes that the Quarterly Report includes trend plots of EDB and benzene concentrations for groundwater samples but does not include such graphs for the other major contaminants. A graph must be prepared for each major contaminant, and for each environmental media (soil, soil vapor, and groundwater). For groundwater, at a minimum, the major contaminants are EDB, benzene, toluene, xylene (total), naphthalene, 1-methyl naphthalene, 2-methylnaphthalene, DRO, GRO, and lead. For soil-vapor, at a minimum, the major contaminants are EDB, EDC, benzene, toluene, ethylbenzene, xylenes, acetone, GRO, 1,3,5-trimethylbenzene; and 1,2,4-

trimethylbenzene. For soil, at a minimum, the major contaminants are the same as those for groundwater and soil vapor combined.

Additionally, the area of contamination shown on maps for a given groundwater contaminant must encompass the entire area of contamination, not just the part that exceeds a U. S. Environmental Protection Agency Maximum Contaminant Limit or a New Mexico Water Quality Control Commission standard.

As mentioned previously, NMED prefers that aerial photographs are not used as the background on the location maps showing the cross-sections for contaminant concentrations. Also, it would be helpful if the wells/borings used to construct cross-sections were differentiated from those not used.

7. Isoconcentration contours shown near the former location of the Fuel Offloading Rack are not discernible on Figure 4-2. Graphics should be inspected to ensure that they are everywhere readable.

8. The Quarterly Report does not contain a map showing the extent and thickness of the LNAPL plume.

9. To better understand the general hydrochemistry of the groundwater, Piper and stiff diagrams should be prepared for shallow, intermediate, and deep depths within the saturated zone. The stiff diagrams for a given depth should be posted on a map at the sample locations (wells) the diagrams represent.

Major Comments on the Oxidation-Reduction Model

10. The Quarterly Report does not contain any maps and cross-sections depicting oxidation-reduction (redox) conditions, although redox data are listed in summary tables for analytical data. The redox data should be treated the same as major contaminants with respect to how they are depicted on cross-sections and maps and used to support a three-dimensional conceptual site model. Also, a discussion of what the redox parameters indicate for the hydrochemical conditions of the site must be included.

Major Comments on the Hydrologic Model

11. Maps and cross-sections depicting saturated hydraulic conductivity at shallow, intermediate, and deep depths within the saturated zone need to be prepared as data become available.

12. Although wells screened below the water table were not available at this time for measuring water levels (thus, total heads), such deeper wells will be eventually completed, and thus, reports will need to present maps and cross-sections representing a coherent three-dimensional model of hydraulic head. It may be adequate and preferable to show the water table and hydraulic heads on the geologic and contaminant concentration cross-sections.

    The water table map shown in Figure 5-1 does not cover a large enough area (see NMED's letter of March 31, 2011, Part 2, Comment #2). The water table map should show all wells in

the area, including the Water Utility Authority production wells located nearest to the Bulk Fuels Facility (Ridgecrest and Burton Fields).

The arrow depicting the direction of groundwater flow (on Figure 5-1) is distracting and should be deleted from future versions of such maps. The groundwater flow direction should be described in the text unless it is so complex in nature that a figure is required to properly illustrate the complexity.

13. There are water-level elevations for some monitoring wells listed in Table 5-1 of the Quarterly Report that were not used to construct the water table map shown Figure 5-1 (e.g. KAFB-1065, KAFB-1066, KAFB-1068, KAFB-10612, and KAFB-10624). Provide an explanation in the text or on the figure as to why these data were not used to construct the water table map.

Other Comments

14. Section 2.3.2, middle of last pararaph on Page 2-15, states "The primary variables that impacted recovery amounts for individual months was system downtime due to mechanical issues, air emissions testing issues, and the need to adjust operational settings on the systems due to decreasing well gas fuel concentrations as a result of interference between the systems." It is unclear what is meant by "the interference between the systems", given in particular that the SVE Units are approximately 400 feet apart. Clarify in future quarterly reports what this phrase means.

15. Table 2-4 lists the top of the screened interval as 484 feet for KAFB-1065, while information submitted as part of the *Submission of Critical Data*, per the NMED letter of August 6, 2010 (page 26, Items 7.i.through ix.) on October 5, 2010, indicates that the top of the screened interval is 479 feet. Provide the correct information in future reports.

16. Table 2-4, 2nd column heading is labeled "Depth of Screened Interval (ft bgs)" and concerns SVE being conducted at groundwater monitoring wells. Because the screened interval of a groundwater monitoring well extends from the top to the bottom of the screen, and the water table extends above the bottom of the screen, the effective length of the "screened interval" for SVE is less than the actual screened interval of the well. The title for the column should be changed to more accurately reflect the values in the column. NMED suggests as a title "Effective SVE Screen Interval" or something similar. Also, the water table depth from the quarter should be listed to help ascertain the numerical value of the effective screen length.

17. Figures 4-1 through 4-5 do not show all of the borings/wells that are on shown on the cross sections depicted in Figures 4-6 through 4-9 (such as FFES-SB-01, FFES-SB-04, and KAFB-106G). Also, KAFB-106G does not appear on the survey coordinates table submitted as part of the "critical data" submission (Critical Data Item I). Specify also if there is also KAFB-106 A through F.

18. For Table 5-1 footnote "b" states "groundwater elevation = top of casing elevation - depth to water - (product thickness * specific gravity of product)." The equation presented in footnote "b" appears to be incorrect. Revise future reports accordingly. Also, groundwater elevation

in this case is probably more correctly described as the elevation of the potentiometric surface.

19. In comparing conductance values in the Quarterly Report to those in the previous quarterly report, it appears that the conductance of groundwater at some wells (for example, KAFB-10622, 99.9 mS/cm on 7/19/10 and .038 mS/cm on 10/07/10) changed significantly (several orders of magnitude) without apparent reason. If known, provide an explanation of this observation in future reports.

20. Section 5.1, page 5-2. Include field data taken while purging wells to demonstrate that groundwater was properly stabilized prior to the collection of water samples.

21. Section 5.1, Page 5-3, last paragraph. It is not clear if purge water from different wells is being comingled or kept separate. Describe in more detail how purge water is managed.

22. The Quarterly Report does not contain a section summarizing what is expected to be accomplished in the next reporting period.

23. Data of various types, including maps and cross-sections, are grouped together in Appendix C of the Quarterly Report, making it difficult to review the data. The various types of data should be presented in separate appendices.

24. The Quarterly Report does not provide hydrographs for groundwater monitoring wells. Hydrographs must be provided in future Quarterly Reports.

25. The Quarterly Report does not provide a summary table listing the detected contaminants and their concentrations for each groundwater and soil-vapor monitoring well. Such a table must be provided in future Quarterly Reports.

26. Provide electronic copies of the data summary tables (in Excel™ format), including quarterly and historical field and laboratory analytical data for soil, soil vapor and groundwater.

27. Historical analytical data in Appendix C, Tables C.1 and C.2 of the Quarterly Report may be included electronically (in Excel™ format) to lessen the amount of paper required to produce reports.

28. All reported surveyed locations (see Table C-3 in Appendix C, for example) should be provided in the same coordinate system: New Mexico State Plane Central Zone, NAD 1983, feet.

29. Although a table of surveyed locations of soil borings was submitted in Appendix C, none was provided for groundwater or soil-vapor monitoring wells.

30. The laboratory reports are not provided in the Quarterly Report. The laboratory reports must be included in the quarterly reports in addition to the data summary tables. Laboratory

reports may be included electronically (in Excel™ format) to lessen the amount of paper required to produce reports.

31. Table 5-2 of the Quarterly Report lists the GRO value for the water sample from monitoring well KAFB-10625 as 110 mg/L; however, the *Executive Summary Detection Highlights* section of the laboratory report (obtained separately from the Quarterly Report) lists the result as 0.11 mg/L. Thus, it appears that this datum for GRO is erroneously presented as 1,000 times higher on Table 5-2 than as reported by the laboratory. The same concern applies to DRO and can be extended to other monitoring wells, and possibly for data included in the 2nd quarterly report for 2010 based on historical data.

32. Explain the meaning of the separation line in the first column of Table 5-2 of the Quarterly Report, pages 1 and 2, between the first set of VOCs and the second set of VOCs.

33. Explain why the laboratory method for EDB is listed as Method 504.1 on Table 5-2 of the Quarterly Report, but is listed as Method 8011 in the laboratory reports for wells KAFB-10625 and KAFB-10626.

34. Explain why the laboratory method for TPH is listed as Method 8015B on Table 5-2 of the Quarterly Report, but is listed as Method 8015C in laboratory reports for wells KAFB-10625 and KAFB-10626.

35. The turbidity for the water sample from KAFB-10628 is listed as 445 NTU in Table 5-2 of the Quarterly Report. Turbidity should not exceed 5 NTU, if possible. Provide an explanation as to the likely cause of the high turbidity and what has been done to decrease the turbidity of water samples collected from this well.

In addition to above comments, NMED has concerns regarding high reporting limits and associated data qualifiers as they relate to some data. It is imperative that data quality objectives be met on this project, and that data are of high quality and are useable for their intended purpose. For this reason, NMED will be evaluating the analytical data included in the Quarterly Report with respect to how data was validated, carried forward into the report, and used to support interpretations and decisions. NMED expects to provide further comment on the data quality issues at a later date. Furthermore, NMED reserves the right to require additional information or to make further changes on how data are reported (including graphical representations of data).

NMED's letter of December 23, 2010 directed the Permittee to correct the deficiencies noted in the October 5, 2010 critical data package and notes that the many of these issues were not provided for in the Quarterly Report. More specifically, the Permittee did not correct, in part or in whole, the deficiencies noted in Comments #1, 2, 3, 7, 8, 9, 10, 11, and 12. Furthermore, the Permittee did not provide a table that details where all revisions are to be found in the Quarterly Report and that cross-references NMED's numbered comments in the December 2010 letter.

Again, NMED is not requiring the Permittee to correct or augment the Quarterly Report; the deficiencies must be corrected in future quarterly reports. Should you need to meet or discuss

any of the comments in this letter, to appropriately address them in future submittals, please contact William Moats of my staff at (505) 222-9551.

Sincerely,

John E. Kieling
Acting Chief
Hazardous Waste Bureau

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