



KAFB

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 377TH AIR BASE WING (AFMC)

ENTERED

NOV 4 2010

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Mr. Bearzi

Kirtland AFB is re-submitting three work plans regarding the Bulk Fuels Facility Fuel Spill. The re-submittal is in response to your 2 Apr and 6 Aug 10 letters, which issued a Notice of Disapproval for deficiencies in the work plans. The deficiencies have been corrected. Re-submittal is required by 8 Nov 10.

The work plans being re-submitted are as follows:

1. Groundwater Investigation Work Plan, Part I: Field Investigation Activities, Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111
2. Vadose Zone Investigation Work Plan, Part I: Field Investigation Activities, Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111
3. Interim Measures Work Plan, Part I: Field Investigation Activities, Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111

If you have any questions with regard to this submittal, please contact Mr. John Pike, 377 MSG/CEAN at (505) 846-8546.

Sincerely

ROBERT L. MANESS, Colonel, USAF
Commander

KAFB3484



Attachments:

1. Groundwater Investigation Workplan
2. Vadose Investigation Workplan
3. Interim Measures Workplan

cc:

NMED-HWB, Mr. Moats
NMED-GWQB, Mr. Olson



Project: Kirtland Air Force Base Enviro
Date: Thu 11/4/10

Task [Bar] Progress [Bar] Summary [Bar] External Tasks [Bar] Deadline [Down Arrow]
Split [Dotted Line] Milestone [Diamond] Project Summary [Bar] External Milestone [Diamond]

Comment	Response	Deviation and Justification
A. Deficiencies Common to All Three Work Plans		
<p>1. Appendix A of the Vadose Zone and Interim Measures Work Plans and Appendix D of the Groundwater Investigation Work Plan – Appendix A and Appendix D are exactly the same plan (about 500 pages, dated April 2004), appended to and occupying 80% or more (by number of pages) of the Vadose Zone, Interim Measures, and Groundwater Investigation Work Plans. Although the plan presented in Appendices A and D is voluminous, it is only a general plan that lays out the Permittee's internal requirements for conducting corrective action for the entire base. Furthermore, the copies of this plan provided to the NMED are missing figures (Figure 3-4), have their own appendices that are noted as "to be provided at a later date", and, in places, have outdated information (Table B7 .2-1, page B-177 of Appendix B of Appendix A). Because Appendices A and D are not specific to the Bulk Fuels Facility Spill, they do not describe in sufficient detail how, for example, project organization, data management, and quality assurance will be implemented under the Vadose Zone, Groundwater Investigation, and Interim Measures Work Plans. For example, under the project management plan, the organizational chart only shows KAFB management. The field sampling plan discusses the various types of field quality control (QC) samples that could be utilized during an investigation, but does not set forth the specific types of QC samples that should be prepared or collected for the Bulk Fuels Facility Project. Furthermore, because it is only a general plan for the entire base, the plan does not commit to the collection of QC samples for any project. Appendices A and D must be deleted from the Vadose Zone, Groundwater Investigation, and Interim Measures Work Plans. They have little value because they do not contain the appropriate level of detail for characterization and clean up of the Bulk Fuels Facility Spill and do not commit the Permittee to do anything. The Permittee shall revise the Vadose Zone, Groundwater Investigation, and Interim Measures Work Plans to include the appropriate level of detail and commitment on project organization, data management, and field and laboratory quality assurance.</p>	<p><i>Concur</i></p>	<p>Three revised work plans have been submitted to the NMED: the Groundwater Investigation Work Plan, the Vadose Zone Investigation Work Plan, and the Interim Measures Work Plan.</p>

Comment	Response	Deviation and Justification
<p>2. Appendix B of the Vadose Zone and Interim Measures Work Plans and Appendix A of the Groundwater Investigation Work Plan – These appendices include only a 2006 NMED guidance document. The guidance is outdated and adds little, if any, value to the Vadose Zone, Interim Measures, and Groundwater Investigation Work Plans, and thus, must be deleted from all three plans. NMED guidance documents may be cited, if necessary, in future submittals.</p>	<p><i>Concur</i></p>	<p>The revised work plans submitted to the NMED do not contain the outdated NMED guidance document. Relevant guidance documents have been cited in the work plans and included, as appropriate.</p>
<p>3. Community Relations - The community relations plan is not included in Appendix A of the Vadose Zone and Interim Measures Work Plans and Appendix D of the Groundwater Investigation Work Plan. Instead, the appendices state <i>Appendix I, Community Relations Plan, (to be provided at a later date)</i>". The Permittee shall revise the Vadose Zone, Interim Measures, and Groundwater Investigation Work Plans to include a community relations plan specific to the Bulk Fuels Facility spill. The plan must specify how the Permittee will inform the public, including the Albuquerque Bernalillo County Water Utility Authority (WUA), the City of Albuquerque, and the Veterans Administration of progress made on characterization and clean up of the Bulk Fuels Facility spill.</p>	<p><i>Deviation</i></p>	<p>A Community Relations Plan (CRP) specific to the Bulk Fuels Facility (BFF) Spill is being prepared by Shaw for the USACE, Kirtland AFB, and AFCEE. This document is in draft form and therefore could not be included with the work plans. A final CRP will be sent to the NMED when it is complete.</p>
<p>4. Schedules - Characterization and clean up of the Bulk Fuels Facility Spill is expected to be a large, complex, and interactive project with many deadlines that will have to be met by the Permittee. The Gantt charts provided in the Interim Measures, Groundwater Investigation, and Vadose Zone Work Plans do not contain sufficient detail and are unacceptable because they over simplify field work on the schedules as only a few tasks. A Gantt chart showing all major tasks, their dependency if any on other tasks, and their early/late starts, early/late completions and critical paths must be provided in each of the plans. NMED expects that charts of sufficient detail would likely require presentation on sheets larger than 11" x 17". The Permittee must also submit to the NMED a Gantt chart that integrates all of the work to be done under the three plans. This Gantt chart must be submitted with the Vadose Zone Work Plan.</p>	<p><i>Concur</i></p>	<p>The work flow schedule included with this crosswalk and transmittal letter shows the main tasks and the timeline for completion. Each revised work plan also contains a detailed project schedule, which includes all phases of the project, not just the tasks specific to a given work plan.</p>

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<p>5. Organization - The organization plans in the Interim Measures, Groundwater Investigation, and Vadose Zone Work Plans only include mention of a project manager and a field team manager, and again reference the general site plan under Appendix A of the Vadose Zone and Interim Measures Work Plans and Appendix D of the Groundwater Investigation Work Plan. NMED notes that there are personnel mentioned by name under the Project Management Plan of Appendix A and Appendix D that have not worked for the Permittee at KAFB for the last several years. It is likely that more than a project manager and a field team manager will be required to manage and execute a project of this size and complexity. Furthermore, it is unclear if there will be a separate field team manager for different tasks, such as conducting geophysical logging, drilling and installation of wells, operating and maintaining soil vapor extraction (SVE) units, and sampling of environmental media. Also, the plans do not include details on the responsibilities and the qualifications of the personnel (by position) that will be involved. Simply stating that a kick off meeting" ... will outline roles and responsibilities of all participants ... " is not acceptable. It must be clearly understood in writing prior to project start who (by position) will be responsible for overseeing and conducting the myriad of events that need to happen such as field work, interpretation and management of various data, data validation, updating of the conceptual site model, communicating and reporting, and so forth. The Permittee must revise the Interim Measures, Groundwater Investigation, and Vadose Zone Work Plans to correct these deficiencies.</p>	<p><i>Concur</i></p>	<p>The project organization chart and organization plan within each work plan reflect the actual staffing for the work being conducted at the BFF Spill. Key personnel have been named in the plans, where possible. For positions where a specific name was not provided, Shaw will provide that information as it becomes available.</p>
<p>6. Data Management - The Data Management Plan provided in Appendix D of Appendix A of the Vadose Zone and Interim Measures Work Plans and Appendix D of Appendix D in the Groundwater Investigation Work Plan is a general plan for entire base (see Comment #1 of Section A, Part 1) and, thus, is not specific to the Bulk Fuels Facility Spill. The plan specifically fails to provide detail concerning the types of data that are to be managed, schedules for data submittals and entries into the database, how accuracy and completeness of the data will be ensured, and data availability to the NMED. The Permittee must revise the Interim Measures, Groundwater Investigation, and Vadose Zone Work Plans to correct these deficiencies.</p>	<p><i>Concur</i></p>	<p>The three work plans include a Data Management Plan, which is specific to the BFF Spill project. The Data Management Plan also reflects contractual requirements and how data management fits into Kirtland AFB requirements.</p>

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<p>7. Identification of and Approach to Addressing Data Gaps - Section 1.2 of each of the plans states "following previous investigations at the BFF, data gaps were identified ... ". Because these work plans are meant at a minimum to address data gaps identified in NMED's letter of April 2, 1010, the Permittee must list the data gaps that apply to each of the three plans, as appropriate for the topic of the plan, and indicate where in each of the plans the data gaps are addressed. The Permittee must revise the Interim Measures, Groundwater Investigation, and Vadose Zone Work Plans to include a description of the data gaps identified by the NMED and point specifically to where in each the document these data gaps are addressed.</p>	<p><i>Concur</i></p>	<p>The work plans have been revised to include a clear discussion of data gaps related to the tasks described in the work plan. The data gap discussion identifies data gaps and how the data gaps will be filled.</p>
<p>8. Extent of Contamination and Clean Up Criteria - The extent of contamination in the various media (soil, soil vapor, groundwater) shall be based upon determining at what locations hazardous constituents occur at levels that exceed approved background concentrations. This was stated in the NMED's letter of April 2, 2010, and applies to all RCRA facilities in New Mexico that must conduct correction action. Regarding clean up criteria, any soil contamination left in place within 20 feet of the surface must meet NMED's risk requirements for an acceptable level of risk for all hazardous constituents (10-5 for carcinogens and Hazards Index < 1 for noncarcinogens under a residential land-use scenario). Any soil contamination left in place at any depth must also have sufficiently low concentrations of hazardous constituents to be protective of groundwater. The Permittee may use the NMED's Soil Screening Levels in lieu of conducting a baseline risk assessment to determine the risk of contaminants. While the use of total petroleum hydrocarbons (TPH) as an indicator of contamination is convenient for field screening, the risk to human health and the environment must be assessed through the use of laboratory analysis of hazardous constituents (e.g., benzene, toluene, ethylene dibromide (EDB), naphthalene, xylenes). The Permittee must revise the Interim Measures, Groundwater Investigation, and Vadose Zone Work Plans accordingly.</p>	<p><i>Concur</i></p>	<p>A project-specific, Uniform Federal Policy – Quality Assurance Project Plan (UFP-QAPP) outlines sampling protocols and analyses that will be used to evaluate hazardous constituents in soil and groundwater, as well as soil vapor. The UFP-QAPP also includes NMED soil screening levels (residential) that will be used to determine the extent of contamination and remedial actions.</p> <p>The Interim Measures Work Plan submitted to the NMED reflects the technical approach for evaluating hazardous constituents in soil and how the excavation of soil will be guided by sample analysis results. Soil will be sampled and excavated to depths of 20 feet, based on hazardous-constituent sample results.</p>

Comment	Response	Deviation and Justification
<p>9. Site Specific Conceptual Model. The plans continue to provide what appears to be an outdated conceptual model of geologic, hydrologic, and contaminant conditions. However, regardless of the use of current data or the lack thereof, graphical representations of the conceptual model are of poor quality because the graphics are not always legible, are often too small to convey details, don't present sufficient numbers of cross-sections, and rely too much on the presentation of cartoons in lieu of detailed and accurate drawings (for example, Figures 2-8 and 2-9 in the Groundwater Investigation Work Plan). NMED expected more in the discussion of site specific geology, as what was provided is similar to that presented in reports for the last 8 years or so. A site conceptual model encompassing the source area(s), the fuel percolation area, the light non-aqueous phased liquid (LNAPL) plume floating on groundwater, and the dissolved-phase contaminant plume in groundwater must be included in each of the plans. The model should be illustrated through the liberal use of detailed, accurate, and scaled geologic cross-sections, maps in plan view, and any other necessary graphical representations to clearly and accurately show geologic and hydrologic features, and contaminant levels. NMED suggests that the geophysical logs, especially the electric logs, for KAFB-0115, KAFB-10624, KAFB-16 and Ridgecrest-3 wells would be useful for assisting in the interpretation of the stratigraphy of the area of interest, as these logs clearly show certain stratigraphic horizons in the vadose zone that are distinctive and widespread units ("marker beds"). The site-specific conceptual model in the Interim Measures, Groundwater Investigation, and Vadose Zone Work Plans must be revised to correct the above noted deficiencies.</p>	<p><i>Deviation</i></p>	<p>A site-specific conceptual site model (CSM) will be included in the Groundwater Investigation Work Plan, Part II: Nature and Extent, which will be submitted following the collection of additional data needed to adequately develop the CSM. The Part II: Nature and Extent Work Plan will include a CSM in the form of 3-dimensional models, as well as cross-sections and will include geophysical data collected in existing monitoring wells. Maps will be done in plan view showing geologic and hydrologic features and contaminant levels.</p>

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<p>10. Failure to Provide Graphics and Data Submittals - Section E of NMED's April 2, 2010 letter states "The investigation plans required under this letter shall include relevant maps and cross-sections that show concentration data for contaminants and other relevant information with supporting data posted on the maps and cross-sections in a <i>legible</i> (emphasis added) manner, and clearly showing which borings/wells contributed data towards construction of the maps and cross-sections and which did not. Tables including all existing soil borings, soil-gas monitoring wells, and groundwater monitoring wells, listing their surveyed location, sampling points and maximum depth of exploration shall also be included in the reports and plans. For soil-gas monitoring wells, tables and graphs shall also be included providing trends of TPH concentration versus time for the depths below ground surface of 25, 50, 150, 250, 350, and 450 feet." Many of the figures in the Interim Measures, Groundwater Investigation, and Vadose Zone Work Plans are illegible and the required tables and graphs were not included, or were not provided in the format required. These tables and graphs are necessary to assess the adequacy of proposed</p>	<p><i>Deviation</i></p>	<p>Maps and cross-sections showing concentration data and relevant information will be included in a Phase II: Nature and Extent Work Plan to be submitted at a later date. This work plan will include existing and newly collected data to create tables, maps, and cross-sections to define the nature and extent of contamination in the vadose zone and groundwater.</p>
<p>11. Quality Assurance (QA)/Quality Control (QC) plan The Quality Assurance Plan provided in Appendix D of Appendix A (or Appendix D of Appendix D in the GW Plan) is a general plan for the entire base (see Comment #1, Section A, Part I of this letter) and is not specific to the Bulk Fuels Spill Project. The Interim Measures, Groundwater Investigation, and Vadose Zone Work Plans must specify exactly what field and laboratory quality control samples are to be prepared or collected, as appropriate, and other aspects about quality control that are important to the Bulk Fuels Facility project, including the quality control targets that will be considered acceptable for each of the analytes of concern for each given media. The Permittee must revise the Interim Measures, Groundwater Investigation, and Vadose Zone Work Plans to correct these deficiencies.</p>	<p><i>Concur</i></p>	<p>A project-specific UFP-QAPP has been included with the revised work plans. The project-specific UFP-QAPP contains information on how field and laboratory quality control will be completed, as well as a list of analytes used in the project. The UFP-QAPP is included as an appendix to each work plan.</p>

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<p>12. Certification Statements: The Vadose Zone, Interim Measures, and Groundwater Investigation Work Plans and associated transmittal letters do not contain the required signed certification statement under RCRA and the New Mexico Hazardous Waste Act. Pursuant to 20.4.1.900 NMAC, incorporating 40 C.F.R. § 270.1 I (d)(1), all plans and reports shall include a certification, signed by a chief or senior executive officer of the Facility stating: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. The revised Vadose Zone, Interim Measures, and Groundwater Investigation Work Plans or associated transmittal letters must include this signed certification.</p>	<p><i>Concur</i></p>	<p>This signed 40 CFR 270.11 Document Certification statement is included in the front of each work plan.</p>
<p>13. Waste Management. The Waste Management Plan provided in Appendix E of Appendix A of the Vadose Zone and Interim Measures Work Plan, and Appendix E of Appendix D in the Groundwater Investigation Work Plan) is a general plan for entire base (see Comment #1, Section A, Part I of this letter) and is not specific to the Bulk Fuels Facility Spill project. Investigation Derived Waste (IDW) includes, but is not limited to, general refuse, drill cuttings, excess sample material, water (e.g., decontamination, development, purge), spent materials, and used disposable equipment generated during the course of investigation, corrective action, or monitoring activities. All IDW shall be properly characterized and disposed of, and otherwise managed in accordance with all federal, state, and local laws and regulations. The Permittee shall include a description of the anticipated IDW management process as a revision to the Interim Measures, Groundwater Investigation, and Vadose Zone Work Plans.</p>	<p><i>Concur</i></p>	<p>A project-specific Waste Management Plan has been developed and is included as an appendix within each of the revised work plans.</p>

Comment	Response	Deviation and Justification
B. Interim Measures Work Plan		
<p>1. General Comments on Interim Measures Work Plan The Interim Measures Work Plan was to address two major requirements of NMED's letter of April 2, 2010: 1) remove the Fuel Offloading Rack and excavate to a depth of 20 feet contaminated soil surrounding the Fuel Offloading Rack; and 2) conduct interim measures to remediate the LNAPL plume within five years. This Part (Part 1) of this letter addresses the deficiencies on addressing the first requirement; Part 2 addresses the second requirement to immediately take action to remediate the LNAPL plume floating on the groundwater. Rather than complying with the NMED's April 2, 2010 direction to take immediate action vis a vis LNAPL remediation, the Permittee proposes characterization of the vadose zone for some unspecified time period, followed later by SVE. More specifically, the Interim Measures Work Plan includes: testing six wells to determine LNAPL transmissivity (Tn); conducting air sparging and multi-phase extraction pilot tests, and conducting characterization studies using PneuLog tests. NMED emphasizes that interim measures are actions quickly taken to reduce or prevent the migration of contaminants, or reduce or prevent exposure to contaminants while long-term remedies are evaluated. While characterization studies may be useful for improving remediation efforts, or for proposing and designing a final remedy, interim measures for remediating LNAPL floating on groundwater need to be implemented immediately. Any effort to successfully remove LNAPL floating on groundwater must also involve the removal of LNAPL from the source(s) and fuel percolation areas within the vadose zone.</p>	<p><i>Part 1) Concur; Part 2) Deviation</i></p>	<p>As part of the Interim Measures Work Plan, impacted soil will be excavated to a depth of 20 feet in the area of the Former Fuel Offloading Rack (FFOR). Structures associated with the FFOR are being removed under a separate contract by the USACE and are not discussed in this work plan.</p> <p>The vadose zone requires additional characterization before the installation of interim measures to address contamination in the vadose zone. The Interim Measures Work Plan and Vadose Zone Investigation Work Plan outline the additional characterization needed and include a schedule providing a timeline for completion. Upon completion of the additional characterization, a design report will be submitted, detailing additional interim measures to address the vadose zone.</p> <p>Interim measures at the BFF Spill include the removal of soil and the implementation of the LNAPL containment system. A separate work plan is being</p>

Comment	Response	Deviation and Justification
		<p>submitted for LNAPL containment and the liquid treatment System. LNAPL containment will isolate the groundwater plume from the source and will prevent further migration of the contamination.</p> <p>The current SVE systems will continue to be operated and maintained during the implementation of characterization and interim measures.</p>
<p>2.0 Specific Comments on Interim Measures Work Plan, 1. Page 2-10, Section 2.4 – This section of the plan indicates that the Permittee is preparing a report on indoor air quality, and that the report is currently in draft. A copy of the final indoor air quality report must be provided to the NMED by October 6, 2010, and as indicated in the Compliance Schedule of Table 5 of this letter.</p>	<p><i>Concur</i></p>	<p>This report has been submitted and the requirement has been met.</p>
<p>2.0 Page 3-1, Section 3 – Throughout Section 3 (for example, Section 3.2, 3.2.2, 3.4.1, 3.4.2, 3.5) the Permittee states its intent to characterize and excavate only soils with “mobile LNAPL”, and to leave any other contaminated soil for later remediation under the Corrective Measures Implementation Plan (CMI), which the Permittee referred to as a Corrective Measures Evaluation (CME). The term “mobile LNAPL” was coined by the Permittee and apparently means soil containing such a high concentration of fuel contamination that the soil is dripping wet with fuel.</p> <p>The reasons given by the Permittee not to excavate other contaminated soils (soil without mobile LNAPL) is that a risk assessment would have to be developed separately for such soils, and the Permittee expresses its desire to delay excavation of such soils until long-term corrective actions are initiated for the site. Due to the urgent need for action at this site, such an approach is not acceptable. The Permittee can rapidly develop clean up goals based on NMED’s risk requirements noted above, or simply use NMED’s soil screening levels for hazardous constituents. Soils</p>	<p><i>Concur</i></p>	<p>The Interim Measures Work Plan and the UFP-QAPP discuss the interim measure of soil removal in the area of the FFOR. Soil will be sampled for hazardous constituents and removed down to a depth of 20 feet. Structures in the area of the FFOR are being removed under a separate contract and are not discussed in the Interim Measures Work Plan.</p>

Comment	Response	Deviation and Justification
<p>do not need to be dripping wet with fuel to pose a risk to human health or the environment. NMED estimates that a Corrective Measures Evaluation Plan will not be approved for at least several years because of the inadequate state of site characterization today. Leaving contaminated soil to a depth of 20 feet that represents an unacceptable risk to human health or the environment shall be excavated and removed from the Fuel Offloading Rack area.</p> <p>As mentioned above, due to the urgent need to accelerate remediation, the Permittee is directed in Part 2 of this letter to implement interim measure, which includes removal of the remaining components of the Fuel Offloading Rack and excavation of contaminated soil. This work shall be completed in accordance with the Interim Measures Work Plan as modified by the requirements of this letter and in accordance with the Compliance Schedule in Table 5 of this letter.</p>		
<p>3. Page 3-2, Section 3.2.2 – This section indicates that soil samples will be analyzed in the laboratory only if samples do not respond to a field test kit. This is an unacceptable approach. The Permittee shall use laboratory analysis on all soil samples in shallow borings for TPH, VOCs, SVOCs, and lead.</p>	<p><i>Concur</i></p>	<p>Soil samples will be analyzed in the laboratory for hazardous constituents including TPH, VOCs, SVOCs, and lead. The project-specific UFP-QAPP lists all analyses that will be run on the soil samples collected.</p>
<p>4. Page 3-4, Section 3.4.2 – This section indicates that a detailed excavation plan for the Fuel Offloading Rack will be submitted to the NMED at a later date. NMED’s April 2, 2010 letter intended for the Interim Measure Work Plan to be the detailed plan.</p> <p>The excavation of contaminated soil and removal of structures at the Fuel Offloading Rack is a relatively simple “dig and haul” operation, and represents by far the easiest of the two major interim measures that the Permittee was directed to accomplish in NMED’s letter of April 2, 2010. NMED requires the Permittee to begin excavation and removal of structures at the Fuel Offloading Rack immediately (see Section A of Part 2 of this letter).</p>	<p><i>Concur</i></p>	<p>Removal of contaminated soil from the FFOR will be completed following approval of the Interim Measures Work Plan. Soil will be excavated to a depth of 20 feet.</p>

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<p>5. Page 4-1, Section 4.2 – In part, this section states “Kirtland AFB proposes to install an IRM to remove, to the extent practicable within five years of work plan approval, mobile LNAPL present at the water table that has the potential to migrate along the water table and potentially further endanger the regional aquifer that provides drinking water for ABCWUA. Immobile LNAPL and sorbed and dissolved fuel contamination in groundwater will be addressed by the future CME.”</p> <p>The NMED finds several unacceptable concepts related to these statements. First, as previously mentioned, NMED does not Concur with the Permittee-coined term “mobile LNAPL” and “immobile LNAPL.” The point of the interim measure is to clean up contamination (LNAPL) that poses a threat to groundwater, regardless of contaminant concentrations. Even LNAPL that is not migrating along the water table has the potential to contaminate groundwater with concentrations of hazardous constituents that are at unsafe levels for human consumption. Second, the phrase “to the extent practicable” suggests that the Permittee has already admitted defeat without even attempting to clean up the groundwater and the floating LNAPL. Third, the LNAPL floating on the water table endangers water supply wells in addition to those operated by the WUA. Lastly, like the cleaning up of contaminated soil around the Fuel Offloading Rack, the Permittee is stating its desire to delay clean up for at least several years while a final remedy through an approved CMI Plan is implemented, which is unacceptable. The Permittee must revise the Interim Measures Work Plan to remove the above-noted deficiencies.</p>	<p><i>Concur</i></p>	<p>The Interim Measures Work Plan has been revised to address the stated deficiencies.</p>

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<p>6. Page 4-4, Section 4.6 - In the last paragraph the Permittee states that "Routine system optimization will be performed ... to maintain the highest mass extraction rate ... " The Permittee shall revise this section to explain in detail how the system will be optimized.</p>	<p><i>Concur</i></p>	<p>The Interim Measures Work Plan has been revised to include a complete and clear discussion of how the information collected will be used to optimize and design systems for remediation of LNAPL contamination. Two systems are proposed for the BFF Spill: additional SVE systems for the vadose zone and an LNAPL containment and liquid treatment system for the LNAPL and dissolved-phase components of the spill. A separate work plan, the LNAPL Containment Interim Measure Work Plan, has been submitted separately and discusses the design elements of that system.</p>

Comment	Response	Deviation and Justification
<p data-bbox="170 232 1188 362">7. Page 5-1, Section 5 - The Permittee states: "Vadose zone interim remedial measures will be implemented if data collected during the PneuLog profiling, supplemented by results of the concurrent vadose zone investigation, identify the presence of potentially mobile LNAPL within the vadose zone."</p> <p data-bbox="170 402 1188 727">As mentioned above, the NMED does not Concur with the Permittee-coined terms "mobile LNAPL" and "immobile LNAPL." It should be inarguable that fuel infiltrated from near or at the ground surface and has percolated through the vadose zone to groundwater. Some fuel is likely still draining to groundwater. However, hazardous constituents can still migrate to groundwater as vapor even in areas where the draining of liquid fuel to groundwater has stopped or never took place. The Permittee must revise the Interim Measures Work Plan to indicate that remediation of the vadose zone will be conducted to accomplish clean up of LNAPL floating on the groundwater, regardless of whether fuel-saturated conditions exist in the vadose zone in a given area.</p>	<p data-bbox="1188 232 1514 264"><i>Deviation</i></p>	<p data-bbox="1514 232 1925 1130">References to “mobile” or “immobile” LNAPL have been removed from the work plans. The Interim Measures Work Plan focuses on the removal of contaminated soil from the FFOR and the installation of PneuLog wells. The Vadose Zone Investigation Work Plan discusses the characterization of contamination in the vadose zone and how collected data will fit into filling data gaps identified for defining the nature and extent of contamination. LNAPL on groundwater, as well as the dissolved-phase, will be handled through a containment system and liquid treatment system described in the LNAPL Containment Interim Measure Work Plan. This plan has been submitted separately. The Groundwater Investigation Work Plan provides information on the characterization of groundwater contamination.</p>

Comment	Response	Deviation and Justification
<p>8. Page 5-2, Section 5.2 - The fourth paragraph states: "PneuLog will be performed at three locations ... starting from the point(s) of release to the water table." Figure 5-1 shows the proposed locations for PneuLog testing about 750 feet northeast of the Fuel Offloading Rack and approximately 750 feet north of the southern extent of the LNAPL plume that is floating on groundwater. According to the conceptual model provided in the Interim Measures Work Plan, the proposed locations for PneuLog testing could lead to missing the path of percolation that the fuel took to groundwater.</p> <p>The Permittee must revise the Interim Measures Work Plan to include some PneuLog testing in the fuel percolation area. See Comment #4 in Section C of Part 1 of this letter for information on the area NMED has identified as the fuel percolation area. Indicate also in the Interim Measures Work Plan the significance of using three locations for PneuLog testing and explain in more detail how the air flow potential of the geologic units will be assessed and used in the design to optimize SVE.</p> <p>The Interim Measures Work Plan shall also be revised to indicate that geologic and geophysical (induction, gamma, and neutron) logs will be made for the boreholes used for PneuLog testing.</p>	<p><i>Concur</i></p>	<p>A total of nine PneuLog locations have been proposed in the Interim Measures Work Plan. These locations will aid in the definition of the percolation path and area. Geologic and geophysical logging will be conducted at each PneuLog location. The Interim Measures Work Plan describes how the PneuLog locations will be stepped-out based on the testing results in order to ensure complete definition of percolation in the area surrounding the Fuel Offloading Rack.</p>
<p>9. <i>Figures.</i> Figures 2-2 through 2-5 are very difficult, and in some cases impossible to read. Cross-section A-A' is not the view seen in Figure 2-8.</p> <p>The Permittee shall revise the Interim Measures Work Plan to include corrected and legible figures.</p>	<p><i>Concur</i></p>	<p>New, legible figures have been included in the Interim Measures Work Plan.</p>

Comment	Response	Deviation and Justification
C. Vadose Zone Work Plan		
<p><i>1. General Comments on Vadose Zone Work Plan</i> In NMED's letter of April 2, 2010, the Permittee was directed to submit a Vadose Zone Investigation Plan that describes the additional actions the Permittee will take to investigate vadose zone hydrology and geology, to identify and characterize the source of the releases at the Bulk Fuel Facility, and to identify the extent of soil and soil-gas contamination in the vadose zone from the surface to groundwater. The Vadose Zone Plan was to describe in detail all research, locations, depths and methods of exploration, field procedures, sampling and analysis of soil and soil gas and related quality control procedures, the results and the means by which the results are to be reported, and a schedule of the work.</p> <p>The Vadose Zone Work Plan that has been submitted is inadequate to accomplish the objectives established in NMED's letter of April 2, 2010. A major reason is that the proposed borings and soil-vapor wells are located too far apart to characterize in adequate detail the contaminant and geologic conditions in the vadose zone. NMED therefore directs herein a general increase in the number of sampling points. The Permittee shall revise the Vadose Zone Work Plan to include all of the soil borings and soil-vapor well installations required by this letter.</p> <p>For the convenience of providing further discussion in this letter, NMED has divided the vadose zone into five principal areas: the tank farm, pipeline, Fuel Offloading Rack, fuel percolation area, and the far field area of the soil-vapor plume. Each of these areas is discussed below.</p>	<i>Concur</i>	<p>Additional locations have been added to the Vadose Zone Investigation Work Plan. These locations are based on the recommendations of the NMED in the August 6, 2010 letter, as well as an evaluation of existing data to identify data gaps.</p>
<p><i>1. Tank Farm</i> - Contamination is known to occur from the surface to deep levels at the Tank Farm. In its letter of April 2, 2010, NMED directed that nine deep soil borings/soil-vapor wells be completed in the tank farm area; the Permittee proposed only three. Through its direction in its April 2, 2010 letter, NMED was hoping to avoid the time-consuming process of "dickering" with the Permittee on numbers of borings (and wells, to be discussed later). Nevertheless, in the interest of comity and upon further consideration, NMED Concurrs that by adjusting locations and completing some shallow borings, the tank farm area could be covered at least initially by five deep soil borings/soil-vapor wells and five shallow soil borings. Depending on what is found, additional soil borings/soil-vapor wells may be</p>	<i>Deviation</i>	<p>A total of 35 deep vadose zone wells will be installed at the Bulk Fuels Facility spill area. Four deep wells will be installed in the vicinity of the Fuel Offloading Rack. For the deep wells, soil samples will be collected every 10 feet to a depth of 50 feet after which samples will be collected at 50 foot</p>

Comment	Response	Deviation and Justification
<p>needed, and NMED reserves its rights to require such additional borings, wells, or both in the future.</p> <p>The Permittee shall complete the soil borings/soil-vapor wells at locations #16, 17, 19 and 20; and the soil vapor well at location #6 that are listed in Tables 1 and 2 of this letter, respectively, and shown on Figure 1 enclosed with this letter. The Permittee shall also complete shallow soil borings to a depth of at least 20 feet at locations #1 through 5, which are listed in Table 3 of this letter and shown also on Figure 1. Soil samples from the shallow borings shall be collected at depths of 0, 5, 10, 15, and 20 feet and shall be analyzed for TPH, VOCs, SVOCs, and lead.</p>		<p>intervals and changes in lithology. Soil samples will be analyzed for hazardous constituents listed in the Project Specific UFP-QAPP.</p>
<p>2. <i>Pipeline</i> - The Permittee has not investigated the pipeline that runs between the tank farm, the pump house, and the Fuel Offloading Rack. In NMED's letter of April 2, 2010, the Permittee was directed to complete four deep soil borings/soil-vapor wells along the buried and exposed portions of the pipeline. The Permittee proposed none.</p> <p>In lieu of completing deep soil borings/soil-vapor wells, the Permittee proposed to complete shallow borings along the buried portion of the pipeline extending south of the pump house. However, the Vadose Zone Work Plan is unclear as to the number of shallow boreholes that would be completed. Additionally, the proposed plan is inadequate because the entire length of pipeline between the tank farm and the Fuel Offloading Rack is not included in the investigation.</p> <p>The Permittee shall complete the deep soil borings/soil-vapor wells at locations #4, 6, 7, 8, and 24 that are listed in Table 1 of this letter and shown on Figure 1. The Permittee shall also complete shallow borings along the entire length of the pipeline between the tank farm and the Fuel Offloading Rack, regardless of whether the pipeline runs underground or on the surface. The borings shall be spaced at intervals not to exceed 25 feet and are to be located on both sides of the pipeline. Soil samples from the shallow borings shall be collected at depths of 0, 5, 10, 15, and 20 feet. The soil samples from deep and shallow borings shall be analyzed for TPH, VOCs, SVOCs, and lead. Depending on the results, NMED may require further investigation of this area, including more and deeper borings.</p>	<p><i>Concur</i></p>	<p>Deep wells will be installed in the vicinity of the pipeline, including the locations listed in Table 1 of the August 6, 2010 letter. Shallow soil borings will be installed and soil samples collected along the full length of the pipeline (detailed in the Interim Measures Work Plan) from the tank farm to the fuel off loading rack. Soil samples will be collected at 0, 5, 10, 15, and 20 feet for analyses to define the extent of excavation.</p>

Comment	Response	Deviation and Justification
<p>3. <i>Fuel Offloading Rack</i> - The Fuel Offloading Rack is supposedly the main source of the fuel spill, but it has not been adequately characterized since discovery of the fuel leak 10 years ago. Previous investigative efforts appear to have been arbitrarily terminated once TPH concentrations were found to be less than 100 mg/kg in soil and below 100 ppmv in soil vapor. In NMED's letter of April 2, 2010, the Permittee was directed to complete a <i>minimum</i> of six deep soil sampling/vapor wells at the Fuel Offloading Rack to determine the full extent of contamination; the Permittee proposed four. NMED reaffirms its previous direction. The Permittee shall complete the soil borings/soil-vapor wells at locations #1, 2, 3, 4, 11, and 12 that are listed in Table 1 of this letter and shown in Figure 1.</p>	<p><i>Concur</i></p>	<p>Deep wells will be installed in the area of the Fuel Offloading Rack, including the locations listed in Table 1 of the August 6, 2010 letter. Soil samples will be collected every 10 feet to a depth of 50 feet after which samples will be collected at 50 foot intervals and changes in lithology. Soil samples will be analyzed for hazardous constituents listed in the Project Specific UFP-QAPP.</p>
<p>4. <i>Fuel percolation area</i> - This area, east of the Fuel Offloading Rack, is currently believed to constitute the core of the contamination in the vadose zone, and represents the place where fuel presumably migrated to groundwater. In NMED's letter of April 2, 2010, the Permittee was directed to complete a <i>minimum</i> of six deep soil sampling/vapor wells in order to significantly improve characterization of this area. This is critical to understanding the amount of fuel contamination in the vadose zone that must be remediated. The Permittee proposed to complete only two of the deep soil sampling/vapor wells that the NMED specified.</p> <p>The Permittee did, however, propose an additional 3 deep soil sampling/vapor wells at locations further to the east. NMED Concur that these latter locations are necessary to properly characterize this area. Thus, to improve the understanding of the amount of fuel contamination in the vadose zone that must be remediated, the Permittee shall complete the soil borings/soil-vapor wells at locations #5,9, 10,21,22,23,25,26, and 27 listed in Table 1 and shown on Figure 1.</p>	<p><i>Concur</i></p>	<p>Deep wells will be installed in percolation area, including the locations listed in Table 1 of the August 6, 2010 letter and the three locations out to the east as proposed in the previous work plan. Soil samples will be collected every 10 feet to a depth of 50 feet after which samples will be collected at 50 foot intervals and changes in lithology. Soil samples will be analyzed for hazardous constituents listed in the Project Specific UFP-QAPP.</p>
<p>5. <i>Far field area of Soil-Vapor plume</i> - In its letter of April 2, 2010, NMED directed the Permittee to install six soil-vapor wells at locations north of the Fuel Offloading Rack and fuel percolation area to investigate the concentrations of hazardous constituents in soil gas that overlies groundwater in these areas. The Permittee shall complete the soil-vapor wells at locations #1, 2, 4, 3, 5, 6, 8, and 9; and the soil boring/soil-vapor well at location #24, that are listed in Tables 2 and 1, respectively, and shown on Figure 1.</p>	<p><i>Concur</i></p>	<p>The specific locations have been included in the Vadose Zone Investigation and deep borings will be installed.</p>

Comment	Response	Deviation and Justification
<p>6. <i>Sampling Requirements Applicable to all Five Vadose Zone Areas</i> - Soil samples from the deep borings shall be collected at a frequency of at least one sample every 10 feet for the first 50 feet, and at least one sample thereafter every 50 feet to total depth, and at least one sample at total depth in each boring. Each deep boring at each location shall be drilled from the surface to the water table, and each deep boring shall be completed as a permanent soil-gas monitoring well. The soil-gas monitoring wells shall be capable of yielding discrete samples of soil gas recovered from depths of 25,50, 150,250,350, and 450 feet below the ground surface.</p> <p>All boreholes that will have soil-vapor monitoring wells constructed in them shall be logged using induction (medium and deep), neutron, and gamma tools. Geologic logs shall also be prepared for these boreholes showing the geologic conditions from the surface to the total depth of each borehole.</p> <p>The coordinates in Tables 1-3 are State Plane Coordinates in feet, NAD83. All boring/soil vapor well locations are also shown on Figure 1 enclosed with this letter.</p> <p>The Permittee shall revise the Vadose Zone Work Plan to incorporate the general comments and correct the deficiencies noted above.</p>	<p><i>Concur</i></p>	<p>For the deep boring, soil samples will be collected every 10 feet to a depth of 50 feet after which samples will be collected at 50 foot intervals and changes in lithology. Shallow borings will be sampled every 4 feet. Soil samples will be analyzed for hazardous constituents listed in the Project Specific UFP-QAPP. Geophysical logging of the boreholes will be conducted, as described, and geologic logs will be completed.</p>
<p>2. <i>Specific Comments on Vadose Zone Work Plan 1. Downhole Geophysical Logging</i> - Section 3.2.1.1, Table 3-1, Topic 3, states "If proposed vapor monitoring points are screened in zones determined to be fine grained lithologic units adjust the screen location vapor monitoring points up or down to the nearest coarser grained unit."</p> <p>Because individual fine grained or coarse grained beds do not necessarily extend laterally for any significant distances, any geophysical logs used to adjust screen locations must be generated for that particular borehole.</p> <p>The Permittee must revise the Vadose Zone Work Plan to indicate the maximum distance that screened zones are to be adjusted from the required screen depths should adjustment be necessary. For screens that are to be set 100 feet apart as directed under this letter, the Permittee may adjust screens by no more than 25 feet. For screens that are to be set 25 feet apart, the Permittee may adjust screens by no more than 5 feet.</p>	<p><i>Concur</i></p>	<p>The Vadose Zone Work Plan includes a detailed discussion of well construction, including how screen intervals will be determined and/or adjusted.</p>

Comment	Response	Deviation and Justification
<p>2. <i>Seismic Refraction, Section 3.2.1.2</i> - NMED encourages the use of geophysical techniques; however, NMED is doubtful that seismic refraction will prove useful in this case. NMED is concerned that refraction will only detect shallow loose material near the surface, somewhat more dense subsurface material, and saturated material beginning at the water table. Although KAFB is free to conduct the refraction survey, the NMED will not allow such survey to delay completion of other work required for characterizing and cleaning up the Bulk Fuels Facility Spill.</p> <p>If the Permittee proceeds with conducting the refraction survey, the following issues must be addressed in the revised work plan.</p> <ul style="list-style-type: none"> A. Explain why seismic refraction was chosen and not shallow reflection. B. Explain how seismic refraction is expected to identify the difference between a fine-grained unit and a coarse-grained unit above the saturated zone at depths of 450-500 feet (see DQO step 5 for topic 1 on Table 3-1). Table 3-1, DQO step 6, topic 1 implies that refraction will be able to define a unit within I-foot depth at a depth of 500 feet. These Data Quality Objectives cannot likely be achieved. C. If the I-foot depth is actually referring to the location of geophones, specify what the QC targets are for the seismic survey (for example, how close should the interpreted seismic interface be to the actual depth to water). Specify the site-specific conceptual model of the seismic layering. Indicate the expected thicknesses versus depth of units to be detected. D. Explain what seismic source is planned to be used in this "noisy" environment that can carry an off-the-end shot for the 1500 foot line. Conceptually, specify how many shot points and what locations are planned per line. E. Figure 3-1 shows 13 seismic lines that are all oriented in an east-west direction. Section 3.2.1.2 discusses orthogonal lines. Clarify how many lines are planned. Specify how the orthogonal lines will be placed, and show them on a corrected Figure 3-1. Explain why the proposed seismic lines are shown crossing buildings. 	<p><i>Concur</i></p>	<p>Seismic Refraction will not be completed.</p>

Comment	Response	Deviation and Justification
<p>3. <i>Resistivity</i>, Section 3.2.1.3 - Like the refraction survey discussed in the proceeding comment, the NMED is doubtful that the IPIRES techniques will prove useful in this case. Although KAFB is free to conduct the resistivity survey, the NMED will not allow such a survey to delay completion of other work required for characterizing and cleaning up the Bulk Fuels Facility Spill.</p> <p>If the Permittee proceeds with conducting the survey, the following issues must be addressed in the revised work plan.</p> <ul style="list-style-type: none"> A. As described in Section 3.2.1.3 of the plan, 56 stakes are proposed to be situated along 1,850 feet transects. This amounts to an electrode separation of about 30 feet, which would yield a shallowest apparent resistivity of the upper nominal 30 feet, with a value every 30 feet horizontally. Explain how the resistivity survey is expected to provide good results with all the surface interferences, cultural conditions, pipelines, surface topography changes, utilities, and other conditions known to be present at the site. Explain how close, for example, does the interpreted depth to groundwater need to be to meet the "Specify Limits on Decision Errors" concept on Table 3-1. Specify the QC procedures to be performed, such as calibrating to a known resistance and reciprocity tests. B. Explain why the proposed resistivity lines are shown crossing buildings. C. Indicate whether the geophysical parameters measured in the Sunbelt Geophysics report were taken into account in planning the resistivity investigation. D. Specify what size transmitter is to be used to be able to measure the appropriate parameters with appropriate detail at large depths, and what electrode arrays are to be used. E. Indicate if an analysis has been conducted modeling what MN, AB, and AB-MN spacings seem plausible based upon site-specific resistivities (estimated from resistivity or induction logs) and equipment specifications. F. Indicate and explain the computer model by which the data are to be interpreted. 	<p><i>Concur</i></p>	<p>Resistivity will not be completed.</p>

Comment	Response	Deviation and Justification
4. Page 3-5, Section 3.2.3 - Substitute semi-volatile organic compounds (SVOCs) for polycyclic aromatic hydrocarbons (PAHs) and add lead to the parameters to be analyzed for in soil. The Permittee must revise the Vadose Zone Work Plan accordingly.	<i>Concur</i>	The Project Specific UFP QAPP lists all analyses relevant to the project.
5. Page 3-6, Section 3.2.3 - The first paragraph on this page says that soil samples containing LNAPL will not be sent to the laboratory for chemical analysis. All soil samples, including those containing LNAPL, must be sent to a laboratory and analyzed for TPH, VOCs, SVOCs, and lead. The Permittee must revise the Vadose Zone Work Plan accordingly.	<i>Concur</i>	The Project Specific UFP QAPP lists all analyses relevant to the project.
6. Page 3-6, Section 3.2.4 - This section states that screens on soil-vapor monitoring wells will be set to "anticipated depths" of 25, 50, 150, 250, 350, and 450 feet. The Permittee must revise the Vadose Zone Work Plan to indicate the maximum distance that screened zones are to be adjusted from the required screen depths, should adjustment be necessary. For screens that are to be set 100 feet apart as directed under this letter, the Permittee may adjust screens by no more than 25 feet. For screens that are to be set 25 feet apart, the Permittee may adjust screens by no more than 5 feet. The Permittee must revise the Vadose Zone Work Plan accordingly.	<i>Concur</i>	The Vadose Zone Work Plan includes a detailed discussion of well construction, including how screen intervals will be determined and/or adjusted.
7. Cross-section "A-A" - Cross-section A-A' location shown on Figures 2-2 through 2-5 does not correspond to Cross-Section A-A' shown in Figure 2-8. Supply the intended cross-section A-A' with data shown clearly and legibly, and with appropriate data.	<i>Deviation</i>	Cross sections for the vadose zone will be included in a separate groundwater investigation work plan Part II Nature and Extent.

Comment	Response	Deviation and Justification
D. Groundwater Investigation Work Plan		
<p>General Comments on Groundwater Investigation Work Plan</p> <p>In NMED's letter of April 2, 2010, the Permittee was directed to submit a Groundwater Investigation Work Plan that describes the additional actions the Permittee will take to characterize the nature, horizontal and vertical extent, and the fate and rate of migration of the groundwater contamination. The Groundwater Investigation Work Plan was also to include construction details and the locations and depths of the groundwater monitoring wells to be installed, actions to characterize the geology and hydrogeology at and below the water table, groundwater flow direction and velocity, field procedures, and the sampling and analysis of groundwater and related quality control. The Groundwater Investigation Work Plan was also to describe the means (<i>e.g.</i>, cross-sections, plan views) by which results would be reported after the investigation and include a schedule to complete the work.</p> <p>The leading (northern) edge and the eastern and western margins of the dissolved-phase and LNAPL plumes are as yet undefined, and the nature and concentrations of contaminants in the core of each of the plumes are poorly characterized because existing wells are located too far apart (generally at distances greater than 500 feet), vertical characterization information is nonexistent, and water quality beneath the LNAPL plume has not been assessed. Additionally, the vertical extent of contaminated groundwater, key aspects of the hydrology of the groundwater (hydraulic conductivity, velocity), and the geology (horizontal and vertical characteristics) of the saturated zone are poorly defined or are unknown.</p> <p>In general, the Groundwater Investigation Work Plan proposes too few wells, both in a vertical and horizontal sense, than is needed to adequately characterize the geology, hydrology, and the nature and extent of contamination over such a large area of groundwater contamination. As mentioned earlier, NMED was hoping to avoid the time-consuming process of "dickering" with the Permittee on numbers of borings and wells by providing clear and specific direction in its April 2, 2010 letter. Nevertheless, in the interest of comity and upon further consideration, NMED Concurrs that by adjusting locations some well locations directed in NMED's April 2, 2010 letter can be replaced with some proposed by the Permittee in the Groundwater Investigation Work Plan. NMED nonetheless directs an increase in the</p>	<p><i>Concur</i></p>	<p>The groundwater investigation work plan has been revised into two parts. Part I is the characterization work plan and Part II is the nature and extent. Part II will follow as new data is collected and incorporated into the revised CSM.</p> <p>All well locations as directed in this letter will be implemented during the groundwater field work.</p>

Comment	Response	Deviation and Justification
<p>number of sampling points over that proposed by the Permittee, with the goal of achieving adequate site characterization more quickly to address the urgent matter of cleaning up the Bulk Fuels Facility Spill. Depending on what is found, additional wells may be needed, and NMED reserves its rights to require such additional borings, wells, or both in the future. The Permittee shall revise the Groundwater Investigation Work Plan to include all of the well installations required by this letter.</p> <p>NMED has identified several other general deficiencies with the Groundwater Investigation Work Plan, which includes issues related to background water quality, vertical characterization, water quality beneath the LNPAL plume, rate of contaminant migration, cluster/nested wells, and characterization of plume cores and margins. These general deficiencies are discussed below.</p>		
<p><i>1. Background Water Quality</i> - Only two upgradient wells have been installed that potentially may yield groundwater samples that are free from contamination. Both of these wells were only recently completed; none is screened appreciably below the water table to provide vertical characterization of water quality, geology, and hydrologic conditions. The Permittee must complete the background cluster/nested wells at location #6 listed in Table 4 of this letter and shown on Figure 2 (enclosed).</p>	<i>Concur</i>	Intermediate and deep monitoring wells are planned for completion at location No. 6.
<p><i>2. Vertical Characterization</i> - The plan identifies proposed wells that are to be screened at various depths below the water table as "B" and "C" wells, with the "C" wells the deepest screened well at a given cluster/nested well location. Due to urgency of this matter, the NMED does not approve of "C" well installation being contingent on "B" well results. Given that the pumping of water supply wells is known to induce vertical gradients in groundwater, can cause significant components of vertical flow in the vicinity of such wells, and draws water preferentially from productive zones that may be deeper than the water table, vertical characterization of groundwater quality, hydrology, and geology is required for all well installations specified by this letter.</p>	<i>Concur</i>	At each location shallow, intermediate, and deep monitoring wells will be completed for groundwater sample collection and vertical characterization.

Comment	Response	Deviation and Justification
<p>3. <i>Water Quality Beneath the LNAPL Plume</i> - Although the lack of water quality information was identified specifically by the NMED as a data gap, the Groundwater Investigation Work Plan states that groundwater at well locations within the boundaries of the LNAPL plume will not be sampled and analyzed. This is an unacceptable approach. Knowledge of water quality beneath the LNAPL plume is crucial to understand the full extent and magnitude of the groundwater contamination.</p>	<p><i>Concur</i></p>	<p>All groundwater monitoring wells will be sampled regardless if they are completed the dissolved phase or plume core.</p>
<p>4. <i>Rate of Contaminant Migration</i> - Although a critical question to be answered, it was not clear in the Groundwater Investigation Work Plan if the Permittee has a plan to address the rate of migration of either the dissolved-phase or LNAPL contaminant plumes, and in particular, the time it would take for the dissolved-phase plume to reach surrounding well fields. The Permittee must clarify this point.</p>	<p><i>Concur</i></p>	<p>The LNAPL containment work plan will address aquifer testing and groundwater velocity measurements as part of the design.</p>
<p>5. <i>Cluster versus Nested Wells</i> - The NMED has no objections to the use of nested wells instead of cluster wells, provided the nested wells are properly constructed. However, in this case the NMED will not accept wells that are constructed with 3-inch diameter casing and screens. Three inch diameter casing and screens are inappropriate for constructing groundwater monitoring wells that will be installed to depths of 500 feet or more. The Permittee shall design wells to be constructed in cluster or nested configurations using casing and screen that are no smaller than 5 inches in diameter. The borehole surrounding the well casing for a nested or cluster well must be of sufficient diameter to allow for an adequate annular space between the borehole and well casing and screen. The annular space must be of sufficient size to allow for proper construction of filter packs and seals, and for the installation of grouting (see the groundwater monitoring well construction requirements set forth in Part 2 of this letter).</p>	<p><i>Concur</i></p>	<p>All monitoring wells will be constructed with schedule 80 PVC riser pipe and 5-inch stainless steel screens.</p>

Comment	Response	Deviation and Justification
<p>6. <i>Characterization of Plume Cores</i> - The dissolved-phase and LNAPL plumes extend off base to nearly 0.9 to 0.5 miles, respectively from the presumed source, yet a total of only eight wells currently exist off-base to characterize the cores of both plumes. Of these eight wells, this includes two wells where groundwater has not been sampled for water quality in the past and one well that was only very recently installed at Bullhead Park for which no water quality data has been submitted to the NMED.</p> <p>In NMED's letter of April 2, 2010, the Permittee was directed to install groundwater monitoring wells at a <i>minimum</i> of eight additional locations to characterize the concentrations of contaminants, and the geologic and hydrologic conditions that exist off-base in the plume cores; instead, the Permittee proposed only four.</p> <p>To achieve the objective of providing initial plume-core characterization, the Permittee shall install the groundwater monitoring wells at locations #11, 12, 13, 14, 15, 16, 17, 18, 19,20,21, 22, and 23 listed in Table 4 and shown on Figure 2.</p>	<p><i>Concur</i></p>	<p>Water table, intermediate, and deep, monitoring wells will be installed at location 11, 12, 13, 14, 15, 16, 17, 18, 19,20,21, 22, and 23 to characterize the plume core.</p>
<p>7. <i>Characterization of Plume Margins</i> - Only five existing wells define the edge of the plume off-base (including one well recently installed). In NMED's letter of April 2, 2010, the Permittee was directed to install groundwater monitoring wells at a <i>minimum</i> of eight additional locations to characterize the concentrations of contaminants, and the geologic and hydrologic conditions that exist off base along the plume margins; instead, the Permittee proposed five.</p> <p>To adequately provide initial plume-edge characterization, the Permittee shall install the groundwater monitoring wells at locations #1, 2, 3, 4, 5, 7, 8,9, 10, 24, 25, 26, 27, and 28 that are listed in Table 4 and shown on Figure 2. Three groundwater monitoring wells shall be installed at different depths at each of the well locations listed in Table 4. The screen depths shown in Table 4 are distances (in feet) that the top of the screens shall be set below the water table, except wells screened across the water table (those with screen depths of zero in Table 4) may have screens that extend above the water table. Screen lengths for wells shall not exceed 15 feet, with the exception that wells screened across the water table shall have screens 20 feet long, with no more than 15 feet of screen length situated below the water table.</p>	<p><i>Concur</i></p>	<p>Water table, intermediate, and deep, monitoring wells will be installed at location 1, 2, 3, 4, 5, 7, 8,9, 10, 24, 25, 26, 27, and 28 to characterize the dissolved plume margin.</p>

Comment	Response	Deviation and Justification
<p>The geologic conditions encountered from the surface to the total depth of the borings at each well location shall be logged. Boreholes completed for well installations at all locations shall also be logged using induction (medium and deep), neutron, and gamma (large crystal) tools. Geophysical and geologic logging at a given cluster well location is required only in the well at the location having the deepest screened interval.</p> <p>Coordinates in Table 4 are State Plane Coordinates in feet, NAD83. All of the locations listed in Table 4 are also shown on Figure 2 enclosed with this letter.</p> <p>The Permittee shall revise the Groundwater Investigation Work Plan to incorporate the general comments and correct the deficiencies noted above.</p>		
<p>2. Page 3-4, Section 3.3.2 - This section states that "NMED will be notified regarding any deviations in well constructions per Section 4.0." Aside from the fact that there is no Section 4.0, well construction and any changes thereto must be approved in advance by the NMED. E-mail or telephone approval may suffice to facilitate in-field decision-making. The Permittee shall revise the Groundwater Investigation Work Plan accordingly.</p>	<i>Concur</i>	NMED approval will be requested for all changes in advance.
<p>3. Page 3-5, Section 3.3.3 - Soil samples shall be collected at well locations #11, 12, 17, and 18 listed in Table 4 from the deepest borehole at each location. The samples shall be collected at a frequency of at least one sample every 10 feet for the first 50 feet of the borehole, then at least one sample every 50 feet to the bottom of the borehole, and at total depth of the borehole. The soil samples must be analyzed in the laboratory for TPH, VOCs, SVOCs, and lead. The Permittee shall revise the Groundwater Investigation Work Plan accordingly.</p>	<i>Concur</i>	Soil samples from these four locations will be collected during soil boring advancement as requested.
<p>4. Page 3-7, Section 3.3.5 - This section indicates that wells screened below the water table will be considered by the Permittee to be "piezometers" (normally for measuring only hydraulic head). Groundwater samples must be collected from all wells, regardless if the wells are screened at the water table or deeper, and all samples must be analyzed for TPH and hazardous constituents. The Permittee shall revise the Groundwater Investigation Work Plan accordingly.</p>	<i>Concur</i>	Piezometers will not be installed as part of the groundwater characterization.

Comment	Response	Deviation and Justification
5. Page 3-7, Section 3.3.5 - This section states that wells located within the area of the floating LNAPL will not be developed. All wells, including those within the LNAPL plume, shall be properly developed to provide representative water samples. The Permittee shall revise the Groundwater Investigation Work Plan accordingly.	<i>Concur</i>	All groundwater monitoring wells will be developed regardless if they are completed in the dissolved phase or plume core.
6. Page 3-7, Section 3.3.6 - This section states that groundwater at wells located within the area of the floating LNAPL will not be sampled. Groundwater in all wells will be sampled, including those within the LNAPL plume. The Permittee shall revise the Groundwater Investigation Work Plan accordingly.	<i>Concur</i>	All groundwater monitoring wells will be sampled regardless if they are completed in the dissolved phase or plume core.
7. Page 3-7, Section 3.3.6 - For analysis of groundwater samples, add lead and substitute SVOCs for PAHs, and dissolved iron and dissolved manganese for iron and manganese, respectively. Samples must not be filtered, except for sample fractions for dissolved iron and dissolved manganese. Add alkalinity and pH to the list of field parameters. The Permittee shall revise the Groundwater Investigation Work Plan accordingly.	<i>Concur</i>	Groundwater samples will be analyzed for the parameters as directed. Alkalinity will be performed in the field. The groundwater investigation work plan specifically calls for installation of 78 monitoring wells and 39 SVM wells. All locations are indicated on maps included in the work plan.
8. Page 3-6, Section 3.3.4 - It is not clear how many wells are actually proposed because wells KAFB-10629, KAFB-10630, and KAFB-10638 are not listed on Table 3-2 of the Groundwater Investigation Work Plan. The Permittee must clarify or resolve this discrepancy in a revision to the Groundwater Investigation Work Plan.		
9. Page 3-1, Section 3.1.1 - Indicate what geophysical logs will be run and at what stage of the borehole/well installation process. The discussion should be included in Section 3.3 instead of Section 3.1.1. The Permittee shall revise the Groundwater Investigation Work Plan accordingly.	<i>Concur</i>	Downhole geophysics will run on all deep monitoring wells at each cluster. The geophysics suite will consist of induction, neutron, and gamma logs.
10. Page 3-2, Section 3.3.1 - See specific Comments #2 and 3 for the Vadose Zone Work Plan regarding surface geophysical surveys.		Seismic Refraction and resistivity will not be completed.

Comment	Response	Deviation and Justification
PART 2		
A. Direction to Conduct Interim Measures and Other Actions		
1. conduct additional soil vapor extraction,	<i>Defer/Deviation</i>	Additional soil vapor extraction may be added following the results of the Vadose Zone Investigation and subsequent system design. Current SVE systems will continue to be operated and maintained. A separate Operation and Maintenance Plan will be submitted at a later date.
2. improve the Operation and Maintenance Plan for the SVE units,	<i>Concur</i>	The Operation and Maintenance Plan for the SVE units will be submitted separately at a later date.
3. begin immediate excavation of contaminated soil at the Fuel Offloading Rack,	<i>Concur</i>	This action will begin with approval of the Interim Measures Work Plan.
4. provide an estimate of the contaminant migration rate,	<i>Concur</i>	This has already been provided by Kirtland AFB to the NMED.
5. install sentry wells,	<i>Concur</i>	The sentry wells will be installed. These wells will be prioritized in the drilling schedule.
6. log existing wells, including using geophysical methods,	<i>Concur</i>	Shaw is in the process of scheduling geophysical surveys of all existing wells.
7. submit critical data to the NMED	<i>Concur</i>	This has already been submitted to the NMED by Kirtland AFB.
8. provide adequate funding to the WUA for sampling and analysis of well water.	<i>Concur</i>	This has been incorporated into the Project Specific UFP-QAPP and Groundwater Investigation Work Plan.

<i>Comment</i>	<i>Response</i>	<i>Deviation and Justification</i>
B. Technical Requirements for Conducting Interim Measures		
The technical requirements listed in this section of the August 6, 2010 letter have been incorporated into the revised Groundwater Investigation, Vadose Zone Investigation, and Interim Measures Work Plans.		