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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

April 2, 2010

Colonel Michael S. Duvall
Base Commander
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2000 Wyoming Blvd. SE
Kirtland AFB, NM 87117-5606

Mr. John Pike
Director, Environmental Management Section
377 MSG/CEANR
2050 Wyoming Blvd., Suite 116
Kirtland AFB, NM 87117-5270

RE: SOLID WASTE MANAGEMENT UNITS ST-106 AND SS-111, BULK FUELS FACILITY SPILL
KIRTLAND AIR FORCE BASE
EPA ID# NMD9570024423, HWB-KAFB-10-004

Dear Colonel Duvall and Mr. Pike:

As you are aware, the U. S. Department of Defense Kirtland Air Force Base ("Permittee") is conducting an investigation of contaminated groundwater at the Bulk Fuels Facility Former Fuel Offloading Rack (Solid Waste Management Unit ["SWMU"] ST-106) and the associated Light Non-Aqueous Phase Liquid ("LNAPL") plume (SWMU SS-111, or Phase-Separated Hydrocarbon Bulk Fuels Facility Remediation) (collectively, the "Bulk Fuels Facility Spill"). Data submitted by the Permittee show that the contamination caused by the Bulk Fuels Facility Spill represents a significant threat to human health and the environment, particularly to well water in urban neighborhoods adjacent to Kirtland Air Force Base ("KAFB"). Despite the fact that this release of hazardous constituents was first discovered 10 years ago, the Permittee has not completely characterized the Bulk Fuels Facility Spill, nor conducted adequate remediation.

As stated in the New Mexico Environment Department ("Department") Ground Water Quality Bureau ("GWQB") letter enclosed with this letter, the GWQB has transferred oversight of the Bulk Fuels Facility Spill to the Hazardous Waste Bureau ("HWB"),

the vadose zone at and in the vicinity of the Former Fuel Offloading Rack, to install additional wells, and continue operation of the existing soil-vapor extraction units as directed below. Additionally, pursuant to Section R.5 of Module IV of the Permit, the Permittee is directed to immediately complete characterization of contaminated soil and soil-gas in the vadose zone, and to immediately complete characterization of the dissolved-phase contamination in groundwater. Furthermore, in accordance with Section M.1 of Module IV of the Permit, the Permittee will be directed by NMED to conduct one or more Corrective Measures Evaluations. The Permittee shall comply with the detailed instructions specified below by the indicated deadlines.

A. REQUIREMENT FOR COMPLETING CHARACTERIZATION OF CONTAMINATION IN THE VADOSE ZONE

The Department finds that contaminant characterization is inadequate at the tank farm, the piping extending from the tank farm to the Former Fuel Offloading Rack, and areas in the vicinity of the Former Fuel Offloading Rack. More specific details on this finding are presented in the next two paragraphs.

Based on information provided by the Permittee, only four soil borings have been completed at the fuel tanks and no borings have been completed along the ancillary piping leading from the fuel tanks to the Former Fuel Offloading Rack. The four soil borings at the tanks were completed to shallow depths ranging from 25-48 feet. Diesel Range Organics ("DRO") contamination was detected in all four boreholes, with the highest concentrations (1800-2400 mg/kg) found in borehole SB-09. A number of hazardous constituents were also detected in soil samples from SB-09 and SB-06. Despite these findings, the Permittee did not determine the extent of contamination near the tanks. The latter is particularly notable given that the Permittee's *Stage 1 Abatement Plan Report* (February 8, 2006) contains the following recommendation (in Section 4.4):

> It is recommended that additional field investigation at the east side of the Bulk Fuels Facility be conducted to determine the full extent of petroleum hydrocarbons in soil and soil vapor beneath Tank 2422...Additional investigation will also determine whether release(s) associated with this tank are the source of sorbed-phase and vapor-phase petroleum hydrocarbons previously indentified in distal monitoring wells SVMW-13 and SVMW-15.

To date, the Permittee has not conducted the additional field investigation to determine the full extent of petroleum hydrocarbons and hazardous constituents in soil and soil vapor around the Bulk Fuels Facility.

The Permittee has also not completed characterization of the contaminated soil in the vicinity of the Former Fuel Offloading Rack, as previous investigative efforts seem to have been arbitrarily terminated once Total Petroleum Hydrocarbons ("TPH") concentrations in soil were found to be less than 100 mg/kg. Additional soil borings should have been completed to investigate the full

Report results for subsurface-soil sampling	Within 15 months after Department approval of Vadose Zone Investigation Plan
Complete first four quarters of soil-gas sampling and analysis	Within 24 months after Department approval of Vadose Zone Investigation Plan
Soil-gas sampling	Quarterly after well installations completed
Submit quarterly soil-gas monitoring reports to the Department	60 days after the quarter during which sampling occurred

Furthermore, in addition to any other locations the Permittee identifies, the locations listed in Table 2 of this letter shall be included in the Vadose Zone Investigation Plan and must be sampled for contaminants in soil and soil gas (all coordinates in this table are State Plane Coordinates in feet, NAD83). Soil samples 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 boring at each location shall be drilled from the surface to the water table, and each boring shall be completed as a permanent soil-gas monitoring well. All of 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. While the Permittee shall continue to analyze samples for TPH and hazardous constituents, the investigation shall not be limited to only those areas containing or suspected to contain TPH at concentrations of greater than 100 mg/kg (100 ppm) in soil or 1000 ppmv in soil gas. Instead, investigation of the Bulk Fuels Facility Spill shall be designed to determine the full extent of contamination above background levels regardless of contaminant concentration levels.

Table 2. Borehole locations for soil sampling and for conversion to soil-gas monitoring wells.

Location #	Easting	Northing	Characterization Purpose
1	1541119	1473793	Step out from Fuel Offloading Rack beyond 100 mg/kg contaminated zone
2	1540808	1473503	Step out from Fuel Offloading Rack
3	1541123	1473310	Step out from Fuel Offloading Rack
4	1541425	1473313	Step out from Fuel Offloading Rack
5	1541961	1473492	Path from Fuel Offloading Rack to LNAPL Plume
6	1542002	1473057	Piping
7	1541794	1473061	Piping
8	1542370	1473058	Piping
9	1541898	1473276	Path from Fuel Offloading Rack to LNAPL Plume
10	1541720	1473369	Step out from Fuel Offloading Rack

Water Utility Authority well fields. Given that the pumping of water supply wells is known to induce vertical gradients in groundwater and can cause significant components of vertical flow in the vicinity of such wells, vertical characterization of groundwater quality and geology is required.

The leading edge and the eastern and western margins of the plume are undefined, and the nature and concentrations of contaminants in the core of the plume are poorly characterized because existing wells are located too far apart (generally at distances greater than 500 feet). Additionally, only one upgradient well has been installed that may yield groundwater samples that are free from contamination. Given the magnitude of this spill, several upgradient wells should be installed that are screened at different depths at and below the water table to ensure that all areas of contaminated groundwater have been located, and that the background wells are truly monitoring background water quality.

Therefore, on or before **July 7, 2010**, the Permittee must submit to the Department for its review and approval a Groundwater Investigation 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 Plan shall 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, and the groundwater flow direction and velocity. The plan shall also present details on field procedures, and the sampling and analysis of groundwater and related quality control. The Groundwater Investigation Plan shall describe the results, the means (*e.g.*, cross-sections, plan views) by which these results will be reported after the investigation is completed, and a schedule for implementation of the work that complies with the compliance schedule in Table 4 of this letter.

Table 4. Compliance Schedule for Groundwater Investigation

Task	Date Due
Submit Groundwater Investigation Plan to the Department	July 7, 2010
Complete installation of all wells	Within 12 months after Department approval of Groundwater Investigation Plan
Submit well installation report to the Department	Within 15 months after Department approval of Groundwater Investigation Plan
Complete first eight quarters of groundwater sampling and analysis	Within 36 months after Department approval of Groundwater Investigation Plan

				characterization
19	1542653	1475338	0, 15, 85	Plume core, deep characterization
20	1542535	1475975	0, 15, 85	Plume core, deep characterization
21	1543199	1475767	0, 15, 85	Plume core, deep characterization
22	1543068	1476494	0, 15, 85	Plume core, deep characterization

C. REQUIREMENT FOR INTERIM MEASURES

In its October 28, 2009 letter, the GWQB wrote:

> The New Mexico Environment Department (NMED) has determined, based on information generated by Kirtland Air Force Base (KAFB) during its investigations, that the scale and observed impact of the Light Non-Aqueous Phase Liquid (LNLAP) hydrocarbon contamination of groundwater associated with the SS-111 Bulk Fuels Facility constituting the majority of the KAFB ST-106 LNAPL plume has been largely defined. This plume of LNAPL hydrocarbons has been found to have contaminated groundwater over a substantial area that is the source of drinking water supplies for the City of Albuquerque and is also located in the vicinity of several public water supply wells. The volume of LNAPL hydrocarbons on groundwater, which has been estimated by KAFB to be in the millions of gallons, will take a substantial period of time to remediate. Currently, the majority of the LNAPL hydrocarbon plume is located off of KAFB property and is not being actively remediated.

The Permittee's records indicate that the LNAPL and dissolved-phase plumes have migrated horizontally a distance of about 0.5 mile and 0.9 miles, respectively, from the area of the Former Fuel Offloading Rack.

Interim measures are required to reduce or prevent the migration of contaminants, or to reduce or prevent human or environmental exposure to contaminants while long-term corrective action remedies are evaluated and implemented. Section K.1 of the HSWA Module IV of the Permit states:

> If during the course of any activity initiated under this module, the Administrative Authority determines that a release or potential release of hazardous constituents from a SWMU poses a threat to human health and the environment, the Administrative Authority may specify interim measures. The Administrative Authority will determine the specific measure, including potential permit modifications, and the schedule for implementing the required measures.

Additionally, Section K.2 of Module IV of the Permit states:

structures associated with the Former Fuel Offloading Rack (mostly the underground portions of the original structures), and has not excavated and removed contaminated soil around the Former Fuel Offloading Rack. The Permittee has instead abandoned the structures and contaminated soil in place. Soil containing considerable amounts of sorbed fuel, thus containing high concentrations of hazardous constituents, must exist at the Former Fuel Offloading Rack at shallow depths, posing a continuing source of contamination and threat to the groundwater resource.

Therefore, on or before **June 7, 2010,** the Permittee must submit to the Department for its review and approval an Interim Measures ("IM") Plan that describes what immediate actions it will take to remediate and stop the migration of the LNAPL plume. The IM Plan must also describe excavation and removal of all structures of the Former Fuel Offloading Rack, including the underground components, and the excavation and removal of contaminated soil at and in the vicinity of the Former Fuel Offloading Rack to a depth of at least 20 feet. The IM Plan must also include an implementation schedule showing that remediation of the LNAPL plume will be completed within five years of the Department's approval of the IM Plan, and that excavation and removal of structures and contaminated soil at and in the vicinity of the Former Fuel Offloading Rack will be completed within one year of the Department's approval.

Furthermore, on March 16, 2010, the Permittee sent a *Stage 2 Abatement Plan Modification Addendum* (dated March 16, 2010) concerning the proposed installation of three additional offsite groundwater monitoring wells. The March 16 submittal does not address the deficiencies identified by the GWQB in its letters of June 23 and October 28, 2009. This plan would not adequately characterize the LNAPL plume, the dissolved-phase groundwater contamination, or contaminated soil and soil gas at the Bulk Fuels Facility. However, given the urgency to complete characterization and implement an effective remedy, the NMED nevertheless approves the March 16, 2010, submittal as a second and separate interim measure, subject to the modifications described herein:

1. The March 16 plan proposes that well screens are to be constructed with lengths of 25 feet or more. Screen lengths for the wells shall not exceed 20 feet, with 15 feet of screen situated below the water table, and 5 feet of screen constructed above the water table.
2. The March 16 plan proposes that wells completed in the area of the LNAPL plume will not be developed after installation, and proposes that groundwater samples will not be acquired for laboratory analysis from wells located within the area of the LNAPL plume. Although existing wells within the area of LNAPL plume have in the past served only as sampling points to measure LNAPL thickness and as soil-vapor extraction points, these wells must now also be available to sample groundwater below the floating LNAPL so that concentrations of dissolved-phase contaminants can be assessed in this area. This same requirement will also apply to all future wells installed to address the Bulk Fuels Facility Spill, including the wells required under this letter. Thus, all wells that address the Bulk Fuels Facility Spill, including those located within the LNAPL

Implement March 16, 2010 Stage 2 Abatement Plan Modification Addendum with required modifications	Immediately, except within two weeks of gaining permission for that portion of the March 16 Plan that requires access to City property.
Submit report to the Department on well installations conducted under March 16 Plan	July 6, 2010, or 90 days after required access from the City is granted, whichever is later
Submit report to the Department on groundwater sampling results conducted under March 16 Plan	October 5, 2010, or 120 days after required access from the City is granted, whichever is later

Until such time that the IM Plan is approved by the NMED, the Permittee shall continue to operate the four SVE units already in service 24 hours per day, 7 days a week, except when necessary to perform maintenance or repairs. If maintenance or repairs are necessary, the maintenance or repairs shall be completed as quickly as practicable, and the unit returned to service immediately after maintenance or repairs are completed. Any maintenance or repairs that will take more than 3 calendar days shall be reported in writing to the Department within 24 hours of discovery that the maintenance or repairs will take more than 3 days. The Permittee shall explain in the report why the maintenance or repairs will take more than 3 calendar days and why the delay is beyond the control of the Permittee.

D. REQUIREMENT TO CONDUCT A CORRECTIVE MEASURES EVALUATION

In accordance with Section M.1 of HSWA Module IV of the Permit, if the Administrative Authority has reason to believe that a SWMU has released concentrations of hazardous constituents, or if the Administrative Authority determines that contaminants present a threat to human health and the environment given site-specific exposure conditions, the Administrative Authority may require a Corrective Measures Study (herein referred to a Corrective Measures Evaluation, or "CME"). With this letter, the Department hereby notifies the Permittee that it is required to conduct a CME for the Bulk Fuels Facility Spill. The CME shall be conducted to develop remedial alternatives that, if implemented, would be appropriate to effectively arrest and remediate contamination in the vadose zone, the LNAPL plume, and the dissolved-phase groundwater contamination in a reasonable period of time. A CME Report shall be prepared that describes in detail the results of the CME. The CME Report shall be submitted to the Department within 180 days after the Department notifies the Permittee that characterization of the Bulk Fuels Facility Spill has been completed and approved by the Department. The CME and CME Report shall also be completed in accordance with Sections O and S of HSWA Module IV of the Permit.

If you have any questions or comments concerning the technical matters in this letter, you may contact William McDonald or Sid Brandwein of my staff at (505) 222-9582 and (505) 222-9504, respectively. If you have other questions or comments, I may be contacted directly at 505-476-6000.

Sincerely,

James P. Bearzi
Chief
Hazardous Waste Bureau

cc: M. Leavitt, Director, NMED WWMD
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