



SUSANA MARTINEZ
Governor
JOHN A. SANCHEZ
Lieutenant Governor

NEW MEXICO
ENVIRONMENT DEPARTMENT

Harold Runnels Building
1190 Saint Francis Drive (87505)
P.O. Box 5469, Santa Fe, NM 87502-5469
Phone (505) 827-0419 Fax (505) 827-0310
www.nmenv.state.nm.us

KAFB BFFS ST-106 and SS-111
Groundwater
Gas
Bubbles



RYAN FLYNN
Secretary
BUTCH TONGATE
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

June 27, 2014

Colonel Tom D. Miller
Base Commander
377 ABW/CC
2000 Wyoming Blvd. SE
Kirtland AFB, NM 87117-5606

John Pike
Director, Environmental Management Services
377 MSG
2050 Wyoming Blvd. SE, Suite 116
Kirtland AFB, NM 87117-5270

**RE: APPROVAL WITH MODIFICATIONS
THIRD QUARTER CY 2013 GROUNDWATER GAS SAMPLE RESULTS
BULK FUELS FACILITY SPILL, SOLID WASTE MANAGEMENT UNITS ST-106 AND SS-111, JUNE 2013
KIRTLAND AIR FORCE BASE, EPA ID# NM9570024423,
HWB-KAFB-13-016**

Dear Colonel Miller and Mr. Pike:

The New Mexico Environment Department (NMED) has reviewed the U. S. Air Force's (Permittee) report *Third Quarter CY 2013 Groundwater Gas Sample Results, Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111* (Report), dated September 2013. The Report addresses the composition of gas bubbles occurring in groundwater samples at various wells associated with the Bulk Fuels Facility Spill.

NMED concurs that, based on the samples collected and analyzed, the composition of the gas bubbles in the groundwater samples appears to closely match that of air as stated in the Report.

The Permittee asserts that the air was introduced into the groundwater during air rotary drilling during installation of the wells, and that if this is the case, the air bubbles will eventually disappear as additional purging of the wells is conducted in the future. While it may be true that air was introduced into the groundwater by the drilling method, residual air introduced during drilling is unlikely to remain for a significant length of time in wells completed in a coarse-grained unconfined aquifer near the water table. While drilling, only a few feet of the saturated zone is exposed to the air between the end of the casing and the drill bit, and the borehole provides an easy escape route to the atmosphere. The return air is the mechanism for cuttings removal and there is no record of significant loss of circulation during the drilling of the wells

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related to the Bulk Fuels Facility Spill. In addition, proper well development normally removes residual fluids and other materials introduced during drilling and well installation. Air bubbles have been observed in more wells than would likely be affected, if standard well installation and development practices are implemented.

Groundwater samples retrieved from some of the wells have exhibited bubbles for about two years. The presence of air bubbles in groundwater samples has been inconsistent but air bubbles have been observed in an increasing number of wells over time. Air that has been dissolved in groundwater during well installation would likely have travelled more than 100 feet from any particular well in two years. In addition, a discussion of the inconsistencies in the observation of gas bubbles in various well screens since the wells were installed was not provided. If the air bubbles exist as a separate gas phase, it seems likely that it should be possible to remove the bubbles with more well development or extended pumping either during well purging prior to sampling or as a separate action to specifically remove the gas bubbles from the affected wells.

The central problem with gas bubbles in water samples is that analytical results for volatile organic compounds (including for ethylene dibromide) may be biased low. It is critical at and near the plume edge and for as-yet unaffected downgradient detection-monitoring wells that representative water samples be acquired for analysis.

NMED received a letter by electronic mail prepared by CB&I, dated January 16, 2014, with a subject of "Third Quarter CY 2013 Groundwater Gas Sample Results" (Letter). The Letter discusses the composition of the gas bubbles present in groundwater samples at certain wells associated with the Kirtland Air Force Base Bulk Fuels Facility Spill and provides an analysis of the loss of volatiles to air from groundwater in sample containers. CB&I is a contractor for the US Air Force (Permittee).

The Letter postulates, by application of Henry's Law (which only apply at equilibrium conditions), that only a very small amount of EDB (less than 1%) would escape from a water sample into a bubble trapped in the sample container. This only takes into account volatilization once the groundwater sample is sealed for the last time in the sample container. It does not account for any air stripping that occurs during the 500 feet or more transport from the saturated zone to the surface, which poses a more significant potential for volatilization. Also, the sampling procedure employed in the field and observed by NMED staff includes rotating and agitating the sampling container to coalesce air bubbles after initially filling the container, followed by opening the container, releasing the accumulated air and adding more sample, a procedure which further increases volatilization. This procedure must be discontinued beginning with the second quarter 2014 sampling event. NMED is not convinced that the amount of contaminant loss due to the presence of air bubbles in water samples is small enough to be considered negligible, as indicated in the Letter.

Additionally, the Letter states: "[b]ased on recommendations from NMED and the Air Force, those samples containing bubbles will continue to be documented during sampling, and the approximate bubble volume will be noted on the sample collection logs. In future Quarterly Monitoring Reports, VOC concentrations in these samples will be labeled with a footnote next to

the Validation Qualifier column title, indicating that the sample results could potentially be biased lower than reported concentrations. Additionally, text will be added to the Quarterly Monitoring Reports that details how bubble volume is approximated and the calculation of potential low bias for EDB based on air volume in the VOA vial.” Although water samples containing bubbles should be documented; since the air bubbles are not a natural phenomenon, NMED does not agree that it is sufficient to merely flag data as being potentially biased low.

NMED agrees with the statement in the Letter that the chemical analytical results for groundwater samples containing air bubbles are likely biased lower than actual volatile organic compounds (VOC) concentrations in the associated groundwater. Therefore, the results of the analyses of groundwater samples containing air bubbles cannot be used for compliance purposes and may not be suitable for the purpose of detection monitoring in groundwater wells located at and near the plume edge, in monitoring wells currently considered to be downgradient of the plume, or in sentry wells near the Veterans Administration Hospital.

If you have any questions, please contact me at 505-827-2855.

Sincerely,

Tom Blaine, P.E.
Director
Environmental Health Division

cc: J. Kieling, NMED HWB
D. Cobrain, NMED HWB
S. Reuter, NMED PSTB
B. Gallegos, AEHD
F. Shean, ABCWUA
L. King, EPA-Region 6 (6PD-N)

File: KAFB 2014 Bulk Fuels Facility Spill and Reading