Kieling, John, NMENV

From: Shean, Frederic [fshean@abcwua.org]
Sent: Thursday, December 01, 2011 5:10 PM
To: Thomas.Berardinelli@kirtland.af.mil
Cc: msanchez@abcwua.org; JStomp@abcwua.org; mleonard@cabq.gov; bgastian@abcwua.org; dprice@abcwua.org; bagallegos@cabq.gov; alieuwen@abcwua.org; Kieling, John, NMENV; will.moats@state.nm.us; John.Pike@kirtland.af.mil
Subject: RE: Water Authority Comments for KAFB BFF Spill Q2 Report and SVE Optimization Plan
Attachments: 20111201_ABCWUA-comments on Q2-2011 Report.pdf; 20111201_SVEOptReview.pdf

Documents attached.

From: Shean, Frederic
Sent: Thursday, December 01, 2011 5:09 PM
To: Thomas.Berardinelli@kirtland.af.mil
Cc: Mark Sanchez (msanchez@abcwua.org); P. E. John M. Stomp III (JStomp@abcwua.org); Mary Lou Leonard (mleonard@cabq.gov); Barbara Gastian (bgastian@abcwua.org); David Price (dprice@abcwua.org); Billy Gallegos (bagallegos@cabq.gov); Lieuwen, Andrew L. (alieuwen@abcwua.org); Kieling, John, NMENV (john.kieling@state.nm.us); will.moats@state.nm.us; Pike, John S Civ USAF AFMC 377 MSG/CEAN (John.Pike@kirtland.af.mil)
Subject: Water Authority Comments for KAFB BFF Spill Q2 Report and SVE Optimization Plan

Mr. Berardinelli:

Attached are the Water Authority's comments regarding the following KAFB submittals to the New Mexico Environment Department:

1) *Kirtland Air Force Base, Albuquerque, New Mexico, Quarterly Pre-Remedy Monitoring and Site Investigation Report for April – June 2011 Report (Q2 2011 Report)*
2) *Kirtland Air Force Base, Albuquerque, New Mexico, Soil-Vapor Extraction Optimization Plan, Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111*

Please let me know if you have any questions regarding our comments.

Sincerely,

Rick Shean
Water Quality Hydrologist
Albuquerque Bernalillo County Water Utility Authority
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Albuquerque Bernalillo County
Water Utility Authority

Technical Memo

To: Tom Berardinelli, Director of Staff, 377th Air Base Wing KAFB (via email)

From: Rick Shean, Water Quality Hydrologist, ABCWUA

CC: Mark Sanchez, Executive Director, ABCWUA
John Stomp, Chief Operating Officer, ABCWUA
Mary Lou Leonard, Director, COA EHD
Billy Gallegos, Manager, COA EHD-ESD
John Kieling, Hazardous Waste Bureau Chief, NMED
Will Moats, Project Manager, NMED-HWB

Date: 12/1/2011

Re: ABCWUA comments on the KAFB BFF Quarterly Pre-Remedy Monitoring and Site Investigation Report for April – June 2011 Report

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Introduction

The Albuquerque Bernalillo County Water Utility Authority (Water Authority) is submitting its comments to Kirtland Air Force Base (KAFB) on the Quarterly Pre-Remedy Monitoring and Site Investigation Report for April – June 2011 Report (Q2 2011 Report). We have reviewed the report text, figures, tables and appendices and below we have listed our comments in the section in which they can be found. The Water Authority appreciates your attention to our comments and hopes they are incorporated in future quarterly reports.

After review of the first and second quarterly reports for 2011, the Water Authority still requests that data contours include analytical results above the project specified method detection limit (MDL) values used prior to 2011, and an effort be made by your contractor to provide the public with the boundary for the entire area of the aquifer affected by the jet fuel plume.

Water Authority Comments on Q2 2011 Report

Section	Comment
5.3.1	The summary of sites with detections of TPH – GRO above the method detection limits in production wells excludes the result for KAFB well no. 3, which is 64.3 µg/L J.
5.3.1	The summary for EDB results states that "the EPA maximum contaminant level (MCL) of 0.05 µg/L was used for the lower contour limit." The lowest contour limit on the figures for EDB, are actually an estimate at .012 µg/L. Please see additional comments on EDB figures below.

Section 5 Figures General Comments –

1. The Water Authority recommends including a description of the standards and parameters chosen to produce the figures with the ArcGIS software in the text of the report, including quality assurance procedures for map preparation, and using the standard consistently to create the figures for the chosen analytes.

2. KAFB and VA production wells were excluded from the Section 5 figures in the Q2 report. The results for most of the production wells are noted in the text of Section 5 and provided in the table section for water quality results. However the figures are the most "public friendly" representation of the data and spatial analyses of these results are crucial to understanding the full extent of the jet fuel contamination. Please revise figures for the shallow data results to show the sampling results for KAFB wells # 3, 15 and16, and Veterans Administration well # 2.

3. Data result contour values and colors are not consistent between quarterly reports. As stated above, the figures are the best display of the data for public consumption, but the changing contour values and shading between quarterly reports makes it difficult to compare between reports and determine trends for any reviewer. Also, using the color white for any contour interval is also confusing to the public.

4. Trends in groundwater data quality are difficult to assess when figures provide only a "snapshot" of data values. Please attribute historical results to the previous eight consecutive quarters in small, but legible tables to each sampling point on the groundwater figures, or in another manner, which can easily be

5. The use of different interval contour values between the well identifiers and the contour lines is confusing. For example, it would appear on figure 5-12, 1,2-Dibromoethane (EDB) in Shallow Groundwater that based on the color coding for well results that well "KAFB 10626" has a result between 0.012 – 0.050 ug/L, and could have a "J", "J+" or no qualifier next to the value. With an above MDL result, a line may be drawn at least to well KAFB 10626, based on the apparent plume delineation procedure. In addition, the value provided with a "U" qualifier is not the method detection limit (MDL) as described in the note on all three of the EDB figures

(5-12, 13, & 14). It is the Reporting Limit value provided in the projects. Quality Assurance Project Plan. Other figures in the report do include the MDL at "non-detect" locations.

For this same figure (5-12) it appears that the shading for estimated values between 0.11-10 ug/L were intentionally truncated just north of well KAFB-10622, perhaps to allow for results from Qtr.3 to describe what is occurring north and east of this well. Without the benefit of having the Qtr. 3 sampling results to review at this time, the Water Authority would request KAFB figures display the estimated concentrations in areas without wells based on a standard spatial analysis approach.

6. In Figure 5-6, Gasoline Range Organic Concentrations in Shallow Groundwater, it would appear that there are two distinct plumes based on the use of this single quarter's data set and the use of solid lines between the two estimated masses. This appears to be an example where weighing historical results for the previous eight consecutive quarters to display estimated plume boundaries would provide a more realistic image of the groundwater contamination.

Appendices

7. The historical data table provided as Appendix E-1 does not include data for Quarter 4, 2010 results.

8. In Appendix H, Response to 2011 1st Quarterly Report Comments-No. 11, it is noted that a previous instruction by the New Mexico Environment Department (NMED) requiring that maps show the entire area of contamination, not just the part that exceeds a U. S. Environmental Protection Agency Maximum Contaminant Limit or a New Mexico Water Quality Control Commission standard, was reversed at a meeting between NMED and KAFB on September 7, 2011. As stated above, the Water Authority requests that the original requirement to display the "entire area of contamination" be followed for the upcoming Quarter 3 report.

Albuquerque Bernalillo County
Water Utility Authority

To: Tom Berardinelli, Director of Staff, 377th Air Base Wing KAFB (via email)

From: Rick Shean, Water Quality Hydrologist, ABCWUA

CC: Mark Sanchez, Executive Director, ABCWUA
John Stomp, Chief Operating Officer, ABCWUA
John Kieling, Hazardous Waste Bureau Chief, NMED
Will Moats, Project Manager, NMED-HWB
Mary Lou Leonard, Director, COA-EHD

Date: 12/1/2011

Re: ABCWUA comments on the revised Soil Vapor Extraction Optimization Plan of September, 2011

Introduction

On behalf of the Albuquerque Bernalillo County Water Utility Authority (Water Authority), INTERA Incorporated (INTERA), reviewed the document entitled *Kirtland Air Force Base, Albuquerque, New Mexico, Soil-Vapor Extraction Optimization Plan, Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111* (Optimization Plan). This document was reviewed largely independent from other project-related reports and documents. Reference was made, however, to recent quarterly monitoring reports and correspondence between the New Mexico Environment Department (NMED) and Kirtland Air Force Base (KAFB). Comments and questions provided in this memorandum may be addressed in other documents related to the corrective actions performed at the site. The Water Authority understands an addendum to the aforementioned Optimization Plan, but our comments are still relevant to both the conceptual and technical aspects being proposed.

Summary of Concerns and Recommendations

Optimization of the existing soil vapor extraction (SVE) system, as described in the work plan, does not address the larger and more pertinent question of how to remove jet fuel as quickly and as efficaciously as possible. The work plan should be amended to include activities that will lead to maximal recovery of volatiles from the vadose zone as soon as possible.

Information provided in the Optimization Plan suggests that the existing SVE system may be inadequate to meet aggressive site cleanup objectives. Observed contaminant

recovery rates from the past six years of operation of the SVE system suggest that less than one pore volume exchange may have been achieved. Literature suggests that most successful remediation projects using SVE typically achieve a pore volume exchange rate of 1 to 10 per day.

The SVE Optimization work plan analyzes the system with a radius of influence (ROI) approach, whereas the U.S. Army Corps of Engineers, the contracting agency, specifically recommend against the ROI approach. The work plan should be revised to adopt one or both of the Army Corps' recommended approaches.

The work plan does not include two important analysis tools devised by the U.S. Air Force's Center for Environmental Excellence (AFCEE) for evaluating SVE systems. The work plan should be revised to incorporate the use of these evaluation tools.

The work plan does not address the impacts on system performance from the rising water table and should be revised to discuss how the system will be changed to continue to remove jet fuel from deep in the vadose zone even as the water table continues to rise.

General Comments

Our review of the Optimization Plan revealed that it has a narrow focus on optimization of the SVE system "within the constraints of the existing SVE and monitoring wells and the capacity of the four internal combustion engine SVE systems". The plan does not address the paramount problem of achieving maximum removal of jet fuel from the vadose zone as quickly as possible. The large quantities released and the far smaller quantity recovered argue for expansion of the SVE system beyond its current configuration and the work plan should be revised to include data collection, testing, and other activities that will lead to more rapid recovery of jet fuel.

Information provided in the Optimization Plan suggests that the existing SVE system may be inadequate to meet aggressive site cleanup objectives. For example, at the end of Section 4.6.1, a discussion regarding vadose zone contaminated pore volume, extraction rates, and decline in contaminant recovery rates suggests that over six years of operation of the SVE system a total of less than one pore volume exchange may have been achieved. Literature suggests that most successful remediation projects using SVE typically achieve a pore volume exchange rate of 1 (US EPA, 1995) to 10 per day (US ACE, 2002).

Corrective action objectives need to be identified or reiterated in this document. It is uncertain to the Water Authority if the existing SVE system is designed as an interim corrective action measure, as a pilot study for future full scale implementation of the technology, or as the final treatment remedy.

Instead of optimizing existing operations, we recommend that more focus be placed on accelerating contaminant removal through enhancing infrastructure, i.e. larger diameter extraction wells, injection/passive inlet wells, more robust extraction blower(s), etc.

Detailed Comments

The following points require additional clarification or consideration in the Optimization Plan.

A. More detail on optimization criteria is warranted. The Optimization Plan states that 3D SVE modeling will be used to optimize the SVE units to access the current high-concentration contaminant areas in the vadose zone. This approach suggests that optimization is defined only by the focusing of SVE efforts on discreet zones where contamination persists. Although this criterion is important, "optimization" should include means of reaching closure or remediation objectives quicker. The optimization should include an analysis of well spacing, infrastructure improvements, and pore volume exchange rates that could increase treatment efficiency and reduce long term operational costs.

B. Section 5 of the Optimization Plan indicates that the basis for optimization will be the results of the radius of influence (ROI) testing. The U.S. Army Corps of Engineers (USACE) indicates that a design based on pore-gas velocity or travel time is preferred over a design based on ROI. A pore-gas velocity approach puts an emphasis on the rate of air exchange (pore volume per time), with a minimum pore-gas velocity of 3 to 30 feet per day recommended.

C. The operational data of applied vacuums and extraction rates suggest that there is a strong possibility that the current system is operating more as a bioventing system than an SVE system. Section 4.6.1 of the Optimization Plan states "…the overall vapor concentration declines potentially can be attributed to natural degradation of organic compounds…" and that additional data to confirm the effects of degradation is required. If future operations of the SVE system are constrained to the use of the existing infrastructure and equipment, then it seems like more emphasis should be placed on at least understanding the in situ degradation dynamics. The Optimization Plan does not include microbial studies (for example, heterotrophic plate counts) or a discussion regarding available macronutrients (i.e. nitrogen and phosphorus). It's possible that given the low extraction rates, the observed asymptotic contaminant recovery rate may have to do in part with degradation and not exclusively diffusion limitations. Additionally, there is no discussion given to the benefits of oxygen introduction through passive inlet wells or air injection wells. Air injection, particularly near the capillary fringe, could provide dramatic improvements in degradation rates as

well as SVE efficiency, because pore volume exchange rates could be accelerated.

D. The Optimization Plan assumes that there are adequate data for solid matrix properties and does not specifically discuss the results of sieve analyses, porosity testing, moisture content analyses, or estimated air permeability for each extraction zone. These will be important parameters needed for the model. The reason for addressing this issue is that there were references to "assumed" effective porosity in one of the calculations. If geotechnical properties of the soil have not been quantified using lab and/or bench scale tests, then it is recommended that samples be collected during the next drilling event from each elevation associated with a typical screen interval in an SVE well.

E. There was limited discussion in the text regarding the impacts of groundwater mounding in the vicinity of the SVE wells and testing procedures provided in Sections 5.1 and 5.2 do not include the logging of water levels in the test area. If SVE wells span the water table, then consideration should be given to installing transducers in the well during tests to log water table levels. Significant and prolonged mounding can impact treatment efficiencies by:
    a. Reducing the screen interval in the well,
    b. Flooding NAPL in the capillary zone and making it more difficult to reach with SVE treatment, and/or
    c. Moving LNAPL away from the well and toward areas of lower head.

F. Related to the groundwater level issue, it was observed that there was a lack of discussion regarding the rebound in regional water table elevations as a result of reduced municipal demand on the aquifer. Construction of a 3D model and development of an optimization plan should address observed changes in the water table as well as predictive trends to the extent possible. The SVE system design and 3D model should evaluate necessary changes and we anticipate the aquifer to continue to rise as planned by the introduction of the Water Authority's water resources programs.

G. Field measurements of vapor temperatures and barometric pressure logging were not observed in the testing section (Section 5). These are parameters that will be useful in development of the model, optimization of the SVE system, and analysis of the data.

H. Figure 5.1 shows several PneuLog® installations across the site. There was no discussion in the Optimization Plan about collecting data from these locations. Are the PneuLog® devices still viable and how will they be used?

I. In 2001, the Air Force Center for Environmental Excellence (AFCEE) developed a guidance document for SVE optimization (AFCEE, 2001). This document stressed the importance of two tools for evaluating an SVE system, both of which are missing from the Optimization Plan. The first tool is monitoring vapor chemistry responses at monitoring points as well as vacuum. The document states:

> *The Air Force recommends a combination of vacuum and soil gas chemistry monitoring at multiple discrete [vapor monitoring points] [VMPs] as the most practical indication that a volume of soil is being treated by an SVE system. Changes in vacuum and soil gas chemistry can be easily measured in discrete VMPs located at varying distances and in varying soil types. This method has been widely applied at bioventing sites and has been found to be more reliable than vacuum methods alone in confirming the area of treatment influence. To use this method, multiple VMPs should be in place before the SVE system is turned on. Soil gas concentrations of oxygen, carbon dioxide and total volatile hydrocarbons should be measured in each VMP before starting the extraction system. Once the system is started, these measurements should be taken at 2, 4, 8, and 16 hours and then daily intervals until soil gas chemistry stabilizes. At most waste sites, initial soil gas oxygen will be depleted and carbon dioxide is elevated above levels found in clean background soil gas (Background oxygen in soil gas is generally 18 – 20 percent. Background carbon dioxide in soil gas is generally < 1 percent.)*

In general, a change in soil gas chemistry is a more convincing indicator of SVE system influence than just vacuum.

The second tool that should be considered is a performance indicator to incorporate into the operation and maintenance of the system. AFCEE recommends periodic equilibrium/rebound testing. The asymptotic reduction in contaminant concentrations in the soil gas may not be a good indicator of treatment effectiveness. It may just be indicating a transition from contaminant recovery by advective flow conveyance to desorption and diffusion dominant conditions. AFCEE recommends turning the system off on routine intervals and allowing the contaminants in the soil gas to equilibrate. Comparison of the contaminant levels each time the system is restarted is a better indicator of treatment effectiveness than looking only at the mass removed over time.

J. Section 5.2., No. 2.iii. indicates that all other SVE monitoring and extraction wells will be measured daily for vacuum. What about the ground water monitoring wells? Vacuum responses at the NAPL interface are important data.

K. The ROI testing described in Section 5.2 describes a test sequence that starts by applying a vacuum to SVEW-01 (screen depth 245'-260' bgs). After stabilization, vacuum is applied to SVEW-05 (screen depth 445'-460' bgs) while continuing to extract from SVEW-01. Other wells are added in this fashion. Is there value in doing exclusive ROI testing from each screen zone? For example, how will the ROI for SVEW-02 (screen depth 45'-60') be determined accurately if other well screen intervals below it are also under vacuum?

References

United States Air Force Environmental Restoration Program, June 2001. Guidance on Soil Vapor Extraction Optimization, Air Force Center for Environmental Excellence.

U.S. Army Corps of Engineers, June 3, 2002. Engineering and Design, Soil Vapor Extraction and Bioventing – Engineering Manual.

U.S. Environmental Protection Agency. May 1995. How to evaluate Alternate Cleanup Technologies for Underground Storage Tank Sites, A Guide for Corrective Action Plan Reviewers.