UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 9
75 Hawthorne Street
San Francisco, CA 94105-3901

July 3, 2018

Catherine Jerrard
Program Manager/BEC
AFCEC/CIBW
706 Hangar Road
Rome, New York 13441

RE: Demonstration of Hydraulic Containment at ST12 Fuels Spill Site, Former Williams Air Force Base, Mesa Arizona

Dear Ms. Jerrard:

Given that Air Force (AF) is proceeding with a pilot test of Enhanced Bioremediation using injection of sulfate as a terminal electron acceptor (TEA) under a continually rising water table and with the knowledge that the benzene plume is currently not contained, EPA is concerned that contamination may be allowed to spread and create a groundwater plume that not only could be costly to address in the future, but could one day impact City of Mesa's new public supply wells being installed down gradient of the site in the path of groundwater flow.

Please note that Monitored Natural Attenuation (MNA) remedies are not appropriate for expanding groundwater plumes. The baseline benzene data collected in April 2018 demonstrate that benzene at concentrations greater than the Maximum Contaminant Level (MCL) exist at the downgradient extent of the thermal treatment area, and are migrating away from the thermal treatment area. Benzene concentrations at the downgradient wells remains in most cases orders of magnitude greater than the cleanup criteria. The current sentry wells are in many cases hundreds of feet away from the thermal treatment area, which allows benzene to migrate downgradient for large distances before being detected.

As stated in EPA's previous comment letters, hydraulic containment is critical to the success of the long- term remedy for ST12. The regulatory agencies were notified by email on June 21, 2018 of loss of containment in the Cobble Zone indicated by a detection of benzene in ST012-CZ23 at 97 µg/L last April. This well had previously been less than or equal to 6.3 µg/L for benzene and was considered a perimeter sentry well. The delay of several weeks in notifying the agencies is also concerning. Given these circumstances, EPA believes the Environmental Indicator status of "groundwater migration not under control" for ST12 continues to be justified.

EPA previously commented on Field Verification Memo (FVM) 5A Extraction and Treatment Capture Evaluation (Finalized 1/24/17). In AF responses to EPA comments on the draft dated 9/30/16 AF acknowledged the Agencies concern for loss of containment was real, but loss of containment had not yet occurred, and indicated that additional wells and monitoring requirements could be implemented at a later date to address loss of containment. Now that loss of containment has been demonstrated, it seems appropriate to now implement additional measures to ensure the site is adequately contained. EPA is providing the enclosed guidelines for demonstrating plume containment, for purposes of the Pilot Study as well as Environmental Indicator status, as were previously provided in our comment letters. Additional monitoring wells should be installed closer in to the thermal treatment area to allow detection of a loss of the dissolved phase plume in a timely manner, and before it has spread large distances.

Please contact me at (415) 972-3150 or dAlmeida.Carolyn@epa.gov if you have questions or require additional clarification about these comments.

Sincerely,

Carolyn d'Almeida

Carolyn d'Almeida
Remedial Project Manager

cc: Ardis Dickey, AFCEC/CIBW
Wayne Miller, ADEQ

References:

U.S. EPA. A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems. U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/003, 2008.

REQUIRED TO DEMONSTRATE CONTAINMENT AT WILLIAMS ST-12 FUELS SPILL SITE

1. Collection of Groundwater Levels to Develop Groundwater Elevation Contour Maps.

The current modeling of groundwater flow in the Cobble Zone (CZ), Upper Water Bearing Zone (UWBZ), and Lower Saturated Zone (LSZ) have not been verified using current monitoring data from Site ST012. To develop an appropriate containment plan for Site ST012 and substantiate the groundwater model, groundwater elevation/potentiometric surface contour maps should be developed for each unit (CZ, UWBZ, and LSZ) using groundwater and product elevation data collected from as many wells as possible during a single synchronized gauging event. Groundwater elevation/potentiometric surface maps should be generated from data collected using an oil/water interface probe corrected for the presence of product, if present. If possible, groundwater elevation/potentiometric surface maps should be generated using data collected before groundwater extraction began, after groundwater extraction began and using current data. Once sulfate injections begin, groundwater elevation/product level measurements should be collected bi-weekly.

Specific to Cobble Zone:

Please collect a synoptic round of Groundwater Levels to Develop Groundwater Elevation Contour Maps under the present condition of pumping from CZ07. This should include all CZ/UWBZ wells in the vicinity of CZ23 and CZ07. This information will help determine if this pumping is influencing groundwater flow at CZ23. If the pump in CZ07 is replaced by one with a higher pumping capacity, as suggested by the June 21, 2018 email and during the June 28, 2018 teleconference, then the measurements can be repeated to provide additional information on the response of the water table to pumping. However, this information alone cannot confirm that pumping from CZ07 is capturing the extent of the dissolved phase plume. If continuous water level data is collected from nearby wells via the use of transducers, this data may be used to estimate the hydraulic conductivity of the cobble zone. Temperature trend data from the transducers may also be useful due to the large body of heat that remains in the subsurface at this site to help determine the direction of groundwater flow.

The guidance document *A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems,* EPA/600/R-08/003 (2008) includes methods to estimate the capture zone of pumping wells knowing the transmissivity (hydraulic conductivity x aquifer thickness) and the pumping rate. This estimate can be confirmed by measuring groundwater elevations. The most definitive demonstration of containment will be declining benzene concentrations in CZ23 to below the cleanup criteria. Knowing flushing rates in the area of the downgradient plume may allow estimation of how long pumping will be required to recover the benzene that has already migrated downgradient.

2. Installation of Monitoring Wells Beyond Perimeter Well/Downgradient Wells.

Cobble Zone: Based on Figure 3-2 (EBR Injection, Extraction, and Monitoring Well Locations - CZ) of the Pilot Study WP, no CZ monitoring wells exist beyond ST012-CZ023, between ST012-CZ21 and ST012-CZ24, or between ST012-CZ09 and ST012-C02 to delineate the nature and extent of contamination. Given the benzene concentration detected at ST012-CZ023, immediate installation of four additional CZ monitoring wells is warranted to evaluate the extent of contamination and plume displacement during sulfate injections:

- Approximately 100 feet East-northeast (downgradient) of ST012-CZ023 (Figure 3-2, location 1)
- 100 ft North of ST012-CZ023 (Figure 3-2, location 2)
- East-southeast of ST012-CZ09 (Figure 3-2, location 3)
- East of ST012-CZ21 (Figure 3-2, location 4)

Upper Water Bearing Zone: Based on Figure 3-3 (EBR Injection, Extraction, and Monitoring Well Locations - UWBZ) of the Pilot Study WP, no UWBZ monitoring wells exist beyond ST012-UWBZ09, between ST012-UWBZ12 and ST012-U02, between ST012-UWBZ32 and ST012-UWBZ31, or between ST012-UWBZ21 and ST012-U02 and ST012-UWBZ38 to delineate the nature and extent of contamination. Installation of four additional UWBZ monitoring well is warranted:

- East of ST012-UWBZ09 (Figure 3-3, location 1)
- East of ST012-UWBZ12 (Figure 3-3, location 2)
- Northeast of ST012-UWBZ32 (Figure 3-3, location 3)
- East of ST012-UWBZ21 (Figure 3-3, location 4)
- downgradient of UWBZ30 (which had a concentration of 6000 ug/L in April 2018).

In addition, inclusion of existing monitoring well ST012-UWBZ17, located northeast of ST012-UWBZ10, in the groundwater sampling program is warranted to delineate the nature and extent of contamination.

Lower Saturated Zone: Based on Figure 3-4 (EBR Injection, Extraction, and Monitoring Well Locations - LSZ) of the Pilot Study WP, no LSZ monitoring wells exist northeast of ST012-LSZ44, east of ST012-W34, northeast of ST012-LSZ45, east of ST012-W36, or between northeast of ST012-W36 to delineate the nature and extent of contamination. Installation of five additional LSZ monitoring wells is warranted:

- Northeast of ST012-LSZ44 (Figure 3-4, location 1)
- East of ST012-W34 (Figure 3-4, location 2)
- Northeast of ST012-LSZ45 (Figure 3-4, location 3)
- East of ST012-W36 (Figure 3-4, location 4)
- Northeast of ST012-W36 (Figure 3-4, location 5)

The monitoring wells should be sampled and analyzed for volatile organic compounds (VOCs) (Method 8260B), total petroleum hydrocarbon (TPH) (Method 8015D, DRO/GRO), inductively coupled plasma (ICP) Metals (Method 6010B), nitrate and sulfate (Method 2320B), alkalinity (SM 2320B), sulfate field screening. During installation of the wells, the cores should be screened using a PID and where the PID readings are elevated, the soil should be evaluated using light non-aqueous phase liquid (LNAPL) Dye Test Kits. Baseline groundwater sampling of these wells should be conducted before sulfate injections are initiated.

3. Evaluation of Extraction at Downgradient Well Locations.

Given the benzene detections at ST012-CZ23 during the re-baseline sampling event in April 2018 [97 micrograms per liter (ug/L)] and the follow-on sampling event in May 2018 (90 ug/l, preliminary result), extraction at ST012-CZ07 alone is insufficient to prevent further migration. Specifically, extraction at ST012-CZ07 did not impact the benzene concentration detected at ST012-CZ023 during the follow-on sampling event in May 2018. As such, extraction at ST012-CZ07 is insufficient to prevent the migration of contamination. Extraction at ST012-CZ09, ST012-CZ23, ST012-UWBZ09, ST012-UWBZ12, and ST012-LSZ14 should be evaluated, following Steps 1 and 2, to prevent further downgradient migration. However, downgradient monitoring wells should be installed before perimeter extraction begins so that the effect of additional extraction on the plume can be monitored.

4. Establishment of Containment Criteria.

Containment criteria are needed to ensure the enhanced bioremediation (EBR) implementation does not result in plume displacement. Baseline sampling of the new perimeter monitoring wells should be conducted before sulfate injection and starting extraction in additional wells. The criteria should be applied to baseline sampling results. For example,

- **Baseline sampling benzene concentration at 5 micrograms per liter (ug/L) or below:** If the benzene concentration doubles (maximum detected concentration of 10 ug/L), EBR injections should be immediately suspended and only extraction wells should be operated.
- **Baseline sampling benzene concentration between 5 ug/L and 10 ug/L or greater than 10 ug/L:** If the benzene concentration increases by 25% (maximum detected concentration of 12.5 ug/L in perimeter wells), EBR injections should be immediately suspended and only extraction wells should be operated.