**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION IX**
**75 Hawthorne Street**
**San Francisco, CA 94105**

**ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY**
**1110 West Washington Street**
**Phoenix, Arizona 85007**

May 3, 2016

Cathy Jerrard
AFCEC/CIBW
706 Hangar Road
Rome, New York 13441

RE: Need for Continued Extraction for Containment at ST-12 Fuels Spill Site, Former Williams Air Force Base, Mesa, AZ.

Dear Ms. Jerrard:

The US Environmental Protection Agency and Arizona Department of Environmental Quality ("The Agencies") previously sent a joint letter dated March 7, 2016 expressing concern that the termination of the Steam Enhanced Extraction System (SEE) at the former ST12 Fuels Spill Site was premature, given the large mass of contaminants still being extracted on a daily basis and the unknown, but believed to be significant quantity of LNAPL that remains unaddressed at the site. Regardless of our request, the SEE operations were terminated on March 4, 2016. We understand that soil vapor and groundwater extraction ceased on or about April 29, 2016, after only 8 weeks of post steam extraction. The purpose of this correspondence is to request continuous extraction and also additional site characterization.

The following four points summarize why the regulatory agencies disapprove of termination of the extraction system:

1) The mass of mobile LNAPL remaining behind at the site is still unquantified and uncharacterized.

2) The site is still hot from SEE operations and contaminants are more mobile.

3) The agencies have expressed concern on numerous occasions of the potential for loss of containment of contaminants during the SEE operations, and the concerns have not been addressed through characterization.

4) The water table is now within the more transmissive Cobble Zone and without extraction to reverse the gradient there is nothing to prevent contaminants from spreading widely offsite beyond the reach of the currently proposed EBR treatment.

The following points provide supplemental and supportive observations to continue the extraction process.

1. Vapor and liquid extraction should be continued because:

    a. The total mass removal rate was hovering around 3,000 pounds per day with or without steam injection through the end of March. This rate has increased during April despite diminished LNAPL recovery as illustrated in Weekly Progress Report Figures 3 and 4. In recent meetings TerraTherm continued to assert the majority of mass being treated in the thermal accelerators was coming from the air strippers; ADEQ has continually challenged that by stating the dissolved hydrocarbon mass in extracted water entering the air stripper, under the best conditions, was only about 270 pounds per day and therefore the other 2,000+ pounds per day of extracted mass (not including recovered LNAPL) must be extracted as a vapor from the existing/former steam zone, whether this zone is inside the original, arbitrary, TTZ or outside it. In addition, Figure 2 of the Weekly Progress Report shows the concentration entering the air strippers declining. ADEQ stated during the SEE Pressurization Data Review Teleconference on 2-Mar-16, the Quarterly BCT Meeting on 15-Mar-16 and the Monthly BCT Meeting on 21-Apr-16 that continued extraction was necessary to redeem the benefits of this larger steam zone.

    b. The contaminant sources for the recent vapor mass recovery (dissolved phase and volatilized contaminants in extracted steam or air) are likely masses of residual LNAPL remaining in the TTZ (and other soil volumes previously heated to steam temperature).

    c. LNAPL columns likely reside in extraction well casings. The bottom of such LNAPL columns may exist above the pump intakes because of limited drawdown and therefore LNAPL does not appear in jar tests. This LNAPL is not recovered by pumping but can supply vapors for extraction. If so, the persistence and increase in vapor mass recovery indicates this LNAPL is being replenished from a "reservoir" of NAPL around such extraction wells. If the bottom of the LNAPL column is below the top of the screen intervals it is hydraulically connected to the formation for replenishment. Recent mass vapor extraction rates exceed the equivalent of 300 gallons/day of LNAPL. Each casing has a capacity on the order of 50 gallons therefore, if this LNAPL is the source of extracted vapors, the formation is replenishing the LNAPL in the casing as fast as it is removed. The drawdown increased with the cessation of steam injection and likely contributes to the increased vapor recovery rate. If the water levels in the extraction wells are allowed to rise, the vapor mass recovery will likely diminish. That reduction will not be the

result of LNAPL remediation but rather hydraulically disconnecting residual LNAPL in the formation from vapor extraction.

2. AMEC Foster Wheeler has stated the criteria for transitioning from SEE to EBR described in the Work Plan have been met, but the agencies have continually disagreed on two points. First, the mass removal rate has not decayed sufficiently, and secondly, the extracted benzene concentration continues to be elevated. Claims that contaminant mass and elevated benzene are coming from the "outside" are unfounded as described above and extraction should continue. In addition,

    a. Much of the reported data for determining benzene concentrations was collected during steam injection when dilution was occurring (i.e., clean water in the form of steam condensate was being introduced) and is not representative of subsurface conditions for EBR.

    b. The agencies continually contend that the peak mass removal rate cited for comparison to determining the reduction in mass removal rate is not valid. The cited peak is based on a PID reading calibrated to analytical data collected a week later. A single PID reading is not valid for regulatory decisions; data for this level of decision should come from a certified laboratory.

3. Though some efforts have been made to estimate the mass of mobile LNAPL remaining at the site, these estimates are subject to high uncertainty. It appears from contaminant extraction data (i.e., continued removal of NAPL), the NAPL found in numerous wells, and high dissolved contaminant concentrations in many locations, that the remaining NAPL source mass is significant and likely to adversely affect the effectiveness and timeliness of the proposed EBR and MNA remedies. Neither EBR nor MNA are source removal remedies, so they are inadequate to address the remaining NAPL.

4. The site is still at elevated temperatures from SEE operations, so contaminants are more mobile at this time; continuing the extraction efforts is likely to remove significantly more NAPL source material.

5. Continued hydraulic control of the site is necessary to actively prevent plume expansion. Hydraulic control is particularly important given that the water table is now within the more transmissive Cobble Zone, and without extraction to reverse the groundwater gradient there is nothing to prevent contaminants from expanding offsite beyond the reach of the currently proposed enhanced bioremediation (EBR) treatment area.

6. Note also that EPA policy is that MNA is not applicable to expanding plumes, so MNA could not be part of the site remedy in such a case. Also, EPA policy is that contaminant plumes must be completely delineated before MNA can be used as part of the site remedy. Significant additional characterization is necessary to address the current minimal understanding of plume extent and behavior both for EBR and for MNA.

The Agencies request the Air Force continue to extract and contain the contaminants until the concerns identified above have been satisfactorily addressed. The agencies are deeply concerned that failure to contain the plume and prevent contaminant migration now could create a more serious and costly problem for Air Force to address in the future.

The agencies would also welcome a timely consideration of more applicable and cost effective methods for drawdown and LNAPL recovery to replace the current extraction system designed for use during steam injection.

We believe that characterization of the remaining contamination should be a priority now. Enclosed is a figure indicating additional for characterization that were not included in Amec's proposal to help address the concerns on delineating the remaining contamination. It is critical for the success of the Enhanced Bioremediation project to quantify the baseline conditions and initial mass to be addressed for any future modeling effort to determine the effectiveness of the EBR application. We do not understand Amec's reluctance to address these concerns as expressed in the Base Closure Team (BCT) meeting on April 21, 2016.

Please contact us if you would like to set up a call to discuss.

Sincerely,

Carolyn d'Almeida

Carolyn d'Almeida
Remedial Project Manager, EPA

Wayne Miller
Remedial Project Manager, ADEQ

Enclosure