AQS

Environmental

January 18, 2013

DCN: NMED-2013-01

Mr. David Cobrain
New Mexico Environment Department (NMED)
Hazardous Waste Bureau
2905 Rodeo Park Dr. E/Bldg 1
Santa Fe, NM 87505

RE: Evaluation of the approval with modifications for the *Final Soil Background Study Report, SWMU 80, Sewage Treatment Plant Sludge Waste Pile (WSMR-30), SWMUs 12, 14, 16, 17, 21, and 22, Main Post Sites (WSMR-60, WSMR-33, WSMR-79, WSMR-73, WSMR-31, and WSMR-32) and SWMU 140, Former LC-37 Paint Dump (WSMR-84)*, White Sands Missile Range, dated August 2012.

Dear Mr. Cobrain:

In response to White Sands Missile Range's (WSMR's) *Revised Final Soil Background Study Work Plan*, NMED requested three modifications to the work plan to be performed and incorporated in the *Final soil Background Study Report*. This letter addresses the evaluation of whether WSMR's *Final Soil Background Study Report* incorporated NMED's three modifications as outlined in NMEDs Approval with Modifications for the *Revised Final Soil Background Study Work Plan*. The evaluation of the three modifications is outlined below.

Comment Number 1. NMED directed WSMR not to sieve soil samples; the larger rock fragments may be removed by hand. As indicated in Section 3.1.2, large pieces of gravel were removed, and as also shown in Photos 3-6 through 3-8, it appears that WSMR complied with this request and did not sieve soil samples.

Comment Number 2. The second modification directed WSMR to submit figures showing background soil sample locations at least 10 days prior to sampling activities if the locations were changed. NMED also directed WSMR to choose sample locations that are away from potentially disturbed areas (e.g., away from dirt roads or paths). The final background sample locations that were sampled shown in the *Final soil Background Study Report* for the Main Post Sites (Plate 3-1) and solid waste management unit (SWMU)-140 (Figure 3-2) differ from the proposed background sample locations submitted in the work plans. It is not clear whether these were approved by NMED at least 10 days prior to sampling. It was also noted on Plate 3-1, which shows the background sample locations for the Main Post Sites, that there are: 1) two sets of samples (MP-BH08/MP-BH09 and MP-BH06/MP-BH07) which appear to be adjacent to each other and may not have yielded independent sample results; and 2) several of the sample locations (MP-BH06, MP-BH07, MP-BH08, and MP-BH10) were moved adjacent to dirt roads

or paths and may not be entirely representative of background conditions. NMED may wish to verify that the background sample locations were approved prior to sampling.

Comment Number 3. NMED directed WSMR not to pre-select which statistical test would be used in calculating background tolerance values without first determining the distributions of the data sets. Several inconsistencies were noted with regard to the calculation of background tolerance values:

1) Upper confidence limits (UCL) of the mean concentrations for the background data sets were calculated and displayed in Tables 5-2 through 5-10. It is not clear how or if WSMR intends to use the UCLs in conducting site versus background comparisons. Site-to-background comparisons should be based on two-sample hypothesis tests, or point-by-point comparisons utilizing 95% upper tolerance limits (UTLs), 95% upper prediction limits (UPLs), or upper percentiles.

   Furthermore, it appears that the selection of the UCL computational methods was done incorrectly. Text in Section 4.4 of the *Final soil Background Study Report* indicates that distributional tests were conducted on the background data sets. However, it does not appear that the selected UCL computational methods were based on the distribution of the data sets. As stated in Section 4.5, "The 95th UCL of the mean was calculated using the nonparametric 95 percent bootstrap-*t* method for elements with no nondetect concentration. The Kaplan-Meier 95 percent bootstrap-*t* method was used to calculate the 95th UCL of the mean for elements with one or more nondetects." As instructed in USEPA's ProUCL 4.1 User's Guide, the UCL computational method selected should depend on the distribution of the data set (rather than the number of detects/nondetects). Therefore, the UCLs listed in Tables 5-2 through 5-10 are, in most cases, not the appropriate values that should have been selected based on the distributions of the data sets.

2) Although Text in Section 4.4 indicates that distributional tests were conducted for determining the UTLs, the "Distribution Type" listed in Tables 5-2 through 5-10 are inconsistent with the data distribution results in the provided ProUCL output files. In addition, it does not appear that the selected UTL was based on the recommended data distribution. In addition, while Section 4.4 indicates that tests were conducted to determine whether the data were distributed normally and/or lognormally, it does not appear that WSMR considered whether the data followed a gamma distribution or any other distribution. As shown in Tables 5-2 through 5-10, the distribution types listed are either normal, lognormal, or nonparametric. It is noted that 'nonparametric' does not describe the distribution of the data set, but rather assumes no specific distribution.

3) Many of the UTLs listed in Tables 5-2 through 5-10 are well above the maximum detected concentrations. The UTL is meant to be an upper bound estimate of the maximum concentration and a not-to-exceed value used for point-by-point comparisons. Therefore, the calculated UTL should not be greater than the maximum detected concentration.

4) It was noted that a coverage coefficient of 95% was selected when computing UTLs. The use of this less conservative coefficient may be a contributor for results that are larger than the actual background values. A default value of 90% is typically recommended for the coverage coefficient.

5) It does not appear that a statistical outlier test was performed. As instructed in ProUCL, "While computing reliable background statistics, it is essential that one is dealing with a single population representing site background without potentially impacted observations (outliers)."

For the UCLs, it is recommended that WSMR do one of the following: 1) remove all references to UCLs from the background study report; or 2) select appropriate UCLs that are based on the distributions of the data sets and update Tables 5-2 through 5-10 accordingly.

For the UTLs, it is recommended that WSMR first perform a statistical outlier test and remove any values that are outliers. Second, WSMR should determine the specific and/or most appropriate distribution of each data set. Last, WSMR should recalculate and propose new background values that are: 1) based on the distribution of the data; 2) upper bound estimates (95 % UTLs, 95% UPLs, or upper percentiles) of the maximum concentrations; 3) not greater than the maximum detected concentration; and 4) calculated based on a 90% coverage coefficient. For ease of use, all of these functions can be performed using ProUCL 4.1.

If you have any questions, please contact me at (801) 451-2864 or via email at paigewalton@msn.com.

Thank you,

Paige Walton
AQS Senior Scientist and Program Manager

cc: Kristen Van Horn, NMED (electronic)
        Joel Workman, AQS (electronic)
        Sunny McBride, AQS (electronic)