

**Rocky Flats Environmental Technology Site
Responses to Questions on the 1993 Background Characterization Report
(BGCR) in a Letter from Mr. Steve Tarlton of the CDPHE
to Mr. Steve Slaten dated December 23, 1996**

- 1. Section 4.3.3.1.3 of the Report states: "Consequently, accuracy could not be evaluated for radionuclides in groundwater." If true, and no evaluation of accuracy was performed, it is difficult to understand how this data can be reliably used. Please present any information that you have concerning the accuracy in ground water radionuclide measurements performed as part of this background study.***

After a thorough review, RMRS believes the data can be reliably used for the following reasons. The complete statement from the BGCR is: "The data set contains no spike results for either total or dissolved radionuclides. Consequently, accuracy could not be evaluated for radionuclides in groundwater." This statement is not completely accurate. RMRS believes the authors were unaware that the necessary QC data for performing accuracy calculations for radionuclides are not reported in RFEDS. The data are reported in the hard copy data package delivered soon after the analyses are run.

Quantalex, the validation contractor for RFETS since 1988, indicated that accuracy, along with other QC parameters, was calculated as part of the validation process as set forth in the General Radiochemistry and Routine Analytical Services Protocol (GRRASP), Part B. This document is very specific as to laboratory procedures and reporting requirements that must be adhered to by contract laboratories. Accuracy calculations are reported in the data validation package.

About 90 percent of the data used in the report was validated. No rejected data were used in the statistical calculations. Therefore, the data used in the report met the requirements of the GRRASP, Part B and can be reliably used.

Preliminary draft background values for actinides in groundwater, calculated using an enlarged database, were attached to a letter from Steve Slaten to Steve Tarlton and Tim Rehder dated January 8, 1997 (97-DOE-05129). After comments are received, this report will be finalized, and QC calculations will be performed and reported.

- 2. Measurement results for dissolved uranium isotope concentrations are reported as being significant at 10 attocuries per liter (3.7×10^{-7} disintegrations per second per liter). This is equivalent to measuring 11.68 disintegrations per year. This is an unrealistic degree of measurement precision. While data is reported to five decimal places, often 2 or 3 or 4 and sometimes five places are zeros. Please provide any information available identifying the degree of significance of the data used in this report.***

The reviewer is correct in observing that five decimal places is a unrealistic degree of measurement precision. RFEDS stores data as received from the analytical laboratories. Most radionuclide results are reported by the laboratories to two or three decimal places. In keeping with DOE practice radionuclide results are reported as received from the laboratories and the reader can round the data to what they consider an appropriate degree of precision. In our opinion, the data is accurate to two decimal places.

3. ***The degree of error associated with individual measurements of dissolved uranium isotope activity is often greater than the magnitude of the measured concentration, as is one convention for reporting measured values less than the detection limit. Measured values less than the error of the measurement are in the same statistical population as a measured value of zero. Using such data to describe anything other than the radiation measurement error of the system is highly questionable. It appears that any measurement less than 0.27 picocuries per liter is more likely to be error than a measurement of uranium isotope radioactivity. What is the detection limit of the measurement system used in generating this data?***

Minimum Detectable Activities (MDAs) in radiological analyses are dependent upon predetermined choices about counting intervals and satisfactory statistical inferences. For radionuclide analyses it is not possible or appropriate to substitute a value for results below the MDA, partly because for the nature of a MDA and also, because this would be contrary to DOE practice, which requires that the actual result of all radionuclide analyses must be used rather than a replacement value.

The required MDA for uranium is 0.6 pCi/L. Most reported MDAs are well below this value. Samples with MDAs above that required by the GRRASP, Part B are rejected by the validation.

All radiological results are reported with error and MDA values that are calculated specifically for each sample. It is unclear exactly how the reviewer arrived at the value of 0.27 pCi/L as the lower limit of a meaningful result.

4. ***The error associated with a radioactivity measurement is part of the data, but was not part of the report. Please submit the error associated with the total uranium isotope concentration in groundwater used in this report.***

No total uranium isotope data for groundwater was included in the report. Individual uranium isotopes (U-233/234, U-235, and U-238) were reported. The error associated

with each measurement was included on a data diskette that was included with each report.