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November 17, 2005

Mr. Linn Havelick
Director of Environmental Health and Safety
Chauvenet Hall Rm. 194
1015 14th Street
Golden, CO 80401

Subject: Review of Background Study at the CSMRI –Creekside Site submitted by the S.M. Stoller Corporation (Stoller) on September 15, 2005

Dear Mr. Havelick:

Staff has completed its review of the CSMRI – Creekside Site Draft Report on Background dated September 13, 2005. This report was discussed at the September 20 meeting with representatives from CSM, Stoller, and CDPHE-HMWMD.

At the meeting Steve Brinkman of Stoller indicated that the background at the Creekside Site should be 10 pCi/gm for radium-226 and guaranteed that the site could not be cleaned up to below 7 pCi/gm. It was pointed out to him that other radioactive sites have lower background and were able to be cleaned up to less than 5 pCi/gm (see below). Many of these sites are on the western slope and are located in sparsely populated areas, while the Creekside site is located on a college campus in the City of Golden, Colorado. CSMRI has indicated that they would like to cleanup the site to unrestricted use, but has proposed cleanup objectives higher than at sites located in uranium rich areas and that will continue to be licensed by the U.S. NRC and restricted and monitored by the U.S. DOE.

Following are staff comments on the report:

1) On page 2 Stoller states "Determining background concentrations for site contaminants should consider the background activity of the four bedrock formations as well as the four surficial deposits." This was not done in any of the three previous studies. On page 10 under section 4 - **Assessment of Reports**, it indicates that seven different geologic units underlie the site. Figures 2 and 3 show eight units. The first full paragraph on page 16 also refers to seven formations and a literature search. The report

does not give information for each geologic formation, but refers only to two other sites, Rocky Flats and the Molycorp-Louviers facility. Please clarify and give the information obtained for each geologic unit with regard to background.

2) On page 10 Stoller makes the statement "A complete background analysis would include a background evaluation for each geologic unit underlying the site." The report tries to rely upon the division's Soil Screening Guidance to dictate the calculation methods, yet the background data do not meet the requirements of the guidance. In order to have a "valid background study" a separate background concentration for each unit must be calculated. This will require 18 samples from each geologic unit, 9 surface and 9 subsurface. The sampling plan should be submitted to the division for approval before commencing the sampling program. The plan would also need to determine which background unit is comparable to each cleanup area.

However, it would seem that if background were designated for each individual unit, then the excavation would have to proceed on a unit-by-unit basis. Given the fact that such discrete excavation has already proven to be impractical at the site, such necessary background sampling might not lead the school to a solution that is any more implementable than you claim the existing situation to be.

3) On page 12, it states "Using the u+2 sigma to determine background cleanup levels for radiological constituents is less conservative than using the u + t sigma (as was done in the elements analysis.) No explanation is given on why a different technique was used to determine the cleanup level." Staff is curious as to why the report then goes on to calculate background values using the mean plus 2 standard deviation method that is criticized. The Soil Screening Guidance uses the t-statistic method, not 2 standard deviations and does not address radionuclides. It should be noted that at most radioactive sites in Colorado, the arithmetic mean is used for determining background. Background range has been an ALARA cleanup objective in Colorado.

4) On page 15 Stoller has proposed using the method of analysis that would correspond to methods outlined in CDPHE's Proposed Soil Remediation Objectives. This has never been done at other radioactive sites undergoing soil remediation. The ALARA principle drives cleanup of radiological sites (see *Colorado Rules and Regulations Pertaining to Radiation Control* Sections 3.16.2.5.2 and 4.5.2). Also see 11 below and OTHER INFORMATION ON BACKGROUND IN COLORADO discussed in this letter.

5) On page 16, Stoller says that they are using both the gamma spec and the combination alpha and gamma spec data in their analysis, yet they are excluding the field duplicates. This doesn't make any sense. Why would you use two separate measurements on the same sample, but not use the duplicate? No justification is provided for this discrepancy. Please provide.

6) On page 16, Stoller notes that they did not conduct an outlier test because URS did not flag any radionuclide data as outlying. This seems to be picking and choosing which sections of the Soil Screening Guidance to follow. If Stoller is following the guidance,

they should have used the ASTM method for dealing with outliers to check for outliers; then conducted the statistical analysis on the remaining data.

7) As mentioned in comment 2 above, the use of 2 standard deviations is not appropriate if they are following the Soil Screening Guidance. In addition, the report needs to state how many samples they had for each analysis, because this is also important for determining whether or not the Guidance was followed correctly. Please provide the data and calculations for our review used in determining the background in Tables 12 and 13.

8) The analysis of other Front Range sites did not include the CSMRI TMRC site and/or the PD - Amax site. There is other information available about background radiation levels in Colorado such as the ORNL /TM-7343 report. This report indicates that 32 samples were taken throughout Colorado with a range of 0.48-3.4 pCi/gm, an arithmetic mean of 1.4 pCi/gm and a geometric mean of 1.3 pCi/gm and a standard deviation of 1.5 pCi/gm.

9) On page 19 and 20 in Tables 14 and 15 you should include the mean and standard deviations for both sites.

10) On page 20 Stoller indicates that "Variations in surface geologies, date distribution, depths of samples, number of representative sites, etc. make it difficult to directly compare background values. Relatively large standard deviations in the combined URS data tend to elevate cleanup levels beyond those found in the literature search. As noted in Tables 12 and 13, log normal statistics were used in some cases to determine the background levels, which tend to result in larger background levels". Using this method would result in less conservative background numbers, be less protective of the students and citizens of Golden and could result in cleanup numbers inconsistent with the ALARA principle. The section below shows that cleanup of radioactive sites in Colorado can be accomplished to well below 5.0 pCi/gm.

OTHER INFORMATION ON BACKGROUND IN COLORADO

Following are background means at several radioactive sites undergoing remediation in Colorado.

Maybell – in a uranium mining area 1.7 pCi/gm.
Hecla -in the Colorado Plateau Uranaium/Vandium Mineral Belt - 0.98 pCi/gm
Uravan -in the Colorado Plateau Uranaium/Vandium Mineral Belt - 2.1 pCi/gm*
Cotter in Canon City, Colorado – 1.3 pCi/g**
Amax in Golden, Colorado - 1.3 pCi/g

*Uravan included Thorium decay at 1,000 years.

**Cotter is required to cleanup to background range off site which is 2.3 pCi/gm. On site as with the other sites the requirement is 5.0 pCi/gm above background mean for the top 15 cm consistent with Part 18 of the *Colorado Rules and Regulations Pertaining to Radiation Control*. At all of these sites, the material is classified as 11.e.2 materials. Radioactive material at CSMRI-Creekside is classified as TENORM and is subject to PARTS 3 and 4 of the Regulations. All of

the above sites will continue to be licensed by NRC and will have DOE do long-term surveillance except AMAX which is being cleaned up to unrestrictive use.

At the AMAX site, cleanup has been to 3.5 pCi/gm. At the Hecla site cleanup has varied between 2.0 pCi/gm to 3.6 pCi/gm.

At the Molycorp site near Louviers, Colorado, the average background Ra-226 was 0.92 pCi/gm with a standard deviation of 0.26 for a cleanup objective of 1.4 pCi/gm. It should be noted that this number is similar for the radium-226 number reported in Table 1 for the 2000 URS background concentration of 0.94 pCi/gm mean with a standard deviation of 0.75 pCi/gm. The cleanup average in the old ponds area was 1.15 pCi/gm after pond removal. Radioactive materials at this site, which could not be reprocessed, were classified as TENORM and were sent to the CSI Inc. facility for disposal. This site has been remediated for radioactive materials to unrestricted use.

In summary, the Department's review of this report finds the following:

- The requested background concentration is inconsistent with a large volume of data for sites in Colorado.
- The assertion that cleanup objectives cannot be met in accordance with the approved plan is unfounded, based on successful cleanups at lower levels elsewhere in the state.
- The proposal is not protective of unrestricted use of the property, nor is it consistent with the ALARA principle.
- The manipulation of data in the analysis is subject to similar arguments that the report presents on others' manipulation of data at the site.

The Department recommends CSM keep the same cleanup numbers as were originally proposed and accepted by CDPHE in the Decommissioning Plan, and implement the approved plan. If CSM wishes to continue to challenge the approved cleanup, they need to resample and get new data as discussed above. Calculations for background using the new data should be performed consistent with what has been done in the past at other radioactive sites in Colorado. If the new data obtained by sampling is different from the agreed upon numbers, then it is recommended that CSM have a public meeting to discuss these numbers with the community. It is also recommended that any change in the approved Decommissioning Plan should be presented to the community including disposal.

If you have any questions with regards to this letter, please call me at 303.692.3452.

Yours Truly,

Philip S. Stoffey
Project Manager
CSMRI Creekside Site
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cc: File Copy 617-01, File 3.2
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