

Steven Reneau,9/7/97 2:42 PM,Reach LA-3 Update**1**

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From: sreneau@lanl.gov (Steven Reneau)

Subject: Reach LA-3 Update

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Analytical data are in from our 1st round of sediment sampling in reach LA-3, in Los Alamos Canyon immediately upstream from State Road 4. I have given the analyses for Cs-137, Am-241, Pu-238, Pu-239,240, and Sr-90 a quick preliminary evaluation, including preparing an estimated inventory for these analytes and comparing these data with our data from reach LA-2. I have not yet looked at the full-suite data, and will leave identification of other analytes above background to Randy Rytli. A summary of some key points is presented below. As usual, spreadsheets with summaries are available upon request.

Contaminant Concentrations: Maximum concentrations of the key rad analytes are significantly less than in reach LA-2, as expected. The maximum measured for Cs-137 is 13.8 pCi/g (vs. 211 in LA-2), for Am-241 is 11.8 pCi/g (vs. 26 in LA-2), for Pu-239,240 is 3.18 pCi/g (vs. 6.4 in LA 2), and for Sr-90 is 7.03 pCi/g (vs. 38 in LA-1). The highest concentrations for Cs, Am, and Pu, and the 2nd highest Sr measurement, are in the same sample, within the "c3" section where the highest field gamma measurements were obtained (interestingly in a sample above where the max. gamma was measured). The highest Sr-90 value was anomalously from a relatively deep, relatively coarse-grained sample from the younger "c2" unit with lower field gamma readings. Average values in the "c3" overbank sediments (the unit with the highest concentrations), are 7.7 pCi/g Cs-137, 3.0 pCi/g Am-241, 1.8 pCi/g Pu-239,240, and 1.7 pCi/g Sr-90.

Contaminant Inventory: The largest part of the estimated inventory for each of the key rad analytes are within the "c3" overbank sediments, ranging from ~47% of the Sr-90 to ~71% of the Am-241. The amounts of each stored along the channel are much less than in reach LA-2, an estimated 16 mCi/km Cs-137 (vs. 88 in LA 2), 5 mCi/km Am-241 (vs. 26 in LA-2), 4 mCi/km Sr-90 (vs. 22 in LA-2), and 3 mCi/km Pu-239,240 (vs. 10 in LA-2; note: Pu estimates in P-4 are more than 10X greater, ~160 mCi/km in P-4 East and ~360 mCi/km in P-4 West).

Sediment Age and Correlation with LA-2: Examination of the Pu-239:238 ratios for the LA-3 samples indicates that there is little post 1942 pre-1968 sediment stored within LA-3 (use of Pu-238 at Los Alamos increased dramatically ~1968, causing Pu-239:238 ratios to drop). Only 2 LA-3 samples yielded Pu-239:238 ratios similar to the "garden plot" ("c3" unit of LA-2) and older post-1942 LA-2 sediments, and these are both coarse gravelly channel deposits below the "c2" and "c3" units. Apparently, most post-1942 pre-1968 sediment within LA-3 has been remobilized and mixed with younger sediment, suggesting typical sediment residence times of <30 years. This is consistent with the evidence in LA-2, where the pre-1968 "c3" sediments only occur in a small part of the reach.

Contaminant Dilution: Most of the "c2" and "c3" sediments in LA-3 probably were deposited within the same time period (post 1968) as the LA-2 "c2" and "c2b" sediments, and comparison of these data allow preliminary estimates of the dilution of contaminants that occurred between these two reaches (note: a better estimate will be made after receipt of particle size data,

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and a comparison of data from subsets with similar particle size distributions). For Cs-137, where we have the largest data set, average concentrations in LA-3 have apparently been reduced to about 20-30% that in LA-2, although this is only a very preliminary estimate.

Floodplains. The analytical data confirm inferences from the field gamma measurements about the lateral extent of significant Cs-bearing sediment. Cs-bearing floodwaters have apparently been restricted to a narrow belt along the active channel that typically ranges from about 3-10 m in width. Sediments deposited on the "f1" surface have Cs concentrations typical of both the "c2" and "c3" units. Samples from 2 "f2" surfaces suggest either very thin post-1942 layers or some deposition of wind-blown sediment derived from the nearby post-1942 overbank sediments. Pu-238 concentrations in these samples are below the detection limit, suggesting high Pu 239:238 ratios and a source from relatively old (pre-1968) sediments.

Observations of Utility of Field Gamma Measurements. Mapping and sampling in LA-3 was biased heavily by the field measurements of gamma radiation, including preparation of an estimated Cs inventory based largely on the gamma measurements and comparison with LA 2 data. Several points are notable. 1) Differentiation of the "c2" and "c3" units based on field gamma data was supported by the analytical data, with all sampled "c3" sections providing higher maximum Cs-137 than sampled "c2" sections. 2) The relative amount of total Cs in each unit corresponded remarkably well with a June 1997 estimate (e.g., 6/97 estimate placed 52% of the Cs in the "c3" overbank sediments, and the present estimate is ~56%). 3) The average Cs concentration was generally underestimated from the field data, and the current inventory estimate is ~80% greater than that in June. 4) Surprisingly, in most sampled sections, the layer with the highest measured Cs did not correspond with the layer with the highest field gamma measurement. This suggests that, at such relatively low concentrations, other factors such as variations in moisture content and "shine" from nearby layers may limit the precision of this instrument in pinpointing the layers with the highest Cs.

Please contact me if you have any questions.

Steve

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