

SYMPOSIUM ON HYDROGEOCHEMICAL AND STREAM-SEDIMENT
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COLLECTION AND PREPARATION OF WET AND DRY
STREAM-SEDIMENT SAMPLES *

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Lawrence Livermore Laboratory is responsible for the Hydrogeochemistry and Stream Sediment Reconnaissance (HSSR) program for uranium in the seven far western states. The work thus far has concentrated on the arid to semi-arid regions of the West and this paper discusses the collection and preparation of sediment samples in the Basin and Range province. The sample collection and preparation procedures described here may not be applicable to other parts of the far western states or other areas. These procedures also differ somewhat from those used by the other three laboratories involved in the HSSR program.

Selection and Location of Sites

The sample site locations must be related to the geology and the mobility of uranium in a given environment. In the semi-arid Basin and Range we have chosen to emphasize stream sampling along the front of the ranges. If the drainage is large enough, sites are placed up the canyon and along tributary canyons in order to obtain representative coverage consistent with a selected site density. In valleys, dry sediments are collected only along major, well-defined drainages and if the range-front sampling does not provide adequate coverage. (A paper by D. Leach, presented at this seminar, will go into more detail on the subject of sample density).

Sampling points are selected by LLL geologists on the latest topographic maps and/or air photos. These sites are selected using the best geological, hydrological and geochemical information available.

It is desirable to have each sample site as close to natural conditions as possible. The geologist in the field may change these sites if any contamination is evident. Some common forms of contamination in the Basin and Range are aeolin deposits, Pleistocene lake beds, farming and ranching activity.

Because we are measuring uranium in parts per million, seemingly insignificant sources of contamination could mask the natural background. Samples are therefore collected upstream from roads, bridges, rubbish and any potential sources of pollution. Heavily fertilized lands are avoided as phosphate fertilizer may contribute uranium to the system. In addition it is not uncommon to find that the aggradation of an alluvial fan has changed a stream's course. If it is necessary to move a site, then the reasons are recorded and an alternate site is chosen as close as possible to the original location. Alternate sites are best located in the same drainage as the original site. If this is impossible then the next stream drainage with similar geology is sampled in order to help maintain the overall site distribution and density.

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Sample Collection

The collection of wet and dry sediments is basically the same. Both involve the collection of a composite sample from five locations, five yards apart, of either the bedload or the dry sediment. Samples are taken from the active part of the stream channel and care is taken to avoid bank sluff material. If any form of contamination is visible, the sample is moved, as previously described.

Dry sediments are sieved using a No. 3 (1/4" square opening) stainless steel sieve; large fragments are removed by hand. At least five pounds of the sieved material is then placed in a polyethylene bag and sealed.

For wet sediments, a selective sample is taken of the finer size material from the stream bottom. Sand bars located in midstream, and the fine-grained deposits located on the inside of meander curves provide the best sampling sites. Normally a polyethylene scoop is used for sampling sandy or muddy bottom streams. In some cases an aluminum shovel is used to sample a stream having a coarse-grained bottom sediment. After sampling, all large rocks are removed by hand and the remaining sample placed directly into a polyethylene bag. Part of the excess water is then drained off, at the same time trying to retain as much as possible of the finer sediment fraction. The bag is then sealed around the top with a wire-reinforced strip. It should be pointed out that this procedure applies only to the small streams that we have encountered. In wetter areas of the West, where larger streams are abundant, a more elaborate sampling procedure may be used.

The bags of wet and dry sediments are numbered and inserted into a second polyethylene bag and tightly sealed. The number on the bag corresponds to a numbered sample form which contains such information as sample location, description, and the nature of the stream bottom. The sample number is also entered appropriate topographic map. The same sample number is placed on a yellow paper tag and placed in a visible location at the sample site. If a contractor is collecting the samples for LLL, he is required to take a Polaroid picture of the site for verification. Samples are deposited twice weekly in a specified field location, usually a laboratory trailer or storeroom. From there they are then returned to the laboratory for processing as soon as possible.

Sample Processing

Samples are received by the laboratory, verified and logged in. The following procedure applies for both wet and dry sediment:

- . All samples are removed from the polyethylene bags and placed in glass drying pans and oven-dried at $105^{\circ} \pm 5^{\circ}$ C.
- . If necessary, dried samples are disaggregated slightly, using a polyethylene scoop or aluminum scoop for "hard" samples.
- . The dried material is sieved in stainless steel sieves into four particle-size fractions.
- . The analytical sample is then blended and split several times in a riffle-type splitter.

Approximately 3-5 gm of the 500 to 1000 μm sample is carefully loaded into polyethylene bags, heat-sealed, weighed, and loaded into INAA rabbits. The sample is then ready for irradiation.

The historical samples are bagged and stored for each individual size fraction, along with a split of the analytical sample. The sieves are then cleaned with forced air, carefully washed, and dried.

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