General ENTERED No Date

LANL/ER/FRAMWORK

Understanding Background Chemistry: The Role of Soils and Landscape Position for Interpreting Environmental Data

This whole talk does not apply to ER decisions.

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Abstract

Results of soil background investigations demonstrate that Laboratory soils have extreme diversity and spatial variability in their physical and chemical properties and in their vertical stratification of soil horizons. A significant source of variation is due to a diversity of topography, soil parent materials of varying materials (i.e. tuff, dacite, pumice, dust, older soils) and ages (100's to 100,000+ years), and episodic periods of landscape instability that has resulted in truncation and/or burial of soils and the formation of complex-stratified soils. Because of this high soil spatial variability, soil chemical and physical properties can vary significantly over a few meters laterally for any given landsurface across the Laboratory. Surface and near-surface sampling of soils and sediments for site characterization, therefore, can be problematic because samples collected for purposes of establishing elemental background distributions in soils may represent very different soil conditions, and in turn, different trace element background levels. This is further compounded by: (1) strong relations between high concentrations of trace elements and well-developed soils and (2) the fact that the current soil background data set is largely representative of soils developed on mesa tops. Soils formed on steep hillslopes and canyon bottoms generally have widely different soils properties than those on mesa tops, but only very limited background data for soils formed on hillslopes and canyon bottoms currently exists. Because of the (1) diversity of soils and trace element background levels and (2) limited data regarding trace element background levels for extensive soils found along hillslopes and canyon bottoms, great care and caution is required is applying current trace element background data to site-specific problems across the laboratory and for addressing site-specific issue regarding remediation strategies. Given the current state of knowledge regarding soil elemental background, the following recommendations are suggested:

(1) Use of a multi-disciplinary approach for characterizing site background. Personnel with technical expertise is soils and geomorphology should provide assistance and guidance for sampling, field-based descriptions of soil and sediment samples, and determining the appropriate set of background data for comparison. Detailed soil surveys would greatly enhance site-specific information regarding the spatial distribution and diversity of soil and sediments and provide guidance for developing sampling strategies and appropriate use of background database.

(2) Adequate information should be recorded for each sample collected for background describing the soil master horizon(s) sampled and/or degree of disturbance of soil setting (i.e. fill material). Such information will assist evaluation of sampled background levels.

(3) Additional soil background sampling and characterization of (a) A and C soil horizons and (2) soils commonly found along hillslopes and canyon bottoms. Expanding background database for other widespread and important soils will greatly increase the applicability of the background data to the divers soil and sediment conditions found across the Laboratory.

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