

Contaminants from South Texas Uranium Mines: Livestock Pond Sediments from the Falls City, Texas UMTRA Site – Scrutiny of Contaminant Classification

Ronald L. Parker and **Bruce E. Herbert**, Department of Geology and Geophysics, Texas A & M University, College Station, Texas 77843 rlp4045@geo.tamu.edu

Philippe E. Tissot and **Geoffrey E. Ussery**, Conrad Blucher Institute for Surveying and Science, Texas A & M University – Corpus Christi, Corpus Christi, Texas, 78412

Surface remediation of uranium mill tailings at Falls City, Texas was completed in 1994 as part of the Uranium Mill Tailings Remedial Action (UMTRA) program managed by the United States Department of Energy (USDOE). The UMTRA Vicinity Property program was charged with evaluating nearby land impacted by wind and water transported tailings. Vicinity property FC-00025 was the site of the Lockett open-pit uranium mine that was converted to a disposal pit for mill processing slurries. Processing wastes eventually filled the 40-foot deep pit to a level above the former land surface. A pond located immediately adjacent to the former pit was hypothesized to have received episodic intrusions of tailings-derived contaminants due to eolian and stormwater processes. As the result of an initial site radiometric survey, the pond was identified as a target for remediation by the USDOE. Plans for pond remediation included water drawdown, removal of impacted bottom sediment to a secure tailings repository, replacement of an outlet drain, fish re-population, replacement of stock holding pens and access to an alternative livestock watering source.

Contamination classification initially performed by the USDOE was based on the ratio of ^{226}Ra to ^{238}U . The classification held that mill processing tailings could be discriminated from naturally occurring sediment radionuclides because processing removed uranium but not radium. Thus, natural sediment would have a ^{226}Ra to ^{238}U ratio near 1 while processed tailings (having been stripped of 85% of the uranium) would have ratios significantly above 1. During the initial radiometric survey, elevated ratios in pond sediments signified tailings impact and triggered remediation. During early phases of remediation, however, very low ratios were observed in pore waters. Because ground water was the assumed medium of transport to the pond, the absence of elevated pore water, ^{226}Ra to ^{238}U ratios was taken by the USDOE to indicate an absence of pond contamination by migration away from tailings. Thus, non-pore water measurements were discounted, the pond was deemed to have been contaminated by natural mineralization sources and was not remediated.

A primary assumption of this classification scheme is that concentrations of Ra and U follow the sediment and are not subjected to differential losses or additions. This assumption is not supported by the literature. Preferential solubilization and complexation of U by oxidizing freshwater prevents discrimination of materials that have lost U due to mill processing vs. aqueous dissolution. Reducing natural waters with abundant organic matter are well-documented sinks for dissolved uranium. Radium, which is not subject to redox changes, is readily removed from the aqueous phase by solid sorption phenomenon.

We present data from gamma spectroscopy that provides an alternative interpretation of the ^{226}Ra to ^{238}U ratio data reported by the USDOE. Our reinterpretation indicates that pond sediments were (and remain) contaminated by processing mill tailings.

GSA Abstracts with Programs, Vol. 31, no. 7, p. A340.