Development of Radiological Screening Levels and Associated Gamma Survey Methodologies Being Applied for Radiological Characterization at US DOE Defense-Related Uranium Mines (DRUM) Sites

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Thousands of former uranium mining sites in the United States, primarily in the southwestern states of Colorado, Arizona, New Mexico, Arizona, and Utah, are being identified and evaluated to assess their potential for causing public and environmental impacts. The common radiological contaminant of concern that characterizes these sites is naturally occurring uranium ore and associated wastes that may have been left behind, post-mining. The majority of these sites were "abandoned" and, in general, are referred to as "Abandoned Uranium Mines" (AUMs), regardless of the government authority currently managing the land or, in some cases, assigned responsibility for the oversight of assessment and remediation.

The U.S. Department of Energy (DOE) Office of Legacy Management (DOE\-LM) has identified over 2500 Defense-Related Uranium Mines (DRUM sites) on public land from which uranium ore was purchased by the U.S. government for nuclear defense programs prior to 1970, which it is currently inventorying and performing environmental screening. This paper initially presents a brief summary of the results of the analysis that was performed for establishing radiological screening criteria for DOE's DRUM sites that is currently being used as input to the overall ranking of these sites for prioritization of additional assessment, reclamation, or remedial actions. These radiological screening levels were developed by calculating the radiological dose to future recreational users of DRUM sites at which a future camper spends 2 weeks per year at the site engaged in recreational activities.

Given that the external exposure rate was determined to represent > 85 % of the annual dose to a future site recreationist and is easily measured in the field, it was chosen as the primary screening level criteria. The remainder of the paper presents the results of the gamma survey instrument performance verification ("normalization") studies that were conducted to assess important physical and related instrument characteristics associated with the complexities of measurement of 238 Uranium decay series radionuclides in the field (e.g., energy dependence and tissue equivalence). Field techniques being used for performance of these surveys and examples of results for the almost one thousand DRUM site gamma surveys completed to date are presented.