Date Fri, 05 Nov 1999 112710 -0700
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Subject: Blue Alert- Hard-to-Detect Radionuclides

Title: Blue Alert- Hard-to-Detect Radionuclides- Characterization
Date November 4, 1999 Identifier ERC-99-0008

Lessons Learned Statement:
1. Each area must be characterized using all available data for projected activities. Surface contamination measurements are appropriate for non-destructive activities, but must be supplemented by volumetric data when intrusive activities are performed.

2. A 'one instrument fits all conditions' approach requires analysis to substantiate. While many probes will work in most situations, analyze the characterization data to determine the most appropriate instrument deployment and methods.

Description of Event: The Environmental Restoration Contract has been performing environmental restoration and decommissioning and demolition activities on the Hanford site for over five years. The scope of these operations have ranged radiologically from slightly contaminated soil, to fuel storage basin sludge. For each operation, radiological characterization has been performed, including not only the extent and concentration of activity, but also the radioisotopic constituents. Whenever the characterization data has indicated the presence of hard-to-detect (HTD) radionuclides, particularly 63Ni or 14C, the project radiological engineers took several actions. One of the actions was determining whether the HTD radionuclides could pose a radiological hazard to the workers. In each case, the radiological controls required for the easier-to-detect radionuclides, with consequently greater radiological risks, have been sufficient to control the harder-to-detect hazards. The project radiological engineers have also accommodated for the low efficiency of most field instruments for these radionuclides. This accommodation has taken the form of either lowering the release limit for materials from that project, using a correction factor, or using a lower effective efficiency for the probe. In the majority of cases, where the HTD constituents were less than 30% of the total activity, the slight decrease in efficiency and increase in count times has not presented a significant operational detriment. In August 1999, a radiological control technician (RCT) submitted an Issue Evaluation Request (IER) concerning the approach of the RadCon organization toward these issues. As the IER noted, there was no document stating the policy of RadCon for a standardized approach to these issues. As part of the response to these issues, a policy statement regarding the control of these radionuclides was issued, including direction to radiological engineers to ensure thorough characterization of their facilities. The policy document specified the use of correction factors, or lowering the control values for release, essentially documenting past practices that are considered appropriate. Following issuance of the HTD policy document, the radiological engineer for the 105-F and 105-DR Reactor D&D activities reviewed the available characterization data to ensure that appropriate correction factors were used for planning work in these facilities and selected areas within them. The F and DR reactor facilities housed 2000 MW, graphite-moderated reactors that were deactivated in 1964 and 1965. During this review, three areas were identified that showed characterization data in which the HTD ratio to other nuclides was greater than the previously assumed ratios. While the review indicated that there

was no significant radiological hazard presented by the HTD radionuclides from airborne, internal or external radiation, the surveys required to release equipment and people from the areas was operationally unacceptable. That is, the necessity for more and longer static counts to make valid release decisions could not be effectively implemented in the field. Following this identification, access to the areas with the highest ratios of HTD nuclides was prohibited until more appropriate survey methods or equipment could be deployed. Survey practices for the remaining areas of these facilities required only minor modifications and were implemented immediately.

Actions Taken or Recommended: The RadCon staff performed several actions to clarify and resolve the HTD issue. These actions include making more measurements, and taking more representative samples of the areas of concern. Because the areas are predominantly porous concrete surfaces, the only samples collected to date were solid concrete core samples that are not necessarily representative of the contamination of radiological concern. To better characterize the nuclides and their distribution, the following sample types were included as part of the new characterization scheme measurement of removable activity (standard RadCon smear), total activity (wire brush removal of surface), and more concrete cores. The available data were processed to analyze the changing activity over time, since decades of time could be involved, and to determine the changing composite efficiency of the standard ERC radiological instruments used over that same time frame. These analyses were performed based on the characterization sampling for the three areas of concern, and for a more common 'Hanford' mixture of radionuclides. These analyses indicate that activity levels have decreased between a factor of two (since reactor shut down) for the areas with a large percentage of HTD nuclides, to a factor of twelve decrease in activity of areas containing the common Hanford mixed fission and activation product mixture. These analyses demonstrate the steadily increasing proportion of HTD radionuclides over time, and indicate that the problem will only become a more significant issue with time, with the HTD ratio doubling over the expected span of the ERC project. By more thoroughly characterizing all areas, using appropriate correction factors and the most appropriate instruments and probes, HTD radionuclides can be handled with a minimum disruption to normal worker protection controls.

Priority Description Blue/Information
DOE Functional Category Radiation Protection
Work Activity D&D/Radiological
Hazard Radiological
ISM Core Function Analyze and Develop/Implement Controls
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Keywords radionuclides, detection, radiological
References N/A