Reduction of Radionuclide Transport in Storm Water in DP Canyon, Los Alamos, New Mexico



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Abstract

Treated radioactive liquid waste was discharged into upper DP Canyon in Los Alamos, NM from 1952-1985, with prior discharges of untreated radioactive liquid waste at the same location. The majority of the radiological material remaining in the treated discharge water (⁹⁰Sr, ²⁴¹Am, ^{238&239/240}Pu and ¹³⁷Cs) preferentially bound to sediment in the canyon and was then available for remobilization and transport by canyon flows from storm-water runoff. Small amounts of soluble contaminants, such as ⁹⁰Sr, remained in solution and have impacted shallow groundwater. DP Canyon is a tributary of Los Alamos Canyon, which flows into the Rio Grande upstream of a newly constructed water intake intended to supplement the City of Santa Fe, New Mexico's drinking water supply. Remedial actions (soil/sediment/rock removal) were completed below the liquid waste outfall point in 1996-1997 and again in 2002-2003. A grade-control structure was installed slightly down-canyon of the outfall location in early 2010 to limit sediment transport from the upper reach of the canyon. A limited set of historical storm-water quality and flow data from DP Canyon just above the confluence with Los Alamos Canyon is available from 1967-8, 1996, 1998-2000, and 2006. Recent samples were taken in 2010. These data span the various remedial actions and demonstrate an overall decrease in the levels of radionuclides transported in the canyon by storm-water runoff. The gross beta activity in the suspended sediment portion of the storm-water samples shows an overall decrease through time from 537 pCi/g in 1968 to 19.0 pCi/g in 2006 (mean activity of time-series samples during single events). The ⁹⁰Sr activity in solution also demonstrates an overall decrease through time from 852 pCi/L in 1968 to 8.1 pCi/L in 2006. The overall decrease in radiological contaminants being transported out of DP Canyon is likely the result of source term removal, dilution and radioactive decay.





Discharge area on north-facing slope of uppe DP Canyon. Note excavated area.



Grade-control structure in upper DP Canyon. Downstream is to the left



History

Technical Area 21 (TA-21): former plutonium processing facility at Los Alamos National Laboratory (Lab) ♦ 1952-1986: Treated wastewater discharged into DP Canyon via drain line from two holding tanks Wastewater consisted of liquids remaining after plutonium extraction, processing of radioactive materials for nuclear weapons and other research, contained a variety of radionuclides and process chemicals. ✤1992, 1993: Site evaluations below drain line resulted in:

◆1996 (Sept): Interim Action ("clean-up") to remove 390 yd³ of radiological contamination in soil ♦ 2002-2003: Voluntary Corrective Measures to remove/dispose of drain line, determine nature and extent of radiological contamination, remove 1,854 yd³ of contaminated soil/tuff

◆2010 (Jan): Installation of grade-control structure in upper DP Canyon to limit sediment transport from the upper reach of the canyon





⁹⁰Sr, Gross Beta, Gross Alpha Concentrations 1967-1968



Left 1967-1968 portion with extrapolated data.

Right: 1996-2010 data with major events labeled.

Note: NMED and Lab data. Extrapolated data calculated from 1996-2010 relationship: beta=2.9716*Sr-1.1533, R²=0.7569





