

Rood, A.S., H.A. Grogan, and J.E. Till. 2002. "A Model for A Comprehensive Assessment of Exposure and Lifetime Cancer Incidence Risk from Plutonium released from the Rocky Flats Plant, 1953-1989." *Health Physics*, Vol. 82 (2) pp 182-212.

ABSTRACT: A model was developed to calculate ambient air concentrations, surface deposition, and lifetime carcinogenic risk with uncertainty from plutonium released to the air from the Rocky Flats Plant between the years 1953 and 1989. The model integrated airborne release estimates and atmospheric dispersion and deposition calculations from 37 years of routine plant operations and episodic releases. Episodic releases included two major fires in 1957 and 1969 that breached the building air filtration systems, and suspension of plutonium contaminated soil from the former 903 waste storage area during high winds. Predicted air concentrations included contributions from site releases and resuspension from contaminated soil. Inhalation was the only exposure pathway considered. Environmental measurements suitable for model validation were lacking for the period when major site releases occurred (1953 to 1970). However, environmental media, such as soil and lake sediment, are natural accumulators and provided evidence of past offsite releases. The geometric mean predicted-to-observed (P/O) ratio for soil was 0.93 with a geometric standard deviation of 1.6. The model systematically underpredicted concentrations near the 903 Area because large, nonrespirable particles that deposited close to the source were not included in release estimates. Plutonium soil inventories for the model domain had P/O ratios ranging from 0.22 to 4.2. The geometric mean P/O ratio for ambient air was 0.90 with a geometric standard deviation of 2.6. Age-dated sediment cores from Standley Lake had a geometric mean P/O ratio of 1.0 with a geometric standard deviation of 1.7. Predicted-to-observed ratios for plutonium inventories in Great Western Reservoir ranged from 0.36 to 1.7. Lifetime cancer incidence risks were calculated for a male laborer scenario who resided in the model domain for the entire assessment time. Maximum cancer risks ranged from 10^{-6} (5th percentile) to 10^{-4} (95th percentile). Most of the exposure was incurred during the 1950's.