

ESTIMATED HUMAN HEALTH RISKS OF DISPOSING OF NONHAZARDOUS OIL FIELD WASTE IN SALT CAVERNS¹

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ABSTRACT

Argonne National Laboratory (ANL) has completed an evaluation of the possibility that adverse human health effects (carcinogenic and noncarcinogenic) could result from exposure to contaminants released from nonhazardous oil field wastes (NOW) disposed in domal salt caverns. In this assessment, several steps were used to evaluate potential human health risks: identifying potential contaminants of concern, determining how humans could be exposed to these contaminants, assessing the contaminants' toxicities, estimating contaminant intakes, and, finally, calculating human cancer and noncancer risks.

Potential human health risks associated with hazardous substances (arsenic, benzene, cadmium, and chromium) in NOW were assessed under four postclosure cavern release scenarios: inadvertent cavern intrusion, failure of the cavern seal, failure of the cavern through cracks or leaky interbeds, and a partial collapse of the cavern roof. To estimate potential human health risks for these scenarios, contaminant concentrations at the receptor were calculated using a one-dimensional solution to an advection/dispersion equation that included first order degradation.

Assuming a single, generic salt cavern and generic oil-field wastes, the best-estimate excess cancer risks ranged from 1.7×10^{-12} to 1.1×10^{-8} and hazard indices (referring to noncancer health effects) ranged from 7×10^{-9} to 7×10^{-4} . Under worst-case conditions in which the probability of cavern failure is 1.0, excess cancer risks ranged from 4.9×10^{-9} to 1.7×10^{-5} and hazard indices ranged from 7.0×10^{-4} to 0.07. Even under worst-case conditions, the risks are within the U.S. Environmental Protection Agency (EPA) target range for acceptable exposure levels. From a human health risk perspective, salt caverns can, therefore, provide an acceptable disposal method for NOW. (Note, at the time this paper was prepared, Reference 2 was a draft; the findings are, therefore, preliminary and subject to change).

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