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March 9, 2000

Mr. Tom Pauling
U.S. Department of Energy
Weldon Spring Site Remedial Action Project
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. Pauling:

Per your request, we have completed risk calculations using data collected underneath the Frog Pond Outlet culverts during remediation activities in the fall of 1999. We hypothesized two scenarios to address the range of potential future exposure at this location, if any. The risk estimates indicate that exposure to the residual contaminant levels at the culvert area would result in very low (at 10^{-6} or lower) potential risk to an industrial worker or recreational visitor. Attached to this letter is a brief summary of the risk calculations performed.

Please feel free to call me at 630-252-7669 if you have any questions or if we could provide additional information.

Sincerely,

Mary Picel

Mary Picel
ANL Program Manager

MP/pk
Attachment

cc: S. McCracken, DOE
Y. Deyo, PAI
D. Blunt, ANL
S.Y. Chen, ANL

RISK ESTIMATE FOR FROG POND OUTLET

Risk calculations were performed to determine potential risk to residual uranium levels in soil underneath the culverts at the Frog Pond Outlet after remediation activities were completed in the fall of 1999 (Ref.1). Two scenarios were evaluated representing the range of likely events that could occur at this area.

Of the two scenarios evaluated, the most likely scenario is that of an industrial/construction worker involved in culvert excavation and repair. It was assumed that the culvert would undergo replacement or repair, whereby the soil would be excavated potentially exposing the worker to the residual contamination. The repair or excavation activity was assumed to be a one-time event for a duration of 40 hours. This is a reasonable assumption given the size of the area in question. The exposure pathways evaluated include external radiation, incidental ingestion and inhalation of fugitive dust or soil.

A second scenario was also evaluated to simulate an event where the soil is excavated, spread over the ground surface in the area and is accessible to a recreational visitor. For this recreational visitor scenario, it was assumed that 10 visits per year would occur for 1 hour each visit over a period of 30 years. The exposure pathways evaluated include incidental ingestion and external radiation. Inhalation of fugitive dust or soil was not considered to be a viable pathway since it is common practice to re-vegetate a construction area. These assumptions are conservative given the proximity of the area in question to the highway. It is unlikely that recreational visitors would visit the area at the frequency assumed.

As a conservative approach, the maximum concentration detected of 310 pCi/g uranium-238 (Ref. 1) was assumed as the exposure point concentration for both scenarios. Therefore, no credit was taken for any mixing with uncontaminated soil that occurred in the area as it was backfilled.

Risk calculations presented in this attachment were performed using standard equations, slope factors, and exposure parameters recommended by the EPA (Ref. 2, 3 and 4). Risk calculations include the contribution from uranium-234. A list of parameters is shown in Table 1 and the results of the risk calculations are summarized in Table 2. The total estimated risks for the construction worker and the recreational visitor are 9×10^{-8} and 1×10^{-6}, respectively.

Table 1: Exposure Parameters

Parameter	Construction Worker	Recreational Visitor
Exposure time (hr)	8	1
Exposure frequency (d)	5	10
Exposure duration (y)	NA	30
Inhalation rate (m3/hr)	2.5	NA
Ingestion rate (mg/d)	50	60[a]
Particulate emission factor (m3/g)	4.63×10^{6}	NA

[a]Weighted average: 6 years child ingestion of 100 mg/d, and 24 years adult ingestion 50 mg/d.

Table 2: Risk Estimates for the Construction Worker and Recreational Visitor

Exposure Pathway	Construction Worker	Recreational Visitor
External	9.3×10^{-8}	7.0×10^{-7}
Ingestion	1.6×10^{-9}	5.9×10^{-7}
Inhalation	1.8×10^{-10}	NA
Total Risk	9×10^{-8}	1×10^{-6}

REFERENCES

1. MK-Ferguson Company and Jacobs Engineering Group. *Closure Report for Soil Sampling at the Frog Pond Outlet, Addendum 6 of the Engineering Soil Sampling Plan for Army and MDC Vicinity Properties.* Rev. 0. DOE/OR/21548-829. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office, St. Charles, MO, January 2000.

2. U.S. Environmental Protection Agency. *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A),* Interim Final, EPA/540/1-89/002, Office of Emergency and Remedial Response, Washington, D.C., December 1989.

3. U.S. Environmental Protection Agency. *Exposure Factors Handbook, Volume 1, General Factors.* EPA/600/P-95/002Fa. Office of Research and Development, Washington, D.C., August, 1997.

4. U.S. Environmental Protection Agency. *Health Effects Assessment Summary Tables, FY 1997 Update.* EPA-540-R-97-036. Office of Solid Waste and Emergency Response, Washington, D.C., July, 1997.