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August 31, 1994

Karen Reed
U.S. Department of Energy
Weldon Spring Site Remedial
Action Project
7295 Highway 94 South
St. Charles, Mo 63304

Dear Karen:

Per your request, we are providing responses to the comments submitted by the Missouri Department of Natural Resources (MDNR), dated August 3, 1994, concerning the *Preliminary Evaluation of Surface Soil at the Katy Trail / Vicinity Property 9 Area.* We hope that these comment responses will sufficiently resolve the technical issues raised by the Missouri Department of Health. Please feel free to contact Mary Picel or myself if we can be of further assistance.

Sincerely,

Deborah Blunt

cc: H. Avci
L. Durham
M. Picel
S. Warren

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(9/1/94)

Responses to General Comments:

1. The first general issue was clarification of EPA's target risk range that was used as a basis for comparison for results of the evaluation. The EPA has defined general remedial action goals for NPL site in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). These goals include a range for residual carcinogenic risk, which is an excess upper bound lifetime cancer risk to an individual of between $1x10^{-6}$ and $1x10^{-4}$. We refer to this range as a target range, and use it as a point of reference for risks estimated from site exposures.

The Baseline Assessment for the Chemical Plant Area (BA) presented the results of the risk calculations, which were then applied to support the evaluation of remedial action alternatives in the companion document, the Feasibility Study (FS). As stated in the FS, identifying a risk as being within this range does not exclude it from further consideration; nor does identifying a risk above $1x10^{-4}$ necessitate remediation. Site specific considerations must always be factored into developing final remedial action goals (i.e., determine what is acceptable).

I hope this addresses the clarification requested in your first comment.

2. The second general issue raised was that a CERCLA risk assessment should present both dose equivalents and human health risks. In keeping with the focused nature of this evaluation , the results were summarized in a concise format and only final carcinogenic risk estimates were presented. However, dose equivalents were estimated as part of the calculations and we are happy to provide the results for the three exposure pathways in the attached tables.

Responses to Specific Comments:

1. Comment: *Page 1, third paragraph. This paragraph states that "Very conservative assumptions were incorporated into the preliminary risk calculations presented in this enclosure." However, it goes on to state that "...these risk calculations were based on the average concentrations of data collected from the 1/4 grid areas which encompass more than the VP9 area (i.e., it was assumed that the recreational user would not preferentially visit one grid area over*

another)." This is hardly a conservative assumption. Because no grid areas other than those which comprise VP9 were found to be contaminated, averaging together the results from all fourteen grid areas results in the risks from VP9 (especially those from uranium) being drastically underestimated. Please revise the calculations accordingly.

Response: We would like to point out that several very conservative assumptions were used in the analysis. For example, it was assumed that the receptor would spend 4 hours in the area, 20 times a year, for 30 years. This is especially conservative given that a decision for the area will be made in 6 years. Conservative estimates of the amount of soil ingestion, and particulate emission from soil to air were also incorporated into the assessment. Data were averaged over the 14 grids because it is unlikely that a recreational visitor would preferentially visit one area over another for a duration of 30 years. Assuming that the visitor did visit grids 3, 4, and 5 preferentially, the results would not be greatly different on the basis of the data available at the time the evaluation was performed (see Tables 1 and 2). The reason for this is that the major risk contributors are radium and associated daughters, which are essentially at background concentrations.

Since the time that this evaluation was completed, additional sampling in the VP9 area have found elevated concentrations of U-238, with a maximum concentration of 912 pCi/g. To address this finding, an upper-bound risk estimate was calculated using the maximum concentration detected. Using the same conservative exposure parameters, the resultant risk from uranium was estimated to be 5×10^{-5}. This estimate incorporates the contribution from U-238+D, U-234, U-235, Ac-227+D, and Pa-231 (D refers to decay progeny with a half life of less than 6 months). Considering that a decision for cleanup of the area is expected in 6 years, the potential risk was also estimated for an exposure duration of 6 years. For this scenario, the estimated risk is 1×10^{-5}.

2. Comment: *Page 1; third paragraph. This paragraph state "...if the recreational user preferentially visits the grid areas that encompass VP9 (i.e., grid area 5 and portions of 3 and 4), the risk would not be any greater because data indicate that uranium is the principal contaminant of concern in the VP9 area. As is evident in Table 4, the contribution from uranium represents only 5% of the total risk". This statement is inaccurate. Again, averaging together the results from all fourteen grid areas results in the risks from VP9 (especially those from uranium) being drastically underestimated. Please revise the text.*

Response: Assuming that the recreational visitor selectively visits grids 3, 4, and 5 over the entire 30-year exposure period, the incremental risk from uranium and associated decay products would increase from 4×10^{-7} to 1×10^{-6}. The total risk (summed over all radionuclides) would increase from 7×10^{-6} to 8×10^{-6}, which we do not consider to be a "drastic" increase. Using the data available at the time of the assessment (i.e.,

the data presented in Table 3 of the preliminary evaluation), the majority of risk is attributable to Ra-226 and Ra-228 (including associated daughters). The data collected for these isotopes indicate that they are within the range of natural background. As a preliminary evaluation, all analytes were carried through the assessment. Thus far, the data suggests that uranium is the only contaminant of concern for the area.

3. Comment: *Page 6, Table 4, second footnote. This footnote states that a background concentration of 1.2 pCi/g (value obtained from the baseline assessment of the chemical plant area of the Weldon Spring Site) was subtracted from the 95% upper confidence limit (95% UCL) soil concentrations for radium, thorium and uranium and the resulting values used as exposure point concentrations in the calculations. While it is appropriate to compare sampling results to background levels to determine if a radionuclide should be retained as a chemical of concern, it is not appropriate to subtract background from the 95% UCL to determine an exposure point concentration.*

Response: We think it is appropriate to subtract background from the exposure point concentration to estimate risk because the radionuclides of concern at the Weldon Spring Site are naturally occurring and we are interested in estimating incremental risk. As stated in the response to comment 2, the data collected to date suggest that uranium is the only radiological contaminant of concern for the area. For uranium, the issue of background is not of significance. It is clear that uranium is elevated over background concentrations in the VP9 area as a result of activities related to the Weldon Spring site. The incremental risk from background uranium (i.e., 1.2 pCi/g) increases the total risk estimate by $4x10^{-5}$.

4. Comment: *Page 6, Table 4, third footnote. This footnote presents equations which were used to calculate risk for the recreational user. A unit risk factor of $6.0x10^{-7}$/mrem is used in the equations for ingestion, inhalation and the external gamma components. The baseline risk assessment states this number was used by EPA in developing revisions to the National Emissions Standards for Hazardous Air Pollutants (NESHAPS) for radionuclides under Section 112 of the Clean Air Act. The number used by EPA is $6.23x10^{-7}$. Please indicate what the term $2.5x10^{-6}$ is in equation D.*

Response: The risk factor used in the evaluation was rounded to one significant figure because the inherently large degree of uncertainty in the risk factor does not warrant carrying 3 significant figures.

Term D refers to the inhalation of Rn-222 generated from Ra-226 in soil. The methodology for estimating radon exposures is fully explained in Chapter 3 of the BA. For the analysis, radon concentrations in air are estimated from measured soil

concentrations, and then converted to Working Level Months. Keeping with the cursory nature of the evaluation, this calculation was simplified for the purposes of presentation. Justification for the assumptions used in the analysis are provided in the BA.

5. Comment: *Page 6, Table 4, third footnote. Please discuss why DCFs and unit risk factors were used instead of EPAs radionuclide slope factors. DCFs are typically developed for occupational exposures to radiation and may be inappropriate for use in estimating risks to the general public. Additionally, the baseline assessment for the Weldon Spring Chemical Plant Site states that EPA's radionuclide slope factors were not used to estimate radiological risks because they have not been independently verified by the scientific community or widely used. This statement is inaccurate. A personal communication with EPA Region V personnel indicates that DOE routinely uses EPA slope factors for radionuclides at sites in Region V.*

Response: Dose Conversion Factors (DCFs) were used in the evaluation, rather than slope factors, to be consistent with previous documents that have been prepared for the Weldon Spring site. At the time that the BA was prepared, slope factors were not widely used to estimate radiological risks and had not been independently verified by the scientific community. Currently, slope factors are acceptable and routinely used by many professionals. To address your concern over using DCFs, risk estimates were also calculated using the most recent EPA slope factors published in March 1994 (see Tables 1, 2, and 3). A comparison between the results obtained using DCFs and slope factors indicate that the DCF methodology is more conservative, but in general, the results are in good agreement.

6. Comment: *Page 6, Table 4. Risks attributable to U235 decay series radionuclides have not been included in Table 4. Because the percent abundance of U235 is low when compared to U238, the risks from the U235 decay series radionuclides may not be as great as those from the U238 decay series radionuclides. However, Pa231 and Ac227 both have some rather large inhalation slope factors. For this reason, the U235 decay series should be evaluated in the risk assessment.*

Response: Your comment is noted. The inclusion of U-235 and associated daughters was omitted in the preliminary evaluation because the results indicated that the major risk contributors were Ra-226 and Ra-228. The risks attributable to U-235 and associated daughters is included in Tables 1 through 3 of the attachment. It is true that Ac-227 and Pa-231 have notably high inhalation DCFs (and slope factors), however; concentrations of these isotopes are very low.

7. Comment: *Page 7, Table 4, fifth footnote. This footnote states that U234 and U238*

concentrations were assumed to be at equilibrium and were obtained by assuming each to be half of the total uranium concentration. While U234 and U238 are in a state of secular equilibrium in nature, the processing of ores containing uranium can affect this state of equilibrium. Concentrated uranium and thorium residues were deposited in the quarry. Please discuss reasons why it is appropriate to assume these radionuclides are in equilibrium.

Response: The Weldon Spring site processed natural uranium in which the activities of U-238 and U-234 are equal. The processing of ore does not affect the state of equilibrium between the uranium isotopes. As confirmation, a source term analysis was performed for soil at the chemical plant quarry; the results of the analysis indicated an activity concentration ratio between U-238, U-234 and U-235 of 1:1:0.046, respectively.

8. Comment: *Page 8, Table 4a. The DCFs shown in this table are referenced as having been taken from Table 4.1 of the baseline assessment for the Weldon Springs Chemical Plant. However, upon comparison of table 4A with Table 4.1, the ingestion and inhalation DCFs for radium-226, and the ingestion, inhalation and external gamma DCFs for radium-228 are not the same. Please explain why these values have been changed.*

Response: The DCFs shown in Table 4A of the evaluation were taken from Table 4.1 of the BA, however; daughter radionuclides were incorporated in the DCFs. For example, Ra-226 includes the contribution from Pb-210, and Ra-228 includes the contribution from Th-228.

9. Comment: *Page 9, Table 5, third footnote. This footnote states that the concentration of chromium VI was assumed to be 10% that of total chromium. While there are no approved Contract Laboratory Program (CLP) methods for hexavalent chromium, there are methods outside of CLP for determining hexavalent chromium concentrations in soil.*

Response: We are aware of the methods that exist for determining hexavalent chromium concentrations in soil. Currently, we are in the process of carrying out sampling that was called out in the Sampling Plan for the Quarry Residuals Operable Unit. If chromium is determined to be a contaminant of concern, then the need to determine chromium VI will be considered.

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Table 1: Risks estimated using exposure point concentrations listed in preliminary evaluation

	Conc (pCi/g)	DOSE (MREM) ING	INH	EXT	RADON (WLM)	TOTAL DOSE	TOTAL RISK	SLOPE RISK*
Ac-227+D	0.02	2.04E-02	1.40E-04	1.40E-02		3.45E-02	2.07E-08	4.87E-09
Pa-231	0.04	2.99E-02	5.43E-05	2.26E-03		3.22E-02	1.93E-08	5.20E-10
Pb-210+D	0.52	2.51E-01	1.21E-05	5.87E-04		2.51E-01	1.51E-07	2.47E-08
Ra-226+D	0.52	4.12E-02	4.55E-06	2.25E+00	6.55E-03	2.29E+00	3.67E-06	8.59E-07
Ra-228+D	0.80	6.91E-02	3.99E-06	1.79E+00		1.85E+00	1.11E-06	6.41E-07
U-235+D	0.30	5.38E-03	3.98E-05	7.18E-02		7.72E-02	4.63E-08	2.00E-08
U-234	6.50	1.22E-01	9.37E-04	2.18E-03		1.25E-01	7.49E-08	7.73E-09
U-238+D	6.50	1.17E-01	8.65E-04	2.18E-01		3.36E-01	2.02E-07	1.00E-07
Th-228+D	0.80	4.32E-02	2.75E-04	2.88E+00		2.92E+00	1.75E-06	1.23E-06
Th-230	0.67	2.56E-02	2.38E-04	3.38E-04		2.61E-02	1.57E-08	6.59E-10
Th-232	0.16	3.23E-02	2.84E-04	4.61E-05		3.26E-02	1.96E-08	1.44E-10
					SUM	7.98E+00	7.08E-06	2.89E-06

*Slope risks refer to risks calculated using slope factors.

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Table 2: Risks estimated for grids 3, 4, and 5

	Conc	DOSE (MREM)			RADON	TOTAL	TOTAL		SLOPE
	(pCi/g)*	ING	INH	EXT	(WLM)	DOSE	RISK		RISK**
Ac-227+D	0.06	6.98E-02	4.80E-04	4.81E-02		1.18E-01	7.11E-08		1.67E-08
Pa-231	0.13	1.02E-01	1.86E-04	7.76E-03		1.10E-01	6.62E-08		1.78E-09
Pb-210+D	0.52	2.51E-01	1.21E-05	5.87E-04		2.51E-01	1.51E-07		2.47E-08
Ra-226+D	0.52	4.12E-02	4.55E-06	2.25E+00	6.55E-03	2.29E+00	3.67E-06		8.59E-07
Ra-228+D	0.80	6.91E-02	3.99E-06	1.79E+00		1.85E+00	1.11E-06		6.41E-07
U-235+D	1.03	1.85E-02	1.36E-04	2.46E-01		2.65E-01	1.59E-07		6.87E-08
U-234	22.30	4.17E-01	3.21E-03	7.49E-03		4.28E-01	2.57E-07		2.65E-08
U-238+D	22.30	4.01E-01	2.97E-03	7.49E-01		1.15E+00	6.92E-07		3.44E-07
Th-228+D	0.80	4.32E-02	2.75E-04	2.88E+00		2.92E+00	1.75E-06		1.23E-06
Th-230	0.67	2.56E-02	2.38E-04	3.38E-04		2.61E-02	1.57E-08		6.59E-10
Th-232	0.16	3.23E-02	2.84E-04	4.61E-05		3.26E-02	1.96E-08		1.44E-10
					SUM	9.45E+00	7.96E-06		3.21E-06

* U-234 and U-238 concentrations are maximum concentration detected minus background.
U-235, Ac-228 and Pa-231 are estimated from source term analysis for quarry soils.
Radium and thorium isotopes are UL95 values listed in preliminary evaluation.

**Slope risks refer to risks calculated using slope factors.

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Table 3: Risks estimated using maximum uranium concentration detected

	Conc	DOSE (MREM)			RADON	TOTAL	TOTAL	SLOPE
	(pCi/g)	ING	INH	EXT	(WLM)	DOSE	RISK	RISK
Ac-227+D	2.60	2.86E+00	1.96E-02	1.97E+00		4.84E+00	2.91E-06	6.83E-07
Pa-231	5.30	4.19E+00	7.62E-03	3.17E-01		4.51E+00	2.71E-06	7.29E-08
Pb-210+D	0.52	2.51E-01	1.21E-05	5.87E-04		2.51E-01	1.51E-07	2.47E-08
Ra-226+D	0.52	4.12E-02	4.55E-06	2.25E+00	6.55E-03	2.29E+00	3.67E-06	8.59E-07
Ra-228+D	0.80	6.91E-02	3.99E-06	1.79E+00		1.85E+00	1.11E-06	6.41E-07
U-235+D	42.00	7.55E-01	5.58E-03	1.01E+01		1.08E+01	6.50E-06	2.81E-06
U-234	912.00	1.71E+01	1.31E-01	3.06E-01		1.75E+01	1.05E-05	1.08E-06
U-238+D	912.00	1.64E+01	1.21E-01	3.06E+01		4.72E+01	2.83E-05	1.41E-05
Th-228+D	0.80	4.32E-02	2.75E-04	2.88E+00		2.92E+00	1.75E-06	1.23E-06
Th-230	0.67	2.56E-02	2.38E-04	3.38E-04		2.61E-02	1.57E-08	6.59E-10
Th-232	0.16	3.23E-02	2.84E-04	4.61E-05		3.26E-02	1.96E-08	1.44E-10
					SUM	9.23E+01	5.76E-05	2.15E-05

Slope Risk refers to risks estimated using slope factors

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SEP 07 1994

Ms. Karen Marcus
Missouri Department of Natural Resources
Post Office Box 176
Jefferson City, MO 65102

Dear Ms. Marcus:

RESPONSES TO TECHNICAL ISSUES RAISED BY MISSOURI DEPARTMENT OF HEALTH RE. THE "PRELIMINARY EVALUATION OF SURFACE SOIL AT THE KATY TRAIL/VICINITY PROPERTY 9 AREA" (6/17/94 CORRESPONDENCE)

With this transmittal we are providing the above-described information in response to your August 3, 1994 correspondence. In that correspondence, several technical issues concerning the methodology used to calculate risk were raised. We believe that the methodology used in the evaluation is correct. Based on our calculations and consistent with previous findings, we believe the area presents a low risk to a visitor in the Katy Trail area.

As we have stated previously, the assessment is considered preliminary because it is based on a limited amount of current data collected in the area. A comprehensive risk assessment, consistent with CERCLA guidelines, will be performed when characterization is completed for the area as part of the Remedial Investigation/Feasibility Study for the Quarry Residuals Operable Unit.

We hope that these comment responses will sufficiently resolve the technical issues raised by the Missouri Department of Health. If there are any additional concerns, please contact Karen Reed or me at (314)441-8978.

Sincerely,

ORIGINAL SIGNED BY
STEPHEN H. McCRACKEN

Stephen H. McCracken
Project Manager
Weldon Spring Site
Remedial Action Project

Attachment:
As stated

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copy w/attachment:
D. Wall, EPA
L. Erickson, MDNR
G. Kountzman/M. Windsor, MDNR
G. Carlson, MDOH
W. Diefenbach, MDOC
R. Grimes, MDOC
M. Picel, ANL
J. Powers, PMC

bcc: Steve Warren, PMC
Ken Meyer, PMC
Debra Blunt, ANL

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