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▸▸AUTHOR T. Lorenz ▸▸TO K. Reed / S. Iverson ▸▸DATE 4/9/97

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APR 0 9 1997

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U.S. Army Corps of Engineers
601 East 12th Street
Kansas City, MO 64106-2896

Ms. Karen Reed
DOE-Weldon Spring
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. Iverson and Ms. Reed:

Thank you for the opportunity to review and submit comments on the draft final **Remedial Investigation for the Groundwater Operable Units at the Chemical Plant Area, and the Ordnance Works Area, Weldon Spring, Missouri** and the draft final **Baseline Risk Assessment for the Groundwater Operable Units at the Chemical Plant and the Ordnance Works Area, Weldon Spring, Missouri**.

The following comments are the results of our review of the above referenced documents and in addition to those previously sent to you.

If you have question concerning the above comments I am available at (913) 551-7292.

Sincerely,

Tom Lorenz

Tom Lorenz
Federal Facilities/Special
Emphasis Branch
Superfund Division

Enclosure

cc: Ray Strebler, MDNR

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RECYCLE

REMEDIAL INVESTIGATION

1. The RI indicates it is unlikely the shallow bedrock aquifer would be used as a water source because of low yields and the casing requirements. Yields in fractured bedrock aquifers are not universally low, as evidenced by the 10^{-2} centimeters per second (cm/s) hydraulic conductivity referenced in Section 3.2.2.1. The RI indicates that a well with 80 feet of casing would be open to both the weathered and unweathered Burlington-Keokuk formation as opposed to only the upper weathered portion. Both hydrostratigraphic units are part of the shallow bedrock aquifer; consequently, a well screened in either the lower or both units is not isolated from contamination by a confining unit. The RI should give due weight to the possibility of this aquifer potentially being a future water source.

2. The RI references the Twin Island Lakes campground well but does not provide a completion depth or whether the well is hydraulically upgradient or downgradient from the site. This information was previously provided to EPA in a response to comments and should be incorporated in the RI.

   Potentiometric surface maps and regional groundwater gradients for the middle and lower aquifers do not appear to have been included in the RI. This information should be provided in the RI.

   The discussion of aquifer use in the general vicinity of the site is largely limited to the shallow bedrock aquifer. A discussion of use of the other aquifers should also be included.

3. The discussion of the hydraulic connection between hydrostratigraphic units is very limited. The text should address the degree of interconnection of the units and how the determinations were made.

   The text indicates that most wells show a downward gradient in the shallow aquifer. Table 3-5 shows a downward gradient in virtually all wells in the Burlington-Keokuk unit yet an upward gradient for most wells in the Fern Glen unit. The RI should clarify this situation.

The RI does not address whether there are geochemical differences between the two hydrostratigraphic units identified in the upper rock aquifer. The RI should address whether the distinction between the two units is based strictly on physical properties or on geochemical evidence as well.

4. The potentiometric surface map appears to include data from wells screened in the upper hydro stratigraphic unit, the lower hydro stratigraphic unit, and wells open to both. A map with data from wells completed at similar depths in the aquifer would be less subject to the potential effects of vertical gradients on water level measurements. Although not required, this is suggested to improve the reader's ability to understand the hydrologic processes in the area.

5. The comment requested completion depths for the wells listed in Table 3.2. Completion depths and monitored intervals are not provided for the wells used to calculate gradients. The table should be revised to include this information.

6. The comment requested explanations related to Table 3.2.5. This table was not found in the September 1996 or February 1997 documents provided for review.

7. Figures 4-1 through 4-6 do not distinguish wells located in various hydrostratigraphic units as was requested in the comment. Figures presenting data for each hydrostratigraphic unit would allow a better analysis of trends in the data.

8. Well MW-3013 has not been included in Figure 4.2, even though samples from it exceeded the maximum contaminant level (MCL). The figure should be revised to include MW-3013.

   It appears that there is an error on Figure 4.2. Well MWD-18 (with lithium concentration of 7.3 ug/l) is shown as being "below background" whereas well MWD-23 (with lithium concentration of 4.2 ug/l) is shown as being "above background".

9. Based on review of Figure 4.1, Distribution of uranium at the Chemical Plant Area and Ordnance Works Area, it does not appear that the lateral extent of contamination to the southeast of the chemical plant has been defined or identified. The U.S. Department of Energy (DOE) response to this comment previously attributed elevated uranium results at MW-4024 to the use of a bentonite grout. The DOE response also indicates subsequent uranium measurements have been lower (16 picoCuries per liter [pCi/L]). Figure 4.1 indicates a measurement of 60 pCi/L. In either case, the uranium concentrations measured at this location are in excess of the MCL. The RI should address the elevated uranium concentrations identified at MW-4020 and MW-4024 and the extent of uranium contamination in this area.
In addition, Figure 4.1 shows numerous wells to the west of WSRAP, on the WSOW property, that show uranium concentrations in excess of background. Some of the wells showing above background concentrations are across the groundwater divide and against the prevailing winds. What is the explanation for this?

10. Contaminants of concern have been identified in the springs but have not been included in the figures of this section. Figures should be revised to include appropriate spring data.

11. The RI does not indicate whether groundwater samples were collected from the middle and lower aquifers and analyzed for tritium. DOE's response to EPA's comment addresses the difference between upper and lower hydro stratigraphic units in only the upper aquifer. The text should be revised to include a discussion of tritium concentrations in all three aquifers.

12. <u>Section 5.2.4, page 5-9, paragraph 1.</u> Third line should read ..... 2,4- DNT, and 1,3,5-TNB.

3.0 BASELINE RISK ASSESSMENT

General Comment: The 89th Regional Support Command, U.S. Army Reserve, has forwarded plans to higher command for the construction of a Reserve Training Center (RTC) on the Weldon Spring Training Area grounds. This building would contain the headquarters for several reserve units and have up to 30 full-time personnel assigned to it. The units that would be headquartered in the building would conduct drills on assigned weekends and evenings at the facility and the training area. The risk model for the reservist and national guard was constructed around fewer full-time and drilling reservist on the training area grounds for less time. In light of the plans the RSC has for the area we believe that the part of the risk model addressing their presence should be modified and the risk reassessed.

1. The comment requested that additional information pertaining to high concentrations of uranium be provided. The response says the text was revised to clarify that bentonite used in well MW 4024 placement may have contributed to the uranium concentration in the well water. However, the text actually states that the sampling methodology may have contributed to the uranium concentration.

Section 2.2, Page 2-4, Paragraph 2.
Citation for activity ratio of uranium isotopes in natural ores is missing.
Section 2.1, Page 2-5, Paragraph 2.
Citation for conversion factor of 0.0015 mg/pCi total uranium is missing.

Section 2.2, Page 2-8, Table 2-3.
Nitrate should be specified as nitrate-nitrogen here, in Table 3.2 (page 3-10), and in Table 3.6 (page 3-21). Also, the maximum nitrate concentration reported here for surface water (10,000 ug/L) is less than the maximum level reported in Table 3.2 (12,000 ug/L).

Section 3.1.1, Page 3-2, Paragraph 4.
Data and citation for the attenuation of gamma radiation by water is missing.

Section 3.1.1, Page 3-5, Table 3.1.
Source for each exposure scenario assumption and intake parameter should be identified. Acute and subchronic risks to infants should be considered due to their significantly greater susceptibility to nitrates and nitroaromatic compounds.

Section 2.2, Page 2-3, Paragraph 4 and Table 2.1.
Section 3.2, Page 3-8, Table 3.2 and Page 3-15, Table 3.5.
The method for identifying Chemicals of Potential Concern (COPCs) is not clear. On page 2-3, it is stated:

> all contaminants identified in the RI were considered COPCs for the human health assessment and are carried through the risk calculations presented in the remainder of this report. The RI identified contaminants by comparison to background levels; these contaminants are listed in Table 2.1.

This appears to be erroneous. Table 2.1 (page 2-4) omits barium, chromium, copper, strontium and thallium, all of which are identified as Chemicals of Ecological Concern (COECs) for surface water in Table 2.3 (page 2-8).

A number of surface water contaminants are not evaluated in the recreational visitor scenarios. Table 3.2 (page 3-8) omits barium, cadmium, chromium, copper, iron, lead, strontium, thallium, and nitrotoluenes. Also, the exposure point concentration for mercury in Table 3.2 (page 3-9), 0.94 ug/L, is less than the range for mercury contamination of surface water reported in Table 2.3 (page 2-8). If radioactive isotopes of strontium are present in groundwater or surface water, these should be evaluated for carcinogenic risk.

Section 3.2, Page 3-14, Table 3.4.
Over what time period does the estimated uranium intake occur?

Section 3.3, Page 3-42, Paragraph 1.
Claiming that neither cancer slope factors nor reference doses are available, intakes and risks were not calculated for iron, lead, chloride, sulfate, nitrotoluenes, and 1,2-dichloroethene. This is not appropriate. According to risk assessment guidance under CERCLA, the IEUBK model is to be used to assess the health risks of lead exposure in children. There is also an adult lead

model available. An oral reference dose for the nitrotoluenes is available from HEAST. Toxicity values for 1,2-dichloroethylene are available from IRIS and/or HEAST. There are drinking water guidelines and literature sources by which iron, chloride, and sulfate can be evaluated. These chemicals should be included in Table 3.5 (page 3-15).

Further discussion should be included concerning chemicals detected above background in previous investigations of groundwater and surface water, but not included in the risk assessment because they were not detected during the joint sampling rounds (cadmium, for example). Are there factors which account for differences in the monitoring results, such as seasonal variation? If so, could these factors affect overall risks?

Section 3.3.1, Page 3-43, Paragraph 2.
Conversion factor 10 L/cm3 appears to be erroneous.

Section 3.3.2, Page 3-44.
Dermal permeability coefficients for all contaminants should be listed in a table, along with citations. The method for estimating the concentration of TCE in air should be outlined, with information and data sources cited.

Section 3.4.2, Page 3-48.
All available tissue analysis results for fish and macroinvertebrates should be included in this report, along with calculated bioconcentration factors. The potential for other spring water contaminants to bioconcentrate should be evaluated. In the absence of actual tissue data, modeling can be used to estimate tissue levels. Potential risks to species higher in the food chain should be evaluated (fish-eating birds, etc.). The potential for human exposure via consumption of contaminated fish should also be evaluated. Did the tissue analysis account for methyl-mercury as well as elemental mercury?

Section 3.4.4, Page 3-50, Paragraph 4.
For the white-tailed deer, only 1.8% of total water intake was considered to come from contaminated springs. This fraction was derived from the ratio of total surface area of the Burgermeister Spring drainage to the total available surface water area within the home range area. Can a citation for this approach be

provided? This approach appears to be flawed for two reasons. Aquatic surface area will be dominated by lakes and wetlands, but deer will only drink from the perimeter of such areas. Thus, it seems that a proportion of water frontage would be more relevant. Secondly, this approach seems to assume that the Burgermeister Spring drainage is the only contaminated drinking water source in the home range. Is this an appropriate assumption?

Section 3.4.4, Page 3-52, Table 3.14.
Why are many of the daily dose estimates reported as "less than" rather than point estimates? Exposure concentrations in surface water should be included in a table.

Section 4.2.1, Page 4-2 through 4-4.
In the list of COPCs in groundwater, 1,2-dichloroethane should be 1,2-dichloroethylene. The discussion of chemical toxicities should include the Lowest Observable Adverse Effects Levels (LOAELs) and the No Observable Adverse Effects Levels (NOAELs) which serve as the basis of the Reference Dose (RfD). Specific health effects and target organs at the LOAEL should be discussed. The guideline for blood lead level in children (10 ug/dl) should be noted, along with the adverse health effects in children who exceed this level. It would be relevant to include the LOAEL and potentially lethal levels for nitrates in drinking water, since levels found in groundwater (900 mg/L) are well above levels which have caused fatal methemoglobinemia in infants. The 1-day and 10-day health advisory for nitrates in drinking water (10 mg/L) is also relevant, especially if camping occurs in the conservation areas.

It is noted that both nitrates and nitroaromatic compounds cause methemoglobinemia (page 4-4). The risk of combined exposure to these compounds in infants should be evaluated.

Nitrites are approximately ten times more hazardous than nitrates. Was analysis for nitrites in groundwater conducted? If not, this should be discussed in the uncertainty section.

Section 4.3.1, Page 4-5, Paragraph 4.
The citation for radionuclide slope factors is missing.

Section 5.2.1.1, Page 5-3, Paragraph 3.
In this risk assessment, it is assumed that contaminant levels in the springs are at peak concentrations and will not increase in the future. Considering the high levels of contaminants in groundwater, particularly nitrates and nitroaromatic compounds, this assumption should be given more than cursory evaluation.

Section 6.2.1.1, Page 6-4, Table 6.1.
Why is 2,6-DNT listed NC, as not a chemical of ecological concern for surface water? In Table 2.3 (page 2-9), 2,6-DNT is retained as a COEC for surface water. The potential ecological impacts of numerous contaminants are not evaluated due to the lack of a benchmark value. The potential for this to lead to an underestimate of ecological risk should be discussed in the uncertainty section (Section 6.3, page 6-11). An attempt should be made to derive benchmark values from toxicity data reported in the literature. It would be beneficial to explain why different values are used as ecological screening values in Table 2-3 (page 2-8) versus the benchmark values used in Table 6.1 (page 6-3).

Section 7.3, Page 7-6, Paragraph 3.
Deficiencies in the assessment of potential health effects from nitrates in drinking water have led to statements in the conclusion section that somewhat understate risks. The most significant risks calculated for a hypothetical future resident are described as "somewhat high (greater than 1) hazard indices. As shown in Table 5.4, some hazard indices are as high as 40.

Table 3-21 shows nitrate concentrations in well water as high as 900 mg/L. Numerous wells exceed 100 mg/L. These nitrate concentrations are potentially fatal for infants. The risk assessment methodology used in the BRA does not evaluate the risks to children.