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SOUTH PLUME R.A. GROUNDWATER MODELING REPORT

05/20/92

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George V. Voinovich
Governor

May 20, 1992

Re: SOUTH PLUME R.A.
GROUNDWATER MODELING REPORT

Mr. Jack R. Craig
Project Manager
U.S. DOE FEMP
P.O. Box 398705
Cincinnati, Ohio 45239

Dear Mr. Craig:

Listed below are Ohio EPA's comments on the South Plume Removal Action Groundwater Modeling Report.

General Comments

1. The conclusions reached in the above-mentioned report seem to place too much credibility on the ability of the model to accurately predict the effects of well placement variation on the chemical migration. The current model lacks the required level of calibration to accurately differentiate between the alternate well schemes. For example, on page 5-1, line 8, the model is not accurate enough to reliably state that the currently proposed well field will deflect the inorganics plume by less than 20 feet. The position of the plumes is simply not that well known.

2. The discussion on model sensitivity on page 4-7, lines 25-35 clearly indicates that the model is overly constrained in its ability to represent the groundwater flow system. The model does not include the local hydraulic variability on the scale of tens and hundreds of feet, thus is not appropriate to draw conclusions at this scale. Results of the referenced sensitivity analysis (i.e., variation of hydraulic conductivity and recharge) are not provided in the report.

3. The Groundwater Report (ASI/IT, 1990) shows the predicted present plume (Figure 21-27) and the 70-year prediction (Figure 21-32), whereas this report shows the present plume (Figure 7 - which matches the Groundwater Report) and the 5-year prediction (Figure 13). There is no way to easily inspect the simulated effects of the currently proposed well field. To illustrate the simulated effects of the proposed recovery well withdrawals, the report should display the predicted plumes at 5 or more years with and without the proposed wellfields.

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4. The predicted hydraulic head map (Figure 15) should include greater detail (i.e., a contour interval of 0.1 ft. on a separate smaller-scale figure) in the region near the well field. This will allow a better interpretation of the simulated capture zone.

5. There appears to be too much credibility placed on the predicted well performance in Figures 16 to 18. The simulated plume is a gross generalization near Paddys Run. In the Groundwater Report, the two uranium measurements in layer 1 have residuals of -35.54 and 161.88 (Figure 21-11) and in layer 2 a residual of -116.19 ug/l is reported (Figure 21-12). Predicted concentration reductions in this area of the model are suspect as evidenced by the fact that deviations between measured and simulated uranium concentrations are on the order of the simulated well field concentration changes.

6. The predicted heads in layer 1 of the local transport model (Figure 6) are clearly impacted by the assumed recharge distribution (groundwater report, Figure 20-15) and are not the same as those appearing in the groundwater report (Figure 20-19) in the area east of the village of Fernald and just west of the bedrock "island." The importance of this is that the spatial allocation of the recharge in this area significantly determined the convergence of the plume as is crosses Route 128. Furthermore, the degree of flow convergence directly determines the predicted easterly deflection of the particles from Paddys Road Run Site (PRRS). The sensitivity and importance of the recharge variations should be addressed and not simply dismissed on page 4-7.

7. Results of the 72-hour aquifer test conducted in the vicinity of alternate water supply well AW-1 suggest that the hydraulic conductivity of the Great Miami Aquifer in the south plume area may be much greater than that used in the model. If this is the case, then much higher pumping rates will be required for plume capture. DOE reports that the proposed recovery well locations will be optimum in any event (page 4-7, lines 25-26). However, if the pumping rates need to be doubled or tripled to achieve the desired plume capture, will the Part 3 IAWWT system have adequate capacity? DOE should conduct a bounding type analysis of its 72-hour pump test to estimate a range of hydraulic conductivity consistent with the test data; and then report its results. What are the consequences for the removal

action if the hydraulic conductivity in the south plume area is significantly higher than estimated by DOE? What contingency options are available to deal with the consequences?

Specific Comments

1. Page 1-1, Line 36: Mercury is not a contaminant associated with the Paddy's Run Road Site (PRRS) and should be removed from this line.

2. Section 1.0, Page 1-4, 3rd Paragraph: The last sentence in this paragraph appears to be misstated. Part 3 was expanded to ensure that no more than 1,700 lbs. of uranium would be discharged annually to the Great Miami River.

3. Page 1-4, Line 7: "will not" should be changed to reflect probability associated with modeling efforts. While this may appear trivial, Ohio EPA wants to stress the limits of numeric modeling to DOE. A model is at best a tool which can help a hydrogeologist make decisions which are based upon a sound knowledge of the hydrogeology of a site. A model can never be a substitute for good data.

4. Page 1-4, Line 20: It is unclear to Ohio EPA if this is based upon actual data or a model prediction. This should be clarified by DOE.

5. Page 2-9, Line 1: DOE should give specific references; do not simply reference "scientific literature".

6. Page 2-9, Line 7: If geochemical investigation showed "that uranium is in complexes which have neutral or negative charges; such charges imply low retardation," then why does DOE use a retardation factor of 12 in the ground water model? This should be explained in detail by DOE and should be supported with the appropriate field data.

7. Page 2-9, Lines 17 through 31: A ground water plume may not have a true mean concentration. If the concentration changes in time it may be, and probably is, related to temporal changes in geochemistry. Therefore, it is technically incorrect to average concentrations over a two year period of time for the sake of calibration.

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8. Page 3-1, Lines 24 through 29: It is unclear to Ohio EPA as to how DOE determined that the error in the model indicates that source loading was greater in the past. Ohio EPA believes that this error could also represent incorrect values for attenuation and hydraulic conductivity.

9. Page 3-1 Line 38 through Page 3-2 Line 4: This section describes modeling of the alternate water supply area. DOE does not have any site specific hydrogeologic data for this area. Such data is necessary for model calibration.

10. Page 3-2, Lines 27-34: The Ohio EPA recommends that DOE develop contingencies which will allow for the installation of additional capture wells if it is determined that they are necessary to meet the goals of the interception system. Site specific data for this area will not be obtained until after the first recovery well is installed. As a result, DOE has used a ground water model which is not capable of accurately determining contaminant concentrations to provide information on the location of interception wells. This was deemed by GeoTrans to be an unacceptable use of the ground water model. This practice is inverse of the accepted use of ground water models. Ground water models are intended to provide a hydrogeologist with tools to take existing site specific hydrogeologic data and extrapolate out the effects of time and influence. Once the conceptual model is created, the standard scenario for modeling is:

    1. Estimate hydrogeologic values based upon published data for the general area.

    2. Obtain site specific data.

    3. Input site specific data into the ground water model.

    4. Calibrate the model based upon observed data and existing site specific data.

    5. Verify the model over time.

    Because DOE did not input site specific data and use regional area data, the effectiveness of the model is greatly reduced. When such a model yields contaminant concentrations twice those which are observed, the only logical conclusion is that the confidence in the ground water model to represent real conditions is further minimized.

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11. Section 4.0: In order to allow the reader to better visualize the affects of various pumping scenarios on the PRRS plumes a current state or no action (baseline) scenario map should be provided within the work plan.

12. Page 4-1, Section 4.X: The Ohio EPA comments on the modeling effort apply to this section as well as the ones previous. However, the actual final locations of the interception wells appear to be acceptable based upon the limited data which exists. These locations could change if the assumptions prove to be incorrect. As a safeguard, Ohio EPA recommends the use of a ground water monitoring program specific to the interception system to determine the effects of the system upon the FEMP plume and the PRRS plume. Because the advanced wastewater treatment system is not designed to treat contaminants found in the PRRS plume, the condition closely resembles a wellhead protection issue. It is important to closely monitor the PRRS plume to guarantee early warning of its impact on the interception system.

In order to resolve the significant issues covered in these comments, Ohio EPA suggests that we have a meeting to discuss DOE's responses to these comments and develop an Action Plan to resolve these problems.

If you have any questions please contact Tom Schneider or me.

Sincerely,

Graham E. Mitchell
Project Manager

GEM/acn

cc: Jenifer Kwasniewski, DERR
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