



United States Department of the Interior

U.S. GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

Great Valley Corporate Center
111 Great Valley Parkway
Malvern, PA 19355

Phone 610-647-9008 FAX 610-647-4594

August 7, 1996

Mr. Orlando Monaco
Naval Facilities Engineering Command
Northern Division
Environmental Restoration Branch
10 Industrial Highway
Lester, Pennsylvania 19113

Dear Mr. Monaco:

I reviewed the draft report "Feasibility Study Report for Groundwater in Areas A, B, and D Naval Air Warfare Center (NAWC) Warminster, Pennsylvania" by Brown and Root Environmental dated June 1996. My comments are listed below.

- P. 1-12 Unless the head in the aquifer is equal to the head in the stream or the stream has an impermeable bottom, a stream either gains or loses water. If stream levels are higher than those of the ground-water system (indicating a losing reach) and this is a headwaters stream, what is the source of the water in the stream if it is not ground-water discharge?
- P. 1-12 Lower gradients in the shallow zone can be caused by pumping of deeper zones.
- P. 1-13, fig. 1-3; P. 1-15, fig. 1-4; and P. 1-17, fig. 1-5 Data for clusters HN-50 and HN-52 should be added, and the area of the mapped potentiometric surfaces should be extended. Extraneous lines and symbols should be removed from the map; they clutter the map and detract from its value. Only the data points, measurements, and contour lines should be shown. Water-level elevations should replace well numbers. The reader is unable to evaluate a contour map that contains no data. Contour lines should be dashed where data are not adequate to define them.
- P. 1-19 and P. 1-39 Reference the source of the aquifer test information presented here.
- P. 1-20 Well WTMA-26 is the only significant pumping well near NAWC.
- P. 1-25 1,1-Dichloroethene and 1,1-dichloroethane are dehalogenation products of TCE and PCE. Because their concentration is higher in water from well WTMA-26 does not mean that they are from an alternate source. It may mean greater degradation of TCE and PCE along a longer flow path.
- P. 1-26 Are the concentrations of inorganic constituents cited here for dissolved or total constituents? It makes a big difference in the interpretation of the data.
- P. 1-39 The meaning of the fourth paragraph is unclear. In the last paragraph, the Stockton Formation is heterogeneous. The difference in transmissivity is most likely due to local variability.

- P. 1-41, fig. 1-10 Extraneous lines and symbols should be removed from the map. Only the data points, measurements, and contour lines should be shown. Water-level elevations should replace well numbers. The reader is unable to evaluate a contour map that contains no data. Contour lines should be dashed where data are not adequate to define them. The date of the water-level measurements should be shown on each map.
- P. 1-43 The text states that "contamination of the aquifer appears to be limited to the top 100 to 150 feet of the bedrock aquifer." Only three wells in area B are screened below 150 feet: HN-5-D at 180-204 feet, HN-08-D at 157-178 feet, and HN-10-D at 225-245 feet. The water from well HN-5-D contains toluene and carbon tetrachloride, the water from well HN-8-D contains chloroform and toluene, and no contamination is present in the vicinity of well HN-10-D. Water from 2 of the 3 deep wells (67 percent) is contaminated, and, therefore, you cannot assume that contamination is limited to the upper 150 feet of the aquifer.
- P. 1-51 Recent potentiometric-surface mapping and chemical analyses by the USGS does not indicate an off base source for the contamination in well HN-49-I. A ground-water divide separates well HN-49-I from Casey Village. Also, wells between HN-49-I and the well with the highest reported concentrations of TCE (Stephens) have much lower concentrations than water from either the Stephens well or HN-49-I.
- P. 2-58 Deed restrictions are discussed for the NAWC property. However, the plume extends offbase. Will deed restrictions be applied to these properties?
- P. 4-29 Your chemical data do not indicate that dehalogenation is occurring.
- Appendix B, P. 2 Please give the equation solved by the model. The reference does not look like it would be easy to obtain.
- Appendix B, P. 4 An effective porosity of 30% seems to be too high for these fractured rocks. How was the porosity estimated? A hydraulic conductivity of 3.29 ft/d is higher than that obtained from the aquifer test data. According to the text, the aquifer is 140 feet thick (50 feet for each of the shallow, intermediate, and deep zones minus 10 feet of unsaturated thickness). Using the range of transmissivities you cite (139 ft²/d for HNUS and 178-409 ft²/d for OHM), the hydraulic conductivity should be between 0.99 and 2.9 ft/d. What are the initial concentrations for TCE and benzene that were used?
- Appendix C, P. 6 The hydraulic gradient in the vicinity of well WTMA-26 is unknown. A steeper gradient would reduce the size of the capture zone. Some continuous water-level monitoring in off-base wells would help to define the extent of the pumping influence of well WTMA-26.

Sincerely,



Ronald A. Sloto
Supervisory Hydrologist

cc: J. Dale
G. Glenn
J. Orient