



PENNONI ASSOCIATES INC.
CONSULTING ENGINEERS

One Drexel Plaza
3001 Market Street
Philadelphia, PA 19104
Tel: 215•222•3000
Fax: 215•222•3588

N62269.AR.000493
NAWC WARMINSTER
5090.3a

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April 8, 1998

Mr. Lonnie Monaco
Naval Facilities Engineering Command (NAVFACENGCOM)
Northern Division
Environmental Contracts Branch, Mail Stop No. 82
10 Industrial Highway
Lester, PA 19113

**RE: Summary Report for Areas A & D Groundwater
Former NAWC Warminster, Pennsylvania**

Dear Mr. Monaco:

Pennoni Associates Inc. ("Pennoni") has reviewed the "*Summary Report for Areas A & D Groundwater*" prepared by Brown and Root Environmental and dated February 1998. We have also included the United States Geological Survey ("USGS") draft report concerning "*Results of Borehole Geophysical Logging and Hydraulic Tests Conducted in Area D Supply Wells, Former U.S. Naval Air Warfare Center, Warminster, Pennsylvania*." We offer the following comments:

1. The Area A & D report illustrates groundwater flow gradients for shallow, intermediate and deep wells. Because of the dip of the rock beds a shallow well in the southern part of the site could be monitoring the same strata as an intermediate and deep well in the northern part of the site. A clearer representation of groundwater flow would be to show the flow gradient in a lithologic interval to reflect groundwater movement along the bedrock bedding planes.

Such an illustration should also be provided for the interval with the highest contaminant concentration to better interpret the migration of contaminants.

2. The report states that the tetrachloroethane ("PCE") concentration of 91 micrograms per liter ("ug/l") was left out of the isopleth delineation in Plate 2 for the sake of clarity. No technical explanation was provided for ignoring this result.

The report also states that it was unlikely that the PCE concentration of 420 ug/l found in off-base Well HN-52S was related to PCE concentrations at the base because no significant concentrations were found between the base and the well. However the PCE found in the well could be the result of contaminant migration

from a release that occurred previous to the source of the on-base plume. It cannot be assumed that the off-site plume originated off-site based on the information provided.

3. In order to better evaluate the nature and extent of the contaminant plumes, the isopleths and plume delineation should be shown along the same lithologic interval or in cross-section. This would be preferable to illustrating the plumes in shallow and intermediate zones which do not take into account the structural profile of the bedrock.
4. The report suggests that 1,1,1-trichloroethane ("1,1,1-TCA") concentrations detected off-base may not be attributable to the Navy, since upgradient wells did not have detections. This does not preclude the possibility that the plume has moved off-base from a previous release.
5. Well BK-1059 sampling results show detection of contaminants to the northwest of the pumping Warminster Authority Well No. 26. This raises the possibility that contaminants may have migrated beyond the capture zone of Well No. 26. Additional monitoring wells to the north and west of Well No. 26 would be required to verify the effectiveness of the Well No. 26 capture zone.

The following comments concern the USGS report in relation to contaminant migration:

6. A large vertical gradient downward was identified in SW-3 and SW-4 between shallow zones and a deeper zone below a siltstone layer at a depth of 300 feet. The summary and conclusions do not address the potential for migration of groundwater and contaminants in Area D along vertical fractures or joint systems that may provide a hydraulic connection to the deeper zones.
7. The cross-section provided in the report showing correlation of natural-gamma logs does not identify the lithological units except by letter. It would be helpful to identify these as siltstone, sandstone, etc. The identification of Unit A is described in the text as sandy for SW-1 when it appears elsewhere in the report as a silty unit. The groundwater investigation should correlate these logs with nearby monitoring well logs.
8. Wells SW-1 and SW-2 are in close vicinity to each other yet show significant variation in the vertical hydraulic gradient distribution within the wells. The implications for contaminant migration should be evaluated in the Area D groundwater investigation.
9. The mean orientation for the fractures in SW-3 and SW-4 were provided, however it would be useful to describe the orientation of the larger water producing or receiving fractures to evaluate the potential influence on contaminant migration in Area D.

Should you have any questions concerning the above comments, please do not hesitate to contact us.

Very Truly Yours,

PENNONI ASSOCIATES INC.



J. Anthony Sauder P.E., P.G.
Senior Hydrogeologist



Anthony S. Bartolomeo, P.E.
Senior Vice President

cc. Robert Camarata, Warminster Township
David Fennimore, Earth Data