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MEMORANDUM

TO: File, PNM/Red/93

FROM: Jane Cramer, Technical Program *JC*

THROUGH: Steve Alexander, Technical Supervisor *SA*

DATE: January 29, 1993

RE: **Analysis of contaminant source at Public Service Company of New Mexico (PNM) Person Generating Stations.**

Hazardous & Radioactive Materials Bureau (**HRMB**) prioritized review of adequacy of vadose zone or source remediation in an earlier memorandum (December 21, 1992). This memorandum presents the status of that review.

PNM contracted Daniel B. Stephens and Associates (**DBSA**) to evaluate the rate of movement of the organic constituent, tetrachloroethene (**PCE**), through the vadose zone to the water table at **PNM**. The results of this study were submitted in a **DBSA** report in 1985. Geoscience Consultants, Ltd., on behalf of **PNM**, analyzed the magnitude and extent of the contamination in an earlier report (Geoscience Consultants, Ltd., 1984). The adequacy of this work is discussed below.

The **DBSA** report states that, "The analysis relies on determinations of the hydraulic conductivity...estimates of the hydraulic conductivity may vary by two orders of magnitude, and therefore predicted rates of fluid flow through the unsaturated zone may also vary by this amount" (**DBSA**, 1985, page 1). This enters an error factor of two orders of magnitude. Also, the aquifer was modelled using a solute transport model. It has been the experience of **HRMB** that model prediction may vary from measured results by orders of magnitude. This means that the combined error factor in predictions may vary from measured results by three to four orders of magnitude.

The report also states that in 7000 years, 20 ppb **PCE** is predicted to move a maximum of 85 meters (or 280 feet) down gradient from the

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tank area. These calculations were based on uncapped soil, even though a cement cap over the tank area was installed in 1986. This presumably made the estimate even more conservative.

As of January 1993, however, field results show that **PCE**, (27 ppb) has migrated at least 2400 feet in approximately 12 years. Unless there is contamination from another source (and there is no evidence of this), the results predicted in the **DBSA** 1985 report are observed to be incorrect by several orders of magnitude. As the leading edge of the plume is as yet undetermined, the magnitude of error may be even greater.

Geoscience Consultants, Ltd. (1984) reported measured concentrations in soils of up to :

1443.8 ppm for **PCE**, and
2127 ppm for 1,1-trichloroethane (**TCA**).

These concentrations are less than those indicative of the presence of dense non-aqueous phase liquid (**DNAPL**), however the converse does **not** indicate the absence of **DNAPL**. In other words, there is no clear evidence to support either the presence of or the absence of a **DNAPL**.

Results of chemical analyses of groundwater are also ambiguous. The 1991 Annual Groundwater Monitoring Report, submitted by **PNM** to **HRMB** in February 1992, showed concentrations in the **RCRA** monitoring wells to be declining in four of five.

More recently (December 1992), a new monitoring well was installed in the vicinity of the original disposal tank near an existing monitoring well. The existing monitoring well is completed in the upper 10 feet of the aquifer. The new monitoring well is screened over an interval 10 feet lower.

In October the upper of the two showed concentrations of **PCE** and **TCA** in the 100's of ppb. The new monitoring well, sampled in late December showed non-detects. Either no contaminants are migrating downward, or the contaminants are migrating along a path that is difficult to deduce.

Ron Johnson, PNM environmental Manager, argues that these results support the contention that there is no **DNAPL** present at Person Station. Again, it is possible he is correct; it is also possible he is incorrect.

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According to Ron Johnson, the results of a soil-gas survey by Tracer Research Corporation (May 1990), support absence of **DNAPL** in the vadose zone. This report has not yet been reviewed by **HRMB**. **PNM** also sampled aquifer material in the saturated zone, to address the question of whether **DNAPL** might have migrated from the vadose zone down to the saturated zone. Preliminary verbal results of chemical analysis of the aquifer material showed a maximum for VOCs of roughly 300 ppb.

Ron Johnson does not, however, dispute that the absence of a **DNAPL** is unverified. Unfortunately, the current state-of-the-art techniques for detecting **DNAPLs** are inadequate. Ron Johnson argues that concentrations in all wells are decreasing and that there is no evidence that the plume is expanding. He states that it may have reached equilibrium, and its current size, years ago. As stated above, it may never be clear whether a **DNAPL** is present or not. The conservative remediation scheme would be to act as if it is, to the greatest ability of remedial technologies.

The Groundwater Remediation Bureau staff has suggested vapor extraction as an interim action. Ron Johnson proposes continuing with the tasks in the **CAD** and possibly incorporating vapor extraction as part of the Corrective Action Plan, Phase II of the **CAD**. He believes interim actions would require permit modification and would be a slower approach.

According to Bruce Swanton, former Technical Enforcement Section Supervisor, the **CAD** was originally written to allow any remediation indicated (such as remediation of source) to be imposed through Phase II of the **CAD**, the Corrective Action Program.

To be conservative, we may want to impose vapor extraction, pump and treat, etc. (decide when we get there) as part of Phase II, the Corrective Action Plan. Additional information from the 1992 Annual Groundwater Monitoring Report, forthcoming this month, may elucidate this situation further. Based on work in progress, the as yet indeterminate extent of the plume, and the uncertainties inherent in working with a potential **DNAPL**, indications are that interim corrective actions may best be implemented through Phase II of the **CAD**, the Corrective Action Program.

cc: Benito Garcia, Bureau Chief
Ed Horst, Program Manager
Steve Alexander, Technical Supervisor
Jane Cramer, Technical staff
Tracy Hughes, Legal Counsel
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