Note to EPA: The following discussion contains information which has been extracted and condensed from the Draft Middle Rio Grande Water Assessment Final Report as well as several other published documents referenced below.

Hopefully, this information will assist the EPA and others to make better informed decisions concerning the Spartan Facility TCE contamination plume. Since our final report will not be published for another month or two, and it culminates a 4 year cooperative study with several cost sharing partners, we cannot pre-release draft copies of the report. However, we are willing to share this information via this summary description and personal communications to bring other ground water professionals involved "up to speed" on the subject.

Calabacillas Recharge Window

Recent work by John Hawley, New Mexico Bureau of Mines and Mineral Resources, has shown Calabacillas Arroyo to be an important recharge corridor for ground water under the west mesa. This recharge corridor exhibits quite different characteristics between the upper part of the watershed and its confluence with the Rio Grande. In the upper watershed, the source of recharge is precipitation which is very limited and, the channel is generally dry with hundreds of feet of vadose zone above the water table. The lower and most productive part of the arroyo's recharge corridor is located in a window between Unser Blvd. and the Rio Grande where the river's saturated alluvium is in direct contact with coarse grained alluvium of the Calabacillas Arroyo Fan. This condition provides a saturated ground water connection with permeable materials of the Santa Fe Group Aquifer. However, this lower recharge window has been impacted by TCE contamination from the Spartan Technology Inc.'s Coors Road Facility.

Geohydrological and structural geologic data available for the area (Bjorklund and Maxwell, 1961, Kernodle, McAda, and Thorn, 1993 and 1995, Hawley, in process, and CH2MHill, 1996) shows that the TCE contaminate plume is located at the entrance to the Calabacillas recharge window and that it threatens both municpal and private wells downgradient of the site. This information provides a regional hydrologic "road map" of where the contaminant migration is headed and which water supply wells may be impacted. Municipal pumping centers located on the west mesa which are most likely to be impacted include southeastern Rio Rancho, Paradise Hills, Volcano Cliffs, and Zamora well fields.

A combination of structural and geohydrologic features (e.g. the Calabacillas and Oxbow recharge windows, the riparian recharge corridor between Central Avenue and the Oxbow Recharge Window, and the Rio Grande Fault zone) cause a broad ground water divide which diverts shallow alluvial ground water from the Rio Grande alluvium and canal seepage from the Corrales Main Canal westward into the ground water trough which underlies the west mesa. The Calabacillas recharge window and the TCE contaminant plume are near

the head of this ground water divide. Mapping of the contaminant plume as illustrated in CH2MHill's January 1996 report to the City of Albuquerque shows that the plume is rapidly moving through the recharge window toward the west-northwest.

In Technical Report 21, 1961, Bjorklund and Maxwell describe a ground water trough 6 to 10 miles wide, 30 miles long, 30 to 40 feet deeper than the Rio Grande and flowing to the south beyond the Bernalillo/Valencia County line. Data describing this trough was limited and the authors speculated that it was caused by: an area of thicker, deeper, or more permeable Santa Fe Group deposits; ancient axial channel deposits of the Rio Grande similar to that underlying the east mesa; or, a lack of recharge into the area as compared to its conveyance capacity. Since 1961, development of productive well fields along this trough in the Rio Rancho, Paradise Hills, Volcano Cliffs and Zamora well fields suggest that the trough is caused by a combination of thicker and more permeable Santa Fe Group deposits and that it is an "expressway" for ground water migration. Current work by Hawley et al (1996) further confirms this hypothesis.

Mapping of ground water levels in the Santa Fe Group by the USGS (WRI Report 93-4149, Figures 28,29, and 30) shows that ground water conditions in the area are changing in response to heavy pumping of the Santa Fe Group Aquifer. These maps show an evolution of conditions through 1960, 1988, and 1992 where ground water under the river becomes increasingly more prominent as a "ridge", recharging pumping centers in ground water troughs on both sides of the river. As a consequence, gradients along the ground water divide are steepening, inducing more recharge into the Santa Fe Group through the windows and corridors. Additionally, pockets, or areas of greater ground water depression within the trough are developing around municipal pumping centers.

USGS modeling projections of water levels and water level declines in aquifer zones 5 and 9 for the years 1994 and 2020 (WRI Report 94-4251, figures 32 thru 35, 47, and 51) show that pumping centers serving southeastern Rio Rancho, Paradise Hills and Albuquerque are and will continue to increasingly induce the migration of the TCE contaminant plume toward their wells. This occurs as a result of cumulative pumping impacts from these pumping centers which by the year 2020 will cause the trough to start appearing more like a bathtub. These projections suggest that Paradise Hills and other downgradient fields are at risk with respect to gradients as of 1994, while southeastern Rio Rancho will develope a ground water depression sufficient to engage the contaminant plume by the year 2020. Additionally, modeling results for layers 5 and 9 of the Santa Fe Group show that areas of decline and water level trends around pumping centers are relational between the shallow and deeper system, indicating that these are areas of vertical recharge into the municipal aquifer. The time required for the plume to travel into these well fields and contaminate supplies is not yet known.

Remediation of the contaminant source will become more difficult as time passes and the plume is drawn further into the recharge window and deeper into the Santa Fe Group aquifer. One remedial measure should recieve immediate attention to reduce the amount of "driving head" or recharge induced into the window. This can be accomplished to some small degree by lining of the Corrales Main Canal in the vicinity of the Calabacillas Arroyo. The canal, traversing soil conditions similar to this area, has been shown to leak at rates averaging up to 0.4 feet per day per square foot of wetted perimeter. This equates to about 0.36 cfs per mile or 176 acre-feet per mile per irrigation season.

If there are any further questions about this area, please contact Steve Hansen @ 505-248-5349.