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Response to 50 gpm Proposal

The capture area indicated by the proposed 50 gpm containment system is based on relatively simple analytical modeling techniques. These techniques do not account for variably in aquifer parameters across the site. The uniform parameters of transmissivity and groundwater gradient used in the model are not well defined based on site-specific data. Furthermore, the technique of kriging the log transformed TCE concentration data may not accurately describe the actual distribution of contaminants in the aquifer. The accuracy of this technique is of particular importance with respect to the area between MW-32 and MW-42 where there is insufficient characterization to guide the concentration contouring process.

Considering these reservations, the analytical modeling techniques still provide a means to roughly evaluate alternative containment strategies as long as the results are used for comparative purposes and it is understood that a great deal of uncertainty exists in the modeling results. Ultimately, it is empirical data that will be used to determine the capture zone of the recovery well(s). A greater level of confidence in the flow characteristics of the aquifer will be possible after a containment system is operated and data are collected and analyzed. Similarly, groundwater analytical data can be used to better define the concentration profile of TCE in the groundwater, although this can not be accomplished in the area between MW-32 and MW-42 without an additional monitoring point, as described above.

The remainder of this response assumes the above qualifications with the modeling approach and discusses the 50 gpm proposal as if the aquifer parameters were well established, homogeneous, and equal to the values used in the model of the proposed 50 gpm containment system. Further it assumes that the kriged concentrations presented in the proposal are accurate representations of the contaminant distribution. Both of these assumptions allow the required simplifications for conducting comparative analyses using an analytical groundwater flow model.

There are three primary issues regarding the 50-gpm proposal for on-site containment. These issues include, (1) the proposed approach does not contain all groundwater with high TCE concentrations on-site, (2) the approach will likely result in spreading some groundwater with TCE concentrations of 100

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to 200 µg/L TCE to the northeast, widening the plume, and (3) the current proposal does not aid the process of off-site restoration as alternative proposals might.

The first issue, involving on-site containment, primarily relates to the aquifer areas beneath ponds No. 1, 2, 3, and 4. The contour lines provided in the proposal show areas with concentrations in excess of 1,000 µg/L which will not be captured by the proposed containment system. If a greater concentration of contaminants exists in the area between MW-32 and MW-42, this issue becomes more significant. Most of the groundwater beneath the ponds that is not captured by the recovery well will be directed into the main body of the off-site plume and will probably be captured by the off-site containment well. However, this does not address the issue of off-site restoration. The on-site areas where contaminants are allowed to travel into the off-site plume will provide source to the off-site plume for a period of time after the containment is in place. The length of time that contaminated groundwater continues to move off-site with this approach has not been determined but it could reasonably be in excess of 5 to 10 years. These additions of source would confound the efforts to achieve off-site restoration. An argument for the technical inpracticability for off-site restoration can not even be considered if on-site contaminants have been allowed to bleed unnecessarily into off-site areas.

The second issue concerns groundwater on the fringe of the plume with lower TCE concentration (5 µg/L to 200 µg/L). Under the proposed scenario, groundwater of this lower concentration on the northeastern site boundary will be pushed further away from the site than it is currently traveling. This will result in impact to areas of the aquifer that are not currently impacted. These new areas may be captured by the off-site containment system, although this has not yet been shown. This represents an unnecessary expansion of the plume. In addition, lateral spreading of the plume may result in contaminants reaching the currently clean monitoring well nest at MW-59. If these wells become contaminated, it will be necessary to redefine the extent of the plume in this area with new monitoring wells.

The third issue relates to the coupling of the goals for on-site containment and off-site restoration. The proposed plan provides additional flushing, with the reinjected water, to only a small portion of the off-site plume. The off-site areas that receive flushing are the peripheral areas of the plume that are of lower concentration and perhaps less in need of flushing. In addition, the water not captured

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and allowed to discharge to the off-site plume would not technically be considered "flushing" water as it would contain TCE from on-site areas with some concentrations in excess of 1,000 ug/l. The proposed system does provide some flushing of the on-site zones of contamination, but the flushing is generally not through the most concentrated areas. Perhaps a better use of the reinjected water would be to provide flushing action to the off-site areas that will promote off-site restoration where restoration efforts will be the most fruitful.

We have completed some analytical modeling of the on-site containment system using the same general assumptions employed in the work shown in the 50-gpm proposal. As a result of this modeling effort, we have identified some containment scenarios, which also utilize only 50 gpm and may provide some resolution to the three issues discussed above. The following scenarios were evaluated:

A single recovery well in the same location as the well in the 50-gpm proposal with the same pumping rate. For this scenario, the groundwater is reinjected in a drywell at northeast corner of the property the same distance from the site (into the easement) as the recovery well.

Two recovery wells, each pumped at 25 gpm, located near the southwest and northwest corners of the property, at the same distance from the property boundary as the recovery well in the 50-gpm proposal. For this scenario, the water would be reinjected at 50 gpm into a drywell located between the two recovery wells.

Two recovery wells and one reinjection well as in No. 2 above, except all three wells are located on-site along the northwestern boundary of the site.

Two recovery wells, as in No. 3 above, with reinjection into an infiltration pond located between the recovery wells.

The results of these four modeled scenarios are discussed below with respect to the three issues identified for the proposed 50-gpm containment system.

The issue of on-site containment is best measured by the width of capture that the system provides at the downgradient (northwest) property boundary. The proposed 50-gpm containment system captures a width of approximately 490 feet at this property boundary. In contrast, scenarios one through four, described above, captured 615, 810, 810, and 730 feet, respectively, at the same boundary. This indicates that any of these alternative scenarios will provide a more complete capture of the on-site plume with the same 50 gpm pumping and reinjection rate.

The highly concentrated groundwater beneath the building and extending to the northeast and southwest from under the building also represent an important area for a containment system to capture. All modeled scenarios, including the proposed 50-gpm containment system, capture this high concentration zone to the southwest. As discussed above, the proposed 50-gpm containment system allows some groundwater beneath pond No. 3, with TCE concentrations in excess of 1,000 µg/L, to escape containment. All of the scenarios listed above provide more complete containment in this area. Scenarios one through four provide increased capture widths in this area of 90, 10, 100, and 120 feet, respectively, in comparison to the proposed 50-gpm containment system.

The modeled scenarios were also evaluated with respect to the likelihood that they will spread contaminated groundwater into areas that are currently uncontaminated. As discussed above, the proposed 50-gpm containment system appears to spread the width of the contaminant plume in the area between MW-42 and MW-59. None of the scenarios modeled demonstrated the degree of lateral spread noted in the 50-gpm proposal. However, scenario one did show some lateral spreading of groundwater. The spreading was not as severe as noted for the proposed 50 gpm containment system and the groundwater that was spread with this scenario generally had a TCE concentration indicated by the kriging to be less than 100 µg/L. The other three scenarios tested showed no tendency to spread the width of the plume.

Finally the modeled scenarios were evaluated with respect to their contribution to off-site restoration. As noted above, the proposed 50 gpm containment system does not provide significant flushing of the off-site plume and, in fact, provides a continuing source of contaminated groundwater from beneath Pond No. 3. With this proposed containment system, off-site restoration would be problematic for many years until sufficient flushing of the noted high concentration zones on-site is complete.

Each of the four modeled scenarios provided better off-site flushing than the proposed 50 gpm containment system. This was due in part to the greater capture width of the modeled containment

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systems and in part to the pathway that the clean reinjected groundwater takes with each of the scenarios. The pathway taken by the treated groundwater, under the four modeled scenarios, was largely into the off-site plume where the water would provide some flushing action to aid in off-site restoration. Scenarios two, three, and four provided the best flushing action to the center of the kriged off-site plume. Scenario one proved better at flushing than the proposed 50 gpm containment system, but did not perform as well as the other three modeled scenarios.

The modeled scenarios, described above, were not chosen to provide an exhaustive review of the options for on-site containment or for reaching other of the stated goals. However, the modeled scenarios appear to provide better on-site containment, less tendency to spread portions of the contaminant plume, and better coupling with the off-site goals of aquifer restoration. These benefits are achieved at the same pumping and reinjection rate as the proposed 50 gpm containment system. Other containment strategies may further improve the model runs conducted for this analysis.

FAX TRANSMISSION SHEET

U.S. EPA, REGION 6
COMPLIANCE ASSURANCE AND ENFORCEMENT DIVISION
HAZARDOUS WASTE ENFORCEMENT BRANCH
TECHNICAL SECTION

TRANSMISSION DATE: **August 12, 1998**

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COMMENTS: Draft response re: the Sparton 50 gpm proposal. Please review and call me with comments ***ASAP*** since we have to send this out to Sparton by COB today.

Thanks, Mike Hebert