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TO: Michael Hebert **DATE:** June 7, 1998

FROM: Jim Peeples **FILE:** sparton\SVEmemo2.doc

SUBJECT: Start of SVE Design Issues Document for Sparton

SVE DESIGN ISSUES

Based on or discussions held on July 30, 1998 regarding the SVE workplan, the following design issues were raised and are reiterated and expanded here for your convenience in understanding our position.

The current SVE system is working well for remediating a limited area of the site (a radius of approximately 50 feet). The thermal and catalytic destruction of contaminants appear to have worked well for the initial phase of the project without the need for additional treatment equipment.

As anticipated, the concentration of contaminants of interest in the extracted vapor has declined dramatically since the start-up of the SVE system. This is typical of vapor extraction systems. As a result of this decline in vapor concentrations, the SVE system has entered a new phase of operation. The concentration of VOCs in the extracted vapor is now low enough that the vapor could be discharged to the atmosphere without treatment. This factor and others make this a good time to reevaluate the options for SVE treatment of the soils.

We understand that Sparton is planning to continue operation of the existing SVE system and to move the vacuum to other existing vapor extraction wells, essentially one at a time. For treating small amounts of known impact, that approach will work, but there are several

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associated problems. Of particular interest is the issue of cost. The current approach will cost more than alternative approaches and will achieve less. This issue and others are discussed below.

1. **The current approach will take too much time to achieve the soil gas goals.**

As stated above, there is nothing inherently wrong with moving the system between adjacent vacuum extraction wells if:

a) the site has been fully characterized to make certain that each zone of contamination is addressed ;
b) the zones of influence for adjacent extraction wells overlap;
c) the system is moved successively around the network until all zones are cleaned to below 10 ppmv.

The issue of time relates to items a) and c). If this site is fully characterized, it is quite possible that many locations above 10 ppmv will be identified. Many areas of the lower vadose zone will be over 10 ppmv due to residual product and contact with contaminated water (the two effects cannot be easily separated). Thus, the system will have to be moved to many locations and each location will need to be treated for a sufficient time period to achieve the stated goals under low flow conditions. It may appear that time is not of the essence in that SVE project, due to the presence of an on-site containment system. However, operational time for the existing SVE system can be easily translated into cost, and a long duration of SVE operation will be unnecessarily expensive for Sparton.

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2. A far more extensive characterization of the vadose zone contamination will be needed.

We have identified locations in the upper vadose zone where previous studies have indicated potential contamination. If one or more of these locations show contamination, it must be assumed that contaminants traveled from the source area to the newly identified "hot spot". It will then be necessary to evaluate the area between the source and the "hot spot", or assume that it is contaminated and place new extraction wells on a minimum MAX of 100 feet centers from the source area to each "hot spot". Similarly, the deep vadose zone will have to be characterized to determine where "hot spots" exist at depth. As discussed in the July 30 meeting, a robust SVE system that fills the gaps between known areas of contamination eliminates much of the concern regarding characterization. An SVE system with an effective radius of 50 feet does not eliminate characterization issues and necessitates a much more detailed level of site characterization.

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3. **The operation and maintenance costs for the existing system are high relative to effectiveness.**

As discussed above, the existing SVE system is well suited for soil gas with high concentrations of VOCs. It apparently performed well in this capacity for the first months of operation. Now that VOC concentrations from VR-1 are low enough to discharge without treatment, the internal combustion engine is no longer well suited to the task. That problem is that it consumes a large quantity of fuel for a very low vapor extraction rate. A conventional SVE blower with an electric drive could achieve much higher flow rates for lower operating costs. Cost savings can be expected in the following areas:

a) Lower operating costs (with much higher flow rates)
b) Shorter time period to reach goals and consequently less operating cost.
c) Equipment costs for a conventional SVE system will be lower than the probable resale value of the existing internal combustion system.
d) Less characterization of the vadose zone soils will be required if a robust SVE system is operated.
e) Fewer sampling projects will be required for verification sampling.
f) Compliance sampling cost for air quality will be reduced because only one sample location will be required (rather than two), and a shorter project duration.

The issues raised above regarding Sparton's current plan for operating the SVE system can be overcome with relatively minor changes to the existing setup. Sparton has in place most of what would be needed to implement changes that would provide a robust SVE system that would reduce the total cost to treat the vadose zone soils.

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The primary change required would be replacement of the internal combustion SVE system with a larger capacity electrically-driven system. Given the good condition of the existing system, it seems likely that it has a residual value greater than the cost of an electrically-driven SVE system. Off-gas treatment will not be needed based on the City's air quality standards. We propose a system with a positive displacement blower with 500 scfm capacity at three inches of vacuum (mercury). A complete system of this capacity, with all auxiliary equipment and instrumentation, would cost about $7,000 8,000. The system would be skid-mounted and could be moved into the same location as the existing system, connected to existing SVE piping, connected to electric power, and started.

The likely upper capacity limit for VE-1 is about 400 scfm (at the proposed vacuum). This would leave about 100 scfm for "hot spot" treatment, as needed. "Hot spot" treatment would be primarily used to reduce the time required to reach the remediation goals, by individually treating highly contaminated areas. The system connected to VE-1 would provide an estimated radius of influence of 300 to 350 feet. This reaches most of the areas where potential "hot spots" have been identified, and it has the potential to treat areas beneath the building.

An added benefit of the higher flow SVE system would be the potential to desiccate some of the interbedded clay layers within the vadose zone. These layers will be the most difficult to remediate with SVE, and desiccation can to accelerate their treatment.

The greatest savings for this SVE approach will be in operating costs and reduced costs for monitoring and characterization. The proposed SVE system can be powered and operated for a lower cost than the existing system, and the length of time over which these costs will be incurred will be significantly reduced. All aspects translate to less overall cost. The confidence that we have in Sparton being able to achieve the stated vadose zone goals will be increased with the use of a more robust SVE system, and the extensive need for site characterization will be reduced.