APPENDIX I

URS Technical Memorandum – Perched Aquifer Pump Test

Memorandum

Project: Cooper Drum Company RD

Subject: Perched Aquifer Pumping Tests

Date: July 13,2004

Short-term (less than 4-hour) pumping tests were performed on soil vapor extraction test wells SVE-1 and SVE-2. The pumping tests were performed to estimate a groundwater flow rate that could be sustained from the perched water-bearing zone beneath the site. These wells were designed with a continuous screen interval (8 to 43 feet bgs in SVE-1 and 8 to 48 feet bgs in SVE-2) completed across the vadose zone and the perched water bearing zone. The perched zone generally consists of a sandy unit, which has been shown to be continuous beneath the site from a depth range of approximately 35 to 40 feet bgs. This zone is underlain with interbedded finer material (silts and clays) which apparently creates a head differential from wells completed in the perched zone and the wells completed in the shallow aquifer beneath the site. For example in December 2003, the depth to water in SVE-1 was 36.38 feet bgs and as compared to 49.60 feet bgs in adjacent well MW-2, which is screened (from 50 to 82 feet bgs) in the shallow aquifer. As discussed in the RI, the perched zone has been present beneath the site since 1998, but was apparently dry during the early 1990's, suggesting the perched zone has been intermittent in the past.

Dual phase extraction was included as part of the soil remedy at the site because: the shallow occurrence of perched zone; the high levels of contaminants that are present there; the hydraulic head difference from the shallow aquifer (which indicates there is not a good hydraulic connection between the perched and shallow aquifer); and the perched zone could be dewatered at a generally low flow rate and treated effectively with SVE. Additionally pumping would only occurr as long as SVE is effective. Another option would be to remediate the perched zone at the same time the shallow aquifer is remediated. An in-situ method may be equally effective in both water bearing zones, however pump and treat may be less effective based on the limited hydraulic connection between the two zones. Because an in-situ method has not yet been determined effective for the site the RD has included DPE in the HWA as an option, since there is signifcant COC mass in the the perched zone. Groundwater sample results in December 2003 (total VOC greater than 2,200 ug/L) from SVE-1 showed the highest VOC concentrations as compared to any monitor well completed in the shallow aquifer. If new information becomes available indicating insitu treatment is effective for the groundwater, then the need for DPE should be re-evaluated.

DPE was not considered for the DPA because VOC concentrations in groundwater are much lower in this area of the site. Groundwater sample results from SVE-2 showed approximately 250 ug/L of total VOCs. This is consistent with monitor wells MW-1

(not detected), MW-4 (<50 ug/L total VOCs) and MW-22 (approximatey 12 ug/l total VOCs) that are completed in the shallow aquifer around the DPA. Although VOCs are above MCLs, the total mass is signifcantly lower in the DPA as compared to the HWA. Furthermore the groundwater beneath the DPE eventually mixes with the main groundwater plume emananting from the HWA and should be remediated with the same remedy for the shallow aquifer.

The pumping test on SVE-1 was performed on December 3, 2003 and the SVE-2 test was performed on April 29, 2004. Both pumping tests were conducted as part of the baseline groundwater sampling for the HRC pilot-scale field test. Both tests consisted of extended pumping for approximately 2 to 3 hours after samples were collected at the low-flow sampling rate (0.6 liters/minute). In both cases the pump was placed at the bottom of the well to maximize available drawdown during pumping. A hydrograph of the SVE-2 pump test is presented on Figure 1. As shown on the hydrograph, the initial sampling flow rate was 0.6 liters/minute, and followed by higher flow rates of 3.0 liters/min, 3.3 liters/min, and 4.0 liters/min. Water levels continually decreased at the higher flow rates until the well was dry. Total drawdown was approximately 9.65 feet. After 15 minutes the water level recovered to within 1.8 feet of the (pre-pumping) static water level. The well was then pumped at a rate of 3.5 liter/min for 39 minutes until dry. No further pumping was performed.

Based on the short term pumping test on SVE-2 it is estimated that a flow rate of approximately 3.0 litters/min may be sustained from the perched zone. This converts to a flow rate of approximately 0.8 gallons per minute.

Similar flow rates and drawdowns were observed during the SVE-1 short-term pump test. However, this water level data is not available. For the remedial design it is recommended that a flow rate of 1 gallon per minute should be used for each dual phase extraction well. Additionally, the maximum depth of the well screen should not exceed 50 feet bgs. Deeper completion of the well screen may increase the hydraulic connection between the generally low yield perched zone and the "higher" yield shallow aquifer. Flowrates in excess of 30 gallons per minute were sustained in EW-1 and EW-2, which are screened in the shallow aquifer.

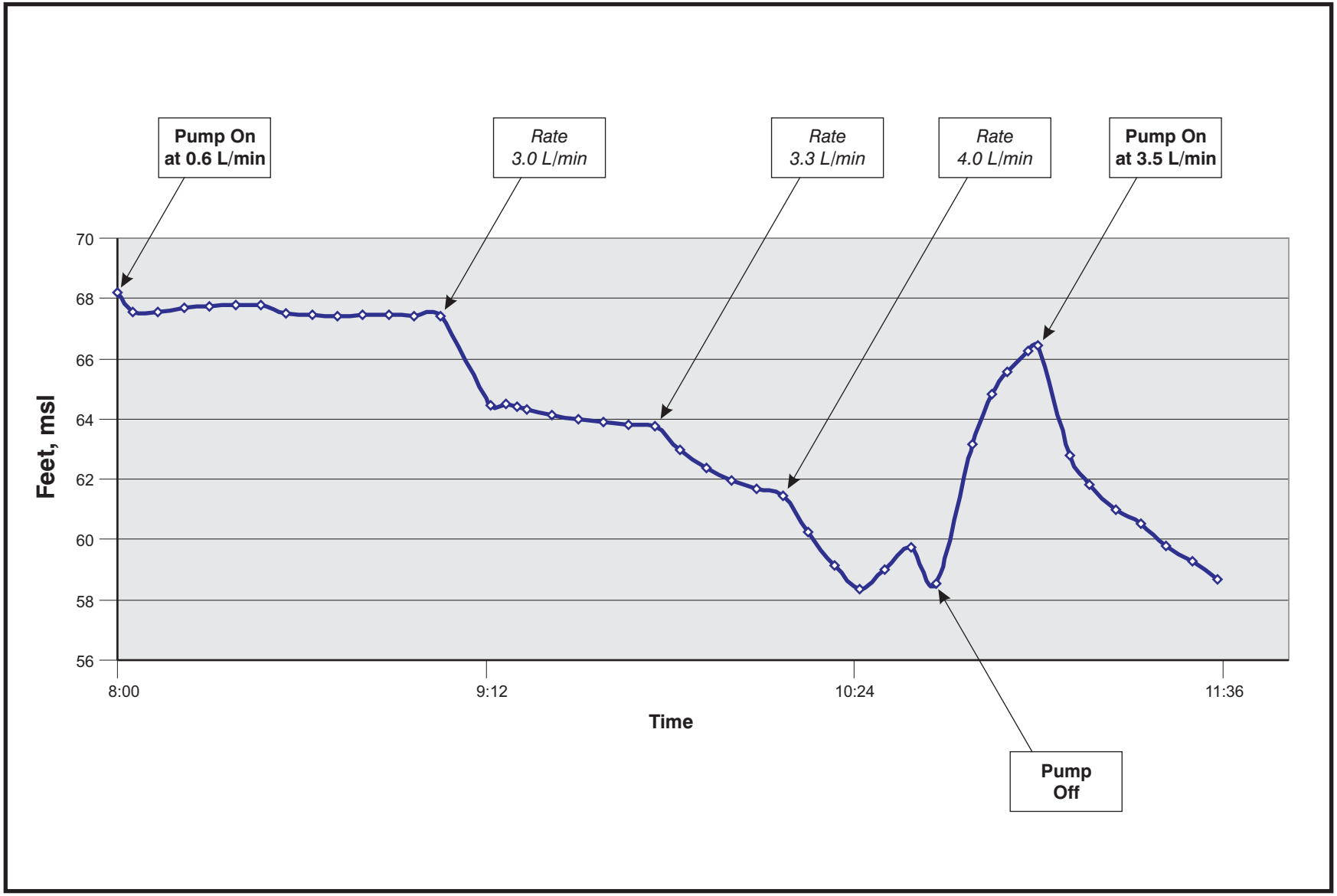

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Figure ?-?. SVE 2- Pump Test, Cooper Drum Company