

**A Comparison of Low Flow Pumping and Bailing  
for VOC Groundwater Sampling at Landfills**

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**Abstract**

The state of Wisconsin has more than 10,000 groundwater monitoring wells at landfills that will be sampled into the unforeseeable future.

Federal solid waste regulations that went into effect on October 9, 1994 banned field filtering of groundwater samples. The Wisconsin DNR groundwater sampling guidelines have recommended field filtering of inorganic samples since 1987. The U.S. EPA is questioning the use of bailers for sampling because of their potential to aerate the sample more and cause significantly more turbidity than using a low flow pump where the sample is withdrawn at less than 500 ml/min. In a study conducted from 1993 to 1994 DNR compared the use of low flow pumping to bailing and field filtering when sampling for metals. Our study found limitations to the use of the low flow pumping technique in some circumstances, such as sampling slowly-recovering wells. We recommended continuing to allow the use of bailers for sampling metals in some situations. As a follow up to that study, we have compared the results of VOC monitoring using a bailer to those using a low flow pump. This paper reports on the results of that follow up study.

We sampled nine monitoring wells at three landfills that had a history of VOC contamination. The wells were sampled using a low flow pump and bailer in the summer of 1994 and again in December of 1994 and January of 1995. Duplicates and rinse blanks were also collected at each sampling event. The low flow pump was connected to a flow-through chamber where pH, conductivity, dissolved oxygen, temperature, turbidity, and flow rate were measured continuously. Flow was kept as low and constant as possible by a pump controller and the sample was collected when all parameters had stabilized. The Wisconsin DNR groundwater sampling guidelines were followed for the bailer sampling. The effects of water table location relative to the well screen location as well as geologic environment and air temperature were also studied.

We did not find a significant difference between the VOC results collected using the low flow pumping and bailing technique. The results generally indicate only small differences between the methods. In addition, the method resulting in higher recovery of organic compounds differed, depending on the particular well, season, and compound. We investigated the difference in results based on characteristics of each compound such as Henry's law constant, although temperature did not appear to affect results consistently. Turbidity was the last parameter to stabilize in most cases. On average it took four times as long to set up, purge and sample a well and pack away the equipment when sampling with the low flow pump than it did using the bailer. The purging volume removed with the pump was half that removed using the bailer. Some problems were encountered when sampling in December and January using the low

**flow pump that may require some restrictions for the method or sampling schedule.**

**We reviewed the historical VOC data collected using bailers at Wisconsin landfills to determine how effective the data collected over the past ten years using a bailer have been in detecting groundwater contamination. We also investigated and compared the cost of the low flow pumping method with the bailing method.**