Reduced Variability In Groundwater Monitoring Results Using the TIGER™ Time-Integrated Groundwater Sampler

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Background/Objectives. For many environmental media (e.g., air, soil), the value of collecting samples integrated over time or space is widely recognized. However, currently accepted active and passive groundwater sampling methods rely on the collection of a single small volume of water from a monitoring well (i.e., a grab sample). We have developed a passive time-integrated groundwater (TIGER™) sampler for VOCs that combines an air-filled passive diffusion sampler with a sorbent-based passive vapor sampler. When the sampler is placed in a monitoring well, VOCs equilibrate between the groundwater and the air-filled sampler and then diffuse into the sorbent sampler at a rate proportional to the concentration in groundwater. The functionality of the sampler has been validated through laboratory and field testing.

Approach/Activities.
A primary advantage of the TIGER sampler compared to conventional water samples is expected to be a significant reduction in event-to-event monitoring variability. The variability in contaminant concentrations in 90-day time integrated samples should be much lower than that observed in conventional grab samples. To evaluate this, we deployed the TIGER™ sampler in 10 monitoring wells at a petroleum impacted site. We have completed three rounds of quarterly sampling using the TIGER™ sampler. For each round, a conventional grab sample was collected at the beginning and the end of the 90-day TIGER™ sampler deployment period. The results were used to compare event-to-event monitoring variability for these two sampling methods.

Results/Lessons Learned.
Benzene was detectable in water samples collected from nine of the 10 monitoring wells and in all 10 of the wells using the TIGER™ samplers. For eight of the nine wells where benzene was detected using both sampling methods, the event-to-event change in benzene concentration was lower for the TIGER™ samplers than for the conventional grab water samples. Although ethylbenzene was detectable in fewer of the monitoring wells, ethylbenzene concentrations were also less variable using the TIGER™. The results obtained demonstrate that the collection of time-integrated samples from groundwater monitoring wells can reduce event-to-event variability in contaminant concentrations. This reduction in variability will improve our ability to evaluate the longer-term contaminant concentration trends resulting in more accurate evaluation of remedy effectiveness and remedy completion.