



To Purge or Not to Purge? VOC Concentration Changes During Line Volume Purging

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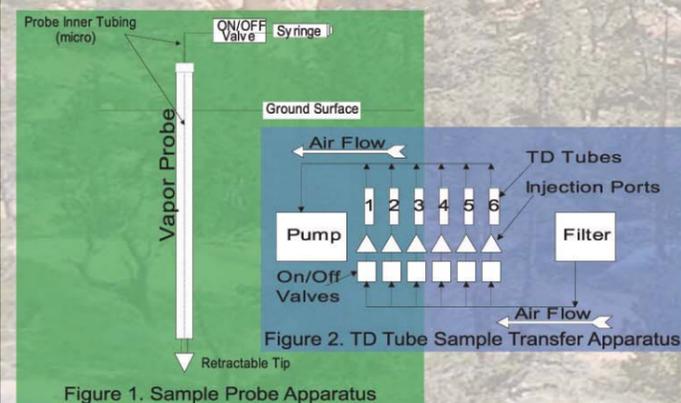
Introduction

Soil vapor surveys are commonly used as a screening technique to delineate volatile organic compound (VOC) contaminant plumes and provide information for soil sampling plans. If these surveys use inappropriate or imprecise sampling methodologies, then they can be a significant source of error. To ensure that 99% of the ambient air contained within the soil vapor probe sampling line is removed, three sampling line volumes are purged and the fourth is collected. This study is an effort to better understand and reduce the errors associated with the sampling of soil vapor for VOCs.

Methodology

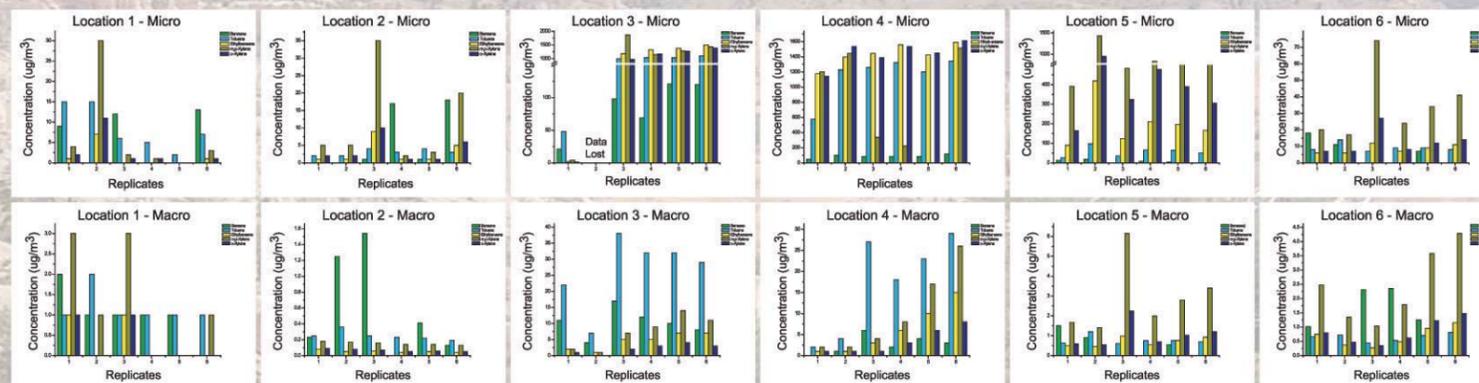
To investigate the above issue, multiple samples were collected at two hazardous waste sites. Two different methods, micro-volume and macro-volume, were used for active soil vapor collection. The micro-volume vapor sample had a total line purge volume of 1.25 mL (per Hewitt, 1998) and the macro-volume vapor sample had a total line purge volume of 15 mL (Geoprobe, 2003). A total of six replicate line purge volumes was collected for each vapor sampling technique. The fourth replicate represented the traditional sample used for site screening data. Each sample was collected using a gas tight syringe (Figures 1 and 2) and transferred to a thermal desorption (TD) tube (Pankow *et al.*, 1998) for transport and analysis.

Samples were stored chilled (4 °C) and analyzed using a modified version of EPA Method TO-17 (USEPA, 1997a) and quantified using the gas chromatography/mass spectrometry technique described in SW-846 Method 8260B (USEPA, 1997b).

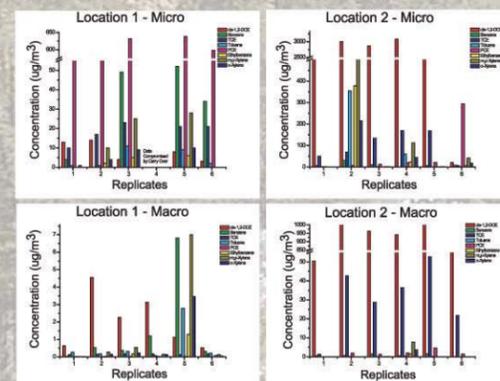


Data

Mare Island Site, detected compounds



Grants Site, detected compounds



Results and Discussion

In thirteen of the sixteen sampling locations/techniques, the data do not demonstrate significant variation of analyte concentrations with sequential purge volume replicates. The three that did show a variation of data with replication would have underestimated the VOC concentrations in the soil vapor if the results of the fourth replicate were used for decision making purposes.

The Mare Island Site was contaminated with Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) at concentrations ranging from < 1 ug/m³ to > 3000 ug/m³. Three of the six micro sampled locations showed a consistent concentration of contaminants following the first replicate. Locations 1 and 2 of the micro samples displayed a increase in contaminant concentration in the second or third, and sixth replicates and a decrease in concentrations in the fourth and fifth replicates. The final micro sample location had a slight increase in the third replicate followed by a decrease in the fourth replicate then increasing through the fifth and sixth replicate.

The Grants Site samples contained *cis*-1,2-Dichloroethene (*c*-1,2-DCE), Trichloroethene (TCE), Tetrachloroethene (PCE), and BTEX compounds at concentrations ranging from <1 ug/m³ to > 3000 ug/m³. Sampling location 1, micro, displayed a general increase in concentration through the fifth replicate. Sampling location 2, micro, displayed an increase through the first three replicates then a decrease in replicates 4 through 6. The macro replicates at location 1 showed a general increase in concentration through the fifth replicate, whereas at location 2, a consistent concentration of contaminants followed the first replicate.

At sampling location 6 at Mare Island and sampling location 1 at Grants, the micro and macro replicate samples displayed a general increase in concentration through the fifth replicate which was the only observable trend at either site between the micro and macro sampling techniques.

Summary and Conclusions

This study was conducted in an effort to better understand and reduce the errors associated with the collection of soil vapor for VOCs using standard sampling procedures. At several locations within each of the two sites, six sequential active soil vapor samples were collected with the micro (1.25 mL) and macro (15 mL) samplers. The samples were taken in gas-tight syringes and transferred to TD tubes for transport and analysis.

In a majority of the samples taken at each location and with each method, the data do not demonstrate significant variation of analyte concentrations with sequential purge volume replicates. This implies that the standard procedure of removal of three purge volumes prior to taking a sample for analysis would have resulted in data representative of these sites.

References

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Notice

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