

REPORT SUMMARY

This study examined leachate and lysimeter concentration data from 34 engineered landfills in Wisconsin. The particular objectives were to (1) examine which volatile organic compounds (VOCs) are most prevalent, (2) determine typical VOC concentrations, (3) examine if temporal trends in VOC concentration exist, (4) compare typical VOCs and VOC concentrations between leachate and lysimeter data, (5) compare VOC concentrations in the lysimeters of clay and composite lined landfills, and (6) compare relative concentrations from field data with those determined from analytical solutions. Landfills examined in this study were located through-out the state and were constructed using either a compacted clay or composite (compacted clay overlain by a geomembrane) liner. Data from landfills examined show that 5 main compound classes are present in both leachate and lysimeters (aromatic hydrocarbons, alkanes, alkenes, ketones, and furans). The concentrations of these compound classes ranged between 1 and 100 $\mu\text{g/L}$ in leachate and between 0.1 and 10 $\mu\text{g/L}$ in lysimeters for the aromatics, between 5 and 75 $\mu\text{g/L}$ in leachate and between 1 and 25 $\mu\text{g/L}$ in lysimeters for the alkanes and alkenes, and between 1 and 10,000 $\mu\text{g/L}$ in the leachate and between 1 and 1000 $\mu\text{g/L}$ in the lysimeters for the ketones and furans. Temporal trends were examined using linear regression analysis. Linear regression results suggest that 70% of the analyses for leachate data and 80% of the analyses for lysimeter data have no trend in concentration with time. ANOVAs comparing leachate concentration data based on the type of waste stream suggest that higher average VOC concentrations are present at landfills accepting MSW compared to those co-disposing of MSW and ISW. VOC concentrations in leachate were examined spatially and VOCs were determined to be detected more frequently and at higher average concentrations in the southeast region of

the state. Eleven VOCs were found in the lysimeters of both clay and composite lined landfills. Liner types were compared (clay vs. composite) using an analysis of variance (ANOVA). ANOVA results suggest that the concentrations were statistically no different between clay and composite lined landfills for 8 of the 11 VOCs. A solution to the advection diffusion equation (ADE) derived and presented by van Genuchten 1981 was used to predict contaminant transport through landfill liners. Results from the analytical solution under-predict the concentrations determined from field data for all of the compounds examined in this paper. VOCs are ubiquitous in landfill leachate and lysimeters and most VOC concentrations do not exhibit decreasing temporal trends. This study has shown that the potential for groundwater contamination from VOC migration remains a problem associated with both clay and composite lined landfills.