DAAccent...*to Local and State Governments*

A Publication of **Draper Aden Associates** December 2002

Monitored Natural Attenuation (MNA):
Effective and Efficient Groundwater Corrective Action

Introduction and Identification of Problem

Leachate produced by municipal solid waste landfills can release solid waste components into groundwater. The impact to groundwater from municipal landfills typically presents low-level, but long-term risks to human health and the environment. Active remediation technologies (e.g., pump and treat) have proven to be limited in their effectiveness to provide groundwater quality remediation. Municipal solid waste landfills in Virginia are publicly owned and have limited financial resources that are strained under corrective action programs. Cost-effective methods to address leaking landfills will redirect local government funding to areas that promote progressive and sustainable programs. Natural attenuation, coupled with source control, risk management and long-term monitoring can provide cost-effective corrective action at landfills.

State of the Science for Natural Attenuation at Landfills

Natural attenuation of polluted groundwater at UST sites, industrial sites and military installations is documented in the professional literature. However, documentation for landfills is quite limited. Gaining regulatory and public acceptance of natural attenuation requires compelling evidence that biologically mediated mass reduction (i.e., intrinsic bioremediation) is taking place in the polluted aquifer.

Cost-effective methods…. will redirect local government funding to areas that promote progressive and sustainable programs.

To be considered a workable option for groundwater corrective action, natural attenuation processes must remove pollutant mass from groundwater, or transform pollutants to less toxic substances. This is in order to be protective of human health and the environment. The components of natural attenuation include hydrodynamic processes (dilution, dispersion), chemicophysical processes (precipitation, chemical transformation, volatilization) and biologically mediated reactions (i.e., intrinsic bioremediation).

Monitored natural attenuation allows for a more natural solution to landfill groundwater mitigation.

Biologically mediated reactions are the primary means for pollutant destruction and transformation under natural attenuation scenarios. As these complex bio-reactions occur, they produce a distinct chemical signature within the leachate-plume. This "footprint" can be identified and used to justify MNA as a viable groundwater remedy. In fact, the EPA Science Advisory Board recently determined that MNA may be selected as corrective action at Superfund, RCRA and UST sites when cause-and-effect relationships between pollutant loss and a natural attenuation "footprint" are documented.

Documenting Natural Attenuation Processes

Assessing a landfill's effect on groundwater can be very complicated and expensive, due to large volumes of a diverse mix of waste distributed over multi-acre sites with significant hydrogeologic variations. Accurate measurement is needed to gain public and regulatory approval for cost-effective corrective action programs at landfills that are based upon monitored natural attenuation. The collection and interpretation of the proper data can provide a cost-effective demonstration of intrinsic bioremediation and justifies MNA as the selected remedy for a landfill.

Draper Aden Associates
Engineering ♦ Surveying ♦ Environmental Services

2206 South Main Street
Blacksburg, Virginia 24073

Survey Results Reflect Current Solid Waste Rates

Recently the Virginia Department of Environmental Quality sent out a survey to localities requesting information about the waste management services provided to their citizens. The DEQ received responses from 65 counties, cities and towns representing all regions of the state. The data gathered by the questionnaire will assist policy-makers in evaluating the impact of a surcharge fee on Virginia's local governments.

The municipalities were asked to provide the current rates per ton for the solid waste management services they provide. The following table displays the range of rates charged as well as the average rate per ton charged for services. The average rate per ton has been rounded to the nearest dollar.

	Collection ($/ton)	**Transfer ($/ton)**	**Disposal (Gate Fee) ($/ton)**	**Waste-to-Energy (Gate Fee) ($/ton)**	**Total reported by locality ($/ton)**
Household Waste	range- $42.77- $61.12 avg.-$55	range- $10.50-$50 avg.-$38	range-$21-$61 avg.-$41	range-$39.95-$61.12 avg.-$49	range-$23.50-$122.33 avg.-$52
Commercial Waste	range- $15-$60 avg.-$34	range- $25-$60 avg.-$44	range- $30-$60 avg.- $43	range-$36-$50 avg.-$43	range- $15-$60 avg.-$41
CDD	$28	range- $15-$55 avg.-$40	range- $25-80 avg.- $41	range-$39.95-$45 avg.-$42	range- $25-$50 avg.-$39
Yard Waste			range-$21.60-$80 avg.-$46		range-$31.70-$97 avg.-$64
Industrial Waste			$32		range-$31.70-$32 avg.-$32
Tires			range- $40-$75 avg.-$59		range $51-$89 avg.-$70

Of the localities responding to the funding source questions, 40% said waste management services were funded by a utility fee for both residential and commercial users. Sixty percent use general funds. A gate or disposal fee was used for residential services by 29% of the responders while 58% used a gate fee for commercial services. Four percent were funded by host fees according to survey participants.

For more information about the results of this survey contact Karen Frahm (krfrahm@deq.state.va.us) at the DEQ at (804) 698-4376.

Draper Aden Associates
Engineering ♦ Surveying ♦ Environmental Services

Corporate Offices: 2206 South Main Street
Blacksburg, VA 24060
(540) 552-0444
Fax: (540) 552-0291
www.daa.com

Blacksburg, VA (540) 552-0444
Richmond, VA (804) 264-2228
Charlottesville, VA (434) 295-0700
Raleigh/Durham, NC (919) 367-9997
daa@daa.com