

## **Wet Cell Versus Dry Tomb: Pay a Little Now or More Later**

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While today 's MSW is less hazardous than what used to go into landfills, it still contains chemicals that may pose threats to the environment for years to come.

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In the past, the "cheapest" methods available were used to manage solid non-hazardous and hazardous waste. Now, with cradle-to-grave liability, many agencies and landfill owners are more critically evaluating near- and long-term liabilities and costs of the various options for handling, disposal, and on-going management of solid and liquid wastes. Recycling and reuse of wastes, coupled with reduction of residues to an inert status is the most desirable outcome. However, most waste management programs involve some landfilling of wastes and treated residues. While claims are made about the environmental protection afforded by modern landfills as prescribed by EPA in Subtitles C and D, the technical deficiencies in the so called "dry tomb" approach to landfilling are a concern to many in the industry. The disposal of wastes carries a significant and perpetual liability for cleaning up contaminated groundwater and eventually the potential for Superfund-like activities for waste removal, site remediation, and proper management. Recycling and reuse can reduce long-term liability but waste residues and their treatment can create or extend the period of exposure.

New Subtitle D regulations prescribe a "dry tomb" landfilling approach in which untreated MSW is placed in plastic sheeting- and compacted soil lined landfills to isolate the wastes from water as long as the wastes are a threat. Evaluation of the systems relative to physical, chemical, and biological processes, and the nature of the materials placed in them shows the "dry tomb" landfilling approach is a flawed technology that will not protect the public health or groundwater and air resources under and above the landfill and adjacent properties. At best, it will postpone the leakage of leachate and gas, adversely affecting public health and environmental quality.

MSW in a "dry tomb" landfill will threaten public health, groundwater, and the environment indefinitely. The effectiveness of Subtitle D landfill liner systems in preventing leachate migration is compromised after installation and will deteriorate over time, allowing increasing amounts of leachate to pass through the liner into the groundwater system hydraulically connected to the bottom of the landfill.

EPA and states' Subtitle D groundwater monitoring approach of using vertical monitoring wells, spaced 100s to 1,000 or more feet apart, is inadequate for detecting incipient groundwater pollution from lined landfills. Unlike leakage from unlined landfills in homogeneous hydrological settings, the initial leakage from plastic sheeting-lined Subtitle D landfills will be through holes, tears, or imperfections in the sheeting. Such point-source leakage results in the

emanation of "fingers" of leachate-contaminated groundwater that are a few feet wide. Vertical monitoring wells have effective zones of capture of leachate-contaminated groundwater of only about one foot around the wells. Such wide spacing of wells will not detect groundwater pollution, much less incipient landfill leakage, before widespread groundwater pollution has occurred.

While classical unlined sanitary landfills are known to release hazardous and otherwise deleterious chemicals to near-by groundwater via leachate and landfill gas (LFG), threatening public health, little quantitative information exists on the total hazard that landfills represent to those who live on or use properties near the landfill. Epidemiological studies of the "exposed" populations near landfills and Superfund sites have not detected a clearly discernible increase in the incidence of cancer. This finding is not surprising; epidemiological methods are not sensitive enough to detect small increases in cancer incidence in limited populations over the normal lifetime cancer risk for the US population, one cancer in three people.

Aside from its hazardous constituents, leachate may contain a variety of conventional pollutants that render groundwater unusable or undesirable because of tastes and odors, or that reduce the service life of appliances and fabric. Furthermore, both LFG and leachate may contain organic chemicals that have not been characterized in relation to public health or other hazards. These "non-conventional pollutants" include more than 95% of the organics in MSW leachate.

There are more than 65,000 chemicals in US commerce today, with 1,000 new chemicals added to the list each year. Only about 200 are regulated and measured in studies of MSW landfill leachate contamination. Given the high concentration of MSW landfill leachate, the unknown character and hazard of many organics in MSW leachate, and the relatively short list of regulated chemicals, groundwater meeting maximum contaminant levels should not be assumed safe to drink. Furthermore, once groundwater is contaminated by MSW landfill leachate of the type produced in today's Subtitle D landfills, it and the associated aquifer cannot be cleansed to render water considered reliable for consumption and other uses. The contaminated portion of the aquifer must be abandoned for use as a domestic water supply source and for conjunctive use storage of surplus surface waters during drought periods. It is prudent public health and water resource management policy to assume that any contamination of groundwater by MSW landfill leachate represents a significant threat to public health and the environment and should cause termination of the use of the water for domestic water supply purposes.

LFG emissions contain chemicals detrimental to nearby property owners and users. They pose a threat of explosions in enclosed structures and contribute to the inventory of greenhouse gases. Both methane and CO<sub>2</sub> in LFG can be detrimental to vegetation on the landfill cover. Obnoxious odors also can persist over great distances.

RCRA set forth a minimum post-closure care period of 30 years. That period also was used by EPA in implementing Subtitle D regulations. However, 30 years is an imperceptibly small and insignificant part of the total time that MSW in Subtitle D "dry tomb" landfills will be a threat. Insufficient funds are being collected from waste generators and set aside to meet the inevitable and perhaps unlimited needs for post-closure care, monitoring, and maintenance, as well as ground-water and landfill remediation for Subtitle D landfills. The Subtitle D landfilling

approach and requirements are superficial and only serve as stop-gap measures for managing MSW. They enable today's society to continue to enjoy solid waste "disposal" without the responsibility and expense of preventing future problems.

Contrary to claims made by EPA in implementing Subtitle D landfill regulations in October 1991, Subtitle D landfill requirements do not address the "NIMBY" issues associated with the active life of landfills or the post-closure care impacts on those who own or use properties within several miles of the landfills. In not recognizing the potential significance of non-conventional pollutants, the processes within the landfills, the limitations of the liner systems and monitoring approaches, and the perpetual threat of contaminants in landfills, neither federal nor state regulations address the issues of the threat. Since Subtitle D landfills only postpone groundwater pollution - and for many landfills, gas emission problems - they do not significantly alleviate the threat of LFG and leachate to those who own or use properties within the sphere of influence of the landfill. The "dry tomb" landfilling approach should be recognized as "temporary" storage for MSW that ultimately will require exhumation and treatment of the wastes, unless groundwaters hydraulically connected to them are to be abandoned as water resources.

Alternatives to EPA Subtitle D "dry tomb" landfills are available to address both the near-term and long-term threats. The additional costs are insignificant compared to the long-term costs that will have to be paid by future generations. One alternative is a fermentation/leaching "wet-cell" approach that includes the recycling of landfill leachate in a double composite-lined landfill containing shredded MSW followed by a decade or so of clean-water washing (leaching) of the solid waste to produce non-polluting residues. The lower composite "liner" serves not for last-resort containment, but as a lysimeter leak detection system for the upper-composite liner. Associated with this waste treatment/management concept is the set-aside of sufficient funding in a dedicated trust fund derived from increased disposal fees to exhume the wastes when leakage through the upper composite liner cannot be stopped. To address justifiable active-life concerns and problems, it is necessary that the landfill be sited with an adequate landfill owner-owned land buffer of at least one mile. The landfill buffer would be used to dilute the adverse impacts of the landfill - odors, seagulls, etc.- that occur with today's landfilling operations. The estimated initial cost of this approach is about 10 to 15 cents/person/day more than that paid for MSW management in Subtitle D landfills. Expenditures of this amount not only will address justifiable NIMBY issues, but also will significantly improve the protection of future generations from adverse impacts of gaseous and leachate emissions.

References as:

Lee, G. F. and Jones-Lee, A., "Wet Cell Versus Dry Tomb: Pay a Little Now or More Later," MSW Management 5:70,72 (1995).