FACT SHEET

L-1148

COMPUTING SANITARY LANDFILL CAPACITIES

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To most communities in Texas, sanitary landfills represent the only practical and environmentally acceptable means of solid waste disposal. A sanitary landfill has been defined as an engineered land disposal facility at which solid waste is spread in thin layers, compacted to the smallest practical volume and covered with soil each operating day in a manner that minimizes environmental hazards.

Potential or existing sites for sanitary landfills should have ample capacity to meet the needs of the community for several years to come. This enables local officials to prepare orderly plans for the acquisition and use of land and to optimize other components of the solid waste management system (e.g. collection, transportation, processing) to achieve greatest efficiency. Thus, the calculation of required or remaining sanitary landfill capacity is an essential planning step.

To facilitate computations of this nature, the nomographs in figures 1 and 2 were developed. The use of these nomographs in determining sanitary landfill capacity is illustrated by the following examples:

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Required Landfill Surface Area (Example 1)

Determine the surface area requirement for a proposed sanitary landfill assuming the following conditions:

- Population served (P) = 62,000
- Per capita solid waste collection rate (G) = 5.0 pounds per capita per day

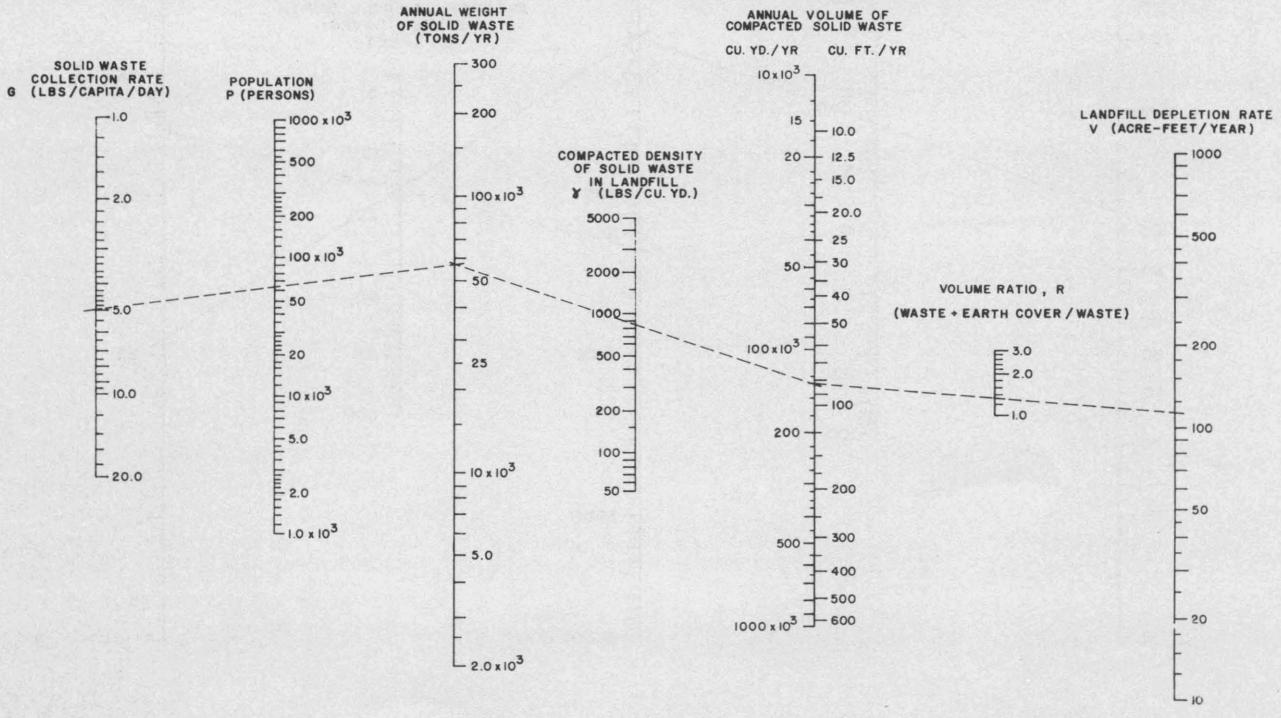

FIGURE 1. NOMOGRAPH FOR CALCULATING DEPLETION RATE OF SANITARY LANDFILL VOLUME

- Compacted solid waste density on a wet basis (γ) = 850 pounds per cubic yard
- Landfill life (Y) = 10 years
- Average depth of sanitary landfill including solid waste plus cover material (D) = 15 feet
- Ratio of the combined volumes of compacted solid waste and cover material to the volume of compacted cover material (R) = 1.33

Proceed from left to right on figure 1. A straight line connecting the given values of waste collection rate (G) and population (P) indicates an annual collection of 56,500 tons of solid waste. A line through this value and the landfill density (γ) of 850 pounds per cubic yard gives a compacted solid waste volume of 135,000 cubic yards per year, or 83 acre-feet per year. Finally, extending a line from this value through R (1.33) results in a projected landfill depletion rate (V) of 110 acre-feet per year.

Continuing on figure 2, a straight line through V (110 acre-feet per year) and landfill life (Y) of 10 years bisects the landfill capacity scale at 1100 acre-feet. In a similar fashion, dividing graphically by the assumed landfill depth (D) of 15 feet reveals that the requisite landfill surface area (A) is 73 acres. Allow additional space for installation of roads, fences, scales, shelter and other ancillary facilities.

Remaining Landfill Life (Example 2)

The remaining life of a sanitary landfill already in use can be determined from known values of landfill depletion rate (from figure 1), depth and surface area. To illustrate, assume that only 22 acres of the original 73-acre site determined above remain unused after 7 years of operation. The values of G, P and R previously assumed are retained so that the landfill depletion rate V remains at 110 acre-feet per year.

Working from right to left on figure 2, a straight line projected from A (22 acres) through D (15 feet) results in a landfill capacity of about 320 acre-feet. Connecting this value with V (110 acre-feet) determines Y, the remaining site life, of only 2.9 years.

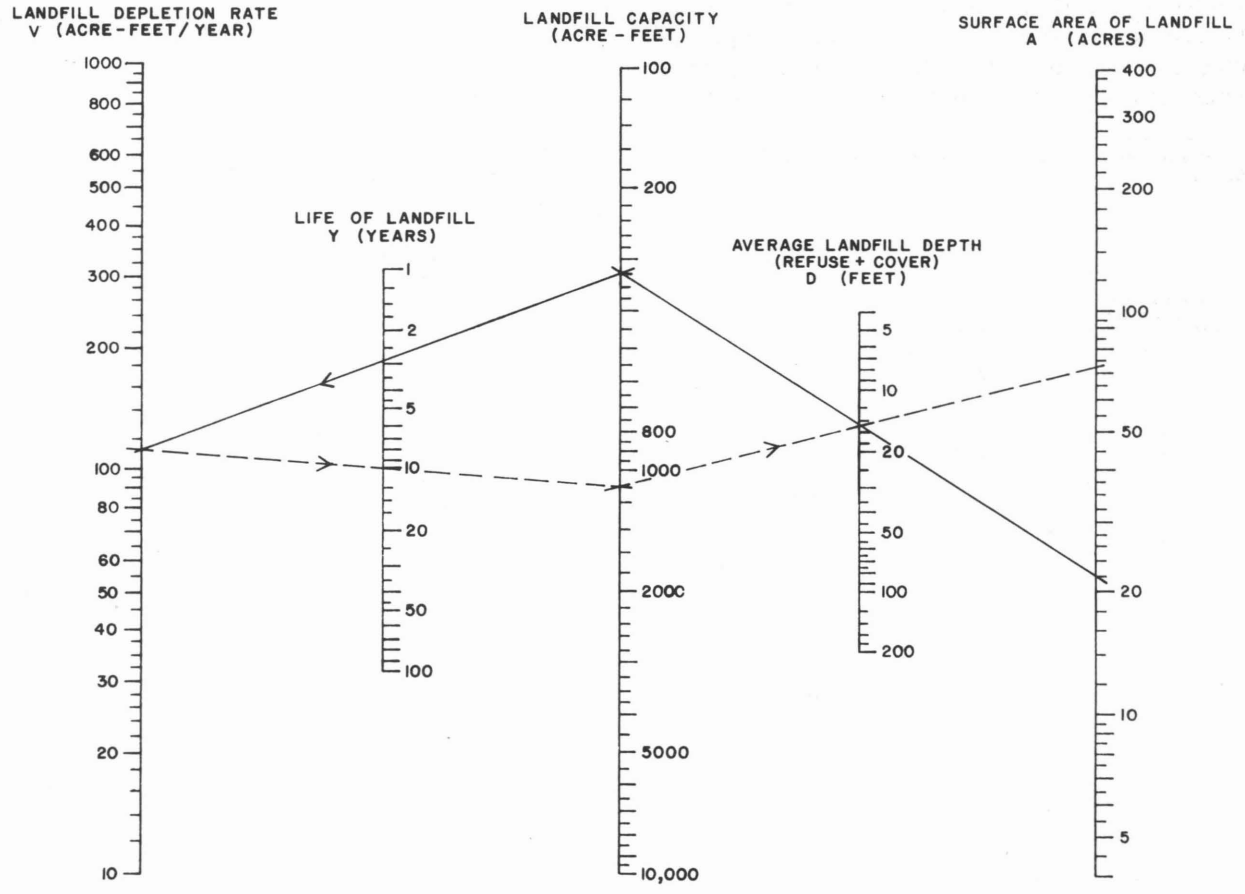

FIGURE 2. NOMOGRAPH FOR COMPUTING LANDFILL AREA REQUIREMENTS AND REMAINING SITE LIFE

General Application of Nomographs

Nomographs are useful for estimating capacities of existing or proposed sanitary landfills in terms of remaining useful life and capacity requirements. Also, effects of changes in landfill design and operating procedure can be determined readily.

The nomographs were derived from the following fomulas, in which the symbols were previously defined:

Rate of depletion of sanitary landfill volume

$$V = \frac{0.226\,G\,R\,P}{\gamma}$$

Sanitary landfill capacity

$$A = \frac{V\,Y}{D} \text{ or } Y = \frac{A\,D}{V}$$

Regulatory Considerations

Sanitary landfills provide the only acceptable land disposal of municipal solid wastes in Texas. The design and operation of sanitary landfills receiving municipal solid wastes should be in accordance with regulations established by the Texas State Department of Health. Industrial and agricultural solid wastes are under the jurisdiction of the Texas Water Quality Board. The state standards and regulations for air and water pollution abatement, administered by the Texas Air Control Board and the Texas Water Quality Board, respectively, also apply to solid waste disposal operations. If sanitary landfills are operated in accordance with recommended Federal guidelines issued by the U.S. Environmental Protection Agency, air and water pollution problems should be insignificant in most cases.

Acknowledgment

Appreciation is given to the staff of the Office of Solid Waste Management Programs, U.S. Environmental Protection Agency, Cincinnati, Ohio, for which the author was serving as sanitary engineer during preparation of this publication.

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Cooperative Extension Work in Agriculture and Home Economics, The Texas A&M University System and the United States Department of Agriculture cooperating. Distributed in furth ance of the Acts of Congress of May 8, 1914, as amended, and June 30, 1914.
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