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SHORT COMMUNICATION

Selecting the Best Site for a Sanitary Landfill

FAUSTINO P. VILLAMAYOR*

Department of Agronomy and Soil Science
Visayas State College of Agriculture
Baybay, Leyte 6521-A

Sanitary landfill is an excavated trench about 5 meters deep where garbage are dumped, compacted and covered with a thin layer of soil. It is a very efficient way of disposing garbage. However their establishment is being prevented by fears of air and groundwater pollution and spread of diseases by insects inhabiting the sanitary landfill. This paper discusses the requirements for the selection of the site for a sanitary landfill so such fears can be avoided.

Soils for a sanitary landfill should have a soil layer with saturated hydraulic conductivity of 1 to 2" per hour and no bedrock or water table at 1.3 m. below trench bottom. The soil should have <25% gravel ,<25% slope, loamy, pH 5.5-7.9 and does not experience flooding. The site should also be at least 8 kms. from residences.

Garbage is a big problem in towns and cities. In some cases they are dumped in rivers which cause their pollution or clogging, or to the sea causing pollution of beaches, or to areas near roads where passers-by can smell the foul odor. Clogged rivers cause flooding as run-off can not be discharged to the ocean or any wetlands. Garbage also cause the spread of diseases that can be transmitted by insects coming from garbage and from drinking contaminated groundwater

A good way to dispose garbage is to construct a compost pit , where garbage can be dumped. However, in big towns and cities, garbage can be collected using trucks and dumped in a sanitary landfill or dumpsite. A sanitary landfill is an excavated trench about five meters deep whereby a refuse or solid waste is spread, compacted and covered with a thin layer of excavated soil daily. It is an efficient and healthy waste management program.

The San Mateo landfill where garbage in Metro Manila are dumped will definitely close by 2001 (Manila Bulletin, July 23,1999). Other sanitary landfills should be built to receive wastes from Metro Manila and on many towns and cities without them.

*Corresponding author: f_villamayor@yahoo.com

Sanitary landfills are very useful for waste management, but there are many fears related to their establishment. Some of them are the possibility of polluting the groundwater with disease causing microbes and products of garbage decomposition or leachate and deposition of garbage to low lying areas if the sanitary landfill is eroded.

These fears can be prevented if a sanitary landfill is located on a best site for it. This article will deal on how a best site for sanitary landfill can be selected using the criteria modified from the National Soils Handbook, Part II (Soil Survey Staff, 1978).

Major considerations and values of important soil properties of a site suitable for sanitary landfill

The site for the sanitary landfill should be suitable for it. Some of the major considerations in the selection of a suitable site for a sanitary landfill and the soil properties important in each consideration are as follows:

Risk of pollution

The leachates or solutions coming from the

decomposition of garbage can pollute the groundwater. They should adequately stay in the soil so they can be purified by soil microorganisms and filtered by the soil. The soil properties to be considered in eliminating the risk of pollution are:

- depth of the soil. There must be about 1.3 m of soil below the trench bottom. Such soil should have a saturated hydraulic conductivity of about 1-2 inches per hour. This value means that water applied on a saturated soil moves downward at the rate of 1-2 inches in one hour. This rate would allow the leachate to stay for a long time in the soil enough to be purified by the microorganisms and filtered by the soil.
- absence of fissured bedrock. There must be no bedrock below the trench bottom. Such bedrock will prevent the downward movement of leachate hence they will accumulate on the trench and would seep sideward of the sanitary landfill.
- presence of water table. Water table should be about 1.3 m. below the trench bottom. The depth of the water table below the soil surface corresponds to the depth where redoximorphic features or soils with mottled color due to saturation with water for some period of the year occurs. The water table can be polluted if it is near the trench bottom.
- slope. Slope should not be more than 25% to prevent soil erosion. Soil on a sanitary landfill present on the soil with more than 25% slope can be eroded causing the deposition of garbage and movement of leachate to the lowland.
- location. The proposed sanitary landfill should be about 8 kms. away from residential areas. This is necessary as foul odor and insects coming from the sanitary landfill can affect the health of people near the sanitary landfill. Residents may also be disturbed by the trucks or other vehicles delivering the garbage to the sanitary landfill.

Ease of excavation

A trench of about 5 m or less is dug in establishing a sanitary landfill. The site for a sanitary landfill should be easily excavated. The soil factors affecting the ease of excavation are:

- presence of bedrock within the proposed trench. The bedrock is difficult to dig so sites with bedrock within 5 m from the surface is unsuitable.
- wet consistence and coarse fragments of the soil within the proposed trench. Very plastic and very sticky soils, and gravelly (35-60% by volume of gravel) to very gravelly soils (>60% by volume of gravel) are difficult to excavate and so are unsuitable.

Trafficability

Garbage will be delivered to the sanitary landfill using vehicles. The area should then be accesible. The accesibility of an area is affected by:

- slope. The area being proposed as sanitary landfill should not have a slope >25 %. The sanitary landfill is inaccessible if the slope is >25%.
- Flooding hazard. The area should not be flooded as traffiicability will be hard. Garbage will also be carried to other places if flooding occurs.

Ease of revegetation of the area

A sanitary landfill once filled up is covered by at least two feet of soil. Such soil usually comes from the soil excavated from the trench. The soil used for covering should be favorable for plant growth so that the sanitary landfill can be easily revegetated. Among the soil properties important in considering the ease of revegetation are.

- pH. The soil where sanitary landfill is being proposed should have a pH 5.0-7.9. Plants will have difficulty in growing on soils with pH not within the range.
- Texture. Sandy soils are not suitable as they are less fertile and with poor waterholding capacity and nutrient content. Clayey soils are also not suitable as they have poor drainage and are difficult to spread over a layer of garbage. Loam, silt loam and sandy loam soils are best for sanitary landfill as they have desirable physical and chemical properties.

Summary and Recommendations

Sanitary landfill is a good way to dispose garbage from towns and cities. Fears regarding the establishment of a sanitary landfill can be avoided if such landfill is built on a soil best suited for it. Such soil should have the following properties:

1. presence of soil layer with saturated hydraulic conductivity of 1-2 inches per hour at 1.3 m. below the proposed trench bottom.
2. absence of bedrock and water at 1.3 m or shallower from the trench bottom.
3. absence of water table at 1.3 m or shallower from the trench bottom.
4. non-plastic, plastic, sticky, non-sticky and gravelly, very gravelly and extremely gravelly (>30% gravel) soils within the proposed trench.
5. slope <25%
6. no flooding hazard
7. pH 5.0-7.9

8. loamy soils
9. far, about 8 kms. away from residential areas.

The above requirements are needed to avoid pollution of groundwater, erosion of soils and deposition of garbage to lowlying areas. They are also needed so that the area can be easily dug or prepared, and revegetated when the sanitary landfill is filled up. Foul odors and insects coming from the sanitary landfill and disturbance of residents near sanitary landfills can also be avoided.

A soil scientist can help determine the suitability of the area for a sanitary landfill. He needs to visit the proposed area, dig the area to a depth of 7 m. and then examine the properties needed for declaring the suitability of the soil for sanitary landfill.

It is important that the garbage be covered with a thin layer of soil after every deposit of garbage. This will minimize foul odor and the harboring of insects. It is also important that only biodegradable items be thrown to the sanitary landfill so as to increase its life span. In countries such as the United States, no fee for garbage collection is charged for recyclable items such as papers, glass and plastic containers.

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