BUSH TECH #13

Choosing a landfilling method

The trench method of landfilling represents good value for money for arid regions. It is not suitable for tropical regions, where the waste should be desposited in above-ground cells.

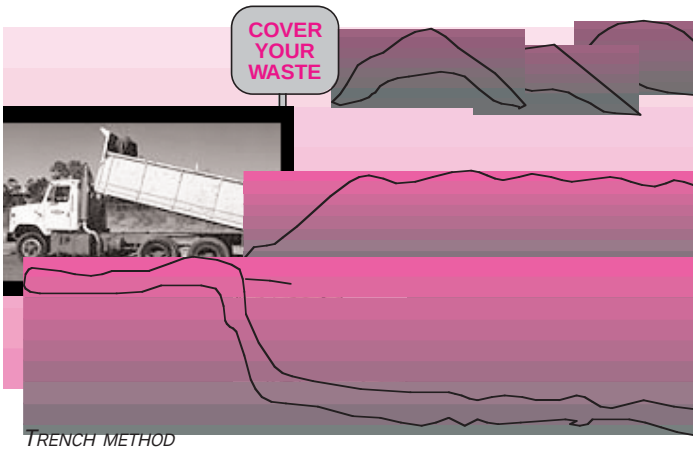
Waste management represents a significant cost to many communities. It can impact on your ability to care for your country and poor waste management can make you ill. Before designing a new landfill, the community will need to decide which method of landfilling is the best for their community.

Three types of landfill

The three main methods of landfilling are the trench method, the area method and the cell method.

Trench method

If you dig a long and narrow trough, ditch or channel in the ground, bury your waste in it and cover it over with soil then you are using the trench method. The trench method is very cost effective for desert regions. Soil excavated from the digging of the trench can be used as a cover material, so you don't have to pay for imported fill from another site, nor do you have to go to the trouble of collecting it. Why do you need a cover material? It will help control disease and odours, reduce the possibility for fires and discourage vermin such as rats and mice. The diagram below illustrates the trench method of landfilling.



Trench method

Advantages and disadvantages

The trench method is very simple and cost-effective. However, it is most suitable for use for very small communities (< 500 people) in desert regions with very low rainfall. In the Top End, or other areas which have high rainfall and are subject to flooding, the trenches would quickly fill with water and overflow, causing waste to be spread all over the community.

A major advantage of the trench method is that the waste can be easily compacted in a trench, without the need for expensive and specialised waste compaction equipment. Ideally you might use a backhoe or front-end loader. Otherwise, you can simply use a spade. Compacting the waste saves space in the landfill. Also and more importantly, compacting will prevent subsidence, both during the use of the landfill, when a CDEP worker is walking across it, or later, when the site has been converted into a football field. Subsidence is dangerous – someone may fall into a hole.

The trench method of landfilling also is useful for a gently sloping site, as it reduces the need for expensive and time-consuming cut and fill work to flatten the site. A trench landfill can be designed with the trenches dug horizontally along the contour. When the landfill is in use the trenches are filled sequentially from the top of the slope to the bottom.

Trenches can only be dug on a site that has soil which is easily excavated. Rocky or stony sites do not easily lend themselves to the trench method of landfilling. Size of the trenches in a trench landfill is about 50 metres long x 2.5 metres deep x 6 metres wide, or at least twice the width of the blade of the machine that will be used for dumping, pushing and compacting the waste.

Area fill method

For larger communities or sites that are susceptible to flooding, stony or rocky, the area fill method is useful. For this method, the waste is entirely above ground. Usually a flat area is used and the waste is deposited and then compacted so that it is not more than two metres above the ground. Sometimes you can take advantage of a natural depression or low area in the ground, filling it with rubbish and then bringing it up to the same height as the surrounding land area. This can be especially useful if you are planning to use the site as a football field when the tip is full of rubbish and finished.

Waste deposited using the area fill method needs just as much cover material as waste that has been deposited in a trench; i.e. at least 150mm.

The place where the waste is deposited, known as the 'active face', should be at right angles to the direction of the prevailing wind, so that litter will not be blown around. Usually, waste is deposited in layers of about one metre. If there is a natural depression there may be many layers. If the landfill is built on flat ground then there usually will be only two layers. Each layer is

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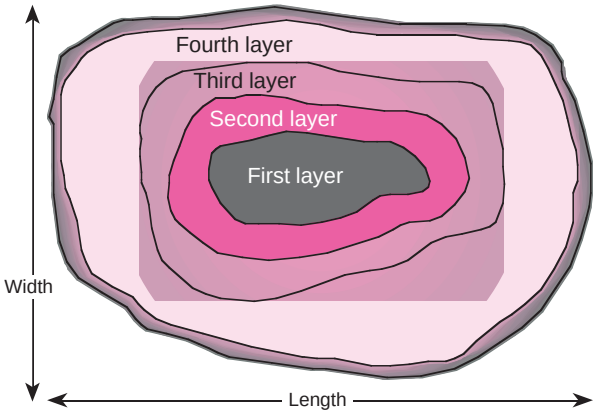
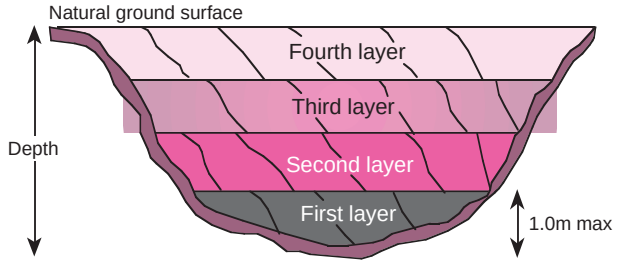
Choosing a landfilling method (continued)



AREA LANDFILL METHOD – TOP VIEW



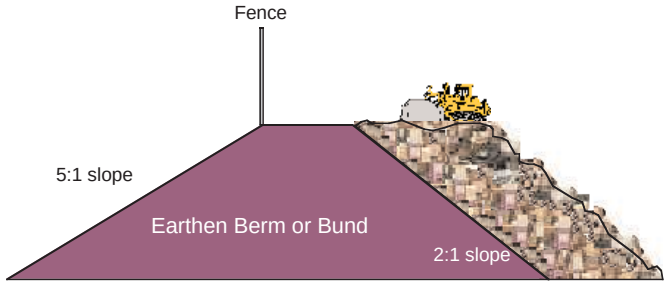
AREA LANDFILL METHOD – SIDE VIEW

made up of smaller quantities of waste that are known as 'cells'.

If the area method is to be used for a very large community (1,000 or more people), it will be necessary to protect the groundwater. This will mean lining the bottom of the landfill with well-compacted clay. If there is no clay available, it may be necessary to use a high-tech geotextile liner.

Cell method

The cell method is a variation of the area method. It is similar to the area method in that the waste is deposited directly on top of the ground without the need for excavating trenches. However a bund wall (or berm) of earth is made and the waste is pushed up against this. This bund wall prevents stormwater from running onto the waste and diverts it away from the landfill. The cell method is useful for larger communities and stony sites, and is the best method for flood-prone areas.



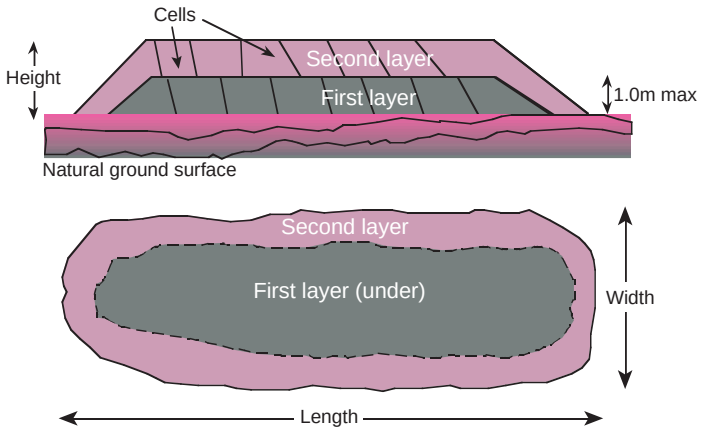
BUND OR BERM ON THE EDGES OF A CELL LANDFILL

As with the area fill method, a large quantity of fill material will have to be imported if the cell method of landfilling is used. In fact an even larger quantity is needed so that the bund or berm can be constructed.

When a bund is constructed, it should be built up to the height of the finished landfill. As illustrated above, there should be a flat section on top of the grade which should be at least the same width as the backhoe or other earthmoving machinery which will be used to cover the waste. The outside of the berm should be compacted very firmly to ensure that soil erosion does not occur. The slope of the outside of the bund should be 5:1 as shown in the diagram.

Drainage should be considered to ensure that water does not pool up behind the bund and stagnate; e.g. by constructing or leaving a gap at the lowest point of the affected area. If fill material is scarce or expensive it is possible to build the bund out of compacted waste. The waste should be covered over with a layer of soil.

When adding waste to the landfill, it should be built up in layers of approximately one metre in height as illustrated in the diagram below.



CELL LANDFILL METHOD – SIDE & TOP VIEW

When the landfill is full of waste and has reached its final design height, it should be compacted with a spade or, preferably, a backhoe, and covered with at least 300mm of soil.

The right choice of landfill method for the site conditions and community size can substantially reduce the costs associated with designing and operating a landfill. For more information, please telephone CAT on 08 8951 4311.

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Links

Guidelines for the siting, design and management of solid waste disposal sites in the Northern Territory,
http://www.lpe.nt.gov.au/enviro/poldoc/landfill/landfill.pdf

Designing a Landfill – Water for the world,
http://www.lifewater.org/wfw/san3/san3d1.pdf

Panamerican Health Organisation – Landfilling Principles,
http://www.cepis.ops-oms.org/muwww/fulltext/repind49/lesson2/lesson2.html