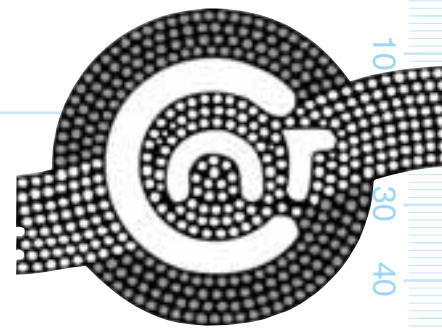


Landfill design



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THE TRENCH METHOD OF LANDFILLING REPRESENTS GOOD VALUE FOR MONEY FOR ARID REGIONS. IT IS NOT SUITABLE FOR TROPICAL REGIONS, WHERE WASTE SHOULD BE DEPOSITED IN ABOVE-GROUND CELLS.

Waste management represents a significant cost to many communities. It can impact on your ability to care for your country. Poor waste management can make you ill.

Perhaps the old rubbish tip is overflowing and you need a new landfill. Maybe you want to establish a new outstation with facilities for waste disposal. How do you go about it? This BUSH TECH is to help you decide on the best location for a new landfill, and how to design the landfill so as to safeguard the health of the community and the environment, for minimum cost.

Where shall we put our new landfill?

A new landfill cannot be located just anywhere. Everyone would agree that it should be far away from houses so that children don't get at it and it doesn't cause an odour nuisance. However, it should not be so far away that the waste collection vehicle has to travel for a long time to deliver the rubbish. That would be a waste of time and fuel. But there's a lot more to it than that.

We need to think about water pollution, the climate, road access, protecting animals and plants, and making sure that the area of land is big enough and flat enough to do the job. And the rubbish dump has to fit in with the surrounding land uses. For example, we wouldn't build the rubbish dump next door to the school or the clinic.

Where does our water supply come from? Is the water table high; i.e. is water found close to the surface of the ground? If so, there is a danger that our drinking water could become contaminated by toxins, such as paint residues, battery acid, viruses, bacteria and parasites. If there is a river or sea nearby, it's best to move the landfill further away. What about flooding? Locating the landfill above the 100-year flood line is important. So where exactly is the '100 year floodline'? Imagine the biggest rain you have ever seen. How high did the water go? Put your tip somewhere higher.

Ideally, the landfill's gradient should not be more than one in five. The tip should be at least one kilometre away from the nearest home. Any roads or tracks that go near the tip should be at least 100m away. Ideally the landfill should be big enough to have enough trenches or area to hold waste for ten years. Usually for design purposes, it is assumed that each person produces about 800kg of waste a year.

How do we design and construct our landfill?

Prior to any earthworks, the site should be cleared of vegetation. The trench method of landfilling is ideal for communities of less than 500 people in desert communities. However the trench method is not advisable for larger communities, or in areas with high rainfall, where the trenches would fill up with water.

When designing your new landfill site, check with the environment department, the health department and/or the shire council in your State or Territory.

Look at which way the site is sloping. A trench landfill should be designed so that the trenches are filled from the top of the slope to the bottom. Trenches should be dug horizontally along the contour.

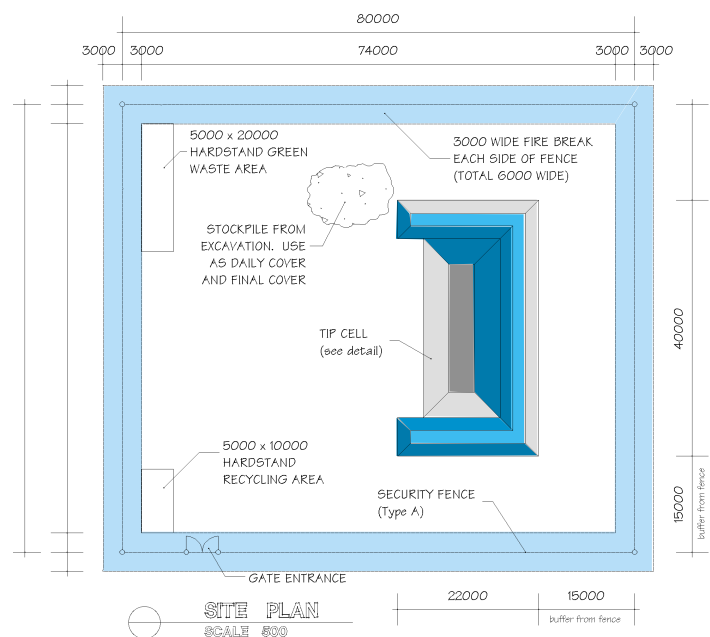
When the trench is dug, the soil or sand should be stockpiled for later use to cover rubbish. This will help to control disease and odours, minimise the likelihood of fires and discourage vermin such as rats and mice. (If the area fill or cell method of landfilling is used, a substantial quantity of fill needs to be imported.)

How big should the trench be? About 2.5 metres deep and about 50 metres long is recommended. The width should be at least six metres, or at least twice the width of the blade of the machine that will be used for dumping, pushing and compacting the waste.

For the area fill method, solid waste is deposited above the ground and there is no need to dig trenches. The place where the waste is deposited, known as the 'active face' should be at right angles to the prevailing wind direction, so that litter will not be blown around the site.

When waste is deposited, it should be compacted so that it is not more than two metres deep. How exactly is waste compacted? By driving a large rubber-tyred roller back and forth across it. Waste deposited using the area fill method needs just as much cover material as waste which has been deposited in a trench; i.e., at least 150mm.

Perhaps you would rather use the cell method of landfilling and keep stormwater out? The cell method of landfilling is just a vari-



TYPICAL SITE PLAN FOR A TRENCH LANDFILL



BUSH TECH #17

Landfill design (continued)

ation on the area fill method. A bund (berm) is constructed, up to the planned final height of the landfill, and the waste is pushed up against that. The outside of the bund should have a slope of at least five to one. The width at the top of the bund should be the same or more than the width of the equipment used for covering the waste with soil.

Signs should be posted advising who is in charge of the landfill and rules about the types of waste that can be dumped there and where each type should be dumped. If your community can participate in some form of recycling, then an area should be set aside for this, where recyclable wastes such as clean containers, old car bodies or scrap metal will not be contaminated with banana peels and disposable nappies. A hardstand area is ideal, if you can afford it. It is best to stack old car bodies separately, away from the trenches.

A fence is essential to stop windblown litter from spreading from one end of the community to the other. The fence will help to keep out children, dogs and other animals. To keep out vermin, it is recommended that the fence be installed in a 300mm trench, which is later backfilled¹. The fence should be at least 1200mm-1800mm above the ground, depending on the regulations in your State or Territory.

How do we protect our water?

Drainage should be put in so that stormwater is diverted away from the trenches or cells, or the active face of the landfill. This prevents water pollution. A bund wall, large enough to withstand heavy rain (technically a one in 20 year flood), should be constructed on the upstream side of the landfill. What happens if we don't do this? A plague of mosquitos will breed ferociously, bringing a threat to health. For a landfill for a large community of say 1000 or more people, we need to think about protecting

groundwater too, by lining the bottom of the tip site with well-compacted clay or even a high-tech geotextile liner, if there is no clay available. If contaminated waste-water (surface or seepage water) is to be discharged off site, it is most likely you will need a permit or licence from your State or Territory's environment department.

The landfill should be located near a piped water supply and an area should be set aside for washing vehicle wheels so that litter and rubbish is not transported around as the vehicle travels. A water supply also is essential for putting out an uncontrolled fire at the landfill. This can be very dangerous. Dig a firebreak around the site too.

THE SITE SHOULD BE CLEARED OF VEGETATION BEFORE TRENCHES ARE DUG. THIS HELPS TO PREVENT FIRES SPREADING FROM THE LANDFILL TO THE COMMUNITY.



THIS LANDFILL HAS A FENCE TO STOP WINDBLOWN LITTER. HOWEVER, ONE OF THE TRENCHES IS EXCAVATED TOO CLOSE TO THE FENCE. THIS MAKES IT VERY DIFFICULT FOR VEHICLES TO DRIVE DOWN BOTH SIDES OF THE TRENCH. IN THE PHOTO AT LEFT, ABOVE, AN AREA HAS BEEN SET ASIDE FOR RECYCLABLE WASTES, TO PREVENT THEM FROM BEING CONTAMINATED BY ROTTING WASTES.



Links

Guidelines for the siting, design and management of solid waste disposal sites in the Northern Territory
www.lpe.nt.gov.au/enviro/POLDOC/landfill/Swcont.htm

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

Panamerican Health Organisation – Landfilling Principles
www.lifewater.org/wfw/san3/san3d1.pdf

Community Solid Waste - Landfill siting
www.pwgsc.gc.ca/rps/inac/content/docs_technical_solid_waste_part5-e.html

Environmental Health Handbook – see pages 130-131
www.menzies.edu.au/publications/ocpapers/ehb.pdf

Environmental Health Standards for Remote Communities in the Northern Territory – see pages B.74 – B.77
www.nt.gov.au/health/healthdev/enviro_health/eh_standards/Environmental_Health_Standards_Remote_NT.pdf

SANDEC NEWS No. 4, January 1999, pp10-14, The Challenges of Waste in Developing Countries
www.sandec.ch/files/sandecnews_4.pdf

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Reference

Shire of Derby – West Kimberley, *Guidelines for the Development of Landfill Facilities for Aboriginal Communities*, Malarabah (Derby) Region, April 2001.