

4.4 Noise Abatement Act

Orders or licences may be issued following complaint investigations. If a noise complaint is found to be justified, the chief executive can require the tip operator to reduce noise to acceptable levels.

4.5 Health Act

The Director General of Health and Medical Services may impose conditions relating to operational standards for municipal landfills.

The *Refuse Management Regulations* specify responsibilities for storage, removal, collection and disposal of domestic and commercial refuse.

4.6 Litter Act

4.7 State Development and Public Works Organisation Act

The co-ordination, planning and management of these refuse tips and transfer stations is also covered by the State Development and Public Works Organisation Act. It is proposed that new refuse tips and transfer stations would be subject to environmental impact assessment procedures under this Act if handling over 200 cubic metres of loose fill per day or otherwise deemed necessary by the Responsible Authority.

5 MANAGEMENT STRATEGIES

Councils should develop site-specific management strategies for waste disposal areas. Strategies should be aimed at:

- providing effective management of waste materials
- preventing noise nuisance to neighbours, and
- preventing unlicensed discharge of wastes to stormwater drains, watercourses and land.

6 ENVIRONMENTAL PLANNING

Landfill sites must be designed and operated in such a way as to minimise environmental risk and fulfil the intended role with economic use of resources.

6.1 Selection of Site

Among other factors, the selection of a site for a municipal landfill should also take into consideration the long term land capability, potential for sterilisation or alienation of resources, potential for pollution and rehabilitation requirements. Apart from site management issues, consideration needs to be given to truck routes and operation times. Site selection is critical in environmental management. Careful site selection can lead to substantial reduction in environmental nuisance and avoid pollution. Relevant site information will include:

- Maintaining adequate buffer areas to separate incompatible land uses. In particular, local zoning schemes and the permissible land use on land adjacent to the site, as well as mapping existing residential development should be thoroughly investigated.
- Site hydrology - flood liability, site drainage, proximity to watercourses and groundwater recharge zones;
- Prevailing wind conditions. In some instances downslope movement of odour (katabatic drift) will be an important factor in selecting a suitable site.
- Adequate land area for all on-site activities and storage of materials. This may include separation and storage of reusable and recyclable materials, reprocessing of materials such as vegetation (woodchip) and aggregates, parking for community access to recycling facilities and perhaps the tip shop;
- Local road network, relative to transport to and from the site. Particular concerns would include all-weather pavement (sealed surface where transport would pass near residential development), road construction and safety standards, particular noise sources such as speed humps, bridges or cattle grids;
- Power and other infrastructure corridors.

7.2 Buffer distances

Land use zoning schemes should establish worthwhile zoning buffers. The objective should be to provide basic protection from complaints for land uses and businesses allowed within zones. Suitable distances are recommended below. Zoning buffers could be open space, playing fields, floodways, green space, adjuncts to fauna conservation areas such as wildlife corridors, or business uses which can occupy separating land without causing problems themselves.

The legislation and environmental criteria developed by other Australian States provides useful reference material for the development of refuse tips and transfer stations. In particular the following demonstrate the integrated life cycle approach proposed by this guideline to meet environmental performance objectives:

- State Environment Protection Policy (Siting and Management of Landfills Receiving Municipal Wastes) - Draft. Environment Protection Authority - Victoria.
- Environment Criteria for Landfill Waste Disposal in New South Wales. (Environmental Guide WD-2)

REFUSE TIPS AND TRANSFER STATIONS Department of Environment and

Heritage
ENVIRONMENTAL GUIDELINE

State Pollution Control Commission.

7.2.1 Air Pollution

Typical air emissions from a refuse tip generally contain odorous compounds and may contain trace volatile organic compounds. These are released from the landfill by the flux of landfill gas, which occurs as a result of the anaerobic decomposition of organic refuse, through permeable cover and/or capping material. The major component of landfill gas, methane, can form explosive mixtures with air if present at 5-15% concentrations and operational procedures should recognise this potential hazard.

Respiratory protection should be worn during any excavation or drilling in 'old' disposal areas. Although methane is odourless, other associated landfill gases such as hydrogen sulphide are odorous and can be detected in very small quantities to indicate potential hazard areas.

Landfill gas control measures are a particularly important consideration if a post-closure land use involves public access.

It is also possible for dust and respirable particulates to arise from site construction activities or facility operations. Any burning on site can generate smoke (particulates) and combustion products.

Some of the above could be of concern from a community health perspective depending on the proximity of sensitive receptors.

For existing facilities, attention to the integrity of cover and/or final capping material is appropriate to minimise off site problems. The placement of an impermeable capping can lead to lateral migration of landfill gas thereby exacerbating potential problems at the perimeter.

For new facilities a variety of landfill gas control measures are available which warrant consideration to address the environmental problems that may otherwise arise. Gas control can be implemented cost-effectively for environmental management purposes without gas collection and utilisation necessarily being a consideration.

The burning of materials at a refuse tip should be strictly limited. Regard should be given to the draft Construction Site Guidelines in relation to cleared timber wastes or garden wastes. Where burning must be considered, a controlled air combustion device, such as a pit burner, provides a means of achieving efficient combustion and minimising smoke emissions. A refuse tip is a suitable location for such a facility should a local authority consider this to be warranted.

The adoption of sanitary landfill operations and minimisation of active tipping face length will provide a better standard of air pollution control in urban areas.

7.2.2 Water Pollution

Infiltration of precipitation into the deposited refuse at a landfill can result in leachate generation, on a seasonal basis, whenever the moisture absorption capacity of the refuse itself is exceeded. Leachate becomes contaminated by the dissolution of trace elements in the refuse as it decomposes and the breakdown of organic matter leads to a significant biological oxygen demand (BOD). Hence, leachate

characteristics though variable, are generally such that it should be considered to be a trade waste and dealt with in accordance with Sewerage By-laws and the Water Supply & Sewerage Act, if sewer discharge is proposed.

Significant pollution may be associated with sediment contained in surface runoff which should therefore be controlled from disturbed areas or the tip working area.

Other pollutants could include petroleum hydrocarbons, chlorinated organics and heavy metals. It is noted that the Refuse Management Regulations require a residual level of insecticide to be used in each lift of the tip to control vermin. This could lead to a problem if excessive quantities were utilised and leached to groundwater in the area.

It is noted that small refuse tips should have some form of leachate control to prevent uncontrolled leachate discharges to surface water albeit by a low cost leachate pond or similar to facilitate evaporation.

The use of imported cover material may lead to water quality problems where geochemical aspects are not considered fully. Materials likely to form low pH solutions when combined with surface runoff should be avoided to ensure leaching of contaminants such as sulphides does not occur.

It is noted that many fill areas, including private land reclamation, can contribute to water pollution through reactions of surface runoff with the material used for disposal. Local authorities should review all such proposals carefully to ensure such potential problems are reviewed by environmental health officers, even where approval responsibility rests in another department of the local authority.

Transfer stations generally produce minimal leachate but the Refuse Management Regulations require site washdown and effluent to be collected and preferably disposed of to sewer as a trade waste discharge.

The proposed Water Policy of the Department of Environment and Heritage contains a section on the water pollution implications of refuse tips. The key proposals of the draft Water Policy insofar as refuse tips are concerned are as follows:

- refuse tips should not be sited in potable water supply catchments or sensitive water environments where groundwater protection is difficult.
- siting in wetlands would be inappropriate.
- land disposal of leachate is preferred.
- leachate disposal to sewer may be another option.
- discharge licences will be discouraged.
- water management plans will be required for proposed refuse tips.
- sediment controls required for stormwater at larger refuse tips.
- hydrogeological and hydrological site assessments are generally required to demonstrate that

groundwater and surface water protection is achievable.

The Water Policy addresses some of the technical difficulties that may be associated with artificial liners for landfills. While recognising the role of such engineering measures to control potential water pollution, it is noted that siting criteria should be applied to refuse tips which would result in artificial liners being a secondary safeguard in suitable geological conditions. These should not be utilised as a primary environmental safeguard. It is suggested that a leachate collection system can be very beneficial in controlling vertical leakage from a refuse tip irrespective of whether an artificial liner is utilised.

The Water Policy provides for the long term monitoring of refuse tips and indicates that contingency planning for groundwater protection should be incorporated in the design process for new facilities.

7.2.3 Noise Pollution

Noise can be an environmental issue for refuse tips and transfer stations themselves and the traffic associated with such facilities. The potential sources of noise include mobile plant such as landfill compactors, bulldozers and graders and fixed plant including pumps and compressors. Traffic noise is associated with transfer-haul prime movers, collection compactor trucks and private vehicles including trucks. General noise can arise from RO/RO bin handling and recycling operations i.e. culler bins.

Each of these areas are covered by either the Department's noise policy insofar as general noise limits are concerned or specific environmental guidelines such as for pumps and compressors.

Where these facilities are public utility operations, the current Noise Abatement Act provides an exception from the regulations of the Act. However, as experience at many such facilities has indicated noise pollution to be a significant perceived public concern, this should not be seen as an endorsement of noise levels that otherwise would be deemed unacceptable.

Noise derived from site operations can be mitigated by integrating acoustic mounds in the perimeter landscape treatment. The landscape plantings when established also assist in noise attenuation and address visual amenity. Site equipment can be fitted with appropriate noise damping devices if necessary.

Selection of access routes for traffic utilising the facilities is an important issue to ensure environmental values are not compromised by trucks or private vehicles particularly considering the seven day operations associated with such facilities.

Most noise issues for new facilities can be addressed in the planning phase by the selection of sites with adequate buffer zones to noise sensitive areas and appropriate traffic management.

HAZARDOUS WASTES

Hazardous wastes generated in local authority areas are, under current legislation, subject to the control of the Department of Health, but local authorities play a key role in their management by excluding particular wastes from refuse tips. The Department of Health has issued standard waste descriptions for those materials considered to be hazardous and which should generally be excluded from refuse tips. Local requirements may warrant specific exceptions subject to Department of Health approval. However, treated

residues from hazardous waste treatment processes are envisaged to be disposed of in sanitary landfills. Clearly any such landfill or section of landfill would be custom designed for this purpose to ensure adverse environmental impacts were avoided. The Hazardous Waste Unit of the Department of Health can supply additional information.

Industrial sludges should not be received at a refuse tip prior to testing to suitably characterise the waste. Any treated residues should undergo leachability testing before being approved for co-disposal.

Former refuse tips may be regarded as potentially contaminated land and should not be considered for reuse until actual conditions have been verified. Therefore, the Local Government (Planning and Environment) Act would apply to such sites.

9 PRACTICAL CONTROL MEASURES

9.1 Refuse Tips

Determining appropriate control measures requires the local authority to determine, on the basis of site conditions, the waste streams to be deposited and environmental quality objectives, whether the landfill is to be based on a containment or a dilution/attenuation philosophy with respect to groundwater protection.

The former approach will lead to an engineered facility, designed and operated to minimise leachate generation and requires the collection and treatment of leachate. This would apply to facilities involving air space of over 500,000 cubic metres and be an option for smaller facilities in sensitive areas. The second approach is to rely on natural chemical, physical and biological processes proceeding at a suitable rate, also in an engineered site, to degrade leachate compounds to harmless materials. The DTTC publication, "Management & Technologies of Wastes, An Australian Perspective, 1990" provides a discussion of landfill technology variations including gas control and leachate management and describes biological and geochemical reactions which occur in a landfill environment in some detail.

A number of well documented criteria for the siting of refuse tips are available and these necessitate consideration of environmental social and economic factors affected by the facility proposed. Field investigations are normally required to confirm site selection. Thorough preliminary investigations ensure appropriate siting decisions and provide essential design data. A further opportunity to minimise adverse environmental effects occurs during site operations. All refuse tips should be operated in accordance with a written operations management plan incorporating details of environmental performance objectives, controls and monitoring requirements. These requirements should be included in contract documents where contract operational services are sought.

Such plans would normally address the following:

- landfill gas control
- surface water management
- leachate management
- odour control

- litter control
- dust suppression
- noise
- environmental monitoring
- waste disposal operations
 - (i) landfill
 - (ii) road maintenance
 - (iii) vermin control
 - (iv) fire control.

9.2 Transfer Stations

For transfer stations it is a requirement that washdown water/leachate be collected and treated or discharged to sewer.

Environmental problems which may arise due to inadequate peak vehicle handling capacity can be addressed by the selection of the optimum waste handling technology for the facility size.

9.3 Environmental Monitoring

It is recommended that provision be made at all refuse tips for environmental monitoring. At larger facilities, a network of groundwater and gas monitoring bores would be involved whereas smaller facilities may have single bores. The design and construction of these facilities should be appropriate to subsurface conditions revealed by site investigations completed prior to the design phase.

Groundwater monitoring bores should be used for the regular collection of data on leachate quality and piezometric levels. The parameters of interest would be as follows:

BOD ₅	-	Biological Oxygen Demand
pH		
TDS	-	Total Dissolved Solid
Cl	-	Chlorides
NH ₃	-	Ammonia.

9.4 Maintenance

A completed refuse tip requires routine maintenance due to the on-going generation of gases and leachate and also due to differential settlement that may lead to local ponding of surface runoff. Pollution control equipment, drainage works, erosion controls and landscaping should all be subject to periodic inspection in addition to the post-closure monitoring program.

10 RECYCLING AND WASTE MINIMISATION

Recycling and waste minimisation programs have been initiated by the Department of Environment and Heritage and should be considered in conjunction with these guidelines to achieve an overall waste management strategy for each local authority area. Recycling can extend the life of a refuse tip and assist in minimising potential for environmental problems associated with certain wastes. Local authorities should have regard to the hierarchy of waste management options available to them and plan land disposal only to accommodate the portion of the total waste stream that cannot be dealt with by other means.

Refuse tips and transfer stations should be planned to include a recycling area which can address the recycling of paper, aluminium, ferrous and non-ferrous metal and glass cullet in the waste stream, subject to suitable markets being available.

11 OTHER CONSIDERATIONS

11.1 Landfill Gas Utilisation

Where sanitary landfills are located in close proximity to an energy market, a variety of beneficial uses are available for landfill gas subject to commercial viability. These include cogeneration of electricity, gas utilisation or synfuel production. Landfills where such activities are proposed incorporate design features which provide for positive landfill gas collection and thereby provide a high standard of environmental performance. Maximising gas production in such landfills requires alternative management strategies and operational practices to a conventional landfill. Landfill gas monitoring is recommended for large sanitary landfills, irrespective of whether collection and utilisation is proposed. Retrofitting gas collection facilities to operating landfills is possible but a decision as to the feasibility of this option is preferred prior to commencement to ensure environmental safeguards can be integrated within the landfill.

11.2 Management Information

Environmental management of large refuse tips is facilitated by the use of digital terrain models for planning and design which can be subsequently used as the basis for a landfill management information system which can incorporate all environmental monitoring and performance data. Compaction standards achieved over time should be monitored by correlation of survey and weighbridge information as it provides a good indication of whether environmental problems may be anticipated.

11.3 Overfilling

Mounding of the finished surface of a landfill by slight overfilling is desirable to allow for settlement and to prevent ponding of surface runoff, which can exacerbate leachate production. This will also enhance the quality of finished surface if a post-closure use of the site is proposed.

11.4 Waste Segregation

It is recommended that certain wastes be segregated from the general refuse stream to facilitate recycling and minimise adverse effects that may otherwise occur. Car bodies should be stored for recycling and battery recycling bins should be provided at refuse tips and transfer stations to encourage recycling in accordance with the Department waste minimisation objectives. Waste tyres may also warrant segregation though recycling options are limited at present.

Oil and other combustible wastes received at these facilities should be handled in bunded areas containing suitable storage facilities for recycling purposes. Adequate provision should be made for small containers generated by ratepayers.

However, better compaction densities are achieved for a mixed fill than a monofil waste segregation should be restricted to removing household toxic materials or major recyclable items.

Garden wastes comprise a major portion of the putrescible waste stream in Queensland refuse streams. Environmental benefits can be derived from segregating such wastes and applying a volume reduction technology in lieu of placement in the landfill where local circumstances suit these approved municipal landfills.

11.5 Internal Transfer Stations

It is noted that some authorities are encouraging the use of internal transfer stations at regional or large urban landfills to achieve higher standards of environmental performance and user amenity. The exclusion of small vehicles from the tip face minimises the working face length required to be open and facilitates control of infiltration and therefore leachate generation. It also aids in windblown litter and vermin control. This arrangement also minimises dust generated by vehicles on unsealed surfaces. The cost of the transfer facilities and equipment can be offset by reductions in internal access road construction costs and improved air space utilisation. Environmental safeguard costs and post closure operating costs are also reduced. In Victoria such facilities are mandatory for serving 150,000 persons or more.

12 FURTHER INFORMATION

Advice on aspects of this guideline, or other matters relating to the control of air, water or noise pollution or waste disposal may be obtained from:

Division of Environment
 Department of Environment and Heritage
 160 Ann Street
 Brisbane
 P.O. Box 155
 BRISBANE ALBERT STREET QLD. 4002.

Telephone (07) 227 6422
Fax (07) 227 7237

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