



Water quality protection note no. 24

September 2015

Landfilling with inert materials

Important notice

This water quality protection note is subject to review and will be updated as a result of the Department of Environment Regulation's forthcoming development of environmental standards and draft guidelines for fill and landfills. Please visit www.der.wa.gov.au for more information.

This note provides advice for landfilling with inert materials, on land that is located in a public drinking water source area or near sensitive water resources, and was prepared prior to the assignment of responsibilities of the then newly created environment and water departments.

If you require additional information about the review of this note, please contact:

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Landfilling with inert materials

Purpose

Man-made depressions in the landscape (eg redundant quarry pits) often require filling, compaction and recontouring to allow for land development. This Department recommends that best environmental management practices be used for all landfill activities. Special care is needed near sensitive water resources (see description provided at [Appendix C](#)). Appropriately controlled inert landfills pose a low risk to the environment provided only stable inorganic non-toxic non-leaching materials are buried. There is always some risk that quantities of toxic or unstable material may arrive mixed with inert materials and be overlooked by the site supervisor. These contaminants, if in significant amounts, may leach and cause damage to the local waters. This Department may oppose inert landfills near sensitive water resources as a precautionary measure.

The Department of Water is responsible for managing and protecting the State's water resources. It is also a lead agency for water conservation and reuse. This note offers:

- the Department's current views on inert landfills;
- guidance on acceptable practices used to protect the quality of Western Australian water resources; and
- a basis for the development of a multi-agency code or guideline designed to balance the views of industry, government and the community, while sustaining a healthy environment.

This note provides a general guide on issues of environmental concern, and offers potential solutions based on professional judgement and precedent. The recommendations made do not override any statutory obligation or Government policy statement. Alternative practical environmental solutions suited to local conditions may be considered. Regulatory agencies should not use the note's recommendations without a site-specific assessment of any project's environmental risks. Any conditions set should consider the values of the surrounding environment, the safeguards in place, and take a precautionary approach. This note shall not be used as the Department's policy position on a specific matter, unless confirmed in writing.

Scope

This note applies to the siting, operation and management of Class I landfill sites (see [Appendix A, reference 1a](#)) ie those that are approved to accept only inert material such as clean wastes listed in Recommendation 1 (overleaf).

Inert landfill applications include:

- disposal of stable, non hazardous material that is both uneconomic or impractical to reuse or recycle and compatible with the local environment; and
- filling of voids left by activities such as extractive industries, to enhance the future land use capability of the site. The result must be a stable, compacted rehabilitated landform suited to a useful purpose such as cropping, parkland or recreational pursuits.

The note does not apply to:

- the filling of land with uncontaminated natural materials such as sand, loam, or crushed rock, which are compatible with the values of the local environment; or
- the disposal or storage in the environment of putrescible, hazardous, intractable wastes, sulphide-rich organics (eg peat) or blended material near sensitive water resources, whether fully contained or otherwise.

Recommendations

Nature of inert material

1. The Department of Environment has defined the following material *wastes that are largely non-biodegradable, non-flammable and not chemically reactive*, as acceptable for disposal at inert landfill sites (see Appendix A, reference 1a).

Wastes accepted as clean, inert and conforming to the above definition may include:

- a. asphalt derived from repair or removal of road surfaces;
 - b. biosolids (sewage sludge) categorised for unrestricted use;
 - c. blasting sand or garnet;
 - d. building and demolition waste;
 - e. casting sand;
 - f. concrete (uncontaminated by chemicals, fuels, lubricants or pesticides);
 - g. masonry materials such as bricks, concrete blocks, and stonework;
 - h. soils that contain contaminants at concentrations less than the Contaminant Threshold CT1 criteria in *Landfill Waste Classification and Waste Definitions, 1996 as amended* (see Appendix A, reference 1a); and
 - i. special type 1 wastes (asbestos), inert waste type 2 (tyres and plastics) and type 3 (inert waste from secondary waste treatment plants) require the Department of Environment's detailed assessment and written approval (normally with conditions) for safe disposal at specified inert landfill sites.
2. Materials that are incompatible for disposal at inert landfill sites include:
 - a. animal waste ie manure or materials contaminated with urine;
 - b. chemical containers;
 - c. putrescible, hazardous or intractable matter, including acids, alkalis, and paints;
 - d. food waste;
 - e. green waste such as grass cuttings and tree loppings;
 - f. metals (including electrical batteries);
 - g. organic solvents;
 - h. paper or cardboard products;
 - i. petroleum hydrocarbons such as oil or grease;

- j. sawdust and forestry materials;
- k. sludge; and
- l. soil exceeding chemical contaminant thresholds or sulphide restrictions (see [Appendix A](#), reference 1a).

Landfill siting

- 3. Local government authorities (councils) require planning and development approval for inert landfills.
- 4. Inert landfill sites that accept more than 500 tonnes of waste per year are prescribed premises that need a Works Approval and a licence issued by the Department of Environment under Part V of the *Environmental Protection Act 1986*.
- 5. New inert landfills should not be developed on the Swan Coastal Plain where there are viable alternatives (see [Appendix A](#), reference 1a).
- 6. A minimum vertical separation distance of two metres to the maximum (wet season) groundwater table is recommended for free-draining soils, to avoid waterlogging and to allow for soil contaminant filtration/ aerobic microbial action.
- 7. Steep land (ie with slope exceeding one in ten) should be avoided, unless geo-technical studies demonstrate that the final landform will be stable.

Landfills near sensitive water resources

- 8. Inert (Class 1) waste, equal to or less than CT1 waste concentration criteria and posing no other hazard to water resources, may be accepted near sensitive water resources (see [Appendix C](#)) for unlined landfills, subject to the restrictions recommended in the following clauses.
- 9. Inert landfills (where approved) should have an adequate separation buffer to sensitive water resources. For information on buffer definition, see this Department's Water Quality Protection Note *Vegetation buffers to sensitive water resources*.

Public Drinking Water Source Areas

Public Drinking Water Source Areas (PDWSA) is the collective name given to catchments declared for the management and protection of any water source used for public drinking water supplies. PDWSA include Underground Water Pollution Control Areas, Water Reserves and Catchment Areas. For summary information on the statutes and associated regulatory measures in PDWSA, see [Appendix B](#).

To protect water resources in PDWSA, this Department's management strategy provides for three risk-management based classifications of land described as Priority 1, 2 and 3. These priority areas are managed in different ways to provide for effective protection of water resource quality.

Priority classifications of land are set through specific Land Use and Water Management Strategies or Water Source Protection Plans that are prepared in consultation with State government agencies, landowners, local government, and key industry and community stakeholders. For additional explanatory information on PDWSA, see this Department's Water Quality Protection Note *Land use compatibility in Public Drinking Water Source Areas*.

10. *In Priority 1 (P1) areas, Priority 2 (P2) areas, Wellhead or Reservoir protection zones:* Inert landfill sites are incompatible with this Department's source protection policy. The establishment of inert landfills or expansion of existing landfills in these areas and zones will be opposed.
11. *In Priority 3 (P3) areas:* Subject to the assessment of a development proposal demonstrating waste conforming to CT1 criteria and no environmental hazards, written approval is required from this Department before an inert landfill may be established. Approval if granted, will be subject to conditions designed to limit the risk of contamination of water resources.
12. Operational inert landfill areas (if approved) should have a minimum 100 metre vegetated separation buffer to the full supply level of reservoirs, their primary feeder streams, and any water production bores or wells used as a source of drinking water.

Natural waterways or Waterways Management Areas

Five Waterways Management Areas have been declared in Western Australia to provide special protection to estuaries and their associated waterways considered especially vulnerable to degradation. These areas are the Albany Waterways, Avon River, Leschenault Inlet, Peel–Harvey Estuary, and the Wilson Inlet.

13. Landfills should not be established on floodplains, where they contact or divert natural watercourses, or as fill on seasonal swampy ground. They should also not be established on sites where they would occupy land, which supports damp land vegetation.
14. If a development is located within a Waterways Management Area, approval must be sought from this Department under the *Waterways Conservation Act (1976)*. Information on waterway values and the location of these management areas can be obtained by contacting the Department of Environment's regional offices.

Swan River Trust Management Area

15. The Swan-Canning Estuary and abutting reserves are managed by the Swan River Trust via the *Swan River Trust Act 1988*. Written approval from the Trust may be needed for any land or water-based development that could have an effect on the estuary or its associated waterways.

Conservation valued wetlands

This Department aims to ensure that chemicals or contaminated water does not enter the environment close to sensitive environments, such as wetlands, where ecosystems may be at risk. Certain wetlands have been identified as having significant ecological value under the Ramsar Convention, in *A Directory of Important Wetlands in Australia*, State environmental protection policy provisions or the dataset *Geomorphic Wetlands, Swan Coastal Plain* (see [Appendix A](#), reference 3).

16. Any operational area proposed within 200 metres of a wetland (including lakes, sump-land, damp-land and palusplain) should be referred to the Department of Environment's nearest regional office for assessment, with supporting information addressing the environmental risks. For information on the protection of wetlands, see [Appendix A](#), reference 1c. Separation distances should be negotiated based on wetland values, vulnerability, local biophysical factors and management techniques at the facility to provide for adequate protection of the quality of water resources and adjoining wetland dependant vegetation.

Bush Forever sites

Bush Forever provides for the protection and management of approximately 51,200 hectares of significant bushland in the Perth metropolitan region. It is administered by the Department for Planning and Infrastructure.

17. Landfills are considered incompatible with the environmental objectives of *Bush Forever* sites and will be opposed by the Department of Environment. For more information, see [Appendix A](#), reference 6.

Private water supply sources

18. These water sources are particularly vulnerable to contamination as their quality may not be routinely tested and comprehensive water treatment processes may not be used. Adequate vegetated separation buffers should be used as recommended in the section on *Landfills near sensitive water resources*.

Site development and management

19. The landfill site should be operated under the supervision of at least one of the following authorities:

- a. A Department of Environment's local regional office (for landfills that accept more than 500 tonnes of waste per year).
- b. This Department's authorised delegate such as the Water Corporation (if operating in a Priority 3 PDWSA).
- c. The local government authority (council).

20. Development applications should include specific data to allow adequate assessment by regulatory authorities, see [Appendix D](#).

21. Overland stormwater flow should be diverted via bypass drains or bunding around the landfill and disturbed soil surfaces. Surface drainage discharged from cleared areas and the landfill operational area should pass through settling pits designed to minimise turbidity. The pits should be designed for a minimum of two hours runoff storage resulting from a 72 hour, two year average return frequency storm event calculated in accordance with *Australian Rainfall and Run-off* (see [Appendix A](#), reference 5). The pits should have an effective trapping system to prevent discharge of any floating matter. Turbid water must not be released to waterways, unless receiving waters immediately upstream at the time have similar natural turbidity. Excess stormwater may be recycled over the landfill to control dust.

22. The excavated landfill area should be fenced and locked to control illegal dumping, wind blown litter and vandalism outside operating hours. Landfill sites should be effectively supervised to prevent the disposal of unacceptable material. The site occupier is normally held accountable for any inappropriate material deposited at the site, the cost of investigations to ascertain the nature and extent of the deposit, and removal of any unacceptable waste.

23. Any unacceptable material delivered to the landfill site should be immediately removed and disposed of at an appropriate class of landfill. This may be achieved primarily by reloading onto the vehicle that delivered the inappropriate material. Alternatively 'skips', similar containers or secure weather-proof bunded hard-stand should be provided for temporary storage of small quantities of various categories of non-conforming materials such as batteries, chemicals, and paint tins.
24. All chemicals stored on-site that may pose a threat to water resources if released into the environment such as pesticides and fuel, should be held in weatherproof bunded compounds. These chemicals should be used in accordance with the supplier's instructions. In Priority 3 Underground Water Pollution Control Areas, this Department's written approval under water catchment protection by-laws is needed for the storage of more than 250 litres of chemicals (including fuel).
25. Where approved near sensitive water resources, all on-site above-ground fuelling facilities for vehicles and plant operations should be constructed and operated within low permeability (less than 10^{-9} metres/ second) bunded compounds designed to allow recovery of any spilt fuel. These compounds should be constructed to capture incident rainfall, jetting fuel, any over-fill of tanks, and resist misuse. Where mobile tanks are used, an impermeable underlay barrier such as a high density polythene liner at least 0.5 millimetres thick, with water tight joints may be suitable provided it is protected from operational damage. More detailed information is available in this Department's Water Quality Protection Note *Tanks for above ground chemical storage*.
26. Where approved near sensitive water resources, mechanical servicing should comply with the recommendations given in this Department's Water Quality Protection Note *Mechanical servicing and workshops*.
27. Servicing of mechanical equipments that involves liquids such as coolants, hydraulic oil, brake fluid or lubricants may be acceptable provided the site operator demonstrates implementation of effective management systems to capture and export these liquids for recycling or disposal at an approved facility.
28. Waste from the operator's site amenities such as toilets and "crib"rooms should be managed in accordance with the *Health Act 1911* and local government authority (council) requirements.
29. Material such as topsoil stockpiled for future site rehabilitation or transport off-site, should be held up-slope of landfill operations in an area where surface water run-off is effectively controlled.
30. Where natural surface or ground water is to be harvested for water supply or dust suppression, a water allocation licence may be required from this Department in accordance with the *Rights in Water and Irrigation Act 1914*.
31. The installation and operation of monitoring facilities, such as groundwater monitoring bores, may be required by regulatory authorities where there is reason to suspect that hazardous, putrescible or contaminating materials may have entered the landfill, escaped from the site into local soils, or a landfill is located near a sensitive water resource.

Staff training and responsibilities

32. Landfill site employees should be well trained concerning pollution risks to the environment. Clearly visible signs or symbols depicting environmental risks (including water resources) posed by the disposal of any materials other than inert waste should be maintained on site to educate site personnel. Where contaminating materials are detected, procedures should be in place to either divert the transport vehicle to an approved facility, or place the inappropriate waste into a secure container for later transfer to an approved recycling or disposal facility.

Site rehabilitation plan

33. Prior to commissioning the landfill facility, the proponent should prepare a rehabilitation plan for future site closure. The plan should provide for a stable landform and offer effective protection against contamination of local water resources and soil cover compatible with the site's post closure land use.

More Information

We welcome your views on this note. Feedback provided on this topic is held on this Department's file No. **13015**. This note will be updated periodically as new information is received or industry/activity standards change. Updates are placed on the Department's internet site www.water.wa.gov.au select *Drinking water*> *Publications*> *Water Quality Protection Notes*.

To comment on this note or for more information, please contact the Water Source Protection Branch at our Atrium offices in Perth, phone (08) 6364 7600 (business hours), fax 6364 6525 or use *Contact us* at the Department's internet site, citing the note topic and version.

Where a conflict arises between the Department of Water's recommendations and any proposed activity that may affect a sensitive water resource, this note may be used to assist negotiations with stakeholders. The negotiated outcome should not result in a greater risk to water quality than if the Department's recommended protection measures were used.

In October 2005, the State Government announced the formation of the Department of Water. From January 2006, the Department of Water has assumed primary responsibility for managing the State's water resources. Once the Department of Water is legally established, it will replace many of the present functions of the present Water and Rivers Commission and operate in parallel (with separate powers) to the Department of Environment.

The custodian and recommendations made in this note will then change to match the assigned responsibilities of the departments of Environment or Water.



Appendices

Appendix A - References and further reading

1. Department of Environment (WA)

a. *Waste management*

- *Landfill Waste Classification and Waste Definitions*, 1996 or as amended;
- *Guidelines for Acceptance of Solid Waste to Landfill*, 2001;
- *Western Australian Waste Reduction and Recycling Policy*, 1997;
- *Siting, design, operation and rehabilitation of landfills*, November 2005;
- *The Western Australian Government's July 1996 response to the Select Committee Report on Recycling and Waste Management*, 1995;

see web page <http://wastemanagement.environment.wa.gov.au>, select *Publications> Guidelines*.

b. *Waterways policy and guidelines*

- *Foreshore Policy 1- Identifying the Foreshore Area*, 2002;
- *Water Note 10 – Protecting riparian vegetation*;
- *Water Note 11 - Identifying the riparian zone*;
- *Water Note 23 - Determining foreshore reserves* (information on identifying biophysical criteria);

see web page <http://waterways.environment.wa.gov.au>, select *Publications> Policies> Foreshore Policies* or *Fact sheets>Water Notes*.

c. *Wetlands policy and guidelines*

- *Position statement: Wetlands*, 2001;

see web page <http://wetlands.environment.wa.gov.au>, select *Publications>Policy*.

2. Department of Water (WA)

Water Quality Protection Notes

- *Dewatering of soils*;
- *Land use compatibility in Public Drinking Water Source Areas*;
- *Mechanical servicing and workshop facilities*;
- *Tanks for above ground chemical storage*;
- *Vegetation buffers to sensitive water resources*;

see web page <http://drinkingwater.water.wa.gov.au>, select *Publications> Water Quality Protection Notes*.

3. Wetland information

a. For RAMSAR wetlands, see internet site: www.ramsar.org;

b. National Department of the Environment and Heritage - *A Directory of important wetlands in Australia*, see web page www.deh.gov.au/water/wetlands/databases.html, or

the Department of Conservation and Land Management (WA) web page www.naturebase.net/national_parks/wetlands/wa_wetlands.html.

c. *Geomorphic wetlands, Swan Coastal Plain* dataset; see web pages or book:

- www.walis.wa.gov.au in conjunction with a guide to viewing the WALIS dataset available at <http://wetlands.environment.wa.gov.au/>, select *Data>Wetland mapping*; or
 - *Perth Groundwater Atlas*, see www.water.wa.gov.au select *Water Information> Data*. For more information, phone the Department's Water Information section on 6364 7459; or
 - *Wetlands of the Swan Coastal Plain, Volume 2B Wetland mapping, classification and evaluation - wetlands atlas* (Hill, Semeniuk, Del Marco 1996). Reference copies are available from the Department of Environment's library in Perth.
- d. *Geomorphic wetlands, Augusta to Walpole* data set as identified in the Water and Rivers Commission report prepared by V. and C. Semeniuk, 1997;
- e. *South Coast Significant Wetlands* as identified in South Coast Regional Natural Resource Management Strategy.

For information on location and boundaries of wetlands described at d. or e. above, visit the Department of Environment's library in Perth or phone the Department's Information services Branch- GIS Support Analyst on 6364 6500.

4. Environmental Protection Authority (WA)
- a. Position Statement No. 4 *Environmental Protection of Wetlands*, 2004;
 - b. Position Statement No. 9 *Environmental offsets*, 2006;
 - c. Environmental Protection (Swan Coastal Lakes) Policy 1992;
 - d. Revised draft Environmental Protection (Swan Coastal Plain Wetlands) 2004;
 - e. Guidance Statement 3 *Separation distances between industrial and sensitive land uses*; see internet site www.epa.wa.gov.au, select *Guidance statements*.
5. Geological Survey of Western Australia (now Department of Industry and Resources)
Guidelines for groundwater monitoring at municipal landfill sites, 1993.
6. The Institution of Engineers, Australia
Australian Rainfall and Runoff (current edition);
see web page www.engaust.com.au/bookshop/eabookspub.html.
7. Western Australian Planning Commission
Bush Forever December 2000;
see internet site www.wapc.wa.gov.au, select *Publications> alphabetical under B*.

Appendix B - Statutory requirements and approvals covering this activity include:

What is regulated	Statute	Regulatory agency
Development approval	<i>Planning and Development Act 2005</i>	Local Government Authority (Council)
Impact on the values and ecology of the environment, including waters	<i>Environmental Protection Act, 1986 – Part III Environmental Protection Policies; Part IV Environmental Impact Assessment</i>	Minister for the Environment advised by the Environmental Protection Authority
	<i>Environmental Protection Regulations 1987 Environmental Protection (Clearing of Native Vegetation) Regulations 2004 Environmental Protection (Unauthorised Discharges) Regulations 2004</i>	Department of Environment - regional office
Development in declared Waterways Management Areas	<i>Waterways Conservation Act 1976</i>	
Licence to use surface water and groundwater from declared areas	<i>Rights in Water and Irrigation Act 1914</i>	Department of Water - regional office
Development and operations in proclaimed Public Drinking Water Source Areas	<i>Metropolitan Water Supply, Sewerage and Drainage Act 1909, and related by-laws</i>	
	<i>Country Areas Water Supply Act 1947, and related by-laws</i>	
Drainage into the Swan or Canning River systems	<i>Swan River Trust Act 1988</i>	Swan River Trust
Storage of fuels, solvents, dangerous goods	<i>Explosive and Dangerous Goods Act 1961, and related Regulations</i>	Department of Consumer and Employment Protection
Disposal of materials that may affect human health	<i>Health Act 1911</i>	Department of Health– Population Health Division
		Local Government (Council)
Emergency response planning	<i>Fire and Emergency Services Authority of WA Act 1998</i>	Fire and Emergency Services Authority

APPENDIX C - Sensitive water resources

Clean water resources, used for drinking water, sustaining aquatic and terrestrial ecology, industry and aesthetic values, along with breathable air, rank as the most fundamental and important needs for viable communities. These water resources should remain within specific quality limits, and therefore require stringent and conservative protection measures. Guidance on water quality parameters necessary to maintain water values are published in the *National Water Quality Management Strategy Guidelines* (see web page www.deh.gov.au/water/quality/nwqms/index.html). This Department strives to improve community awareness of catchment protection measures for surface water and groundwater aquifers as part of a multi-barrier protection approach to maintain the quality of water resources and their values.

To be considered sensitive, water resources must support one or more of the environmental values described below. Any activity or a land use will pose a risk to water quality if contaminants are able to be washed or leached into sensitive water resources in discernible quantities.

These water resources may be shallow groundwater accessed by water supply wells, surface waterways, estuaries, or wetlands. Community support for these values, setting of management

objectives for water resources and implementation of a practical attainment strategy are seen as key elements in protecting and restoring the values of these water resources.

Sensitive water resources include:

- a. Those proclaimed or assigned as Public Drinking Water Source Areas (ie Water Reserves, Catchment Areas or Underground Water Pollution Control Areas) via the *Metropolitan Water Supply, Sewerage and Drainage Act 1909*, the *Country Areas Water Supply Act 1947* or the *Health Act 1911*.
- b. Those used as private drinking water supply sources (ie for human or stock consumption).
- c. Waters with specific quality necessary to support commercial or industrial activities eg aquaculture, food processing or crop irrigation.
- d. Wetlands and waterways – pristine or conservation-valued, (not highly disturbed, unless subject to active management to restore past environmental values), and detailed as follows:
 - areas covering water resources defined via Part III of the *Environmental Protection Act 1986* eg *Environmental Protection (Swan Coastal Plain Lakes) Policy, 1992*;
 - waterways managed under the *Waterways Conservation Act 1976*, ie the Avon, Peel-Harvey, Leschenault, Wilson Inlet and Albany Waterways Management Areas;
 - the Swan-Canning Estuary and adjoining land managed via the *Swan River Trust Act 1988*;
 - wetlands of regional, national and international importance, including but not limited to: Conservation category wetlands and Resource Enhancement category wetlands and wetlands listed within *A Directory of Important Wetlands in Australia* (see the Australian Department of Environment and Heritage web site which also provides information on Ramsar convention sites) www.deh.gov.au/water/wetlands/database/directory; and
 - groundwater aquifers that sustain important ecological functions.
- e. Locations where surface water or groundwater from the water table may be consumed or inhaled affecting people's health or well-being, eg garden, recreation or irrigation sources.
- f. Surface water bodies and wetlands meeting recognised cultural or social needs, eg water resources used for community swimming, fishing or valued for their visual appeal.

Appendix D - Development applications

Where an inert landfill and associated facilities are proposed to be constructed or upgraded near sensitive water resources, proponents should supply a notice of intent to regulatory agencies, including the following details:

- a. Site owner or tenant's contact name and address details.
- b. A site plan showing the location of the facility, and nearby water resources.
- c. A full description of the activities that will be carried out.
- d. The type and quantities of fuels and chemicals stored or handled on site.
- e. Description of the nature and quantities of waste that will be handled at the facility.
- f. Proposals for chemical containment, waste management and disposal (with design sketches).
- g. Information on any licences or approvals already granted for the facility.
- h. Details of any contingency measures to minimise the impacts of chemical spills, and disposal of contaminated waters from fire, flood or other emergency.