# Proposed waste disposal site at Narngulu

## Shire of Greenough and City of Geraldton

Report and recommendations of the
Environmental Protection Authority

Environmental Protection Authority
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# Summary and recommendations

The Shire of Greenough and City of Geraldton are seeking approval for the construction and operation of a solid (domestic) waste landfill site at Meru, 6 km south-west of Geraldton near the Narngulu industrial area, and for the concept of locating various other types of waste disposal (eg liquid and hazardous waste facilities) at the same site. The solid (domestic) waste landfill would have an excavated volume of about 3 million $m^3$, be lined with a minimum of 0.5 m of compacted clay and capped with sand and clay.

The Authority supports the concept of having a single waste disposal facility to handle various types of waste because it reduces the number of sites with potential to cause pollution, reduces the area alienated for buffer zones and can result in better site management.

## Recommendation 1

**The Environmental Protection Authority concludes that the proposal by the Shire of Greenough and City of Geraldton (acting through Geraldton/Greenough Regional Council) to construct and operate a solid (domestic) waste landfill site at Victoria Location 2268 and Part Victoria Location 2227 is environmentally acceptable.**

**In reaching this conclusion the Environmental Protection Authority identified the main environmental factors requiring detailed consideration as:**

- **measures to protect groundwater from contamination by leachates;**
- **monitoring to ensure groundwater protection measures are working and that plans are prepared and implemented to clean-up groundwater contamination should this occur;**
- **management of methane emissions caused by waste degradation in the landfill to reduce greenhouse gas impacts; and**
- **long term responsibility for the site until it is no longer polluting.**

**The Environmental Protection Authority concludes that the environmental factors mentioned above have been addressed adequately by either environmental management commitments given by the proponents or by the Environmental Protection Authority's recommendations in this report.**

**Accordingly, the Environmental Protection Authority recommends that the proposal could proceed subject to:**

- **the Environmental Protection Authority's recommendations in this Assessment Report; and**
- **the proponents' commitments given in the Consultative Environmental Review (Appendix 2).**

Although this proposal considers only landfill disposal the Authority has noted the potential importance of recycling as part of waste management policy and the role of recycling in reducing greenhouse gas emissions from waste disposal practices.

The potential for significant groundwater pollution from leachates is small as a result of the nature of the soils, the proposed clay liner and capping with sand and clay. Nevertheless, monitoring is required to ensure groundwater pollution is not occurring. The Authority considers an appropriate reporting mechanism would set monitoring bore water quality standards, a breach of which would be reported to the Authority promptly and would cause the Authority to consider the need for clean-up operations. Reports on a five-yearly basis would also be appropriate.

## Recommendation 2

**The Environmental Protection Authority recommends that to protect groundwater resources:**

- **the base and sides of the landfill should be lined with a minimum of 0.5 m of compacted clay to the satisfaction of the Environmental Protection Authority on advice of Geological Survey;**

- **there should be an adequate separation between the base of the landfill and the highest known groundwater level;**
- **prior to the commencement of tipping operations four multiport monitoring bores should be installed to the satisfaction of the Environmental Protection Authority on advice of the Water Authority of Western Australia and Geological Survey;**
- **the multiport monitoring bores should be monitored regularly to determine if groundwater contamination is occurring. The frequency of monitoring, parameters to be monitored and reporting mechanisms should be to the satisfaction of the Environmental Protection Authority on advice of the Chemistry Centre and Water Authority of Western Australia; and**
- **should monitoring indicate groundwater quality is being affected to an unacceptable degree, as determined by the Environmental Protection Authority, the proponents should prepare and implement a strategy for clean-up of groundwater contamination to the satisfaction of the Environmental Protection Authority on advice of the Water Authority of Western Australia.**

Refuse in a landfill degrades and typically produces leachates with high pollutant concentrations and landfill gas which is about 50% carbon dioxide and 50% methane until the degradation process is complete. Carbon dioxide and methane are greenhouse gases.

The Greenhouse Gas Audit for Western Australia, which has been endorsed by the State Government, concluded that by phasing out CFC and halon usage and reducing the production of methane from landfills the goal of a 20% reduction in Greenhouse gas emissions which the State Government is working towards could be met. This is the first assessment report of the Environmental Protection Authority to consider management of greenhouse gases from landfills.

Burning methane gas from landfills significantly reduces the greenhouse impacts of landfill gas and can produce energy. As the refuse site is in close proximity to the Narngulu industrial area, the Authority believes that a use for the gas may be found.

## Recommendation 3

**The Environmental Protection Authority recommends that prior to the commencement of tipping the proponents prepare and then subsequently implement an Environmental Management Programme for methane gas to the satisfaction of the Environmental Protection Authority**

The proposed operational practices to reduce odours, windblown litter, pests and fire are considered to be adequate by the Authority.

The Authority endorses the proponents' commitment to put in place a 1000 m buffer zone in which residential development will not take place. The Authority considers it is essential that this commitment is implemented to ensure the site can remain operational with minimal impacts on the public.

The Authority considers that responsibility for post-closure management should remain with an agency or group of agencies which are accountable to the community, have a guaranteed life and sufficient funds to manage the site until the waste is fully degraded. The Authority believes that the Shire of Greenough and City of Geraldton jointly would be the most appropriate agencies in this case.

## Recommendation 4

**The Environmental Protection Authority recommends that the Shire of Greenough and City of Geraldton jointly be responsible for construction, operation, decommissioning and post-closure management of the site until such time as the waste has fully degraded, to the satisfaction of the Environmental Protection Authority.**

The strategy for decommissioning and post-closure management of the refuse site needs to be determined prior to site closure so that closure can take place in a manner consistent with the post-closure management plan and so that the likely costs of post-closure management can be identified. The proponents may then incorporate such costs into the charges levied for waste disposal. Whilst early consideration of a decommissioning and post-closure management plan is desirable, the plan may need to be amended to reflect standards current at the time of closure.

The plan should be presented to the Authority for comments when it is prepared and sent to the Authority for final approval when it has been determined that the remaining tipping space is likely to be filled within two years.

## Recommendation 5

**The Environmental Protection Authority recommends that prior to closure of the site the Shire of Greenough and City of Geraldton jointly prepare and subsequently implement an Environmental Management Programme for decommissioning and post-closure management to the satisfaction of the Environmental Protection Authority.**

# 1. Introduction

In 1989 the Shire of Greenough and City of Geraldton jointly commissioned a Waste Disposal Study to identify strategies for future waste disposal in the region. This study, prepared by Maunsell and Partners Pty Ltd, recommended that the two local authorities combine their operations and establish a new site at Narngulu to handle the full range of waste disposal activities. Several of the recommendations of the Waste Disposal Study have been or are being implemented.

Land for the proposed waste disposal site is jointly owned by the Shire of Greenough and City of Geraldton and the Geraldton/Greenough Regional Council has been created to manage the site.

A Regional Council is a body created under the Local Government Act and may cover all or part of two or more councils. Agreement must be reached by the respective member councils regarding the constitution of the Regional Council, which must include a description of the Regional Council's functions. Regional Councils can be enlarged by varying the constitution, with the approval of the Minister for Local Government. Withdrawal by a council from a Regional Council can occur, however agreement must be reached regarding the adjustment of assets and liabilities between the withdrawing Council and the Regional Council and a new constitution must be agreed upon by the remaining Regional Council member councils before the Minister for Local Government can consider approving a withdrawal. The Governor must approve the actions of the Minister for Local Government.

The Geraldton/Greenough Regional Council constitution was recently approved by the Minister for Local Government. A copy of the functions of the Geraldton/Greenough Regional Council appears as Appendix 3.

# 2. Description of proposal

The proposed site is on cleared agricultural land 6 km south-west of the City of Geraldton at Meru, near the Narngulu industrial area. The nearest residence is more than 1 km from the site and the nearest industrial site is about 600 m away.

Approval is sought for the construction and operation of a solid (domestic) waste landfill site and for the concept of locating various types of waste disposal facilities, such as septage ponds, at the same site (See Figure 1). The waste facilities concept plan shows sites for both liquid and hazardous waste treatment which would be constructed at a later date when there is a demand for this type of waste disposal. Liquid and hazardous waste would not be accepted until appropriate approvals have been sought and obtained.

It is proposed that the landfill would have an excavated volume of about 3 million $m^3$, have a refuse depth of 12 m or less, be lined with 0.5 m of compacted clay and be capped with 1 m of sand and clay. A 5 m vertical separation between the groundwater table and the base of the landfill is proposed. The estimated life of the facility would be about 30 years.

The landfill would be designed so that any leachates produced would be captured at the base of the landfill and pumped back over the refuse or treated. Management practices to limit the production of odour and litter problems, such as daily covering of the refuse, are proposed in the Consultative Environmental Review.

A 1000 m buffer zone, as shown in Figure 1, would be enforced around the site in which no new residential developments would be allowed to ensure both long term operation of the landfill and minimum inconvenience to future residents near the landfill.

It is proposed that the site be returned to agricultural use after waste disposal operations have ceased. The site would be rehabilitated to return it to a form close to and compatible with its original contours.

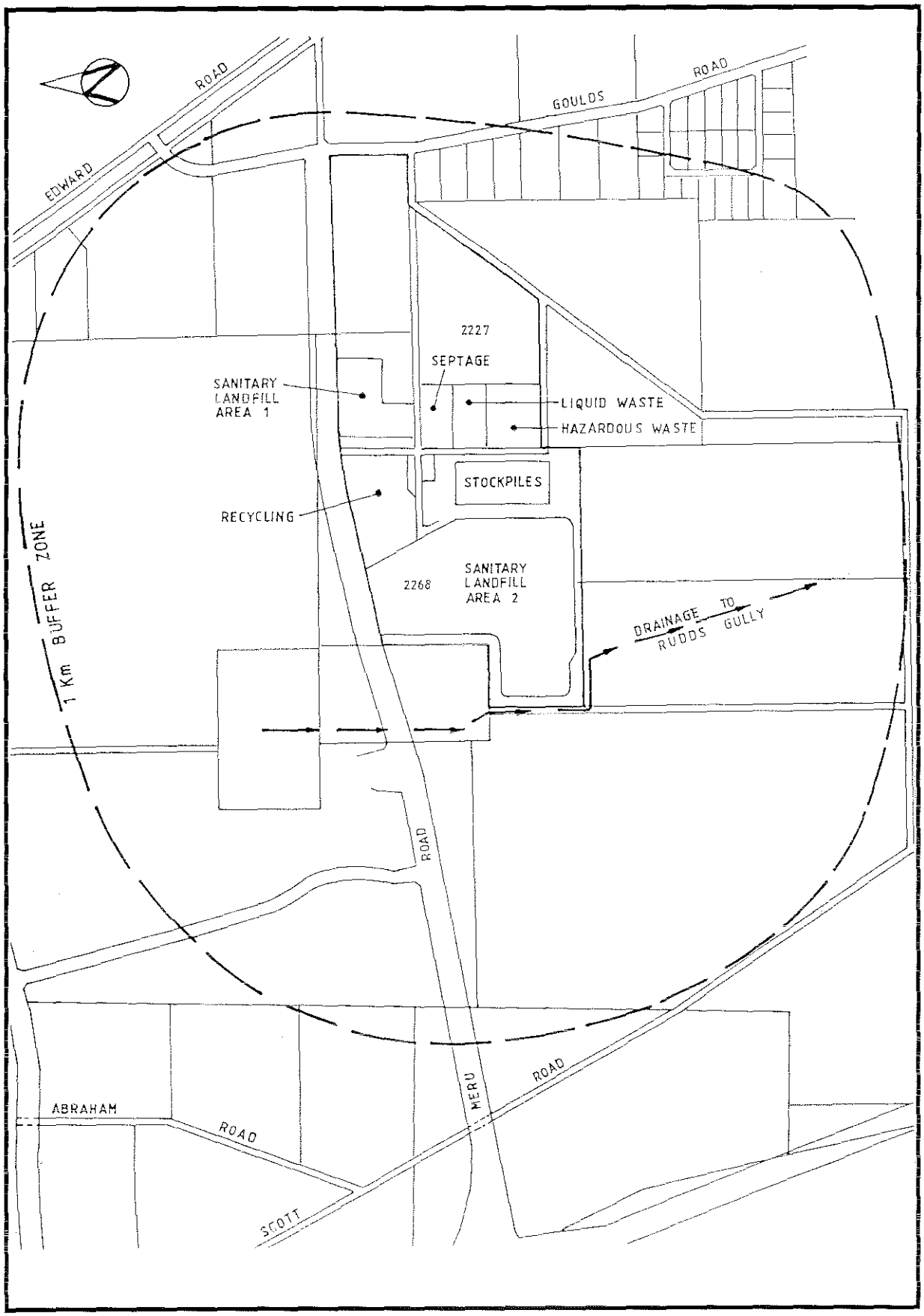


*Figure 1: Waste facilities concept plan for Meru*

# 3. Existing environment

The following aspects of the existing environment are relevant:

- the site is overlain by about 20 m depth of alluvial material which consists of medium to fine sands with interbeds of clay;
- groundwater is brackish (about 1900 mg/L), flows towards the south-west and the watertable is about 4 m AHD;
- the site is currently gently sloping (almost flat), cleared agricultural land and no defined water courses cross the site;
- the annual wind roses for Geraldton show that light winds (ie 1-5 km/h) which can carry odours occur rarely, tend to be in the mornings and are southerly to easterly in the summer and northerly to easterly in winter;
- the nearest residence is 1 km to the north-east and the nearest industrial land about 600 m from the site; and
- the annual rainfall is about 500 mm.

# 4. Consultation

The Environmental Protection Authority required that a Consultative Environmental Review (CER) be prepared for the proposal. The availability of the CER was advertised in the local newspaper and the CER was circulated to relevant government agencies. The Authority received nine submissions in response to the CER, of which three were from the public or community groups.

The principal topics raised in the submissions related to:

- waste disposal philosophy and recycling;
- evaluation of alternative sites;
- protection of ground and surface waters;
- landfill gas and odours;
- visual impacts; and
- potential for unexploded ordinances.

A detailed list of issues raised in submissions and the proponents' response to these issues appears in Appendix 1. A list of submissions received also appears in Appendix 1.

# 5. Environmental assessment

## 5.1 Waste management policies

The State Government has set a goal to replace 50% of the garbage presently going into tip sites by recycling over the next 10 years. The Authority urges the Shire of Greenough and City of Geraldton to work together through the Regional Council to re-assess the feasibility of recycling in the Geraldton/Greenough urban area, with particular reference to door-to-door recycling. The Regional Council could draw on work done by the City of Geraldton's Recycling Task Force and information available from the Authority's Recycling Officer.

Recycling also has benefits in reducing the greenhouse effects of waste disposal, as detailed in Section 5.4 of this report.

The Health Department and Environmental Protection Authority have a jointly agreed policy position that lining is preferable to capping as a method of reducing the environmental impacts of landfills. One of the reasons for this is that at a lined site it is possible to manage waste degradation rates by manipulating the water infiltration rate and bacterial population within the waste without causing serious groundwater pollution. The waste degradation rate directly affects the rate of landfill gas generation. Waste which has fully degraded no longer produces highly polluting leachates or landfill gas.

## 5.2 Proposed waste facilities concept plan

The Authority considers that it is better to have fewer, larger, well controlled disposal sites rather than numerous small ones. Having fewer sites reduces the number of sites with the potential to cause pollution, can permit better site selection, reduces the total area alienated for buffer zones, and often permits better management of the facilities.

Therefore the Authority supports the concept of having the region's various types of waste disposal facilities at one site, provided these facilities are designed and managed to minimise environmental impacts such as groundwater pollution and odours. This assessment has specifically addressed only the the proposed solid (domestic) waste landfill. Each subsequent facility (eg septage ponds, liquid and hazardous waste facilities) should be referred to the Environmental Protection Authority for environmental impact assessment prior to construction.

## 5.3 Groundwater protection

### 5.3.1 Potential for groundwater pollution

The proponents intend to achieve groundwater protection by lining the site with a minimum of 0.5 m of the best clay material obtained during excavation of the site and by leaving 5 m of material between the base of the refuse site and the groundwater level.

The Authority has been advised by Geological Survey that lining of the site as proposed will minimise leaching from the site and that the water table is sufficiently deep, and sediments sufficiently clayey to allow most contaminants leached from the site to be removed by absorption or microbiological degradation. This advice contrasts with that which would be received for a typical Swan Coastal Plain site, where little clay occurs and a liner with a permeability of $10^{-7}$ cm/s or less would most likely be required.

### 5.3.2 Groundwater monitoring

Groundwater monitoring is essential to determine if there is any effect on groundwater quality from the proposed facilities. The proponents have made a commitment to install one multiport bore west of the site and using it to detect if any groundwater contamination is occurring. The Authority has been advised by the Water Authority of Western Australia and Geological Survey that four multiport bores are considered the minimum necessary. The Authority was also advised by the Water Authority that all bores within 2 km of the site between the south and west should be sampled once to determine background levels prior to the commencement of filling operations. The Chemistry Centre of Western Australia has a list of parameters that should be monitored for landfill sites. The four multiport monitoring bores should be monitored when they are installed and on a quarterly or six monthly basis after tipping commences.

The Authority considers an appropriate reporting mechanism would set monitoring bore water quality standards, a breach of which would be reported to the Authority promptly and cause the Authority to consider the need for clean-up operations. However, without detailed knowledge of the existing groundwater quality it is difficult to determine these standards. When the existing groundwater quality is better known, reference water quality standards should be determined. Reports on a five-yearly basis would also be appropriate.

### Recommendation 2

**The Environmental Protection Authority recommends that to protect groundwater resources:**

- **the base and sides of the landfill should be lined with a minimum of 0.5 m of compacted clay to the satisfaction of the Environmental Protection Authority on advice of Geological Survey;**

- **there should be an adequate separation between the base of the landfill and the highest known groundwater level;**
- **prior to the commencement of tipping operations four multiport monitoring bores should be installed to the satisfaction of the Environmental Protection Authority on advice of the Water Authority of Western Australia and Geological Survey;**
- **the multiport monitoring bores should be monitored regularly to determine if groundwater contamination is occurring. The frequency of monitoring, parameters to be monitored and reporting mechanisms should be to the satisfaction of the Environmental Protection Authority on advice of the Chemistry Centre and Water Authority of Western Australia; and**
- **should monitoring indicate groundwater quality is being affected to an unacceptable degree, as determined by the Environmental Protection Authority, the proponents should prepare and implement a strategy for clean-up of groundwater contamination to the satisfaction of the Environmental Protection Authority on advice of the Water Authority of Western Australia.**

## 5.4 Landfill gas and the greenhouse effect

Landfill gas is about 50% methane ($CH_4$) and 50% carbon dioxide ($CO_2$) and is generated as a result of anaerobic degradation processes within the landfill. It has been estimated that about 300 $m^3$ methane/tonne putrescible waste is emitted (Western Australian Greenhouse Co-ordination Council, undated), however the production rate depends on several factors including the moisture status of the waste. The CER report indicates that more than 30,000 tonnes of waste are currently generated in the region each year. Therefore it is expected that a total of 9 million $m^3$ of methane would be generated from each year's dumping over the period of time it takes for the waste to degrade.

The long term relative contribution to global warming for each methane molecule is six times that of a carbon dioxide molecule. Burning one methane molecule produces one carbon dioxide molecule. Therefore, burning the methane produced in tips or preventing its generation through composting or recycling organic waste, is worthwhile.

As the refuse site is in close proximity to the Narngulu industrial area, the Authority believes that a use for the gas as an energy source may be found.

A detailed study for the New Zealand Climate Change Programme (Australian and New Zealand Environment Council, 1990) looked at a range of waste management options from a Greenhouse perspective. It found that increased recycling coupled with capture of methane from landfill was the most effective option in reducing Greenhouse emissions. The study estimated that emissions could be reduced by 50% using this approach.

The Greenhouse Gas Audit for Western Australia, which has been endorsed by the State government, concluded that by phasing out CFC and halon usage and reducing the production of methane from landfills the goal of a 20% reduction in Greenhouse gas emissions, towards which the Government is working, could be met.

The Authority considers it is essential that landfill gas and, in particular the methane gas component of landfill gas emissions, are managed at new refuse sites.

### Recommendation 3

**The Environmental Protection Authority recommends that prior to the commencement of tipping the proponents prepare and then subsequently implement an Environmental Management Programme for methane gas to the satisfaction of the Environmental Protection Authority.**

## 5.5 Operational practices

The proponents have made a commitment to implement management practices which will minimise odour, litter, fire and pest problems. Management practices proposed include daily covering of refuse and construction of a 2.4 m high fence around the perimeter of the site. The Authority suggests that the smallest practicable working face possible be used to minimise the amount of uncovered rubbish at any time. The Authority is satisfied that the operational practices outlined in the CER document would be satisfactory.

## 5.6 Decommissioning and post-closure management

Management of the refuse site is necessary until the waste has fully degraded, which can be many decades after closure of the site for tipping. When the waste is fully degraded methane is no longer generated and pollutant concentrations in leachates reach levels which are not likely to have adverse impacts on the environment.

The Authority considers that responsibility for post-closure management should remain with an agency or group of agencies which are accountable to the community, have a guaranteed life and sufficient funds to manage the site until the waste is fully degraded. The Authority believes that the Shire of Greenough and City of Geraldton jointly would be the most appropriate agencies to take responsibility for post-closure management, because they can generate the funds required during the site's operation and would both would effectively be permanent, accountable bodies under the provisions of the Local Government Act.

### Recommendation 4

**The Environmental Protection Authority recommends that the Shire of Greenough and City of Geraldton jointly be responsible for construction, operation, decommissioning and post-closure management of the site until such time as the waste has fully degraded, to the satisfaction of the Environmental Protection Authority.**

The strategy for decommissioning and post-closure management of the refuse site needs to be determined prior to site closure so that closure can take place in a manner consistent with the post-closure management plan and so that the likely costs of post-closure management can be identified. The proponents may then incorporate such costs into the charges levied for waste disposal. Whilst early consideration of a decommissioning and post-closure management plan is desirable, the plan may need to be amended to reflect standards current at the time of closure.

The plan should be sent to the Authority for comments when it is prepared and sent to the Authority for final approval when it has been determined that the remaining tipping space is likely to be filled within two years.

Future use of the site must be compatible with the required post-closure management.

### Recommendation 5

**The Environmental Protection Authority recommends that prior to closure of the site the Shire of Greenough and City of Geraldton jointly prepare and subsequently implement an Environmental Management Programme for decommissioning and post-closure management to the satisfaction of the Environmental Protection Authority.**

## 5.7 Other issues

### 5.7.1 Maintenance of buffer zones

The Shire of Greenough has made a commitment to putting in place a buffer zone around the Meru facility in which all new residential developments would be excluded until the end of the working life of the facility and has stated that the buffer zone will be to the satisfaction of the Environmental Protection Authority. The proponents have proposed a minimum buffer zone of 1000 m (See Figure 1 of this report).

The Authority strongly supports the establishment of a buffer area from which incompatible land uses are excluded through the planning process. Such a buffer can ensure both the continued operation of the refuse site and the minimisation of impacts to the nearest residences or workplaces where people spend many hours.

The Victorian Environment Protection Authority recommends minimum buffer zones of 200 m and 500 m in urban and non-urban zones respectively for putrescible landfill sites, however given that other waste facilities such as septage ponds are likely to be proposed in the future, the 1000 m buffer zone proposed is considered appropriate.

### 5.7.2 Visual impacts

The proponents have made a commitment to plant a suitable screen of trees around the boundaries of the site to the satisfaction of the Environmental Protection Authority. Some shrubs should also be included in the screen planting.

### 5.7.3 Project detail and approval period

The Authority 's experience is that it is common for details of a proposal to alter through the detailed design and construction phase. In many cases alterations are not environmentally significant or have a positive effect on the environmental performance of the project. The Authority believes that such non-substantial changes, and especially those which improve environmental performance and protection, should be provided for.

The Authority believes that any approval for the proposal based on this assessment should be limited to five years. Accordingly, if the proposal has not been substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further consideration of the proposal should occur only following a new referral to the Authority.

# 6. Conclusion

The Environmental Protection Authority concludes that the proposal by the Shire of Greenough and City of Geraldton (acting through the Geraldton/Greenough Regional Council) to construct and operate a solid (domestic) waste landfill site at Victoria Location 2268 and Part Victoria Location 2227 is environmentally acceptable.

In reaching this conclusion the Environmental Protection Authority identified the main environmental factors requiring detailed consideration as:

- measures to protect groundwater from contamination by leachates;
- monitoring to ensure groundwater protection measures are working and that plans are prepared and implemented to clean-up groundwater contamination should this occur;
- management of methane emissions caused by waste degradation in the landfill to reduce greenhouse gas impacts; and
- long term responsibility for the site until it is no longer polluting.

The Environmental Protection Authority concludes that the environmental factors mentioned above have been addressed adequately by either environmental management commitments given by the proponents or by the Environmental Protection Authority's recommendations in this report.

Accordingly, the Environmental Protection Authority recommends that the proposal could proceed subject to the:

- Environmental Protection Authority's recommendations in this Assessment Report; and
- proponents' commitments given in the Consultative Environmental Review (Appendix 2).

# 7. References

Australian and New Zealand Environment Council, 1990 *Reducing Greenhouse Gases, Options for Australia.*

Western Australian Greenhouse Co-ordination Council, 1989 *Greenhouse gas audit for Western Australia* Prepared by Laura Stocker, Institute for Science and Technology Policy, Murdoch University.

Western Australian Greenhouse Co-ordination Council, Undated *Addressing the Greenhouse Effect; A discussion paper*, Environmental Protection Authority, Perth, Western Australia.

# Appendix 1

## Proponent's response to issues raised by submissions

### List of submissions received

Active Community Environmentalists

Cr K E Gill

Waggrakine and Glenfield Progress Association

Department of Planning and Urban Development

Geological Survey of Western Australia

Health Department of Western Australia

State Energy Commission of Western Australia

Water Authority of Western Australia

Western Australian State Emergency Service

WASTE DISPOSAL PHILOSOPHY

*Issue 1:* *The need for the proposal has not been adequately demonstrated as existing sites have sufficient capacity and recycling could significantly extend present sites. The proposal should therefore be abandoned.*

Response: As stated on page 1 of the C.E.R., the existing landfill sites at Moonyoonooka and Flores Road will reach capacity in 3 and 10 years respectively at current rates of waste generation. At a minimum the proposal requires strong consideration as a planning tool for future waste disposal capacity. Detailed investigation of an alternative recycling facility for sewerage and solid wastes is documented in the 'City of Geraldton, Shire of Greenough, Waste Disposal Study: Maunsell & Partners Pty Ltd, June 1989, pp64-67. The conclusions reached were that recycling is only practical, in a relatively small waste generating area like Geraldton, for a limited type of waste (ie glass, aluminium cans and newspaper). Thus any successful recycling strategy (which the proponent is already implementing) will not have a major effect on the total quantity of waste in the short term.

*Issue 2:* *The proposal should be for a comprehensive recycling facility for sewerage and solid waste rather than landfill. This should be more thoroughly investigated.*

Response: See the response to Issue 1, above.

*Issue 3:* *The waste generation estimates per capita should reduce, not increase, if reuse/recycle strategies are implemented.*

Response: See response to Issue 1, above. In addition, the increasing rate of total waste generation is based on conservative estimated waste generation per capita increases of 2% per year and on the estimated total population growth rate of 1.7% per year. The per capita increase is anticipated because as Geraldton's population grows the city will attract more industry and commercial activity with more waste resulting from these non-domestic sources.

*Issue 4:* *The current financial arrangement may make Greenough Council wish to maximise waste input.*

Response: At the time of writing (1st November, 1990) the Geraldton/Greenough Regional Council Steering Committee has submitted the draft constitution of the Regional Council to the Minister for Local Government for approval. It is envisaged the Regional Council will be formally constituted by February 1991. Once this occurs the disposal of waste in the region will be under the jurisdiction of this Regional Council, hence strategies adopted for the closure of existing tips and the commencement of operations at the Meru tip will be determined by this Regional Council body in the best interests of all residents and ratepayers of the region. Additionally the Regional Council is well aware of the community demand for increased recycling and waste minimization. At the Steering Committee's last meeting on the 24th October, 1990 the formation of a Community Waste Disposal Advisory Committee was proposed so as to provide a community input into waste disposal strategies.

*Issue 5:* *Sewerage wastes should be used as source of fertilizers/water in an agricultural/agroforestry enterprises.*

Response: The proponent has already commissioned/completed a water study (Hydro Plan Pty Ltd) which identifies the recycling of existing treated effluent from W.A. Water Authority sewerage treatment plant in Geraldton.

The Regional Council, despite an earlier rejection by W.A. Water Authority to receive septage, has reopened negotiations with W.A. Water Authority to achieve comprehensive environmental rehabilitation plan to reduce septage infiltration into the groundwater.

The main objectives of the rehabilitation plan are:

1. Achieve a reticulated sewerage system throughout the Geraldton District, thereby shrinking on-site effluent disposal.

2. To integrate sewerage and septage treatment to reduce environmental degradation and increase environmental control parameters.

3. Recycling of total treated effluent for sports ovals and passive recreation areas.

*Issue 6:* *Current practices for the disposal of liquid and hazardous wastes should be described.*

Response: Liquid (other than septage) and hazardous wastes are not currently accepted at the Shire of Greenough's Moonyoonooka tip or the City of Geraldton's Flores Road tip. Instead generators of such waste are encouraged to treat these wastes at source, then recycle/dispose of the solid residues. The safe disposal of such wastes in the future is intended to be carried out at the Meru tip in properly engineered and environmentally approved facilities. The sooner such facilities are approved and installed at the Meru site, the less likelihood there is of illegal dumping of such substances at the existing sites, benefiting both community and the environment.

*Issue 7:* *There is a danger that liquid and hazardous wastes could be disposed of illegally at the refuse site.*

Response: Illegal dumping will be strongly discouraged at the proposed landfill site by several security features. The site will be completely fenced with only one entry and exit gate. The gatehouse will be manned at all times during landfill hours and loads will be examined on a random basis. In addition, the convenient location of the proposed site will encourage ratepaying tippers to use the facility and thus reduce illegal tipping elsewhere.

EVALUATION OF ALTERNATIVES

*Issue 8:* *There was insufficient consideration of alternative sites; a wider search seeking an "ideal" site should have been undertaken.*

Response: In the initial waste disposal study (Maunsell 1989), pp42-44, four alternative landfill sites were evaluated in detail. These sites ranged from 6km to 25km from the city centre and included sand, hardrock and gravel quarry sites. The Narngulu site is preferred because of a number of factors:

- Being 6km from the city centre it is close to present and future development and will save significant transportation and transfer station costs.

- Being located in an area zoned as rural the landfill is and can be buffered from future residential developments. A 1km buffer zone all around is recommended.

- Access is good particularly if planned regional roads feeding the area can be given priority in construction.

- The soils of the area, which consist of alluvium with varying clay characteristics, will have good leachate attenuating properties.

- Being close to the city the chances of being able to sell surplus excavated material are good.

- The nearest residential developments are rural holdings along Edward Road and these are over 1 km away from the proposed waste development areas.

*Issue 9:* *The site should have been closer to the coast to reduce the quantity and potential usability of groundwater which could be polluted.*

Response:

1. In addition to the four alternative landfill sites discussed above, a site in the Southgate dunes was briefly evaluated and quickly dismissed. One of the main arguments against a near coastal location is the potential (however slim) for any leachate generated to migrate into the ocean and pollute popular local beaches. Also there is a lack of suitable clay lining material and capping material in coastal area.

2. It is considered this suggestion is inconsistent with good planning practise as regards the social impact of a waste disposal facility in an attractive location.

PROTECTION OF SURFACE WATERS

*Issue 10:* *Surface runoff may be contaminated or contain overflow from ponds and should therefore be contained on site and not be allowed to enter Rudd's Gully to protect downstream uses.*

Response: The proposed waste disposal area is below ground surface. Therefore, any runoff from the site that enters Rudd's Gully will only occur after clay capping and contouring is complete and will not be contaminated. Any standing water in the excavated waste disposal areas will be collected and retained on site in the leachate collection system described in response to Issue 11, below. Also, standard engineering design criteria for the septage disposal ponds and the final evaporation pond requires that adequate capacity is allowed for approximately 1 year of septage accumulation plus the total rainfall that will fall on the lagoons in the winter months, with additional safety capacity for flood events. The ponds will be engineered so that no overflow will occur.

LEACHATES

*Issue 11:* *The mechanism for removal of leachate from the refuse pit and treatment of collected leachate is not described.*

Response: The proponent wishes to emphasise that based on the water balance study conducted for the CER (see Appendix 1), very little leachate will be generated from the refuse on site. The method of leachate collection, recirculation and/or treatment is also indicated in sections 3.2.5 and 7.1.

If, during the active life of the landfill any leachate is generated, it will be collected in a contoured low point at the base of each cell by a sump rising to the surface. The leachate will be pumped out and trickle irrigated back over the waste material without comprising the capping material. In the future, should sewerage reticulation become available in the area, then consideration will be given to discharge of leachate into the sewer.

PROTECTION OF GROUNDWATER RESOURCES

*Issue 12:* *Ability of clay layer to seal pits should be subject to independent appraisal to ensure leakage of leachates will not occur.*

Response: As stated above in the response to Issue 11, very little leachate will be generated by the refuse on site. However, independent testing of the natural clay material beneath the site shows that it contains up to 23% clay and this clay contains kaolinite and montmorillonite which literature studies confirm have excellent contaminant attenuating properties (see Appendix 2 and reference to Newman, P.W.G. 1981).

In addition, an engineered clay liner will be constructed of the best clay material on site, and then contoured and compacted to give a particularly impermeable lining at least 0.5m thick (see Section 7.1) Leachate Control and Commitment 1).

*Issue 13:* *Half metre thickness of clay layer is inadequate because there is little margin for error in the thickness.*

Response: See response to Issue 12 above. The one half metre thickness quoted is the minimum thickness that will be tolerated by the contract conditions during construction. The thickness and compaction achieved will be tested and completed to the satisfaction of the Health Department and the Environmental Protection Authority (see Commitments 1 and 5).

*Issue 14:* *Plans to prevent downstream contamination of groundwater if the clay lining leaks should be more detailed.*

Response: As explained in the water balance study (Appendix 1) little or no leachate will be formed, especially during active landfill use and for the first ten years after each cell is completed. The plans to prevent the clay lining from leaking after that time are explained above in response to Issues 11, 12 and 13. In addition the commitment to place a strategic monitoring bore downgradient from the site will give advanced notice in the long term by detecting any leachate that may leak from the site.

It should also be noted that a key factor in selecting the proposed location was the generally saline nature of shallow groundwater in the area and the very limited use of groundwater for stock watering purposes only.

*Issue 15:* *Proposed number of monitoring bores is inadequate.*

Response: See response to Issues 11 and 14 above. Monitoring bore requirements and location are carried out in conjunction with the Geological Survey Section of the Mines Department. The number necessary is dependent on the method of tipping and geology of the site. The requirements of the number of bores for monitoring will be continuously reviewed with the appropriate authority in the light of any technical information justifying an increase.

LANDFILL GAS

*Issue 16:* *Methane gas control is very important because of greenhouse concerns.*

Response: Methane gas is known to contribute to the much publicised greenhouse effect. Methane escaping from sanitary landfills is a significant contributor to man-made greenhouse gases but still lies far behind industry, transport, livestock and chloro fluoro carbons. The volume of gas generated is dependent on numerous factors, one of which is the moisture content of the waste. Due to the low annual rainfall in the region, landfill gas generation is not expected to be high, however, the proponent will periodically monitor the gas generated at the landfill to assess the need to collect and flare or alternatively the viability of collecting and selling the gas as an energy source.

The proponent remains in contract with State Energy Commission W.A. Renewable Energy section and has sought and will continue to appraise gas generation/opportunities of energy recovery into the State Energy Commission W.A. grid. The proponent is prepared to add this to its list of commitments.

*Issue 17:* *Methane gas control plan needs to be determined before construction begins because extraction pipes should be installed during filling.*

Response: Gas flow prediction is not an exact science. The variations between different landfills seem to be great. Laboratory measurements are unreliable because the small scale experiments cannot replicate the heterogeneous mass of a real landfill. Even flow rates from operating projects are difficult to analyse because usually only part of the available gas is collected.

There are basically two methods of collection for landfill gas vertical wells or horizontal wells.

The main difference between them is that horizontal wells must be installed during filling and vertical wells can only be drilled into completed landfills. The relative advantage and disadvantages are described below.

The advantage of installing horizontal wells as the tip fills up are:

- Gas can be extracted from the lower layer of refuse before the landfill is complete, in this way valuable methane can be removed which otherwise would disperse into the air.
- The gas can be collected at a lower pressure differential than vertical wells and so air intrusion is minimised.
- The costs are less than vertical wells because no drilling is needed.
- They are not susceptible to damage through settlement.

The disadvantages are:

- The wells can become useless if they are flooded.
- If a horizontal well fails it cannot be replaced, unlike a vertical well.
- The expenditure on the wells must be made some years before any gas can be extracted.

A vertical well system could be used if the landfill is completed to final surface levels in cells. The pipes would have to have a telescoping facility to accommodate settlement.

The advantages are:

- Damaged wells can be replaced.
- Extra wells can be drilled if needed.
- Expenditure is not required until the gas is required.

The disadvantages are:

- The wells can be badly damaged by settlement.
- They cost more than horizontal wells.
- The landfill has to be completed to final surface.
- Drilling in a completed landfill can be difficult.

Gas collection and utilization for energy purposes is generally only commercially viable when:

- There is a large, continuous user of gas nearby, or
- There is a legislation or regulations in place which give an incentive for renewable and alternative energy source development.
- The physical characteristics of the landfill and the prevailing climate are conducive to viable gas generation.

*Issue 18:* *Gas should be used by industry or for electricity generation.*

Response: See response to Issue 17 above.

SEPTAGE DISPOSAL FACILITY

*Issue 19:* *Insufficient information is provided to permit a proper evaluation.*

Response: The information provided for the septage treatment facility in the CER, is to seek approval for the site and concept only. Proper evaluation/design criteria will be conducted by the Health Department and the Water Authority in due course. More detailed plans have already been forwarded to the Health Department in the following public document: "Shire of Greenough, Meru Waste Disposal Facility, Proposal and Management Plan for Establishment and Operation, June 1990."

For the purposes of good planning, all types of future waste disposal activities at the site should be anticipated in advance. Therefore initial design concepts, as proposed in the CER, must include septage, domestic, construction, liquid and hazardous waste disposal with capacity for increased recycling needs.

The proponent is hopeful of negotiating successfully with W.A. Water Authority to integrate sewerage/septage treatment within W.A. Water Authority's reticulation system which will then preclude the requirement for this facility.

ODOURS/FLIES

*Issue 20:* *Odours are likely to be a problem because residents in Woorree still notice odours from the Narngulu rutile plant which has strict pollution controls.*

Response: As explained in the CER, Section 7.2, the proponent is committed to minimising odours produced from the facility by proper management practices including daily soil cover of extremely putrescible wastes. Also see the response to Issues 21, 22 and 23 below.

*Issue 21:* *Procedures to control odours (particularly from the proposed septage facility) need to be outlined.*

Response: The proposed septage disposal facility and odour management plans will be designed to current operational standards, and reviewed and inspected by the Health Department. Also see the response to Issues 22 and 23 below.

BUFFER ZONE

*Issue 22:* *Justification for size of buffer zone not provided. No analysis of likely impact from odour.*

Response: A detailed examination of the likely impact from odours was completed for the previous waste disposal study (Maunsell 1989).

From this report the following text is paraphrased:

> The greatest nuisances from solid waste landfills are windblown refuse and smell. To minimize the effect it is desirable to keep residential development at least 500m to 1,000m from the landfill. We believe a buffer zone of 600m can be maintained without seriously compromising the landfill development.
>
> Proper management of landfill can minimise offensive odours that refuse and decomposition typically produce. The most effective control technique is to ensure that a covering material is placed over the refuse daily. Allowance for a buffer strip around the site will also maximise the distance from the fill to nearby residences.
>
> With these precautions persistent offensive odours should only occur, if ever, during long periods with light (1-5km/hr) winds as strong winds disperse odours quickly. Long term wind speed records are available from Bureau of Meteorology data for Geraldton.

These sources indicate that light wind conditions are relatively unusual and short term in the area. The monthly occurrence of wind speeds between 1-5km/hr at 900 hrs (morning) and 1,500 hrs (afternoon) at Geraldton is shown in the CER, Figure 4.1. This data indicate that the monthly average occurrence of light winds in the morning is 5.25 (i.e. on about 5 in 100 days) and in the afternoon is 2.1% (i.e. on about 2 in 100 days).

If one specific direction is taken, the worst direction for the closest residential area is wind from the south-east and light winds from this direction only occur 1% of the time. It can be expected that a resident located north-west of the landfill may experience the chance of some odour four times during the year.

Whether odour will be a nuisance is an extremely complex subject and is very subjective with little research having been undertaken. However, Geraldton being a relatively windy place and because a 1km buffer has been provided it is extremely unlikely that odour will be a problem.

With proper landfill management odour problems are not likely to occur in the morning as most fill will have been covered with soil the previous day and little exposed rubbish will be present. In the afternoon, light wind conditions mainly occur from May to September. Again, covering the rubbish at the end of each day's operation should effectively ensure that no situations of concern arise.

The above assumes the management of the tip is good with daily covering of refuse and the immediate burial of noxious wastes.

*Issue 23:* *No monitoring of odour complaints is proposed.*

Response: The proponent is the City of Geraldton and the Shire of Greenough. Any odour complaints will go directly to the proponent in their normal capacities as Councils, which appears to be the ideal situation if odour problems occur.

*Issue 24:* *Residential development planned for the north-west edge of the buffer zone will suffer odour problems.*

Response: See response to Issue 22 above.

*Issue 25:* *Buffer zone is inadequate to prevent flies and odours reaching residents.*

Response: See response to Issues 20,21, and 22 above.

VISUAL IMPACTS

*Issue 26:* *Tree planting on the site should be maximised (to prevent possibility of rising groundwater tables.)*

Response: The water table is estimated to lie approximately 17m below ground surface and a rising groundwater table is not expected to be a problem. However, tree planting around the boundary of the site will be maximised to reduce the visual impact of site activities on the surrounding landscape and to provide a windbreak for the reduction of windblown litter.

*Issue 27:* *Visual impact is a major consideration given the topography of the surrounding land and therefore screen planting is essential.*

Response: See response to Issue 26 above. Also, it should be noted that the disposal area is mostly below ground surface and the finished landfill levels will be similar to original ground levels. Above ground activities will be restricted to soil cover stockpiles, administration buildings, low profile septage lagoons and a car body recycling area.

MISCELLANEOUS

*Issue 28:* *Site should be kept as farm land as a 4km buffer from the industrial area.*

Response: See response to Issues 1 and 8 above.

*Issue 29:* *Unexploded ordnance could occur on site.*

Response: Some potential exists for unexploded ordnance (UXO) in the Southgate dunes area. However, no known similar hazard exists at the proposed Namgulu site. However, future excavation contracts in the area will contain a warning on UXO as proposed by the Western Australian State Emergency Working Party on UXO.

*Issue 30:* *Windblown refuse control should be more detailed; adequacy of height of boundary fence to control windblown refuse is questioned.*

Response: Windblown refuse control will be a combination of three management tools that will prove adequate:

1. Daily soil cover of the active landfill face.

2. Construction of a 2.4m (8ft) fence around the entire facility and collection of caught litter as required.

3. Extension planting of trees inside the facility boundary as a windbreak and screen from visual impact.

4. Provision of temporary (chicken wire or shade cloth) fencing immediately adjacent to the tipping face.

*Issue 31:* *Site is too close to the airport (based on an interpretation of US Federal Aviation Administration Order No. 5200).*

Response: The U.S. FAA Order No. 5200 sets a minimum buffer distance for landfills from the end of runways, of 10,000 feet (3,048 metres) for turbo jet aircraft to protect against bird strike.

The proposed site is located at least 4km from the main runway and is away from the main flight path of the Geraldton Airport. The Shire of Greenough owns and operates the airport and is completely aware of the relevant Australian Civil Aviation regulation number CAR96 relating to the dumping of rubbish in the vicinity of airports. A well managed landfill as proposed should not attract pests. Seagulls can be controlled by limiting the extent of the tip face and the use of adequate cover materials.

*Issue 32:* *Separate EPA approvals should be required for hazardous and liquid waste disposal.*

Response: As stated previously in response to Issue 19, separate approvals will be sought from the appropriate authorities for any purpose-built facility at Narngulu including the septage disposal area, and the potential liquid and hazardous waste disposal areas.

*Issue 33:* *Access should be via Goulds Road as indicated in the CER; Alexander Road would be unacceptable.*

Response: It is the Steering Committee's intention that the only access to the site will be via Goulds Road, Narngulu.

# Appendix 2

## Proponent's commitments

The proponents are committed to minimising the potential environmental impacts of the Meru waste disposal facility at Narngulu. Consequently, it makes the following commitments.

1. The proponents commit to lining the sanitary landfill and septage treatment plant with clay prior to wastes being placed in the facility. This will be done to the satisfaction of the Environmental Protection Authority, the Health Department and the Water Authority.
2. The proponents commit to capping the sanitary landfill and the septage treatment plant with 1 m of clay material and sand and finishing it with a 2% slope. This will be done to the satisfaction of the Environmental Protection Authority and the Health Department.
3. The Shire of Greenough commits to putting in place a buffer zone around the Meru facility in which all new residential developments will be excluded until the end of the working life of the facility. This will be to the satisfaction of the Environmental Protection Authority.
4. The proponents commit to the construction of a 2.4 m high fence around the facility. This will be done to the satisfaction of the Health Department.
5. The proponents commit to management practices which will limit the production of leachate, odour and litter, and limit the potential for fire and pest problems. This will include daily covering of refuse. The above will be done to the satisfaction of the Health Department and the Environmental Protection Authority.
6. The proponents commit to installing one multiport bore west of the site and using it to conduct a sampling programme to detect any groundwater contamination emanating from it. This will be done to the satisfaction of the Environmental Protection Authority and the Health Department.
7. The proponents commit to planting a suitable screen of trees around the boundaries of the site. This will be done to the satisfaction of the Environmental Protection Authority.
8. The proponents commit to supplying details of the volume and nature of any hazardous and liquid wastes and the design of facilities to receive these wastes prior to them being received by the Meru facility. This information will be submitted to the Environmental Protection Authority and the Health Department.
9. The proponents commit to rehabilitating the site in accordance with the Management Plan for its use as agricultural land. This will be done to the satisfaction of the Environmental Protection Authority.

# Appendix 3

## Functions of the Geraldton/Greenough Regional Council

## Designated functions

6.1 Subject to the provisions of sub-clause 6.2, the Regional Council shall have the following Designated Functions to be performed by it to the extent that municipalities in Western Australia are authorised or required under any statute from time to time to perform them in respect of their respective municipal districts. The assumption of these designated functions from the Constituent Municipalities shall be at a time as agreed between the Regional Council and Constituent Council:

a The orderly and efficient treatment, disposal and/or recycling of waste delivered to a building or place provided for these purposes by the Regional Council.

b The orderly and efficient collection of waste.

c The promotion and operation of waste minimisation.

d The provision acquisition, disposal and maintenance of fit buildings, places, equipment and machinery reasonably necessary for the purposed of carrying out any Designated Function.

e The charging of fees to all individuals, both private and corporate, for the carrying out of the Designated Functions.

f The letting or leasing of land vested in or held by the Regional Council in the manner provided for in section 267 of the Local Government Act 1960.

g The implementation of all other acts and things which are reasonably necessary for the bringing into effect of the Designated Functions herein or which are incidental to or consequential upon their operation.

h The entering into contracts with one or more other municipalities (not being constituent municipalities) or the carrying out in their municipal districts by the Regional Council of any of the Designated Functions.

i The employment or engagement of Health and/or Building Surveyors for the carrying out of duties undertaken by such officers under the provisions of the Local Government Act 1960 and the Health Act 1911.

j The employment or engagement of regional officers to carry out duties in addition to those specified in items a, b, c and i.

6.2 Until such time as a designated function is assigned to the Regional Council by resolution of the Council of the constituent municipality, declaring an effective date of assignment, nothing herein shall limit any power or prevent any practice or act of that constituent municipality in effecting such Designated Function itself, prior to such declared date aforementioned.

6.3 Once a constituent municipality has resolved to assign a designated function to the Regional Council where such an act of delegation is required by the terms of this constitution, that constituent municipality shall thereafter abide by the authority and direction of the Regional Council.