SEMRC

REGIONAL RESOURCE RECOVERY FACILITY

BACKGROUND PAPER - SITE SELECTION AND TECHNOLOGY CRITERIA

MAY 2006

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Background

The South East Metropolitan Regional Council (SEMRC) was established in 2001 by the Cities of Armadale, Gosnells and South Perth to develop and implement strategic regional approaches to waste management in the region. One of the key strategic activities is waste education across the region.

The SEMRC is a formally constituted Regional Council under the Local Government Act 1995. Each Member Council elects two Councillors to the Regional Council. The Regional Council, which meets every two months, makes decisions relating to strategic waste management issues. The Regional Council currently employs a part-time Chief Executive Officer and a Regional Waste Education Officer.

The Regional Council is advised on technical matters associated with waste management by the Technical Advisory Committee (TAC) comprising the relevant Director and Manager of Waste Services from each Member Council.

In December 2004, the SEMRC adopted a Strategic Plan for Waste Minimization and Resource Recovery. This plan can be downloaded from the SEMRC web-site at www.sermc.wa.gov.au

This report focuses on the Resource Recovery aspects of the strategic plan.

1.2 Vision and Objectives

The SEMRC's Strategic Plan sets out its Vision for waste management in the region and a framework for achieving the Vision as follows:

VISION

To provide sustainable waste minimisation, resource recovery and disposal services for the benefit of the south- east region.

MISSION

By the Year 2009, we will be providing efficient, economic and environmentally sustainable resource recovery programs for the region.

GUIDING PRINCIPLES

In achieving our goals we will provide leadership which demonstrates:

Consultation *which is effective and consistent*

Transparency *which meets and exceeds statutory requirements and community expectations*

Excellence *in service provision and policy development*

Viability *of long term planning and implementation, for assets, infrastructure, systems and sustainability.*

One of the key objectives of the Strategic Plan is:

OBJECTIVE TWO

RESOURCE RECOVERY

OBJECTIVE	OUTCOMES	STRATEGIES
Develop a Regional Plan for Resource recovery	A long term plan for effective resource recovery within the region	Identify and review land opportunities for a regional resource recovery centre Explore partnership options for resource recovery including public – private partnerships, and involvement with other local governments and/or regional councils. Develop and implement a business plan in consultation with the community

1.3 Context (State Policy)

The SEMRC's strategic Vision is consistent with the State Government's long term Strategic Vision for Waste Management in WA. The State's policy is articulated in a report released in September 2003 titled A *Statement of Strategic Direction for Waste Management in Western Australia*

VISION

Towards zero waste in Western Australia

PRINCIPLES

PRINCIPLE 1	***Prevention*** - *to avoid the creation of waste*
PRINCIPLE 2:	***Recovery*** - *to efficiently re-cover, re-treat and re-use all wastes*
PRINCIPLE 3:	***Disposal*** - *to responsibly manage waste into the environment*

The State Government's stated long-term goal is to achieve zero waste to landfill by 2020.

1.4 Feasibility Study and its Objectives

The SEMRC has commissioned a consultancy team lead by Clifton Coney Group to develop a Business Plan for achieving its vision for waste management in the region. The project team is in the process of completing a range of investigations that will ensure that the SEMRC has all the appropriate information when it considers the recommendations made in the Business Plan. The main tasks to be undertaken are as follows:

1. Development of a Project Plan
2. Development of land and technology options guiding principles
3. Preliminary technical and financial assessment of technologies
4. Consultation with the community and stakeholders
5. Detailed assessment of preferred sites and technologies
6. Assessment of waste collection systems
7. Preparation of detailed financial models and a Business Plan

The first three of these tasks had been substantially completed to the satisfaction of the SEMRC when Council was approached by a number of other Councils expressing interest in contributing to the Study with a view to perhaps becoming participating members should the feasibility demonstrate this would be of benefit to ratepayers of both the SEMRC and these additional Councils.

It has been resolved by the SEMRC that the following Councils could participate in the Study as contributing members (although they are not members of the Regional Council):

- The City of Mandurah; and

- The Shire of Murray.

The Shire of Serpentine-Jarrahdale decided that it would prefer to maintain an observer status rather becoming a full participating member but the study will account for the possibility that it may eventually become full member of Council.

This report is an updated version of the report previously considered by the SEMRC which details the Site Selection and Design Criteria that Council will use when evaluating sites and technologies for procuring a resource recovery facility.

The report has been updated to incorporate waste generation and population information from the additional Councils (including Shire of Serpentine Jarrahadale) and includes some modifications to proposed to the siting criteria as a result of further recent investigations conducted jointly with between the Technical Advisory Group and the Community Reference Group.

1.5 Current Waste Collection and Disposal

1.5.1 Existing Systems

Each of the six participating councils provides kerbside waste and recyclable collections to residential and small commercial premises. The weekly waste collections are all based on 240 litre mobile garbage Bins (MGBs) with pickups by side lift trucks.

Recyclables are also collected at the kerbside but this service operates on a fortnightly basis and is undertaken by Cleanaway for all six participating councils.

All councils with the exception of Shire of Serpentine Jarrahdale also offer verge side collection services for junk and green waste several times per year.

Collected waste is directed to landfill for disposal generally, except that South Perth currently directs its waste to the Southern Metropolitan Regional Council's Resource Recovery Facility in Canning Vale. The recyclables for all Councils are directed to Cleanaway's Materials Recycling Facility (MRF) in Bayswater where recyclable products are recovered and a small residual waste stream is collected in bins for final disposal at landfill.

The City of Armadale also operates a Landfill Facility at Hopkinson Road and the City of South Perth operates a transfer station/drop off centre located centrally within South Perth (Corner Hayman and Thelma Roads).

The City of Gosnells and the Shire of Serpentine direct their waste to the landfill operated by WA Landfill Services at South Cardup. In addition to the services offered by Member Councils, large numbers of businesses and industry contract individually with private companies for waste services of varying types. Little or no information is available on the nature or extent of wastes handled under these private arrangements. Based on experience in other areas, a significant proportion of these wastes (perhaps 50% or more) will be inert materials such as sand, bricks and rubble but there are significant waste streams with similar characteristics to the municipal solid wastes collected by the Member Councils.

1.5.2 Current Waste Quantities

The broad characteristics, in terms of population and waste generation, of the Councils participating in the Study are presented in tabular form in Appendix 1. The following table summarises this data on a regional basis

Summary of Domestic Waste Generation (tonnes per annum)

	SEMRC[1]	**Additional Councils[2]**	**Total**
Population[1 (2005)]	184,224	86,765	270,989
Area (km^2)[2]	692	2,905	3,597
Dwellings[2]	71,929	34,211	106,140
Domestic Waste – MGB (tpa)[3]	58,871	22,275	81,146
Domestic Greenwaste (tpa)[3]	6,443	1,683	8,126
Domestic Junk Waste (tpa)[3]	3,675	7,681	11,356
Total Domestic Waste (tpa)	**68,989**	**31639**	**100,628**

1 Based on data from the current SEMRC Member Councils
2 Includes data from the City of Mandurah, Shire of Murray and Shire of Serpentine-Jarrahdale.

1.6 Definitions and Acronyms

There is widespread use of technical terminology and acronyms in the waste management industry. This section of the report provides definitions and clarification for complex terms and acronyms used in this report.

Amenity — *Amenity* is defined as the response of an individual to the experience of the social and natural environment of an area. The amenity of an area is influenced by visual and non-visual elements and can embrace emotional response, sense of place, sound, smell and any other factors having a strong impact on human thoughts, feelings and attitude

Aerobic — Any process which occurs in the presence of significant levels of oxygen. In the case of waste, the term typically refers to biological processes which are conducted in contact with atmospheric gases and in which the process is designed to maximise oxygen levels in the waste body so that aerobic bacteria flourish and act to breakdown complex organic wastes into

	simpler more stable materials that are useful in agriculture or horticulture
Anaerobic	Any process which occurs in an environment with reduced or zero oxygen levels. In the case of waste, the term can refer to biological, chemical or thermal processes which are conducted in the absence or a significant deficit of oxygen when compared with atmospheric levels (20.8%) In biological processes anaerobic processes maintain conditions which favour anaerobic bacteria which act to breakdown complex organic wastes into simpler materials that are more useful in horticulture while also releasing methane gas that can be used as a fuel. Chemical and thermal processes are not considered in detail in this paper and are therefore not described here.
ARI	*ARI (Annual Return Interval)* is a term used when interpreting rainfall data for engineering design purposes. It is generally used in the sense of a 20 year ARI flood event which is the maximum flood event that would be expected to occur once in every 20 years.
Bioreactor	*Bioreactor* is a generic term that is applied to processor where organic materials are placed within a controlled environment that is optimised to encourage certain biological processes to occur. In the context of wastes the term bioreactor can be applied to composting that occurs within a process vessel or can be applied to a class of landfills where wastes are contained in a completed lined and capped environment that captures and recirculates leachates and captures and extracts Landfill Gas for power generation
Biosolids	A general term for a mixture of organic rich soils or particles that are generally a by- product of a process of a treatment process such as sewage treatment or anaerobic digestion. Biosolids are often produced as a slurry which is subsequently dried before use as a soil amendment. Or feedstock into a composting process.
Buffer	A buffer is an area of land used to separate incompatible land-uses (e.g. industrial and residential). The buffer may include a range of land-use zonings grading progressively from a use that is compatible with the sensitive located adjacent to the sensitive land-use (e.g. low density retail next to residential) through to one that is more compatible to the industrial (perhaps a light industrial zoning adjacent to heavy or general industry)
Class I waste	A *Class 1 Landfill* is a type of licensed landfill defined under Environmental Protection Act Regulations which primarily accepts inert materials such as building Rubble and soil.
Compost	A soil improving material derived by the action of aerobic bacteria in breaking down organic materials. There are many types of compost depending on the types organic feedstock used to feed the process and the

	nature and duration of the composting process. Australian Standard. 4454 - 1999 is used to provide guidance on the suitability of a compost for a particular use
CRG	*Community Reference Group* - A group of community members advising the SEMRC .
Inert Waste	Means waste that is not chemically or biologically active such soils, bricks, building rubble and glass.
Landfill Gas (LFG)	A mixture of gases (primarily methane and carbon dioxide) released by the organic components of waste in landfills as they decompose. The gas can be odourous and both carbon dioxide and methane contribute to the greenhouse effect
MGB	*Mobile Garbage Bin*. A wheeled cart typically of 120 litre or 240 litre capacity used in households to store waste. Also known as a ‘wheelie bin’.
MRC	*Mindarie Regional Council.* A formally constituted Regional Council under the *Local Government Act 1995*. Consisting of the Cities of Perth, Stirling, Wanneroo, Joondalup, Victoria Park, Vincent , and Cambridge
MRF	*Materials Recycling Facility*. An industrial facility where mixed recyclables are separated into separate product streams to recover resources for re-use or sale.
MSW	*Municipal Solid Waste*. Co-mingled Waste that is typically collected by local government or its contractors in 240 litre MGB at the kerbside
RRF	*Resource Recovery Facility* – An integrated waste processing facility which is constructed with the aim of maximising resource recovery
SEMRC	*South East Metropolitan Regional Counci*l. A formally constituted Regional Council under the *Local Government Act 1995*. Consisting of the Cities of Armadale, Gosnells and South Perth.
Sensitive land-uses	In the context of this report, sensitive land-uses means land-uses that typically demand a higher level of amenity or environmental protection and are therefore more sensitive to impacts such as odour and noise. Examples of sensitive land-uses would be: residential subdivisions, hospitals, schools, retail shopping areas (particularly those incorporating dining areas) sites, areas of high conservation value or areas containing Declared Rare Flora or Fauna.
SMRC	*Southern Metropolitan Regional Council*. A formally constituted Regional Council under the *Local Government Act 1995*. Consisting of the Cities of Canning, Melville, Fremantle, East Fremantle, Cockburn, Kwinana and Rockingham
TAC	*Technical Advisory Committee.* A formal advisory committee of the

	SEMRC consisting of senior technical officers of the three member Councils
Thermal Technology	Thermal technologies in the context of waste management mean any waste treatment or disposal technology that relies on temperatures in excess of 200 C to destroy or transform waste. Thermal technologies include but are not limited to incineration, pyrolysis, and gasification. Note: This definition can be read in conjunction with the definition adopted by the European Union for Incineration: "According to the most recent EU Directive on Incineration of Waste 2000: Incineration plant "means any stationery or mobile technical unit and equipment dedicated to the thermal treatment of wastes with or without energy recovery. This includes the incineration by oxidation of waste as well as the other thermal processes such as pyrolysis, gasification or plasma processes in so far as the substances resulting from the treatment area subsequently incinerated."
Triple Bottom Line	The concept of triple bottom line assessment and reporting was introduced in the 1980's and requires reporting or assessment of performance against three distinct dimensions: - environment - social - economic.

2. COMMUNITY INVOLVEMENT

The SEMRC is committed to ensuring that residents are consulted and involved in the decision making process associated with developing a new waste management system that is focused on waste avoidance and resource recovery rather than disposal.

To this end it has established a Community Reference Group (CRG) which will assist in developing various policy positions and also in ensuring that the community involvement process is transparent and effective.

2.1 Community Involvement Principles

These principles are derived from the content of the SEMRC's Strategic Plan for Waste Minimisation and Resource Recovery and discussions with TAC members.

Principle CI1 – SEMRC as Decision Maker

The SEMRC is the lawfully constituted body responsible for making decisions in relation to waste management matters in the region. The commitment to consult, engage and involve the community, does not in any way transfer or reduce this responsibility.

Principle CI2 – SEMRC to Involve/Engage the Community in the Decision making Process

The SEMRC is committed to a transparent approach to informing the community and will operate in good faith with the CRG in involving/engaging the community in the process used for decision making.

Principle CI3 – SEMRC to Publicly Report Where Decisions Deviate from the Recommendations of the Community reference Group

The SEMRC has established the CRG to inform it of community views and provide advice on how best to involve the community. The SEMRC will at all times it take into account of the advice of the CRG and in the event that it does not to agree with that advice, the SEMRC will publicly report the CRG's advice and the SEMRC's reasons for adopting a different course.

Note: The SEMRC will use any or all of the following measures to inform the community:

- Advertising in the local community newspaper;
- Council Reports and Minutes;
- Reporting on the SEMRC web-site.

2.2 Community Reference Group (CRG)

The CRG is constituted as far as is feasible to reflect the range of views in the community. This means it should consist of:

- Business/industry operators
- Waste management industry representatives
- Representatives of active environmental interest groups
- Members of the community

The CRG performs the following roles:

1. To provide guidance to the SEMRC on likely community views on issues relating to the development of a Resource Recovery Facility (RRF).

2. To assist in ensuring that the community involvement/consultation process is effective.

3. To provide advice to the SEMRC on the level and type of community engagement processes/community consultation which , in the view of the CRG, should be undertaken during the course of this study;

4. On behalf of the community, to monitor the SEMRC's approach to developing and implementing a RRF and ensure that the SEMRC adheres to the agreed community involvement approach and siting and design criteria.

It is likely that the role of the CRG will evolve as the decision making process evolves.

It is emphasised that the CRG is not a decision making body, the decision making role rests with the SEMRC. However, the SEMRC has made a commitment that it will consider any advice provided by the CRG and if it chooses not to follow that advice, will make both its decision and the advice received from the CRG, public together with an explanation of why it chose to deviate from the position recommended by the CRG.

2.3 Consultation Process

The following steps are envisaged for the Community Involvement program:-

STEP	STATUS
Survey of Community Attitudes.	Completed (See separate report)
Establish a representative CRG.	Completed – CRG established September 2004. Some changes will occur during the life of the project
CRG to develop and agree on a draft set of siting, technology and community consultation Criteria to guide the process.	This document represents the stage one discussion paper for this task
CRG with SEMRC to consult with the wider community on the principles and criteria.	To be completed
Finalize a set of principles and criteria.	To be completed
Using the agreed criteria and principles short-list sites and technologies and develop a business plan.	To be completed
Following SEMRC adoption of the business plan, consult on the short-listed sites with the wider community.	To be completed
On completion of the consultation process select, a preferred site and complete the remainder of the tendering, procurement and environmental assessment processes. A further community consultation program will be developed for these stages of the project	To be completed

It is envisaged that the CRG will monitor the process on behalf of the community.

2.4 Key Issues

Ensuring adequate engagement with the community is a key issue for achieving success in any potentially controversial process that will eventually site a facility of some type within a community.

The community needs to understand and agree with the need for the facility and be assured that the construction of the facility will not adversely impact on amenity, health or land values.

It is therefore important that the SEMRC work with the CRG to inform the community of the process for developing a Resource Recovery Facility and ensure that the community is familiar with the site and technology selection principles and criteria.

It is also important that the community has trust that the SEMRC will adhere to the agreed principles and criteria, both in establishing a facility and then during its operating life.

3. RESOURCE RECOVERY FACILITY PROFILE

3.1 Introduction

The SEMRC does not have a fixed vision for maximising resource recovery in the region. In keeping with principles of sustainability it is considered desirable that facilities for managing wastes generated in the region are sited along the transport routes which service the region. Prior to making a final decision on the optimal approach, the SEMRC will investigate the opportunities for joint ventures with either private interests or other local or regional governments in other parts of the Perth Metropolitan Region which will promote efficient recovery of resources from the waste stream.

Similarly, should the final decision of the SEMRC be to establish a Resources Recovery Facility, the exact nature of the wastes that such a facility would treat is not fixed and nor is the nature of the activities that will comprise the facility.

At this stage, the SEMRC intends that it must have facilities that will handle all of the solid wastes that are collected through Council waste services. This would include:

- Municipal Solid Wastes (MSW) collected at the kerbside.
- Recyclables collected at the kerbside.
- Green waste and junk collections from the kerbside. [1]
- Car/Trailer deliveries of green and municipal waste and recyclable or reusable goods that are currently delivered to a transfer Station or landfill.
- Wastes other than Class 1 Inert Wastes that are generated by Council operations such as maintenance of parks and gardens and municipal facilities.

Through the process of developing a Business Plan the SEMRC will evaluate the appropriateness, desirability and feasibility of providing facilities that can handle commercial and industrial wastes generated in the Region.

The diverse characteristics of the wastes that must be handled in a facility suggest that it is unlikely that a single process will efficiently handle all types of waste. It is therefore envisaged that a Resource Recovery facility is likely to consist of at least 3 main elements:

- A process to sort and treat MSW.

[1] Recognising the additional management issues which will need to be addressed with any provision for public access and transport

- A process that sorts and recovers recyclables from the kerbside recyclables collections.
- A process that sorts and mulches/chips segregated green waste for re-use.

It is emphasised, however, that the SEMRC will await the outcome of the various studies that are to underpin the Business Plan before making a final decision on the exact mix of wastes and infrastructure that will comprise the Resource Recovery Facility.

3.2 Land Requirements

The nature and scale of a facility of this type means that is likely that the Resource Recovery Facility will have physical footprint that occupies several hectares of land.

3.3 Key Issues

A number of aspects associated with the nature of the RRF have been discussed with TAC and the CRG and agreed. These are:

The facility need not be owned by the SEMRC provided that the SEMRC can exert sufficient control through contracts to ensure that the principles and criteria determined through by the SEMRC and community as essential are still met.

The facility need not necessarily be sited within the boundaries of the SEMRC but the location should be determined after considering the environmental and economic costs of transporting wastes over significant distances.

The facility need not only accept municipal wastes provided that any other waste stream is carefully assessed and/or pre-treated to ensure that it does not contain significant levels of hazardous materials and is compatible with the infrastructure and facilities on the site.

The nature of the facilities should be determined after a thorough and informed technical consideration and taking full account of the siting and technology principles and criteria agreed with the community.

4. AVAILABLE TECHNOLOGIES

This section discusses the commonly used waste treatment and disposal techniques and identifies those which the SEMRC considers as prospective for use in any resource recovery facility that it may develop.

4.1 Excluded Technologies

Whilst it is recognised that a number of proponents have treatment technologies based on thermal destruction or decomposition of wastes, the SEMRC has decided that it will not consider any thermal technology as the primary basis for a resource recovery facility.

This decision has been made in view of the high level of public concern in relation to thermal technologies and concerns about the environmental performance of thermal technologies when dealing with a highly variable and heterogenous waste stream like municipal waste.

It should also be noted that whilst the Region wishes to move towards increased levels of resource recovery, it is considered likely that it will continue to rely on landfill as part of its overall management strategy for the foreseeable future. Notwithstanding this ongoing requirement, landfill will not be considered as an acceptable technology on which to base a new Resource Recovery facility.

4.2 Landfill

4.2.1 Description

Landfill is the default technology against which other technologies should be assessed. As indicated above, it should be noted that regardless of the resource recovery technology ultimately selected, there will remain a need to landfill residual waste for the foreseeable future.

The following provides a broad description of the characteristics of a modern well managed landfill:

- A modern landfill will be carefully sited to achieve buffer distances of at least 500m to sensitive land uses such as residential subdivisions or schools.

- Modern landfills are designed with sophisticated lining systems to prevent and detect leakage of contaminated water (leachate) to either the surrounding surface water system or groundwater.

- Waste is placed and compacted in thin layers of 1-2m thickness to achieve high compaction and the size of the active tipping area is minimized to reduce odour release and minimize access to waste by vermin and birds.

- Soil cover of approximately 150mm thickness is applied each day again to limit nuisance impacts such as odour, litter and vermin.

- Landfills are constructed in cells with each cell designed to be filled within 12-18 months. On completion of a cell, it is capped with an impermeable liner to prevent the rainfall entering the cell and to assist with the capture of landfill gas for flaring or power generation.

- A modern landfill site is often equipped with a transfer station and recycling depot.

- A typical modern landfill will receive up 200,000-300,000 tpa of waste and may operate for 20-25 years. Eventually millions of tonnes of waste will be deposited in the landfill which will decompose over many decades.

4.2.2 Impacts

The following impacts are typically associated with landfills:

- Materials deposited in landfills are generally lost as a resource as any valuable recyclable materials are mixed contaminated with organics while the organics themselves are rendered difficult to use as compost.

- Landfills denature the land on which they are sited. Consequently, any further high level use of the land is impracticable because the deposited material is geotechnically unstable and will continue to produce landfill gas and leachate for many years following the closure of the landfill.

- Landfills, whether lined or not, pose a risk of contamination to the surrounding groundwater system and therefore require careful management and design to address this risk.

- Landfills produce landfill gas (LFG) throughout their life and for many years following closure. LFG contains methane, a potent greenhouse gas and also tends to be odourous. Even where landfills are designed and equipped with LFG control systems, significant quantities of methane escape.

- During their active life, even a well managed landfill will result in odour and litter impacts over a significant area and as a result, they must be sited to achieve a buffer zone of at least 500m to sensitive land uses.

4.3 Bioreactor Landfill

4.3.1 Description

A bioreactor landfill is a variant to normal landfill in which cells are constructed to a higher standard with systems to encourage more rapid decomposition of waste. The following points describe the main characteristics of a bioreactor landfill:

- Bioreactor landfills will be carefully sited to achieve buffer distances of at least 500m to sensitive land uses such as residential subdivisions or schools.

- Bioreactor landfills are designed with sophisticated lining systems to prevent and detect leakage of contaminated water to either the surrounding surface water system or groundwater.

- Waste is placed and compacted in thin layers of 1-2m thickness to achieve high compaction and the size of the active tipping area is minimized to reduce odour release and minimize access to waste by vermin and birds. Often the waste mix is controlled to facilitate rapid biological breakdown of the waste body.

- Cover of approximately 150mm thickness is applied each day again to limit nuisance such as odour, litter and vermin.

- Landfills are constructed in cells with each cell designed to be filled within 12-18 months. On completion of a cell it is capped with an impermeable liner.

- The capping and cell are designed to allow leachate to be captured and recirculated through the waste body, this speeds the process of decomposition and breakdown of the waste.

- Landfill gas is captured for power generation.

- Following capping, the conditions in the cell are monitored and controlled to achieve optimum conditions for rapid decomposition of waste.

- Once the cell stops actively decomposing and emitting gas, it can be opened up and the material in the cell recovered by screening to separate the stable organic fraction from the inerts and recyclables. Some of the recyclables can also be recovered at this stage.

- Once emptied the cell can be re-used for a further charge of waste following an integrity check on the lining system.

4.3.2 Impacts

The following impacts are typically associated with bioreactor landfills:

- The bioreactor landfill allows the recovery of some of the deposited materials, although recovery rates would be lower than a modern resource recovery facility.
- As bioreactor landfills involve the removal of the landfilled material, they do not denature the land on which they are sited from any further high level use.
- Bioreactor landfills still pose a risk of contamination to the surrounding groundwater system and therefore require careful management and design to address this risk.
- The LFG capture efficiency of bioreactor landfills is reported to be around 50-60%. They therefore still represent an odour and greenhouse gas emission risk.
- During their active life, bioreactor landfills pose a similar risk to a well managed landfill in terms of odour and litter impacts and therefore require a buffer zone of at least 500m to sensitive land uses.

4.4 Aerobic Composting

4.4.1 Description

- A modern composting facility will be carefully sited to achieve buffer distances of at least 500m to sensitive land uses such as residential subdivisions or schools.
- Modern composting facilities handling MSW are designed with all parts of the waste handling system enclosed inside a ventilated building. With ventilation are typically directed through a biofilter. Although facilities and systems exist where the plant is not enclosed.
- Waste is delivered by trucks to an enclosed tipping floor.
- Waste is checked on the tipping floor to remove large items such as white goods etc. and then pushed onto conveyors where it passes into some form of pre-sorting plant designed to separate the organics from the inerts and recyclables.
- The organic stream is then directed for composting, usually in windrows fed with air by mechanical blowers but in some technologies this stage also proceeds in a reaction vessel. Which ever approach is adopted, the organics are maintained in an aerobic state to promote rapid composting (typically over 28-35 days) and achieve sufficiently high temperatures for pathogen kills (60-70^{0}C).

- On completion of the composting process, the compost is generally re-screened to remove glass and plastic and the chemically analyzed to ensure that contaminant levels are sufficiently low or within acceptable limits before being graded and sent to despatch.

- The inerts will be treated to recover recyclables materials leaving an inert stream that is a mixture of sand, glass and plastics that typically goes to landfill.

- All processes should be completed in enclosed conditions with odour scrubbing.

- A typical modern compost facility will receive up 50,000-150,000 tonnes per annum of waste and will have a design life of 20-25 years.

- An important feature of these systems is that the total inventory of untreated waste in the plant at any time is unlikely to exceed 5000 tonnes. In addition, there may be an additional inventory of perhaps 20,000 tonnes of compost that is becoming progressively more stable and less odorous as it is treated. The overall potential for serious odour impacts is therefore greatly reduced when compared to a landfill which may hold several million tonnes of decomposing waste in relatively uncontrolled conditions.

4.4.2 Impacts

The following impacts are typically associated with composting facilities:

- Where they are enclosed and also because of the relatively small quantities of materials that they hold, composting facilities represent a low threat of ground or surface water contamination.

- A modern RRF plant should not contaminate or denature the land on which it is sited because all operations occur inside an enclosed building. Thus at the end of its design life the plant can be decommissioned and the land should be fit for any purpose following normal contamination assessments.

- During normal operation, a modern composting plant should not cause odour emissions outside the plant boundaries due to its enclosed nature and odour control. Compost plants have the potential to cause significant odour releases during plant upset conditions or breakdowns and therefore should still be located in manner that maintains a significant buffer distance to sensitive land uses.

- The enclosed nature of the plants limit problems with vermin and birds.

- The compost produced from MSW has the potential to be contaminated with pesticides, metals and other chemicals from the waste stream. This does not represent a significant threat at the site but can cause contamination where the compost is used or can create difficulties in marketing the product. As a result, there needs to be careful control over the waste streams fed to the plant and comprehensive compost quality control system for the compost throughout the plant. Proven systems exist to achieve this control as do assessment criteria for compost quality.

- The recovery of the organics by aerobic composting provides greenhouse reductions as no methane is produced.

4.5 Anaerobic Digestion

4.5.1 Description

These facilities are generally similar in nature to composting facilities with the exception that the organic waste stream is treated anaerobically to produce methane which is used to generate power or heat:

- A modern anaerobic digestion facility will be carefully sited to achieve buffer distances of at least 500m to sensitive land uses such as residential subdivisions or schools.

- Modern anaerobic digestion facilities handling MSW are designed with all parts of the waste handling system enclosed inside a ventilated building or enclosed treatment vessels. Ventilation air is typically directed through a biofilter to remove odours.

- Waste is delivered by trucks to enclosed tipping floor. The receival area is designed to allow entry of vehicles without releasing odours.

- Waste is checked on the tipping floor to remove large items such as white goods etc. and then pushed onto conveyors where it passes into some form of pre-sorting plant designed to separate the organics from the inerts and recyclables.

- The organic stream is then directed for anaerobic digestion inside purpose built reaction vessel which excludes oxygen and is designed to prevent explosive or flammable conditions occurring. During anaerobic digestion bacteria break the waste down to produce methane gas which is captured and used for power generation or heating.

- On completion of the digestion process, a biosolid is left which can be used as a soil amendment material. The biosolid is generally not as useful as compost but does provide useful organic carbon and structure to soils.

- The biosolid is generally dried and then re-screened to remove glass and plastic and chemically analysed to ensure that contaminant levels are satisfactory before being graded and sent to dispatch.

- The remaining waste are treated to recover recyclables materials leaving an inert stream that is a mixture of sand, glass and plastics that typically goes to landfill.

- All processes should be completed in enclosed conditions with odour scrubbing.

- A typical modern anaerobic digestion will receive up 50,000-150,000 tpa of waste and will have a design life of 20-25 years.

- An important feature of these systems is that the total inventory of untreated waste in the plant at any time is unlikely to exceed 5000 tonnes. With additional inventory of perhaps 20,000 tonnes of biosolids that are becoming progressively more stable and less odorous as it is treated. The overall potential for serious odour impacts is therefore greatly reduced when compared with landfills.

4.5.2 Impacts

The following impacts are typically associated with anaerobic digesters:

- These plants represent a low impact of ground or surface water contamination because of their enclosed nature and small inventories of material.

- A modern anaerobic digestion plant should not contaminate or denature the land on which it is sited because all operations occur inside an enclosed building. Thus at the end of its design life the plant can be decommissioned and the land should be fit for any purpose following normal contamination assessments.

- During normal operation, a modern anaerobic digestion plant should not cause odour emissions outside the plant boundaries due to their enclosed nature and odour control. They have the potential to cause significant odour releases during plant upset conditions or breakdowns and therefore should be located in manner that maintains a significant buffer distance to sensitive land uses. The nature of anaerobic processes is such that any odours are likely to be stronger and more unpleasant than from a compost plant.

- Because they produce a flammable gas mixture, there is a small risk of explosion or fire with digestion plants. This risk is small and any impacts would be confined to within plant boundaries as gas inventories are small.

- The enclosed nature of the plants limit problems with vermin and birds.

- The biosolid produced from MSW has the potential to be contaminated with pesticides, metals and other chemicals from the waste stream. This does not represent a threat at the site but can cause contamination where the biosolids are used or can create difficulties in marketing the product. As a result, there needs to be careful control over the waste streams fed to the plant and comprehensive biosolids quality control system for the compost throughout the plant. Proven systems exist to achieve this control as do assessment criteria for product quality.

4.6 Key Issues for Consideration

4.6.1 Viability

In determining an approach to managing waste, the SEMRC needs to recognise that waste management is an essential service for the community. The approach finally adopted therefore needs to be based on a proven and reliable technology and also should represent value for money.

Any contracts developed need to assess and allocate risk appropriately between the SEMRC and the contractor. A RRF is likely to have an operating life of 20 years or more and that over time changes will occur in the waste stream, regulatory environment and community expectation.

To accommodate future changes, the tendering and contracting process needs to be very carefully managed and needs to incorporate a thorough assessment of all risks.

4.6.2 Community

The community is a key stakeholder in the decision making process and to be well informed during the decision making process.

It is important that the community recognises that the RRF is being established to better manage wastes and that imposing unreasonable constraints on the development of the RRF through the adoption of overly stringent criteria will be counter productive to achieving a sustainable outcome

The SEMRC needs to continue to recognise the importance of community involvement in the process if it is to be successful.

5. TECHNOLOGY SELECTION

5.1 Principles of Technology Selection

In view of the scale of the infrastructure required to treat a significant fraction of the wastes generated in the region and the potential for adverse environmental impacts, the decision making process associated with selecting a technology needs to be carefully undertaken.

The SEMRC intends that the following principles will be adopted to guide the process of selecting a treatment technology:

Principle TS1 Technologies Excluded as a Primary Process

The excluded technologies (landfill, bioreactor landfill and thermal processes) will not be considered as future options for the primary waste treatment system for the SEMRC (Although it is recognised that there will be some reliance on landfill for management of residuals from any treatment process or as a fall back in the event of plant failure).

Principle TS2 – Technologies to be subjected to Triple Bottom Line Assessment

All technologies will be assessed on the basis of the "Triple Bottom Line" over the whole life of the facility.

Principle TS3 – Compliance with Laws, Standards and Policies

Technologies will only be considered where the proponent can demonstrate that environmental emissions and end products comply with relevant assessment criteria, laws and standards and meet community health standards and expectations.

TS4 – Technology Maturity

Preference will be given to technologies that have a proven track record at a commercial scale. Technologies which are unproven at a commercial scale will not necessarily be eliminated but will be the subject of a more rigorous evaluation to fully evaluate any environmental, social or economic risks.

Note: Any plant of the scale envisaged will be a major capital investment and if not carefully implemented there is, potentially, a significant risk of economic and environmental impacts. It is therefore preferable that the technology has been proven at a commercial scale. Any assessment criterion that is adopted should however, not completely exclude novel or innovative approaches that may result in a better outcome even though not proven commercially.

To be regarded as proven, a technology should have a commercial facility with a nominal capacity of 20,000 tonnes per annum or greater which has operated at least 80% of that capacity for 2 years or more.

The requirement for a proven technology is not intended to prevent consideration of innovative or new technologies that have not been proven at a commercial scale. Where such technologies are to be considered they should be the subject of a more extensive investigation to ensure that the necessary confidence exists that the technology of implemented will be viable. Guidance on the wording of tender documents can be obtained from Sections D7 and D8 of AS/NZS3905.2:1997 or HB90.3-2000: The Construction Industry – Guide to ISO9001:2000.

5.2 Enclosed Waste Handling

In order to provide adequate control over potential odour and surface and ground water impacts, the following criteria are proposed:

All waste receival operations and waste treatment operations will be conducted inside a ventilated enclosure. Ventilation to be directed through an efficient odour scrubbing device.

All waste receival and treatment operations will be conducted on a floor with a sufficiently low permeability to prevent leachate or contaminated water escaping to the environment.

5.3 Compliance with Technical and Regulatory Standards

In order to ensure compliance with all laws and prevent adverse impacts on the environment, the following criterion is proposed

The technology and plant design must be capable of compliance with relevant air, noise and water emission criteria and also of producing products which are compliant with relevant standards and laws governing their sale and use.

5.4 Key Issues

The key issue in relation to technology that remains to be resolved by the SEMRC is the ownership and contractual structures that relate to the procurement process and ongoing operation of any facility.
A successful outcome will require a careful examination of the available approaches and the ways in which they allocate risk amongst the stakeholders to allow an informed decision to be made.

6. SITE SELECTION

6.1 Principles of Site Selection

The SEMRC wishes to ensure that any facility that it proposes to construct and operate is sited in a manner that will ensure that it does not cause any adverse impacts in the surrounding environment. In developing assessment criteria to guide the site selection process, the SEMRC, has used the following principles:

Principle SS1 – Separation or Buffer Distances

The site selected and the transport routes associated with it should be sufficiently separated from sensitive land uses to ensure that any facility will not, under normal operating conditions impact adversely on either environmental values or amenity (See Definition in Section 1.6) of surrounding lands.

Principle SS2 – Site Suitability

The site's characteristics, including topography, geology, hydrogeology, hydrology, flora and fauna, ethnographic and heritage values should minimise the risk of adverse impacts occurring.

Principle SS3 – Proximity to Waste Source

Any facility should be sited in a manner that minimises any adverse economic and environmental impacts arising from transport of wastes or products.

Principle SS4 – Zoning

The site selected should either be zoned appropriately under the relevant planning schemes or be capable of being rezoned to comply with the scheme.

6.2 Co-Location

In selecting a site to establish an RRF, the SEMRC does not wish to exclude the possibility that any facility may be developed in a joint venture with other local governments or private companies. Nor does it exclude an option where the SEMRC's waste may be directed either in whole or part to an existing or new facility constructed outside the SEMRC region.

In the event that the SEMRC was to adopt the approach of using a facility operated by another organisation, its expectation would be that the facility was developed in accordance with similar principles and criteria to those developed by the SEMRC.

6.3 Environmental Impacts

The main environmental considerations for a plant of the type to be considered are listed below with brief comments on the significance of the issue and the principle techniques used to ensure the extent of any impact is minimised.

6.3.1 Air Emissions

Odour

Any facility handling and treating significant quantities of organic wastes has the potential to produce offensive odours and as a result it is necessary to implement management measures that will limit the impact of these odours.

Odours can potentially be emitted from the following plant areas:

- Waste receival areas waste screening and sorting.
- Composting or anaerobic digestion.
- Compost storage.
- Odour scrubbing equipment if overloaded or poorly maintained.

There are a number of approaches which will limit the potential impacts of odours these include:

- Siting the facility on land with sufficient separation distance to sensitive land uses such as residential areas.
- Enclosing the areas of the facility where organic wastes are handled and equipping it with efficient ventilation and odour scrubbing systems.
- Limiting the scale of the facility or managing the waste in small batches.
- Where facilities are enclosed and equipped with efficient odour scrubbing devices, the need for large separation distances is reduced as odour emissions should be minimal under normal operating conditions.

Other Emissions

Other potential air emissions from a facility of the type permitted under the technology criteria (i.e. is a mechanical biological treatment process) are particulate (dust) emissions but these should only during construction given the requirement that all waste handling operations are required to be inside an enclosed building.

Particulate emissions during constructions are addressed thorough the application of well established construction controls that would be documented in a construction environmental management plan.

6.3.2 Noise Emissions

Any facility accepting quantities of waste is likely to have areas of the plant that are potentially noisy. Principal areas of noise emissions are:

- Trucks delivering waste to the plant.
- The action of tipping waste loads.
- Sorting and screening of waste or recyclables particularly glass and metal.
- Green waste shredding and grinding.
- Noise emitted from fans, pumps, blowers and other mechanical equipment.
- Noise from forklifts and front end loaders used to handle waste including reversing beepers.

As with odours there are a range of measures which can greatly reduce noise impacts these include:

- Siting the facility on land with a large separation distance to sensitive land uses such as residential areas.
- Siting the facility in a location where it is serviced by main roads to ensure that truck traffic is not directed on suburban streets.
- Use of facility layout and topography to attenuate noise emission.
- Use of buildings, enclosures or bunds and walls to limit the propagation of noise.
- Fitting equipment with silencers or enclosures.
- Selecting modern well designed equipment with low noise emission levels.
- Limiting the hours of operation for waste receivals and other potentially noise areas.

6.3.3 Surface and Ground Water Contamination

Municipal waste is heterogenous mixes of different waste materials which can potential contain decomposing organic wastes, inert materials, chemicals and cleaning agents and small quantities of potentially hazardous materials.

In small quantities (say less than 1000 tonnes), MSW represents a low threat of contamination to either surface or ground water. Where large quantities are stored as in landfills the organic component will break down producing a slightly acidic liquid material that tends to be rich in organic acids and nutrients (particularly ammonia). This liquid generally known as leachate can have trace levels of pesticides and metals.

Given Perth's reliance on ground water as a water supply and the limited availability of reliable surface water, it is undesirable to unnecessarily contaminate any water source.

The threat posed to natural water systems by waste management facilities can be limited by the following approaches:

- Do not site facilities in sensitive areas such as priority 1 or 2 ground or surface water protection areas.

- Do not site facilities in areas of high ground water table where the water table is at a greater level of threat because there is less undisturbed soil to attenuate contaminants.

- Do not site facilities in close proximity to surface water sources or drains.
- Siting of facilities in areas with clay soils offer greater protection to ground water systems.

- The use of liners in outdoor facilities reduces the threat of water contamination and allows a relaxation of the siting requirements listed above.

Adoption of totally enclosed waste handling and storage areas largely eliminates the threat of ground or surface water contamination.

6.3.4 Flora and Fauna Protection

The Perth Metropolitan Region is a large highly developed urban area. As a result, the remaining areas of remnant vegetation and fauna habitat are precious and there is a comprehensive Government policy framework aimed at prevent loss of valuable areas remnant vegetation.

Vegetation and fauna habitat can be impacted by waste management facilities either by:

- Clearing of vegetation during construction or operation.

- Due to the propagation of weed or exotic species as a result of either landscape planting or the spread of seeds during green waste processing.

These impacts can be minimised by:

- Not siting the facility in or adjacent to areas of high conservation value.
- Retaining vegetation where possible.
- Use of enclosed waste handling facilities where possible.
- Implementation of weed monitoring and management protocols.

6.4 Key Issues

The key siting criteria proposed by the SEMRC are summarised in the following table:

No.	Specific Factor	Criteria	Rankings	Comment
1.	Separation Distances **(Enclosed Waste Treatment Facilities)**	At least 500 metres from Sensitive Land uses	Essential	Under normal operating conditions a totally enclosed plant with efficient odour control equipment should not cause impacts outside the plant boundary and buffer of 150 – 250 metres would be considered adequate. The recommendation for a minimum buffer of 500 metres is made to allow for occasional plant upset conditions or breakdowns and to account for the industrial nature of the activity. **(Sensitive land use includes bushland and conservation areas actively used for recreation)**
		At least 25 metres from any area of any conservation area or area of regionally significant Bushland not actively used for recreation.	**Essential**	**This recommendation reflects the low risk of seeds and viable plant material escaping from enclosed facilities.**
		At least 750 metres from Sensitive Land uses.	Desirable	Under normal operating conditions a totally enclosed plant with efficient odour control equipment should not cause impacts outside the plant boundary and buffer of 150 – 250 metres would be considered adequate. A buffer of 750 metres would be ensure that the plant would seldom if ever cause detectable impacts in sensitive areas.
		At least 50 metres from any area of any conservation area or area of regionally significant Bushland not actively used for recreation.	**Desirable**	**This recommendation reflects the low risk of seeds and viable plant material escaping from enclosed facilities.**

No.	Specific Factor	Criteria	Rankings	Comment
2.	Separation Distances **(Non-enclosed facilities storing or treating Greenwaste or C&D Waste)**	**Any active areas of such facilities should be sited a minimum of 100 metres from regionally significant bushland areas and areas of conservation**	**Essential**	**These recommendations are to protect regionally significant bushland and conservation areas from the risk of propagation of exotic species, weeds and diseases due the spread of seeds and viable plant material by the action of wind, storm water and vehicle movements.** **The increased separation distance reflects the higher risk of propagation from a non-enclosed facility handling green waste.**
		At least 150 metres from any area of any conservation area or area of regionally significant Bushland not actively used for recreation	**Desirable**	**These recommendations are to protect regionally significant bushland and conservation areas from the risk of propagation of exotic species, weeds and diseases due the spread of seeds and viable plant material by the action of wind, storm water and vehicle movements.** **The increased separation distance reflects the higher risk of propagation from a non-enclosed facility handling green waste.**

No.	Specific Factor	Criteria	Rankings	Comment
3.	Transport Routes	The plant should be sited so that it can be readily accessed from appropriately classified traffic routes without heavy vehicles accessing minor suburban roads.	Essential	A 100,000 tpa plant will be serviced by approximately 80 trucks/day (160 truck movement day) delivering waste and perhaps half that number of movements handling export of product from the site. This number of movements will affect the amenity of suburban areas if the site is located so that these vehicles travel down minor suburban roads.
4.	Transport Routes	The plant should be located within 3 km of designated major haulage route	Desirable	With the number of truck movements it is important that the site is in reasonable proximity to a designated heavy haulage route.
5.	Flood plains	At least 500mm above a 20 year ARI floodplain.	Essential	Given the enclosed nature of the plant, the relatively low hazard nature of the waste and the relatively small volumes of materials stored these plants do not need to be sited above all risks of flood but do need to be sited conservatively.
6.	**Natural Waterways/Wetlands/ Marine Systems**	**No closer than 500m to high conservation/ ecological value aquatic ecosystems, not closer than 250m from a slightly to moderately disturbed systems and not less than 100m from highly disturbed aquatic systems.**	**Essential (permanent systems) Desirable (ephemeral systems)**	**RRFs pose a low direct risk of impact from groundwater pollution but need to also consider fire water impacts in the event of a major fire and storm water management in extreme storm events.**
7.	Groundwater/Surface Water	Not within Public Drinking Water Source Areas (PDWSAs) P1-P2 priority areas identified in published development plans.	Essential	The Published guidelines for Priority 1 and 2 Water Protection Areas which are managed to avoid any potential risk would preclude the siting of a plant no matter what level of safeguard is built in.

No.	Specific Factor	Criteria	Rankings	Comment
8.	Groundwater/Surface Water	Not within Public Drinking Water Source Areas (PDWSAs) P3 priority areas identified in published development plans.	Desirable	The Guidelines for Priority 3 PSDWAs protection do permit activities which are a relatively low risk to groundwater quality. Given the low risk of an Enclosed RRF to groundwater and the nature of uses that are permitted in a Priority 3 PSDWA , it is considered that location in P3 zone is acceptable.
9.	Groundwater	Groundwater should be maintained at least 1m below the surface.	Essential	It is desirable that the facility is not sited in waterlogged low lying areas as the groundwater table is vulnerable to contamination. A 2 metre separation distance is regarded as acceptable given an enclosed facility. This would provide adequate protection in the event of emergency events that require waste to be temporarily stored outside a building in the event of a fire where contaminated fire water may enter the environment. By way of example the recommended separation distance for a landfill would be 5 metres in sandy soils and 3 m in clay soils.
10.	Constructed drainage systems e.g. storm water	Not within 25m of an entry point of a constructed surface drainage feature.	Desirable	Despite the low risk of surface water contamination with an enclosed operation it is considered desirable not to site a facility on a site where the operational areas of the site are within 25 metres of drainage point. This accounts for the risk that employees may carelessly dump materials and also the risks arising from fires.
11.	Geological Stability	Located on stable ground e.g. not in a seismically active area, areas susceptible to soil sinking, landslides or swelling, karst or sinkhole terrain.	Essential	Self evident

No.	Specific Factor	Criteria	Rankings	Comment
12.	Topography	Not located in an area with a slope >4 %.	Desirable	Highly sloping sites increase the risk of rapid surface water flow and make management of surface water flows potentially difficult. This issue can be addressed with engineering solutions and so is only proposed as a Desirable criterion.
13	**Conservation Value – regionally significant Bushland, including land hosting threatened flora, fauna or ecological communities**	**The construction of the facility should not result in the clearing of vegetation on regionally significant bushland areas or areas of conservation significance.** **Also see recommendations at items 1, 2 and 6 regarding separation distances**		**In view of the limited preservation of high quality bushland and conservation areas that remain in the Perth Metropolitan Region, it is inappropriate that vegetation in such areas is cleared for the construction of any industrial or waste facilities.**
14	Heritage Value	No negative impact on sites of recognized cultural or historical significance.	Essential	No impacts on either European or Indigenous Heritage.

Appendix 1

Summary of Waste Generation for Study Area

SEMRC WASTE GENERATION SUMMARY

	City of Armadale	City of Gosnells	City of South Perth	SUB-TOTAL	Serpentine-Jarrahdale	Murray	Mandurah	Sub-total	Total
Population[1 (2005)]	52,015	93,279	38,930	**184,224**	12,458	12,163	62,144	**86,765**	**270,989**
Area (km^2)[2]	545	127	19.9	**692**	905	1821	179	**2,905**	**3,597**
Dwellings[2]	22,000	31,775	18,154	**71,929**	4893	5128	24190	**34,211**	**106,140**
WASTE Collection	240 l mgb	241 l mgb	242 l mgb		240 l mgb	241 l mgb	242 l mgb		
Collector	Armadale	Gosnells	Cleanaway		Cleanaway	Cleanaway	Cleanaway		
Kerbside recycling	240 l mgb	241 l mgb	242 l mgb		240 l mgb	241 l mgb	242 l mgb		
Collector	Cleanaway	Cleanaway	Cleanaway		Cleanaway	Cleanaway	Cleanaway		
Domestic Waste – MGB (tpa) [3]	15,250	29,643	13,978	**58,871**		2,220	20,055	**22,275**	**81,146**
Domestic Greenwaste (tpa)[3]	1,797	3,273	1,373	**6,443**			1,683	**1,683**	**8,126**
Domestic Junk Waste (tpa)[3]	827	2,023	825	**3,675**		920	6,761	**7,681**	**11,356**
Total Domestic Waste (tpa)	**17,874**	**34,939**	**16,176**	**68,989**	**0**	**3140**	**28499**	**31639**	**100,628**

Notes

1 Western Australia Tomorrow (Population Report No.6),
2 Figures sourced from Local Government Directory 2005 -2006
3 Local Governments (June 30 2005 figures)