VIABILITY OF ESTABLISHING MATERIAL RECOVERY FACILITIES IN THE LIMESTONE COAST REGION

A Report to Limestone Coast Local Government Association

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Prepared by

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ABBREVIATIONS

BCR	benefit-cost ratio
CBA	cost benefit analysis
DPMC	Department of the Prime Minister and Cabinet
fte	full time equivalent
GISA	Green Industries South Australia
IRR	internal rate of return
LCLGA	Limestone Coast Local Government Association
MRF	Material Recovery Facility
NAWMA	Northern Adelaide Waste Management Authority
NPV	net present value
SA	South Australia

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EXECUTIVE SUMMARY

Like many councils in regional Australia, councils in the Limestone Coast region are generally price takers in waste management due to a lack of competition within the regional recycling industry, and lack of locally developed markets for reuse of sorted recycled materials. Increased recycling costs associated with reductions in demand for materials are significantly impacting councils and ultimately the residents within them.

The Limestone Coast Local Government Association engaged the University of South Australia and BDO EconSearch to assist in the development of a business model to test the establishment of a Material Recovery Facility (MRF) in the region. This engagement involved a high-level assessment of whether the costs in recovery, possible processing and reuse of recyclable materials within a regional context are achievable.

A key objective of this study was to prepare an assessment framework that would include a cost benefit analysis (CBA) to determine the net benefit of a range of alternative options for the management of recyclable waste in the Limestone Coast region.

The cost benefit analysis used a range of data and assumptions gathered by investigating similar facilities in Australia to analyse four different options. These options varied in scale and capital intensity, with the aim of testing the viability of constructing and operating a local MRF in the Limestone Coast region. The analysis did not extend to emerging technologies and how these might modify the local costs/benefits of an MRF.

With scale a key driver in viability and only relatively small volumes of local recyclate materials currently available, the results of the analysis suggest that a low-technology materials recovery facility that is scaled to accommodate the throughput of some of the neighbouring regions (initially assumed to be West Wimmera and Glenelg) would provide the greatest return, with this option providing the highest Net Present Value result at $11.8 million.

It is recommended that a low-technology, high-volume materials recovery facility be further investigated to generate a detailed business case in collaboration with key regional and industry stakeholders. Future detailed analysis should also investigate new and emerging trends and their interface with local opportunities.

1. INTRODUCTION

1.1. Background

Councils are generally price takers in waste management and are vulnerable to changes in the waste market as was experienced when the China National Sword Policy took effect in 2018[1]. This episode exposed gaps in the waste and resource recovery sector which impacted all Councils across Australia. Recycling facilities had to lift their gate prices as recovered materials were either greatly devalued or markets no longer existed. In some cases, as experienced in the Limestone Coast, providers simply discontinued their services. Subsequently, the costs of service have nearly doubled, significantly impacting residents and councils providing the service.

Smaller regional councils often need to transport recycling materials long distances to achieve effective recycling outcomes. This is heavily influenced by current systems requiring economies of scale. In addition, there are hidden streams, such as plastic car bumpers and windscreens, which do not enter the recycling system via councils but add a cost burden to a range of businesses including those in the automotive repair and steel recycling sectors.

Given these circumstances, it is timely to view these issues from a more regionalised or localised circular economy. There are opportunities for recyclable materials to be recovered and reused within regions rather than being transported long distances. For example, glass and plastics can be reused in road making, and paper and cardboard can be reused locally in many different ways.

1.2. Scope of Work

The Limestone Coast Local Government Association engaged the University of South Australia and BDO EconSearch to assist in the development of a business model to test the establishment of a Material Recovery Facility (MRF) in the region. This involves an assessment of whether the costs in recovery, possible processing and reuse of recyclable materials within a regional context are achievable.

The Limestone Coast region generates approximately 4,320 tonnes of kerbside recycling each year (LCLGA 2019). While there will potentially be a larger volume of material available for recycling within a regional MRF, this project analyses the establishment of a MRF based on these data.

Currently, a portion of this volume of kerbside recycling collected from the Limestone Coast Region is transported to the Northern Adelaide Waste Management Authority (NAWMA), and the remainder to a Mount Gambier facility. A cost to councils of $262 per tonne has been used for this analysis, being the cost incurred for councils using the NAWMA facility. Councils using the Mount Gambier facility have collection costs embedded in overall costs. Not only is there a direct cost to the Limestone Coast councils, sending it to a third-party means the council does not benefit from any of the potential jobs or commodity sales generated in the material recovery process. While it would require a significant capital investment to build a local MRF, the viability of doing so is currently being considered, given both the current circumstances in the industry mentioned previously and the potential range of broader benefits that may be realised.

[1] In 2017, the Chinese Government announced the introduction of its *National Sword* program to crackdown on the illegal smuggling of foreign waste into China, targeting industrial waste, electronic scrap and plastics. On 18 July 2017 China announced to the World Trade Organisation that it will no longer accept certain kinds of solid wastes from 31 December 2017. This included plastics waste, unsorted waste paper and waste textile materials (GISA 2020).

The high-level rationale for this project is for councils to gain some control over the escalating costs in waste management, through:

- an analysis of a council-operated Material Recovery Facility (MRF)
- consideration of different broad technologies and their related costs
- taking account of the end uses of recycled materials within the region and the potential for public/private business partnership opportunities.

The first two elements are addressed in the report with specific opportunities and emerging technologies to be explored in subsequent research.

The project will develop a model that will assist a group of councils or individual councils to assess a business case for their recyclable waste stream. A positive analysis would indicate potential for councils to:

- gain control of costs of managing recyclable waste streams
- lower the risk associated with market forces and material prices
- increase the opportunity for local reprocessing businesses (local circular economy)
- provide a cost-effective option for waste from local businesses
- create employment opportunities
- reduce transport costs due to reduced travel distances to the sorting and reprocessing facility
- increase transparency and assist evidence-based decisions related to waste management.

In essence this project aims to deploy an assessment framework that assists regional councils to undertake more detailed analysis into the viability of local processing of recyclable waste. The project aims to populate that framework with a small subset of MRF options specific to the Limestone Coast region.

This report is the key deliverable for the project. It details the workings of the assessment framework and reports results from investigations into the following factors:

- recycling streams available for reuse and applications within the region
- technologies required to process individual waste streams
- costs related to different technologies and cost drivers
- end uses of recycled materials within the region and potential monetary values and possible end users
- project risks and risk allocation
- public/private business partnership opportunities.

1.3. Report Outline

Section 2 details the method of assessment and provides an overview of the data and assumptions made in the analysis.

Section 3 presents the results of the analysis including key indicators and sensitivity analysis.

2. METHOD OF ANALYSIS AND DATA

2.1. Purpose and Scope of the Analysis

A key objective of this study was to prepare an assessment framework that would include a cost benefit analysis (CBA) to determine the net benefit of a range of alternative options for the management of recyclable waste in the Limestone Coast region. The proposed options are compared against a base case scenario, as described in Table 2-1.

Table 2-1 Options for the cost benefit analysis

Option	Description
Base Case	Under the base case it was assumed that the collection and management of waste in the Limestone Coast region would continue to be managed under current arrangements. This involves the 4,320 tonnes of kerbside recycling collected from the Limestone Coast Region being transported to the Northern Adelaide Waste Management Authority (NAWMA), incurring a cost to the council of $262 per tonne, while also preventing them from creating local capacity in this space and benefiting from any associated employment and commodity sales realised from the recovered materials.
1. Low Technology - Limestone Coast (Low Tech LC)	The development is undertaken with a more labour intensive and lower capital cost option. The facility is built to a scale that can process the quantity of recyclate forecast from kerbside collection in the Limestone Coast region[2].
2. Low Technology, Limestone Coast, West Wimmera and Glenelg (Low Tech LCWWG)	The facility is built with the same labour intensive technology as Option 1 but to a scale that can process the quantity of recyclate forecast from kerbside collection in a broader region that includes Limestone Coast region and the Victorian Shires of West Wimmera and Glenelg.
3. High Technology - Limestone Cost (High Tech LC)	The development is undertaken with a more capital intensive and lower labour cost option. The facility is built to a scale that can process the quantity of recyclate forecast from kerbside collection in the Limestone Coast region.
4. High Technology, Limestone Coast, West Wimmera and Glenelg (High Tech LCWWG)	The facility is built with the same capital intensive technology as Option 3 but to a scale that can process the quantity of recyclate forecast from kerbside collection in the broader region described under Option 2, i.e. the Limestone Coast plus the Shires of West Wimmera and Glenelg.

[2] The Limestone Coast region is comprised of seven local government areas, namely District Council of Grant, Kingston District Council, City of Mount Gambier, Naracoorte Lucindale Council, District Council of Robe, Tatiara District Council and Wattle Range Council.

The cost benefit analysis method is outlined in Section 2.2. The main costs and benefits of the base case and proposed options are described in Section 2.3, and the data and assumptions used in the analysis are detailed in Section 2.4.

2.2. Method of Analysis

The cost benefit analysis conducted for this project conforms to South Australian and Commonwealth Government guidelines for conducting evaluations of public sector projects (Department of Treasury and Finance (2008) and Department of Finance and Administration (2006)).

The starting point for the analysis was to develop the 'base case' scenario, that is, the benchmark against which the options are compared.

Given that costs and benefits were specified in real terms (i.e. constant 2020 dollars), future values were converted to present values by applying a discount rate of 6 per cent. The choice of discount rate is consistent with the rate commonly used by the South Australian Government in these type of analyses (DPMC 2016).

The economic analysis was conducted over a 15-year period and results were expressed in terms of net benefits, that is, the incremental benefits and costs of the Option relative to those generated by the Base Case. The evaluation criteria employed for this analysis are described below.

- Net present value (NPV) – discounted development benefits less discounted development costs. Under this decision rule the development is considered to be potentially viable if the NPV is greater than zero. The NPV for the *Option i* was calculated as an incremental NPV, using the standard formulation:

$$NPV_{Option\ i} = PV\left(Benefit_{Option\ i} - Benefit_{Base\ Case}\right) - PV\left(Cost_{Option\ i} - Cost_{Base\ Case}\right)$$

- Internal rate of return (IRR) – the discount rate at which the NPV of *Option i* is equal to zero. Under this decision rule the development is considered to be potentially viable if the IRR is greater than the benchmark discount rate (i.e. 6 per cent).
- Benefit cost ratio (BCR) – the ratio of the present value of benefits to the present value of costs. Under this decision rule the development is considered to be potentially viable if the BCR is greater than one. The ratio was expressed as:

$$BCR_{Option\ i} = \frac{PV\left(Benefit_{Option\ 1} - Benefit_{Base\ Case}\right)}{PV\left(Cost_{Option\ i} - Cost_{Base\ Case}\right)}$$

The evaluation criteria in the cost benefit analysis quantify the net effect of the project on the community as a whole, relative to the base case. This means that all agents affected by the project need to be separately identified with their costs and benefits quantified under the base case and the scenarios under consideration. Often the base case includes some alternative use of the resource under consideration, rather than just 'doing nothing'. The results describe the difference between the costs and benefits under each scenario compared to the base case, treating each agent equally. Agents typically include the businesses/organisations undertaking the development, third-party funders, government, local residents and businesses, visitors to the area and anyone else affected. For example, in this case there are benefits that accrue to various business owners in the Limestone Coast and costs that accrue to local residents (see Table 2-3). Results for each criterion can vary widely so a table of results from a varied range of analyses in Australia is included below for context (Table 2-2).

Table 2-2 Results from other regional cost benefit analyses in Australia

Name	Description	NPV	BCR	IRR
Cross-RDC Impact Assessment and Performance Reporting Update (AgTrans Research et. al. 2016)	Combined CBA of 167 project clusters completed between 2010 and 2015 across 15 rural industry research and development corporations (e.g. wine, forestry, fishing, grains, dairy).	$4.9b	4.5	-
Clare Valley Sport & Recreation Precinct – Business Case (CGVC 2017)	CBA of a proposed project to construct a sport and recreation precinct.	$7.7m	1.7	13%
Economic Analysis of Eutypa Dieback in Coonawarra (EconSearch 2014)	CBA of various Eutypa management options to identify the option with the highest net benefit to the community.	$19m	1.4	-
Economic Aspects of the Zero Waste SA Strategy Review (two case studies) (EconSearch et. al. 2014)	District Council of Cleve Waste Transfer and Recycling Facility	$19,000	1.4	-
	Regional construction and demolition (C&D) resource recovery facility	$3.4m	11.5	-

2.3. Data and Assumptions

The costs and benefits of the development were measured using a 'with' and 'without' project framework, that is, quantification of the incremental changes associated with the option compared to the Base Case. The method, data sources and assumptions used to quantify these values are described below. Consideration was given to those benefits and costs likely to occur over a 15-year period. The major economic costs and benefits of the project are listed in Table 2-3 along with the agent(s) they accrue to.

Table 2-3 Costs and benefits in the scope of the cost benefit analysis

Item	Cost or Benefit	Agent	Description
Base Case			
Limestone Coast Co-mingled charges of $262/tonne	Cost	Limestone Coast Councils	Cost to collect and transport recovered co-mingled waste material to NAWMA. Includes transport costs
Options 1-4			
Avoided costs of Limestone Coast material recovery	Benefit	MRF Operator	Avoided costs associated with transporting materials to NAWMA
Income from West Wimmera and Glenelg material recovery (price premium)	Benefit	MRF Operator	Direct increase in revenue for the region associated with material recovery from West Wimmera and Glenelg council areas, charged at a premium price.
Income from commodity sales	Benefit	MRF Operator	Direct increase in revenue for the region from the sale of commodities recovered from the MRF
Cost saving from electricity credits associated with solar panels	Benefit	MRF Operator	Cost savings/revenue from electricity credits generated from the solar panels installed on the main shed.
Residual value of existing capital	Benefit	MRF Operator	Residual value of capital items with useful life after the 15 year evaluation period
Capital Expenditure on infrastructure	Cost	MRF Operator	Capital costs incurred on the design, site preparation, shed and other building construction, roadways, landscaping, plant and equipment, solar panels and project management.
Ongoing expenditure associated with the operation of the MRF	Cost	MRF Operator	Includes expenditure on items such as employee costs, repairs and maintenance (plant/ancillary), IT software and hardware, audit, WHS compliance, consumables, electricity insurance, EPA charges, landfill, transport and depreciation

2.3.1. Costs

Capital costs

The total capital cost of the project, excluding any potential land purchase costs, were assumed to range from $5.27 million for the Low-Tech LC option (Option 1), to $9.72 million for the High-Tech LCWWG option (Option 4) (Table 2-4). The purchase of land was excluded from the analysis given the abundance of suitable Council owned land that would be suitable for this purpose.

Table 2-4 Capital costs - Options 1 - 4 ($'000)

Expenditure Category	Option 1 Low Tech LC	Option 2 Low Tech LCWWG	Option 3 High Tech LC	Option 4 High Tech LCWWG
Detailed design and project management	397	437	455	500
Demolition and site preperation	86	86	86	86
Shed	1,344	1,344	1,344	1,344
Office building and weighbridge	525	525	525	525
Site service and connections	226	226	340	340
Solar panels	168	168	168	168
Civil works and roads	445	445	445	445
Plant and equipment - loaders, forklifts, etc	150	225	300	450
Plant and equipment – MRF (incl. cameras, lights and sensors)	1,800	1,800	3,800	5,700
Contingency	129	131	134	161
TOTAL	**5,270**	**5,388**	**7,597**	**9,719**

Source: City of Charles Sturt, pers. comm.; BDO EconSearch Analysis

MRF operating costs

Operating costs include expenditure on labour, plant/fleet repairs and maintenance, IT software and hardware, audit, WHS compliance, insurance, fuel, electricity, EPA, landfill and transport costs, as well as depreciation (Table 2-5).

Average MRF operating costs were $1.98 million per year, ranging from $1.56 million for Option 1 to $2.41 million for Option 4.

Table 2-5 Operating costs - Options 1 - 4 ($'000)

Expenditure Category	Option 1 Low Tech LC	Option 2 Low Tech LCWWG	Option 3 High Tech LC	Option 4 High Tech LCWWG
Employee Costs				
Wages and Salaries	633	1,036	431	633
On-costs	75	123	51	75
Fixed Costs				
Plant Repairs and Maintenance	98	98	198	293
Fleet Repairs and Maintenance	30	45	60	90
IT Licences & Telecommunications	50	50	50	50
Audit and Finance	40	40	40	40
WHS Compliance	20	20	20	20
Fuel / Consumables	25	25	25	25
Insurance	30	30	30	30
Depreciation	255	263	409	550
Variable Costs				
EPA Levy	76	151	76	151
Landfill Cost	76	151	76	151
Transport to Landfill	108	216	108	216
Electricity	43	86	43	86
TOTAL	**1,558**	**2,334**	**1,617**	**2,410**

Source: City of Charles Sturt, pers. comm.; Biruu PLC Consulting (2019)

Waste and recyclables transport costs

General waste and recycling transport costs of $100 per tonne to landfill are assumed to be incurred for the 25 per cent of non-usable material (City of Charles Sturt, pers. comm.). For Options 1 and 3 which both assumed a total volume of non-useable material of 1,080 tonnes, the total cost was estimated to be $108,000 per annum. Given the assumed volume of non-usable material for Options 2 and 4 was twice that assumed for the other options, the estimated cost was double ($216,000 per annum).

General waste disposal fees

General waste disposal costs (i.e. landfill gate fees) of $70 per tonne are charged by the EPA for all non-usable materials that end up in landfill (City of Charles Sturt, pers. comm.). Given the assumed 1,080 tonnes of non-usable material for Options 1 and 3, and 2,160 tonnes for Options 2 and 4, the resulting total costs associated with EPA waste disposal costs were $75,600 and $151,200 per annum respectively.

2.3.2. Benefits

Cost savings from avoided material transport costs

Upon constructing the MRF, the council would avoid approximately $1.1 million in annual costs associated with the current $262 per tonne costs of sending their usable volumes to the Northern Adelaide Waste Management Authority (NAWMA) under the base case.

Income from additional material recycling waste streams (Option 2 and Option 4 only)

Option 2 and Option 4 both assume that the MRF increases the volume of waste material throughput by sourcing an additional 4,320 tonnes of material from the nearby West Wimmera and Glenelg shires. A price premium of 25 per cent has been assumed to apply to these volumes (relative to the avoided costs for the Limestone Coast regional councils mentioned above) given the additional risk and costs incurred by the Limestone Coast councils to construct and operate the MRF.

This increase in volume and assumed price premium applied to it are estimated to generate an additional $1.41 million per annum in revenue.

Income from the sale of recyclables

Based on advice from the Limestone Coast Local Government Association, it was assumed that 10 per cent of the regional municipal solid waste is deemed to be non-recoverable, a further 15 per cent is non-reusable (contaminated), leaving 75 per cent that may generate commodity sales post recovery.

Given an assumed price of $80 per tonne, the estimated 3,240 tonnes of useable material from Limestone Coast for Options 1 and 3 is expected to generate approximately $260,000 per annum in additional income. Options 2 and 4 both assume a doubling of waste volume, hence double the volume of useable material, as they include material from West Wimmera and Glenelg in addition to Limestone Coast. Commodity sales for these options are expected to generate double the income accordingly ($520,000 per annum).

Avoided costs associated with electricity credits from solar panels

It was assumed that given the significant electricity requirements of the MRF, solar panels would be installed on the roof of the main shed at an estimated cost of $168,000 for all options. This is expected to generate around $30,200 in electricity credits annually, reducing the overall electricity costs associated with the operation of the MRF.

Residual value of project capital

The project capital employed at the end of the period of analysis (15 years) may have a residual value, based on the depreciable life of the assets. The residual value of project capital in Options 1-4 was estimated to be approximately $1.45 million (undiscounted) on average.

2.3.3. A note on emerging technologies

The analysis that follows is premised on an assumption that technologies remain static over the course of the 15-year project. In practice, recycling and reuse is an active technology with numerous emerging opportunities that can markedly impact the competitiveness of localised recycling/reuse.

In the eastern states it is becoming more common for pavement and road construction to include ‘unconventional’ locally-sourced materials, ranging from plastics, glass to toner cartridges (Sustainability Victoria 2020; VicRoads 2019). For example, Alex Fraser Recycling constructed road base, sub-base course and compacted feeds with 100 per cent recycled aggregate, including 30 per cent recycled glass. However,

15 per cent recycled glass with a maximum particle size of 4.75 mm was recommended in blends to limit the extent of breakdown during the service life (Ali 2012).

In the Limestone Coast region experimentation with different materials in road construction has already occurred, but by employing materials sourced elsewhere. Local new-tech opportunities with potential different business models requires greater analysis, especially in the context of possible environmental gains, value-adding and employment.

3. RESULTS

3.1. Key Indicators

The primary focus of the cost benefit analysis in this study was the costs and benefits that accrue as a result of the development. That is, the cost benefit analysis was used to determine whether the development would increase net social benefits relative to the Base Case.

The results of the analysis have been expressed in terms of three evaluation criteria, the net present value (NPV), the internal rate of return (IRR) and the benefit cost ratio (BCR). The NPV is a measure of the aggregate, annual net benefits (i.e. benefits – costs) of the development over a 15-year period, discounted (i.e. expressed as a present value) using a discount rate of 6 per cent. If the NPV for a scenario is positive, then the scenario is preferred to the Base Case. The BCR is a ratio of the present value of benefits to the present value of costs over 15 years and the IRR is the discount rate at which the NPV of the development equals zero after 15 years. For a project to be viable, the BCR must be greater than 1.0 and the IRR greater than the discount rate. While an impact analysis would illustrate the economic activity arising from the proposed investment, the CBA shows whether or not the proposed investment represents a more efficient allocation of resources. The results of the CBA are presented in Table 3-1.

Table 3-1 Results of cost benefit analysis – Options 1-4

	Decision Rule (preferred to base case if satisfied)	Option 1 Low Tech LC	Option 2 Low Tech LCWWG	Option 3 High Tech LC	Option 4 High Tech LCWWG
Net Present Value (NPV)	If >$0.0	$2.70m	$11.83m	-$0.22m	$6.72m
Benefit Cost Ratio (BCR)	If >1.0	1.21	1.57	0.99	1.26
Internal Rate of Return (IRR)	If >6 per cent	14%	42%	6%	17%

Source: BDO EconSearch analysis

The results indicate that, according to the three evaluation criteria used, only Option 3 would not be likely to increase net social benefit, i.e. it is shown to be not preferred to the base case. The other three options, however, do increase net social benefit and are therefore preferred to the base case.

- Option 2 has the largest **NPV** ($11.83m) indicating that, relative to the Base Case, this option will generate a net benefit to the community of $11.83m over a 15-year period. The decision rule is satisfied as the NPV is greater than zero.
- Option 2 also has the largest **BCR** of 1.57, which indicates, in a broad sense, that for each dollar invested, $1.57 will be returned over the life of the project. For a project to be viable, the BCR must be greater than 1.0.
- The **IRR** provides a measure for the rate of return to capital invested, for Option 2 estimated to be 42 per cent. The decision rule for a project to be viable is that the IRR be greater than the discount rate which, for this project and projects of this kind is 6 per cent.

In addition to the benefits quantified in the analysis, each option will also increase regional employment levels. Again, it is Option 2 that has the largest direct employment outcome, estimated to be 19 full-time equivalent (fte) jobs. The direct fte jobs associated with each option are highlighted in Table 3-2 below.

Table 3-2 Direct employment outcomes - Options 1-4

	Option 1 Low Tech LC	Option 2 Low Tech LCWWG	Option 3 High Tech LC	Option 4 High Tech LCWWG
Managers (fte)	1	1	1	1
Supervisors (fte)	1	1	1	1
Casual Staff (fte)	9	17	4	9
TOTAL	**11**	**19**	**6**	**11**

Source: BDO EconSearch analysis

3.2. Sensitivity Analysis

The results of the CBA were estimated using values for key variables that reflect the uncertainty of those variables. The sensitivity analysis included the following:

- the discount rate
- the annual rate of change in recovery volumes
- the price received for materials
- the tonnes of material processed by each casual fte
- the avoided costs associated with the co-mingled fee currently being incurred in the base case.

The range of values used for each uncertain variable and detailed results of the sensitivity analysis are set out below with some interpretation of the results. Note that each sensitivity analysis for each variable was undertaken by holding all other variables constant at their 'expected' values. The assumptions and results of the sensitivity analysis are summarised and described in the following section.

Discount rate

The discount rate is the rate at which the future stream of costs and benefits are discounted to calculate the NPV from which a range of options can be easily compared. Uncertainties associated with the discount rate generally relate to the level of risk associated with various options and the opportunity costs of capital.

The results of the sensitivity testing on the discount rate are provided in Table 3-3 to Table 3-6 below.

Table 3-3 Results of varying discount rate - Option 1 (Low Tech LC)

	Discount rate		
	4 per cent	6 per cent	8 per cent
Net Present Value (NPV)	$2.72m	$2.70m	$2.70m
Benefit Cost Ratio (BCR)	1.19	1.21	1.25
Internal Rate of Return (IRR)	14%	14%	14%

Source: BDO EconSearch analysis

Table 3-4 Results of varying discount rate - Option 2 (Low Tech LCWWG)

	Discount rate		
	4 per cent	6 per cent	8 per cent
Net Present Value (NPV)	$12.99m	$11.82m	$10.88m
Benefit Cost Ratio (BCR)	1.55	1.57	1.60
Internal Rate of Return (IRR)	42%	42%	42%

Source: BDO EconSearch analysis

Table 3-5 Results of varying discount rate - Option 3 (High Tech LC)

	Discount rate		
	4 per cent	6 per cent	8 per cent
Net Present Value (NPV)	-$0.27m	-$0.22m	-$0.17m
Benefit Cost Ratio (BCR)	0.98	0.99	0.99
Internal Rate of Return (IRR)	6%	6%	6%

Source: BDO EconSearch analysis

Table 3-6 Results of varying discount rate - Option 4 (High Tech LCWWG)

	Discount rate		
	4 per cent	6 per cent	8 per cent
Net Present Value (NPV)	$7.79m	$6.72m	$5.85m
Benefit Cost Ratio (BCR)	1.27	1.26	1.25
Internal Rate of Return (IRR)	17%	17%	17%

Source: BDO EconSearch analysis

Recovery Rate

Factors influencing the rate at which the volume of recyclable materials is expected to change in the future include, but are not limited to:

- the rate of change of the local population including changes within the socio-demographic profile
- changes in consumption patterns of the regional community (including changes in the mix of waste materials generated by household consumption over time)
- the general awareness, attitudes and behaviours of the local community with regards to recycling.

While local population growth has been relatively stable at around 1 per cent per annum, this growth is increasingly coming from new migrants, who tend to have both a difference in consumption patterns and attitude towards recycling compared to the incumbent population. Given the uncertain nature associated

with changes in this rate of recovery, a sensitivity analysis was conducted using values of 5 per cent above and below the current estimates.

The results of the sensitivity testing on the recovery rate are provided in Table 3-7 to Table 3-10 below.

Table 3-7 Results of varying the material recovery rate - Option 1 (Low Tech LC)

	Change in Recovery Rate		
	-3 per cent	0 per cent	+ 3 per cent
Net Present Value (NPV)	$1.66m	$2.70m	$4.02m
Benefit Cost Ratio (BCR)	1.15	1.21	1.28
Internal Rate of Return (IRR)	11%	14%	17%

Source: BDO EconSearch analysis

Table 3-8 Results of varying the material recovery rate - Option 2 (Low Tech LCWWG)

	Change in Recovery Rate		
	-3 per cent	0 per cent	+ 3 per cent
Net Present Value (NPV)	$9.29m	$11.82m	$15.05m
Benefit Cost Ratio (BCR)	1.51	1.57	1.63
Internal Rate of Return (IRR)	38%	42%	47%

Source: BDO EconSearch analysis

Table 3-9 Results of varying the material recovery rate - Option 3 (High Tech LC)

	Change in Recovery Rate		
	-3 per cent	0 per cent	+ 3 per cent
Net Present Value (NPV)	-$1.63m	-$0.22m	$1.56m
Benefit Cost Ratio (BCR)	0.89	0.99	1.09
Internal Rate of Return (IRR)	2%	6%	9%

Source: BDO EconSearch analysis

Table 3-10 Results of varying the material recovery rate - Option 4 (High Tech LCWWG)

	Change in Recovery Rate		
	-3 per cent	0 per cent	+3 per cent
Net Present Value (NPV)	$3.45m	$6.72m	$10.88m
Benefit Cost Ratio (BCR)	1.14	1.26	1.39
Internal Rate of Return (IRR)	13%	17%	21%

Source: BDO EconSearch analysis

The results presented above highlight that all options have increasing returns to scale, producing a larger NPV when additional volumes of material are assumed to be collected over time. It should be noted however that a 3 per cent annual increase in recovery volumes would equate to around 50 per cent more volume at the end of the 15 year period. Processing this amount of additional material would likely stretch the capacity of the facility without some additional investment.

Material Price

The material price is the expected average price received for commodity sales associated with the volume of materials that are recovered by the MRF that have a market value. While the main demand for these recovered materials is focussed on paper and metal commodity uses and markets currently, new technologies and markets and/or potential changes in material recovery volumes and mixes are expected to result in changes to the average commodity price received for recovered materials over time. To highlight the potential sensitivity associated with changes in this price on the viability of the MRF, prices of 20 per cent below and above the expected rate were modelled.

The results of the sensitivity testing on the price of materials are provided in Table 3-11 to Table 3-14 below.

Table 3-11 Results of varying the material price - Option 1(Low Tech LC)

	Change in Material Price		
	-20 per cent	0 per cent	+ 20 per cent
Net Present Value (NPV)	$2.16m	$2.70m	$4.02m
Benefit Cost Ratio (BCR)	1.17	1.21	1.28
Internal Rate of Return (IRR)	12%	14%	17%

Source: BDO EconSearch analysis

Table 3-12 Results of varying the material price - Option 2 (Low Tech LCWWG)

	Change in Material Price		
	-20 per cent	0 per cent	+ 20 per cent
Net Present Value (NPV)	$10.76m	$11.82m	$12.89m
Benefit Cost Ratio (BCR)	1.52	1.57	1.62
Internal Rate of Return (IRR)	39%	42%	46%

Source: BDO EconSearch analysis

Table 3-13 Results of varying the material price - Option 3 (High Tech LC)

	Change in Material Price		
	-20 per cent	0 per cent	+ 20 per cent
Net Present Value (NPV)	-$0.76m	-$0.22m	$0.31m
Benefit Cost Ratio (BCR)	0.95	0.99	1.02
Internal Rate of Return (IRR)	4%	6%	7%

Source: BDO EconSearch analysis

Table 3-14 Results of varying the material price - Option 4 (High Tech LCWWG)

	Change in Material Price		
	-20 per cent	0 per cent	+ 20 per cent
Net Present Value (NPV)	$5.66m	$6.72m	$7.79m
Benefit Cost Ratio (BCR)	1.22	1.26	1.30
Internal Rate of Return (IRR)	15%	17%	19%

Source: BDO EconSearch analysis

The results presented above show that unsurprisingly, all options produce more social benefits when a higher price is assumed for recovered materials. Option 3 is the only option not preferred to the base case for the situation in which prices are expected to decrease rather than increase.

Tonnes per fte

The amount of labour required to process certain volumes of material is dependent upon the level of capital intensity assumed for each option. For the low technology options, a rate of 500 tonnes of material per casual worker was assumed based on comparisons with similar facilities that process similar volumes. For the high technology options, the assumed rate was 1000 tonnes per causal worker given the significant increase in automation associated with these options.

To highlight the sensitivity associated with changes in this assumption on the viability of the MRF, rates of 50 per cent below and above the assumed rate were modelled. The results of this sensitivity testing are provided in Table 3-15 to Table 3-18.

Table 3-15 Results of varying the tonnes per fte - Option 1(Low Tech LC)

	Change in Tonnes per fte		
	-50 per cent	0 per cent	+ 50 per cent
Net Present Value (NPV)	-$1.95m	$2.70m	$4.25m
Benefit Cost Ratio (BCR)	0.89	1.21	1.39
Internal Rate of Return (IRR)	0.2%	14%	18%

Source: BDO EconSearch analysis

Table 3-16 Results of varying the tonnes per fte - Option 2 (Low Tech LCWWG)

	Change in Tonnes per fte		
	-50 per cent	0 per cent	+ 50 per cent
Net Present Value (NPV)	$2.53m	$11.82m	$14.92m
Benefit Cost Ratio (BCR)	1.08	1.57	1.85
Internal Rate of Return (IRR)	13%	42%	55%

Source: BDO EconSearch analysis

Table 3-17 Results of varying the tonnes per fte - Option 3 (High Tech LC)

	Change in Tonnes per fte		
	-50 per cent	0 per cent	+ 50 per cent
Net Present Value (NPV)	-$2.54m	-$0.22m	$0.55m
Benefit Cost Ratio (BCR)	0.86	0.99	1.04
Internal Rate of Return (IRR)	0.4%	6%	7%

Source: BDO EconSearch analysis

Table 3-18 Results of varying the tonnes per fte - Option 4 (High Tech LCWWG)

	Change in Tonnes per fte		
	-50 per cent	0 per cent	+ 50 per cent
Net Present Value (NPV)	$2.08m	$6.72m	$8.27m
Benefit Cost Ratio (BCR)	1.07	1.26	1.34
Internal Rate of Return (IRR)	9%	17%	20%

Source: BDO EconSearch analysis

These results of this sensitivity testing indicate that according to the three evaluation criteria used, Option 2 and Option 4 would increase net social benefits and be preferred to the base case under each of the tonnes per fte assumptions used. Option 1 is not preferred to the base case when a rate of -50 per cent is assumed, and Option 3 is only preferred to the base case for the +50 per cent case.

Co-mingled fee

The co-mingled fee is the current fee incurred by Limestone Coast councils to send their kerbside collected recyclate to the Northern Adelaide Waste Management Authority (NAWMA) for processing. It is hence also the avoided cost assumed, should a local MRF be constructed.

To highlight the sensitivity associated with changes in this assumption on the viability of the MRF, rates of 20 per cent below and above the assumed rate were modelled. The results of this sensitivity testing are provided in Table 3-19 to Table 3-22 below.

Table 3-19 Results of varying the co-mingled recycling fee - Option 1(Low Tech LC)

	Change in Co-mingled fee		
	-20 per cent	0 per cent	+ 20 per cent
Net Present Value (NPV)	$0.37m	$2.70m	$5.03m
Benefit Cost Ratio (BCR)	1.03	1.21	1.40
Internal Rate of Return (IRR)	7%	14%	21%

Source: BDO EconSearch analysis

Table 3-20 Results of varying the co-mingled recycling fee - Option 2 (Low Tech LCWWG)

	Change in Co-mingled fee		
	-20 per cent	0 per cent	-20 per cent
Net Present Value (NPV)	$6.58m	$11.82m	$17.07m
Benefit Cost Ratio (BCR)	1.32	1.57	1.83
Internal Rate of Return (IRR)	25%	42%	65%

Source: BDO EconSearch analysis

Table 3-21 Results of varying the co-mingled recycling fee - Option 3 (High Tech LC)

	Change in Co-mingled fee		
	-20 per cent	0 per cent	-20 per cent
Net Present Value (NPV)	-$2.55m	-$0.22m	$2.11m
Benefit Cost Ratio (BCR)	0.84	0.99	1.14
Internal Rate of Return (IRR)	0.4%	6%	10%

Source: BDO EconSearch analysis

Table 3-22 Results of varying the co-mingled recycling fee - Option 4 (High Tech LCWWG)

	Change in Co-mingled fee		
	-20 per cent	0 per cent	-20 per cent
Net Present Value (NPV)	$1.48m	$6.72m	$11.97m
Benefit Cost Ratio (BCR)	1.06	1.26	1.46
Internal Rate of Return (IRR)	8%	17%	26%

Source: BDO EconSearch analysis

Similar to the previous sensitivity testing results, only Option 3 is estimated to produce a result that is not preferred to the base case. Given it was not preferred to the base case with the baseline assumption used of $262 per tonne, reducing this amount by 20 per cent only reduces the resulting net social benefits even further. All other options are still preferred to the base case with the varied assumptions related to the co-mingled fee, with Option 2 again the option that returns the highest NPV, BCR and IRR.

The overall results of this sensitivity testing indicate that according to the three evaluation criteria used, Option1, Option 2 and Option 4 would all increase net social benefits and be preferred to the base case under the majority of scenarios modelled in relation to the sensitivity of key variables discussed above. Option 3 was rejected initially with the baseline levels assumed for the same variables, and the overall net benefits were only further reduced for all scenarios where a reduction in the baseline assumptions was modelled.

3.3. Recommendation

The results of the analysis suggested that a low-technology materials recovery facility that was scaled to accommodate the throughput of some of the neighbouring regions (initially assumed to be the shires of West Wimmera and Glenelg) had the highest NPV ($11.83 million), BCA (1.57) and IRR (42 per cent). In addition to the initial assumptions made regarding the discount rate, material recovery rates, commodity prices, labour input requirements and co-mingled recycling fees, Option 2 was also the preferred option under a range of alternative values of these key variables, as demonstrated in the sensitivity analysis. It was also the option that generated the highest direct local employment results.

Given these findings, it is recommended that a low-technology, high-volume materials recovery facility is investigated further, with the aim of generating a detailed business case in collaboration with key regional and industry stakeholders as a next step.

Whilst a low-technology MRF should form the basis of future analysis, emerging technologies and uses of recovered material should be included in further analysis.

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Disclaimer

The assignment is a consulting engagement as outlined in the 'Framework for Assurance Engagements', issued by the Auditing and Assurances Standards Board, Section 17. Consulting engagements employ an assurance practitioner's technical skills, education, observations, experiences and knowledge of the consulting process. The consulting process is an analytical process that typically involves some combination of activities relating to: objective-setting, fact-finding, definition of problems or opportunities, evaluation of alternatives, development of recommendations including actions, communication of results, and sometimes implementation and follow-up.

The nature and scope of work has been determined by agreement between BDO and the Client. This consulting engagement does not meet the definition of an assurance engagement as defined in the 'Framework for Assurance Engagements', issued by the Auditing and Assurances Standards Board, Section 10.

Except as otherwise noted in this report, we have not performed any testing on the information provided to confirm its completeness and accuracy. Accordingly, we do not express such an audit opinion and readers of the report should draw their own conclusions from the results of the review, based on the scope, agreed-upon procedures carried out and findings.

APPENDIX: DETAILED COST BENEFIT ANALYSIS RESULTS

Table A-1 Option 1 - Low Tech LC - Detailed cost benefit analysis results

	Present Value	Year 1 2021	Year 2 2022	Year 3 2023	Year 4 2024	Year 5 2025	...	Year 14 2034	Year 15 2035
BASE CASE									
Revenue									
TOTAL REVENUE	$0	$0	$0	$0	$0	$0		$0	$0
Costs									
Variable Costs	$8,739,206	$848,880	$848,880	$848,880	$848,880	$848,880		$848,880	$848,880
TOTAL COSTS	$8,739,206	$848,880	$848,880	$848,880	$848,880	$848,880		$848,880	$848,880
OPTION 1: Low-Tech LC									
Revenue									
Limestone Coast Material Recovery	$11,652,275	$1,131,840	$1,131,840	$1,131,840	$1,131,840	$1,131,840		$1,131,840	$1,131,840
Other Material Recovery	$0	$0	$0	$0	$0	$0		$0	$0
Commodity Sales	$2,668,460	$259,200	$259,200	$259,200	$259,200	$259,200		$259,200	$259,200
Electricity Credits	$310,909	$30,200	$30,200	$30,200	$30,200	$30,200		$30,200	$30,200
Residual Values	$639,614	$0	$0	$0	$0	$0		$0	$1,446,106
TOTAL REVENUE	$15,271,257	$1,421,240	$1,421,240	$1,421,240	$1,421,240	$1,421,240		$1,421,240	$2,867,346
Costs									
Capital Costs	$5,270,443	$5,270,443	$0	$0	$0	$0		$0	$0
Employee Costs	$7,291,718	$708,279	$708,279	$708,279	$708,279	$708,279		$708,279	$708,279
Fixed Costs	$5,636,049	$547,456	$547,456	$547,456	$547,456	$547,456		$547,456	$547,456
Variable Costs	$3,113,203	$302,400	$302,400	$302,400	$302,400	$302,400		$302,400	$302,400
TOTAL COSTS	$21,311,413	$6,828,578	$1,558,135	$1,558,135	$1,558,135	$1,558,135		$1,558,135	$1,558,135
Incremental Revenue	$15,271,257	$1,421,240	$1,421,240	$1,421,240	$1,421,240	$1,421,240		$1,421,240	$2,867,346
Incremental Costs	$12,572,207	$5,979,698	$709,255	$709,255	$709,255	$709,255		$709,255	$709,255
NPV	**$2,699,050**	-$4,558,458	$711,985	$711,985	$711,985	$711,985		$711,985	$2,158,092
BCR	**1.21**								
IRR	**14%**								

Source: BDO EconSearch analysis

Table A-2 Option 2 - Low Tech LCWWG - Detailed cost benefit analysis results

	Present Value	Year 1 2021	Year 2 2022	Year 3 2023	Year 4 2024	Year 5 2025	...	Year 14 2034	Year 15 2035
BASE CASE									
Revenue									
TOTAL REVENUE	$0	$0	$0	$0	$0	$0		$0	$0
Costs									
Variable Costs	$8,739,206	$848,880	$848,880	$848,880	$848,880	$848,880		$848,880	$848,880
TOTAL COSTS	$8,739,206	$848,880	$848,880	$848,880	$848,880	$848,880		$848,880	$848,880
OPTION 2: Low-Tech LCWWG									
Revenue									
Limestone Coast Material Recovery	$11,652,275	$1,131,840	$1,131,840	$1,131,840	$1,131,840	$1,131,840		$1,131,840	$1,131,840
Other Material Recovery	$14,565,343	$1,414,800	$1,414,800	$1,414,800	$1,414,800	$1,414,800		$1,414,800	$1,414,800
Commodity Sales	$5,336,920	$518,400	$518,400	$518,400	$518,400	$518,400		$518,400	$518,400
Electricity Credits	$310,909	$30,200	$30,200	$30,200	$30,200	$30,200		$30,200	$30,200
Residual Values	$641,202	$0	$0	$0	$0	$0		$0	$1,449,697
TOTAL REVENUE	$32,506,648	$3,095,240	$3,095,240	$3,095,240	$3,095,240	$3,095,240		$3,095,240	$4,544,937
Costs									
Capital Costs	$5,388,045	$5,388,045	$0	$0	$0	$0		$0	$0
Employee Costs	$11,936,651	$1,159,463	$1,159,463	$1,159,463	$1,159,463	$1,159,463		$1,159,463	$1,159,463
Fixed Costs	$5,868,723	$570,057	$570,057	$570,057	$570,057	$570,057		$570,057	$570,057
Variable Costs	$6,226,406	$604,800	$604,800	$604,800	$604,800	$604,800		$604,800	$604,800
TOTAL COSTS	$29,419,825	$7,722,364	$2,334,319	$2,334,319	$2,334,319	$2,334,319		$2,334,319	$2,334,319
Incremental Revenue	$32,506,648	$3,095,240	$3,095,240	$3,095,240	$3,095,240	$3,095,240		$3,095,240	$4,544,937
Incremental Costs	$20,680,619	$6,873,484	$1,485,439	$1,485,439	$1,485,439	$1,485,439		$1,485,439	$1,485,439
NPV	**$11,826,030**	-$3,778,244	$1,609,801	$1,609,801	$1,609,801	$1,609,801		$1,609,801	$3,059,498
BCR	**1.57**								
IRR	**42%**								

Source: BDO EconSearch analysis

Table A-3 Option 3 - High Tech LC - Detailed cost benefit analysis results

	Present Value	Year 1 2021	Year 2 2022	Year 3 2023	Year 4 2024	Year 5 2025	...	Year 14 2034	Year 15 2035
BASE CASE									
Revenue									
TOTAL REVENUE	$0	$0	$0	$0	$0	$0		$0	$0
Costs									
Variable Costs	$8,739,206	$848,880	$848,880	$848,880	$848,880	$848,880		$848,880	$848,880
TOTAL COSTS	$8,739,206	$848,880	$848,880	$848,880	$848,880	$848,880		$848,880	$848,880
OPTION 3: High Tech LC									
Revenue									
Limestone Coast Material Recovery	$11,652,275	$1,131,840	$1,131,840	$1,131,840	$1,131,840	$1,131,840		$1,131,840	$1,131,840
Other Material Recovery	$0	$0	$0	$0	$0	$0		$0	$0
Commodity Sales	$2,668,460	$259,200	$259,200	$259,200	$259,200	$259,200		$259,200	$259,200
Electricity Credits	$310,909	$30,200	$30,200	$30,200	$30,200	$30,200		$30,200	$30,200
Residual Values	$646,608	$0	$0	$0	$0	$0		$0	$1,461,918
TOTAL REVENUE	$15,278,251	$1,421,240	$1,421,240	$1,421,240	$1,421,240	$1,421,240		$1,421,240	$2,883,158
Costs									
Capital Costs	$7,596,878	$7,596,878	$0	$0	$0	$0		$0	$0
Employee Costs	$4,969,252	$482,687	$482,687	$482,687	$482,687	$482,687		$482,687	$482,687
Fixed Costs	$8,560,252	$831,497	$831,497	$831,497	$831,497	$831,497		$831,497	$831,497
Variable Costs	$3,113,203	$302,400	$302,400	$302,400	$302,400	$302,400		$302,400	$302,400
TOTAL COSTS	$24,239,585	$9,213,462	$1,616,584	$1,616,584	$1,616,584	$1,616,584		$1,616,584	$1,616,584
Incremental Revenue	$15,278,251	$1,421,240	$1,421,240	$1,421,240	$1,421,240	$1,421,240		$1,421,240	$2,883,158
Incremental Costs	$15,500,379	$8,364,582	$767,704	$767,704	$767,704	$767,704		$767,704	$767,704
NPV	**-$222,128**	-$6,943,342	$653,536	$653,536	$653,536	$653,536		$653,536	$2,115,454
BCR	**0.99**								
IRR	**6%**								

Source: BDO EconSearch analysis

Table A-4 Option 4 - High Tech LCWWG - Detailed cost benefit analysis results

	Present Value	Year 1 2021	Year 2 2022	Year 3 2023	Year 4 2024	Year 5 2025	...	Year 14 2034	Year 15 2035
BASE CASE									
Revenue									
TOTAL REVENUE	$0	$0	$0	$0	$0	$0		$0	$0
Costs									
Variable Costs	$8,739,206	$848,880	$848,880	$848,880	$848,880	$848,880		$848,880	$848,880
TOTAL COSTS	$8,739,206	$848,880	$848,880	$848,880	$848,880	$848,880		$848,880	$848,880
OPTION 4: High Tech LCWWG									
Revenue									
Limestone Coast Material Recovery	$11,652,275	$1,131,840	$1,131,840	$1,131,840	$1,131,840	$1,131,840		$1,131,840	$1,131,840
Other Material Recovery	$14,565,343	$1,414,800	$1,414,800	$1,414,800	$1,414,800	$1,414,800		$1,414,800	$1,414,800
Commodity Sales	$5,336,920	$518,400	$518,400	$518,400	$518,400	$518,400		$518,400	$518,400
Electricity Credits	$310,909	$30,200	$30,200	$30,200	$30,200	$30,200		$30,200	$30,200
Residual Values	$651,493	$0	$0	$0	$0	$0		$0	$1,472,963
TOTAL REVENUE	$32,516,939	$3,095,240	$3,095,240	$3,095,240	$3,095,240	$3,095,240		$3,095,240	$4,568,203
Costs									
Capital Costs	$9,719,296	$9,719,296	$0	$0	$0	$0		$0	$0
Employee Costs	$7,291,718	$708,279	$708,279	$708,279	$708,279	$708,279		$708,279	$708,279
Fixed Costs	$11,296,228	$1,097,256	$1,097,256	$1,097,256	$1,097,256	$1,097,256		$1,097,256	$1,097,256
Variable Costs	$6,226,406	$604,800	$604,800	$604,800	$604,800	$604,800		$604,800	$604,800
TOTAL COSTS	$34,533,648	$12,129,630	$2,410,334	$2,410,334	$2,410,334	$2,410,334		$2,410,334	$2,410,334
Incremental Revenue	$32,516,939	$3,095,240	$3,095,240	$3,095,240	$3,095,240	$3,095,240		$3,095,240	$4,568,203
Incremental Costs	$25,794,442	$11,280,750	$1,561,454	$1,561,454	$1,561,454	$1,561,454		$1,561,454	$1,561,454
NPV	**$6,722,497**	-$8,185,510	$1,533,786	$1,533,786	$1,533,786	$1,533,786		$1,533,786	$3,006,749
BCR	**1.26**								
IRR	**17%**								

Source: BDO EconSearch analysis