

Shire of Esperance

Waste Transport Cost vs Landfilling Assessment Report

February 2021

Executive summary

The Shire of Esperance engaged GHD to undertake a high-level cost review of the following two future waste management options:

- **Option 1** – Collection, compaction and transfer of waste from the Esperance Shire catchment area to Coolgardie for disposal at a proposed new Class III landfill
- **Option 2** – Collection, consolidation/transfer and bulk transportation of waste from the Esperance Shire catchment area and disposal at a potential new Shire-owned and -operated landfill near Grass Patch.

As the bulk waste transfer distances involved in each scenario were around 80 km and 380 km respectively, it was assumed that a putrescible waste transfer station would be established at the existing Wylie Bay Waste Management Facility site.

High level estimates for both capital (Capex) and operational expenditure (Opex), where necessary, were undertaken for all transport, transfer station and landfill aspects relating to both waste management options. An overall cost analysis was then undertaken to compare the options and determine the feasible Coolgardie gate fee/tonne per annum, as detailed below.

Waste management options cost comparison summary

Waste management cost component	Option 1: Transfer and disposal at Coolgardie (\$/t)	Option 2: Transfer and disposal at Grass Patch (\$/t)
Transport (Capex and Opex)	46.00	24.00
Transfer station (Capex)	6.70	5.20
Transfer station (Opex)	20.00	17.00
Local landfill (Capex and Opex)	N/A	72.50
Total	72.70	118.70
Cost difference (feasible Coolgardie gate fee/tonne)	-46.00	

The high level cost estimates developed for transport, transfer station and landfill costs relating to the two identified waste management options revealed that a gate fee of up to approximately \$46/tonne is considered feasible for the Shire to progress with the compaction and transport of waste to Coolgardie landfill for disposal.

Additional transport-related Scope 1 carbon emissions associated with transporting waste to Coolgardie rather than Grass Patch were calculated to be in the order of 312 tonnes per annum (t CO₂-e).

Due to the limitations of this high-level assessment, as outlined in this report, it is recommended that a more detailed financial assessment, or a cost-benefit analysis be undertaken, to verify the initial findings detailed within.

Table of contents

1.	Introduction	1
1.1	Purpose of this report	1
1.2	Background	1
1.3	Project objectives	1
1.4	Scope.....	2
1.5	Limitations	3
2.	Overview of waste management options	4
2.1	Option 1: Compact waste and transport to Coolgardie for disposal.....	4
2.2	Option 2: Aggregate waste and transport to a new local landfill site	4
3.	Transport cost assessment.....	6
3.1	Scenarios	6
3.2	Assumptions.....	6
3.3	Key findings	7
4.	Transfer station cost assessment	9
4.1	Assumptions.....	9
4.2	High level cost estimate.....	9
5.	New landfill cost assessment.....	11
5.1	Assumptions.....	11
5.2	High level cost estimate.....	12
6.	High level cost analysis	13
6.1	Carbon emissions comparison.....	13
7.	Assumptions and qualifications.....	15
8.	Conclusion	16

Table index

Table 3-1	Transport cost outcomes	7
Table 6-1	Waste management option break-even cost comparison	13
Table 6-2	Coolgardie vs Grass Patch transport GHG emissions comparison	14

Figure index

Figure 2-1	Approximate location of proposed Coolgardie landfill site.....	4
Figure 2-2	Indicative location of proposed Esperance landfill site within the current search boundary	5

Appendices

Appendix A – Waste Logistics Cost Study Report

Appendix B – Transfer Station construction cost breakdown

Appendix C – Esperance Landfill cost modelling

1. Introduction

The Shire of Esperance (the Shire) engaged GHD Pty Ltd (GHD) to undertake a high-level cost review of the following two future waste management options:

- **Option 1** – Collection and compaction of waste from the Esperance catchment area and transportation to Coolgardie for disposal at a proposed new Class III landfill
- **Option 2** – Collection of waste from the Esperance catchment area and consolidation, bulk transportation and disposal at a potential new Shire-owned and operated landfill near Grass Patch.

As part of the study, the Shire also required estimation of possible gate fees at the Coolgardie landfill site that would enable Option 1 to be economically feasible.

1.1 Purpose of this report

The purpose of this report is to summarise the high level cost review undertaken on the two future waste management options and provide an overview of any critical information gaps or assumptions that may require further exploration prior to the confirmation of the most viable options and potential outcomes for the Shire.

1.2 Background

The Shire currently has an active licensed waste management facility at Wylie Bay, east of Esperance; the Wylie Bay Waste Management Facility (WMF). This landfill is nearing capacity with an estimated two years of remaining airspace (as of 2020). Further to this, the site licence is currently set to expire in August 2025, with landfilling operations to cease by 31 December 2022. The Shire has indicated that the Department of Water and Environmental Regulation (DWER) would be unlikely to allow significant further expansion of the existing site beyond 2022 or beyond the currently developed airspace and footprint.

As a result of this, the Shire has been working on establishing a new waste management strategy beyond the closure of the Wylie Bay WMF. The search for a new local landfill site has been ongoing since 2012 when the Shire initially commissioned Talis Consultants to undertake a site selection study leading to the completion of landfill capability assessments at sites in Dalyup, Scaddan and Merivale. However, site constraints and/or community pressure ultimately led the Shire to abandon these proposed sites.

In March 2020, the Shire resolved to undertake a new search for a site north of Speddingup Road East and within the Shire boundary. This search area is approximately 80 km north of the Esperance township. GHD was appointed by the Shire in late May 2020 to facilitate this new landfill site search.

Within this same timeframe, the Shire of Coolgardie have been progressing design and approvals for a large capacity engineered and licenced Class III landfill at their existing disposal site, and indicated interest in receiving waste generated in the Esperance Shire.

1.3 Project objectives

The overall project objective is to establish high-level cost models for the two waste management options, and identifying an approximate break-even cost that could be afforded by the Shire as a disposal gate fee at the proposed landfill facility in Coolgardie.

The two options would involve:

- Transport to and disposal at the Coolgardie landfill, located approximately 380 km from Esperance, or
- Construction of a new (future) local landfill site approximately 80 km from town and transport and disposal of waste at this location.

1.4 Scope

The following scope of works was undertaken to complete the high-level cost review:

- **Information review** – to confirm the configuration of each waste management option and identify any key assumptions that have been made, including verification with the Shire
- **Transport cost assessment** – develop a Transport Logistics Cost Model (TLCM) to cost the transport of waste product (\$ per tonne basis) for the two main transport options
- **Transfer station cost assessment** – consideration of costs associated with the collation, sorting, storage, compaction and load-out at a locally located waste transfer facility for the two different options proposed
- **New landfill cost assessment** – development of a high-level cost model for establishment and operation of a new landfill facility within the Shire
- **Waste management option assessment** – providing an overall assessment as to the economic viability of each option through a high level cost comparison and providing an overview of any critical information gaps or assumptions that may require further exploration prior to the confirmation of the most viable outcome.

1.5 Limitations

This report has been prepared by GHD for Shire of Esperance and may only be used and relied on by Shire of Esperance for the purpose agreed between GHD and the Shire of Esperance as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Shire of Esperance arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Shire of Esperance and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

GHD has prepared the preliminary cost estimates set out through this report using information reasonably available to the GHD employee(s) who prepared this report; and based on assumptions and judgments made by GHD.

The Cost Estimate has been prepared for the purpose of providing a high level cost review and must not be used for any other purpose.

The Cost Estimate is a preliminary estimate only. Actual prices, costs and other variables may be different to those used to prepare the Cost Estimate and may change. Unless as otherwise specified in this report, no detailed quotation has been obtained for actions identified in this report. GHD does not represent, warrant or guarantee that the project can or will be undertaken at a cost which is the same or less than the Cost Estimate.

Where estimates of potential costs are provided with an indicated level of confidence, notwithstanding the conservatism of the level of confidence selected as the planning level, there remains a chance that the cost will be greater than the planning estimate, and any funding would not be adequate. The confidence level considered to be most appropriate for planning purposes will vary depending on the conservatism of the user and the nature of the project. The user should therefore select appropriate confidence levels to suit their particular risk profile.

2. Overview of waste management options

The two proposed waste disposal options assessed within this project are detailed in the following sections. For the purposes of this assessment, it has been assumed that both waste disposal options will consider the management of 15,000 tonnes of waste per annum, not subjected to an annual growth rate.

2.1 Option 1: Compact waste and transport to Coolgardie for disposal

Option 1 involves the transport and disposal of compacted waste to the Coolgardie landfill site. The following design elements have been considered as part of this option:

1. Construction of a local transfer station facility, located at Wylie Bay WMF
2. Consolidation and compaction of Esperance waste at a local transfer facility (as per above)
3. Transportation of compacted waste in 47 tonne loads in a 30 m A-Double combination to the Coolgardie landfill site, approximately 380 km north of Esperance, as identified on Figure 2-1
4. Payment of a gate fee to the Shire of Coolgardie for disposal of waste at their landfill.



Figure 2-1 Approximate location of proposed Coolgardie landfill site

2.2 Option 2: Aggregate waste and transport to a new local landfill site

Option 2 involves the aggregation, transport and disposal of waste to the proposed Esperance landfill site. The following design elements have been considered as part of this option:

1. Construction of a local transfer station facility, located at Wylie Bay WMF
2. Site establishment and construction of the proposed Esperance landfill
3. Consolidation of Esperance waste at a local transfer station (as per above)

4. Transportation of waste in 23 tonne loads in a 13.7 metre (45 foot) tri-axle walking floor trailer to the proposed Esperance landfill, approximately 80 km north of Esperance (near the Grass Patch area) as identified on Figure 2-2.
5. Operation, maintenance and environmental monitoring of the proposed Esperance landfill.

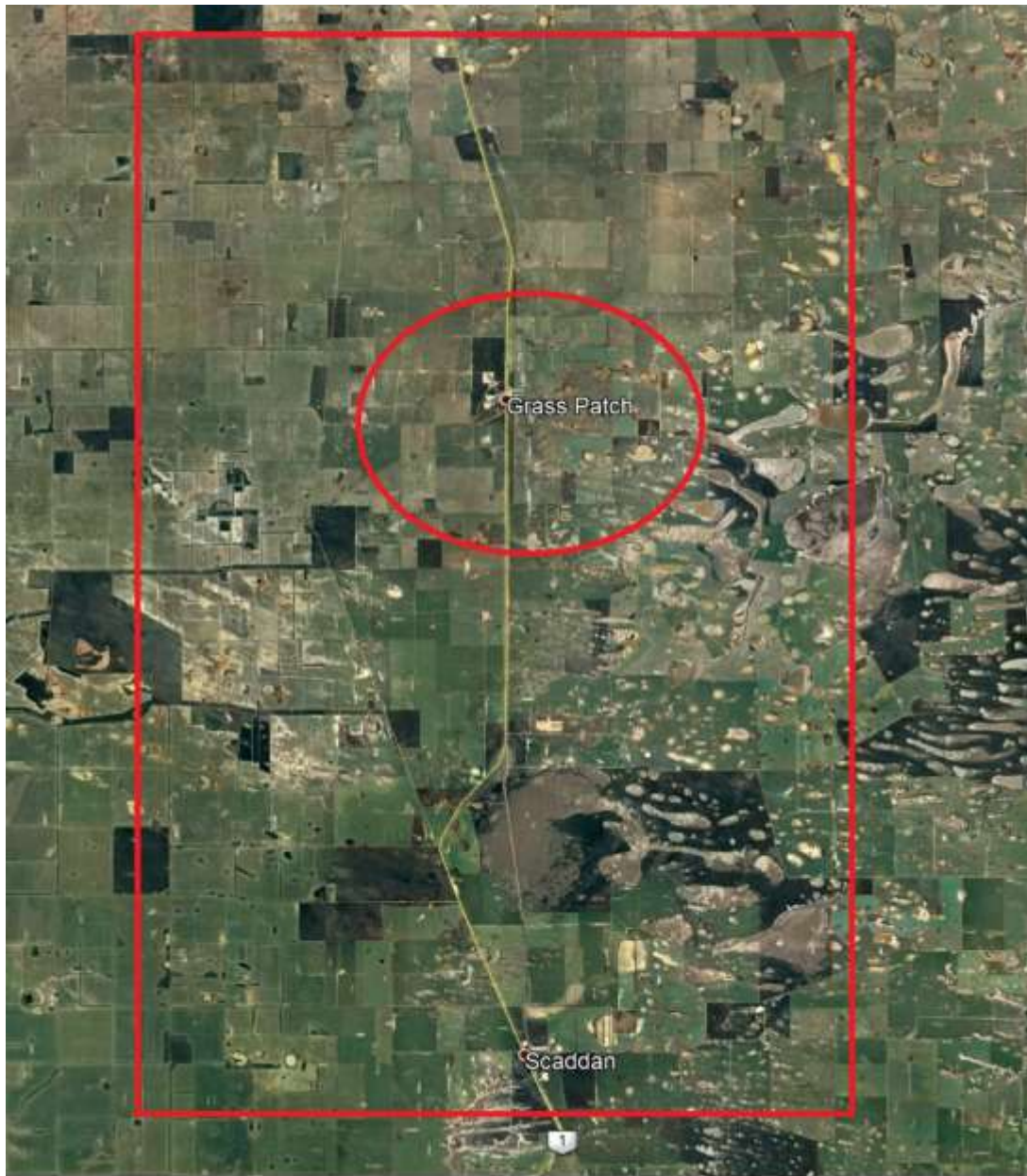


Figure 2-2 Indicative location of proposed Esperance landfill site within the current search boundary

Note that the locality indicated in Figure 2-2 is intended to approximate transport distance and does not suggest this locality is actually suitable for establishing a new landfill site. The selection of a new landfill site is the focus of a separate site selection study.

3. Transport cost assessment

Transport costs required to deliver waste to both the proposed Coolgardie and Esperance landfill sites were estimated as part of this assessment based on the following steps:

- Conducting an information review to confirm the transport task and route specific transport constraints to define the transport operational model
- Preparing an independent cost estimate using GHD's Transport Logistics Cost Model (TLCM) for each route based on the transport task and identified operational to constraints.

GHD utilised its proprietary TLCM to estimate transport costs for each of the origin-destination pairs identified to deliver product to potential customers.

The modelling process adopted a first principles approach and involved specifying the origin, destination, routes and limitations for specific vehicle types. This approach enabled the testing and comparison of transport costs on a \$/unit basis for each of the identified transport route options.

A summary and the findings of the transport cost assessment is detailed in this section, with the full *Waste Logistics Cost Study* report, prepared by GHD, included as Appendix A.

3.1 Scenarios

GHD has modelled the costs of four scenarios; two operational approaches for the two origin-destination pairs. Under the first three scenarios, it is assumed that the Shire will purchase the assets and run the operations. Under the fourth scenario, the assets will be leased and operations conducted in a Third Party Logistics (3PL) arrangement.

The two scenarios modelled for the transport of waste from Wylie Bay WMF to Coolgardie are:

- **Scenario 1:** one set-up consisting of a 30 m A-Double combination with the provision of a spare trailer
- **Scenario 2:** one set-up consisting of a 30 m A-Double combination, with four trailers operating in tandem. Two trailers will be filled at Wylie Bay WMF. Within the time taken to travel to Coolgardie and return, two empty trailers are being loaded so that the time associated with loading in Wylie Bay is excluded from the trucking operations.

The two scenarios modelled for the transport of waste from Wylie Bay WMF to proposed Esperance landfill are:

- **Scenario 3:** one set-up consisting of a single prime mover and a walking floor trailer
- **Scenario 4:** one set-up consisting of a single prime mover and a walking floor trailer. A 10% OPEX profit margin for the 3PL operator has been introduced under this scenario. All other assumptions remain firm.

3.2 Assumptions

There are several key assumptions that influence the operational and commercial values and rules in the modelling process, some of which include:

- 12 hour per day x 7 day per week transport operations
- 350 days per year operating days
- Drivers assist during loading, unloading and refuelling of own vehicle – therefore do not count as rest

- Noting exception in Scenario 2, where two sets of trailers operate in tandem with the loading time of empty trailers occurring while full trailers are on the road to Coolgardie.
- Driver shifts start and end at Wylie Bay WMF, acting as a truck depot
- Handling facilities at both origin and destination have 24 x 7 access
- Shire of Esperance owns their own fleet (except in Scenario 4)
- No costs relating to safety or environmental risks have been considered
- Transport costs have not been assessed as net present value.

The full list of assumptions is included in the full report, provided as Appendix A.

3.3 Key findings

Based on the operational outcomes of the modelling, cost estimates for each scenario were calculated and are detailed in Table 3-1.

Table 3-1 Transport cost outcomes

Aspect	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Freight unit rate (cents/tonne kilometre per annum) (excluding GST)	\$11.98	\$12.72	\$29.10	\$22.50
Freight cost/tonne per annum (excluding GST)	\$46.00	\$48.00	\$24.00	\$19.00
Annual transport cost (excluding GST)	\$680,000	\$720,000	\$350,000	\$270,000

The lowest cost outcome for the operational transport scenarios where the Shire would own and operate the assets was achieved for the shortest haulage distance to the proposed Esperance landfill site, at approximately \$24 per tonne.

Despite having the highest freight unit rate per kilometre, as the impact of loading and unloading time as a proportion of each journey, the modelled cost was significantly lower than the Coolgardie scenarios, which were around \$46 – \$48 per tonne.

For the first two scenarios between Wylie Bay WMF and Coolgardie, the main reason for the difference in cost per tonne is Scenario 2 assumes an additional trailer cost under the tandem operation. The additional trailer incurs more registration fees, insurance and overheads. However, an additional trailer would also improve loading efficiency and offer lower risk of transport continuity interruption associated with trip-related delays (e.g. flat tyre, road maintenance etc).

The low volume of waste to be transported (nominally 15,000 tonnes annually) requires less than one vehicle combination under each scenario. The cost of operating less than one vehicle is possibly lower when outsourcing the operations to a 3rd party (Scenario 4).

Under an own and operate model, the Shire would purchase at a minimum one vehicle combination, however as it would not be used all the time it is considered 'under-utilised'. Based on the underlying assumptions and parameters of the model, the walking floor trailer owned by the Shire in Scenario 3 is only used 63% of the time. It is assumed that the remainder of the time the prime mover/trailer is sitting idle.

Alternatively, Scenario 4 depicts the costs of the same operation if it were to be outsourced to a 3PL operator. As a single truck combination is only required 63% of the time, it is assumed that

the vehicle will be used for other operations, improving utilisation. As such, GHD modelling suggests a reduction of around \$5/tonne to an estimated cost of \$19/tonne.

4. Transfer station cost assessment

In order to effectively transfer waste to either the Coolgardie or Esperance proposed landfill sites, a transfer station within Esperance is required to consolidate and compact waste, prior to transportation. It is proposed that the transfer station be constructed at Wylie Bay WMF as the site is already owned and operated by the Shire.

A high-level Capex and Opex cost estimate for the proposed transfer station was prepared based on GHD's previous experience on similar projects. The high-level cost estimate is provided as Appendix B and summarised below.

The following design elements have been incorporated into the transfer station layout:

- 25m x 25m industrial steel-framed metal-clad building with 9 metres clear height, including earth works and site preparation, push walls and roller doors,
- All civil works, including concrete slabs, stormwater drainage,
- Planning, approvals, certification and design fees,
- Building services, including all fire safety equipment.

4.1 Assumptions

The following assumptions have been made to prepare the transfer station cost estimate:

- Required waste transfer tonnage remains at (nominally) 15,000 tonnes per annum
- Mobile plant and equipment required for waste handling and loading (e.g. wheel loader, light vehicle) have been excluded as it is assumed that existing Shire equipment can be utilised.
- Compaction of waste into specialised transfer trailers is required for the Coolgardie transfer option, whereas transfer to the proposed Esperance landfill would not require compaction, and waste would be top-loaded into walking floor trailer/s.
- Contingency has not been considered as it is only for high level cost comparison purposes.
- Costs have not been assessed on a current comparison basis and not as net present values.

Individual building components and other civil works could be reviewed and potentially reduced as part of a more detailed evaluation, and design and operating assumptions further developed, if desired.

Additional assumptions and qualifications are provided in Section 7.

4.2 High level cost estimate

4.2.1 Capex cost estimate

Based on the design elements and assumptions outlined above, the high-level cost estimate to construct and establish the required Wylie Bay transfer station is \$3.0 million (excluding GST) (equating to \$6.70/tonne), which includes the plant and equipment required to compact the waste for transport to the Coolgardie landfill (option 1).

As compaction is not required for transport of waste to the proposed Esperance landfill, the high level cost estimate to construct the transfer station decreases to \$2.3 million (excluding GST) (equating to \$5.20/tonne) for option 2.

4.2.2 Opex cost estimate

To account for costs associated with transfer station operation where waste is compacted and transported to the Coolgardie landfill, a high-level flat rate estimate of \$20/tonne was allowed for, which includes staff, fuel, power, and building and plant maintenance.

As mentioned in Section 4.1, the compaction plant and equipment (and associated integration works) are not required for the second option to transport waste to the proposed Esperance landfill. Therefore, the high-level operational cost estimate for the local transfer option has been reduced to flat rate of \$17/tonne.

5. New landfill cost assessment

Waste generated within Esperance is currently disposed of at the Wylie Bay WMF, however the landfill is nearing capacity with an estimated two years of remaining airspace (as of 2020). The search for a new local landfill site has been ongoing since 2012, with recent siting studies in March 2020 focusing on potential sites to the north of Speddingup Road East/West and within the Shire of Esperance boundary. This search area is approximately 80 km north of the Esperance township.

A high-level Capex and Opex cost estimate for the proposed landfill site was prepared based on GHD's previous experience on similar projects and information provided by the Shire. The high-level cost estimate is provided as Appendix C and summarised below.

The following conceptual design elements have been incorporated into the landfill site layout:

- Annual waste disposal quantity of 15,000 tonnes
- The total landfill footprint covers approximately 60,000 m²
- Stormwater and leachate pond construction
- Ongoing environmental monitoring and site maintenance
- Cell liner to consist the following:
 - Separation geotextiles
 - Leachate drainage layer consisting of cushioning geotextile, 1.5 mm double textured HDPE, GCL and drainage aggregate
 - Leachate drainage pipework
 - 1,000 mm soil layer
- Final landfill cap to consist of the following:
 - Landfill gas management infrastructure
 - Cover material
 - LLDPE geomembrane
 - Sub soil and topsoil.

5.1 Assumptions

A number of key assumptions have been made to develop the high-level cost estimate for the construction and operation of the proposal landfill, including:

- A growth rate has not been applied to the waste disposal rate
- Contingency has not been considered as it is only for relative cost comparison purposes
- Costs have not been assessed as net present values
- Land purchase price was based on previous property sales information within the general vicinity of Grass Patch, which was provided by the Shire
- All machinery from the Wylie Bay WMF can be utilised at the new landfill site and therefore no additional machinery capital costs have been allowed for.

Additional assumptions relating to specific cost items are provided in Appendix C.

5.2 High level cost estimate

Estimated capital costs required to construct and operate the proposed Esperance landfill included the following:

- Land acquisition
- Site establishment
- Landfill cell detailed designs, construction and progressive capping
- Progressive stormwater infrastructure construction

Estimated expenses required to operate the landfill included the following:

- Staff and administration
- Environmental monitoring
- Site and machinery maintenance

High-level cost estimation revealed the average annual cost expenditure for operation is approximately \$1.09 million (excluding GST), across a 30 year landfill operating period, including Capex and Opex.

This average expenditure derived an estimated 'local' landfill disposal cost of \$72.50/tonne.

6. High level cost analysis

A high-level cost analysis of the two waste management options has been undertaken to compare the options and determine the break-even Coolgardie gate fee/tonne.

A summary of the high-level comparative cost estimates undertaken to determine transport, transfer station and Esperance landfill costs have been detailed in Table 6-1 below.

It is noted Scenario 1 and Scenario 3 from the transport cost assessment have been utilised for waste management Option 1 and Option 2, respectively.

Table 6-1 Waste management option break-even cost comparison

Waste management costs	Option 1: Compact and transport to Coolgardie (\$/tonne)	Option 2: Aggregate and transport to new Esperance landfill (\$/tonne)
Transport (Capex and Opex)	46.00	24.00
Transfer station (Capex)	6.70	5.20
Transfer station (Opex)	20.00	17.00
Esperance landfill (Capex and Opex)	N/A	72.50
Total	72.70	118.70
Cost difference (break-even Coolgardie gate fee)	46.00	

The high-level cost estimates reveal a total cost difference of \$46/tonne between the two waste management options.

Therefore, a gate fee no greater than \$46.00/tonne is considered potentially feasible for the Shire to progress with compaction and transport of waste to Coolgardie landfill for disposal.

6.1 Carbon emissions comparison

A high-level assessment of carbon emissions of the two options estimated additional transport-related Scope 1 emissions associated with transporting waste to Coolgardie rather than Grass Patch to be in the order of 312 tonnes per annum (t CO₂-e).

The estimate accounted for total annual kilometres travelled and estimated fuel consumption for Options 1 and 2 (per the Waste Logistics Cost Study Report in Appendix A) and used National Greenhouse Accounts Factors 2020¹.

A high-level assessment of carbon emissions was also undertaken for a possible future scenario with food organic and garden organic (FOGO) collected separately from households and diverted to composting instead of landfilling. It was assumed that 40% of current landfill tonnage would be diverted, and therefore residual waste transfer (to landfill) would require 40% fewer kilometres travelled per year, with a corresponding reduction in transport fuel consumption for the comparison between Coolgardie and Grass Patch.

The results of the high-level carbon emissions comparison are set out in Table 6-2 below.

¹ <https://www.industry.gov.au/sites/default/files/2020-10/national-greenhouse-accounts-factors-2020.pdf> accessed 9 February 2021.

Table 6-2 Coolgardie vs Grass Patch transport GHG emissions comparison

Site	Emission source	Fuel used		CO ₂ Emissions	CH ₄ Emissions	N ₂ O Emissions	Total Emissions (Scope 1)
		(Q)	Units	t CO ₂ -e	t CO ₂ -e	t CO ₂ -e	t CO ₂ -e
Grass Patch	Single WF* trailer	49	kL	132	0	1	133
Coolgardie	A-double compaction trailers	164	kL	442	1	3	445
Difference in emissions				309	0	2	312
Future FOGO scenario – assumes 40% reduction in residual waste to landfill							
Grass Patch	Single WF trailer	29	kL	79	0	1	80
Coolgardie	A-double compaction trailers	98	kL	265	0	2	267
Difference in emissions				186	0	1	187

* WF: Walking Floor

6.1.1 Landfill emissions considerations

If residual waste was transferred to Coolgardie for landfilling instead of Grass Patch, it is expected that the net emissions from landfilling at Coolgardie would be no worse than at Grass Patch. It is further expected that the emissions from construction of landfill of landfill airspace will be roughly equivalent, regardless of location.

However, it should be noted that with current annual waste tonnages from Esperance, it is unlikely that landfill gas capture would be cost effective at the Grass Patch landfill. Unless landfill gas capture was required under future regulatory controls (e.g. licence conditions), it is likely the relatively low volumes of landfill gas from a landfill at Grass Patch would instead be vented to atmosphere.

In contrast, it is conceivable that the Coolgardie landfill could receive significant increases in waste volumes over time (e.g. from Kalgoorlie-Boulder), resulting in more favourable economics for landfill gas capture. Installation of landfill gas capture and utilisation infrastructure at Coolgardie would effectively reduce the net emissions from landfilling the Shire's waste at Coolgardie relative to Grass Patch.

More detailed evaluation would be needed to assess whether the likely comparative reduction in long-term landfill emissions would fully offset the additional transport emissions.

7. Assumptions and qualifications

In line with the framework for this high-level assessment, and in addition to the task specific assumptions stated throughout the report, the following key assumptions and qualifications are noted:

- The proposed local landfill site would be nominally 80 km north of the Esperance town site with a transport distance (modelled) of 80 km from the Wylie Bay WMF.
- Road access permits will be able to be obtained from relevant approval authorities to enable the vehicle configurations modelled to be operated as envisaged (as applicable).
- Transfer station capital cost estimate incorporates budget pricing for a steel framed metal-clad building as described in Section 4, obtained from Auspan Group, Gnowangerup, and is subject to design and further definition.
- In the Coolgardie transport scenario, the transfer station would incorporate a stationary waste compaction unit suitable for compacting waste into fully enclosed self-ejecting waste transfer trailers. Budget costs for these items were obtained from Wastech Pty Ltd.
- In the proposed Esperance landfill waste transfer scenario, a compaction unit would not be required, and the cost estimates account for top loading of waste into a walking floor trailer, for transfer to the proposed landfill site notionally in the vicinity of Grass Patch.
- Non-municipal wastes received at the WBWMF would need to be transferred to the destination landfill in suitable vehicles and there may be a need to utilize alternate vehicle configurations for certain waste types. As these vehicles would typically employ conventional bulk haulage trailers in lieu of specialised waste transfer trailers, it has been assumed that the modelled costs appropriately approximate the alternate transport configuration that may be appropriate for that proportion of the waste stream that is unsuitable for transporting in self-ejecting compaction trailers (as modelled).
- A more detailed transport options assessment may identify alternate vehicle configurations and combinations that realise a more optimized outcome.
- Capital and operating cost modelling has been high level only, undertaken on a break-even cost comparison basis.

In the event that further options evaluation is required, a more detailed financial assessment should be undertaken to account for depreciation and amortization, and typical cost-benefit evaluation metrics such as NPV, NPC, IRR, ROI etc. These metrics have not been included in this high level assessment, and were considered beyond the scope of the present study.

8. Conclusion

The high level cost estimates undertaken for comparative evaluation of transport, transfer station and landfill costs relating to the two identified waste management options revealed that a gate fee of up to \$46/tonne is considered feasible for the Shire to progress with the first option of compaction and transportation of waste to Coolgardie for disposal.

As previously mentioned in this report, the above cost estimates have not considered an increase in waste disposal rates each year respective to the growth rate, net present value assessment or any other assumptions outlined in the sections above.

A detailed financial assessment could be undertaken to provide more definition and higher confidence in relation to likely costs when accounting for depreciation/amortisation and considering likely waste volume growth rates.

Appendices

Appendix A – Waste Logistics Cost Study Report



Waste Logistics Cost Study

Shire of Esperance

10 February 2021



Contents

1.	Introduction	1
1.1	Background.....	1
1.2	Scope of Works.....	1
2.	Abbreviations	3
3.	Approach.....	4
3.1	Limitations and exclusions.....	4
4.	Transport Supply Chain.....	5
4.1	Supply chain definition	5
4.2	Landfill facilities	5
5.	The transport task	6
5.1	Volume and dimension profile.....	6
5.2	Fleet configuration	6
5.3	Origin and destination	7
5.4	Scenarios.....	10
6.	Transport network.....	10
6.1	Road Mass Limits.....	10
6.2	Transport routes	13
6.3	Operational limitations and constraints.....	14
7.	Logistics cost modelling	15
7.1	Approach.....	15
7.2	Assumptions	15
7.3	Operational Outcomes.....	15
7.4	GHD Cost Outcomes.....	17



Figures

Figure 1 - Supply chain definition	5
Figure 2 - Wylie Bay Waste Management Facility, Origin Location.....	7
Figure 3 - Possible destination for waste material; Coolgardie	8
Figure 4 - Possible destination for waste material, approximately 80 km North of Esperance	9
Figure 5 - Road network classifications along Coolgardie-Esperance Highway connection	11
Figure 6 - First mile road network classification	12
Figure 7- Transport route to Coolgardie landfill location	13

Tables

Table 1 - Assumed trailers to support the waste transport operation	6
Table 2 - Driver hours and rest requirements.....	14
Table 3 - Route operational outcomes (one-way freight).....	16
Table 4 - Cost outcomes of operations per route (excl. GST).....	17

Appendices

Appendix A – GHD Logistics Cost Modelling Assumptions	19
Appendix B – Application and Road Owner Support to Add or Amend a Road on a Restricted Access Vehicle Network	21



1. Introduction

1.1 Background

The Shire of Esperance (**'The Shire'**) has been working on establishing a new waste management strategy beyond the closure of the Wylie Bay Waste Management Facility (**WBWMF**) with landfilling operations to cease by 31 December 2022. GHD was appointed by the Shire in late March 2020 to facilitate a site search for a new landfill site, approximately 80 km north of the Esperance town site. Within this same timeframe, the Shire has been made aware by the Shire of Coolgardie that they propose to develop a large capacity licensed landfill at their existing disposal site and would be receptive to receiving Esperance waste.

GHD have estimated the costs for two scenarios where the waste will be transported in 47 tonne loads in a 30 m A-Double combination in the Coolgardie Scenario, or as 23 tonne loads in a 45 foot tri-axle walking floor trailer to the local option, nominally 80 km North of Esperance. The Shire of Esperance will be responsible for loading waste onto the trucks. The annualised freight task is expected to be between 13,000 to 15,000 tonnes per annum (**tpa**) and trucks will be able to pick up and deliver anytime on a 12-hour, 7 day per week basis (350 days per year).

1.2 Scope of Works

The purpose of this study is to quantify the transport costs required to deliver compact waste to Coolgardie landfill and a new future landfill site. It is noted that the estimates are to be establish, purely on a *cost comparative basis*, the most economically feasible option with regards to Esperance town site waste collection, transport and disposal.

The scope of works for the investigation consisted of:

- A review of route information, fuel prices, registration costs and restrictions associated with the National Heavy Vehicle Regulator and State road authorities.
- Providing cost assessments based on the GHD proprietary Transport Logistics Cost Model (**TLCM**).



Disclaimer

This Report has been prepared by GHD for the Shire of Esperance and may only be used by Shire of Esperance for the purposes contracted between GHD and Shire of Esperance.

GHD otherwise disclaims responsibility to any person other than Shire of Esperance arising in connection with this Report. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this Report were limited to those specifically detailed in the Report and are subject to the scope limitations set out in the Services Agreement.

The opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the date of preparation of the Report. GHD has no responsibility or obligation to update this Report to account for events or changes occurring subsequent to the date that the Report was prepared.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD and described in this Report. GHD disclaims liability arising from any of the assumptions being incorrect.

The Transport Costs have been prepared for the purpose of estimating logistics costs for Shire of Esperance and must not be used for any other purpose.

2. Abbreviations

Abbreviation	Definition
3PL	Third Party Logistics
AUD	Australian Dollar
FTE	Full Time Equivalent
NHVR	National Heavy Vehicle Regulator
NTK	Net Tonne Kilometre
OPEX	Operating Expenditure
RAV	Restricted Access Vehicle
TLCM	Transport Logistics Cost Model
tpa	Tonnes per annum
WA	Western Australia
WBWMF	Wylie Bay Waste Management Facility



3. Approach

Transport costs required to deliver waste to two landfill sites were quantified as part of this study based on the following steps:

1. Conducting an information review to confirm the transport task and route specific transport constraints to define the transport operational model.
2. Prepare independent cost estimates using GHD's Transport Logistics Cost Model for each route based on the transport task and identified operational to constraints.

The process applied during each of the above steps is outlined below.

GHD utilised its proprietary Transport Logistics Cost Model (TLCM) to estimate transport costs for each of the origin-destination pairs identified to deliver product to potential customers.

The modelling process adopted a first principles approach and involved specifying the origin, destination, routes and limitations for specific vehicle types. This approach enabled the testing and comparison of transport costs on a \$/unit basis for each of the identified transport route options.

3.1 Limitations and exclusions

There are several limitations on the outcomes of this study. These limitations largely relate to the fact that commercial agreements are not in place and key infrastructure is not yet built. As such, actual prices, costs and other variables may be different to those used to prepare the Transport Cost estimate and may change.

The battery limits of this report are limited to the trucking operations between origin and destination. Loading and unloading operations, and the costs associated with these activities are excluded from the scope; however, to be able to reflect the impact of loading and unloading operations on the vehicle fleet, a time allowance has been included, so that the time impact on return journeys and the loss of annualised capacity has been included.

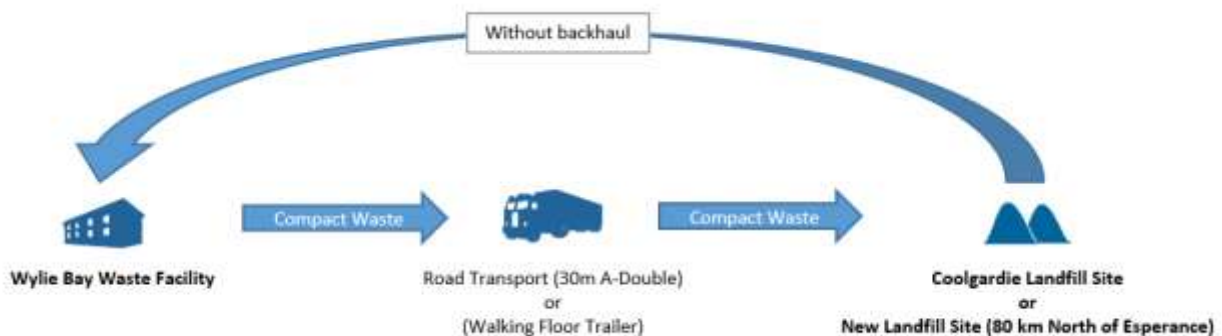
4. Transport Supply Chain

4.1 Supply chain definition

The supply chain required to transport Shire's waste is summarised in Figure 1 and is made up of the following steps:

- Waste is loaded into the rear of trucks at WBWMF.
- Waste is then delivered by road in:
 - 30 m A-double trucks for the Coolgardie landfill site destination scenario,
 - 13.7 m (45 ft) walking floor trailer to a potential landfill site 80 km North of Esperance.
- The truck on the return leg to WBWMF travels directly without backhaul.

Figure 1 - Supply chain definition



4.2 Landfill facilities

An assessment of handling facilities and equipment is excluded from the scope of this report; however, for the purposes of this study, an assumption that the following have been factored into the vehicle cycle time:

- Waste material is fed into a chute opening of a stationary compactor that is pushed into the rear of trailers at WBWMF. An allowance of 1 hour has been assumed to load a 30 m A-double trailer.
- An allowance of 0.5 hours to load walking floor trailers at WBWMF
- An allowance of 1 hour to unload a 30 m A-double trailer at the landfill site.
- An allowance of 1 hour to unload the walking floor trailer (15 minutes to push the load out, and 45 minutes for pushing over the pile with a tracked machine at the landfill site). The truck driver will need to push over the pile as the landfill site will be locked when not receiving transfer trailers.

Utilising the stationary compactor at WBWMF is critical for the fast loading of trailers and enables higher payloads that will reduce the Shire's carbon footprint and transport costs.

Note: Costs for compaction equipment and transfer station operations labour at WBWMF are not included in this report transport cost estimation report.

5. The transport task

5.1 Volume and dimension profile

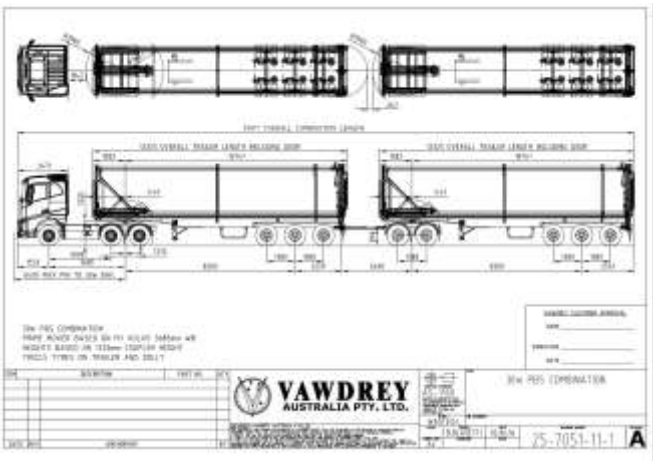
Based on information provided by the Shire, the annual volume of waste material will be approximately 13,000 - 15,000 tonnes. The upper limit has been used to inform the transport cost modelling. The maximum amount of waste compacted into the trailers types is:

- 47 tonnes in a 30 m A-double combination.
- 23 tonnes in a 45 ft tri-axle walking floor trailer.

5.2 Fleet configuration


The identification of suitable vehicle combinations for the waste transport task (Table 1) inform some critical assumptions such as load/unload rate, axle-loads and payload capacities while allowing GHD to establish accessibility to and from origin/destinations using Main Roads Western Australia (**MRWA**) Heavy Vehicle Restricted Access Vehicle (**RAV**) Network tool.

Table 1 - Assumed trailers to support the waste transport operation

Trailer Type	Description	Example Image
30 m A-Double	<p>The 30 m A-Double combination consists of a 3-axle prime mover, two tri-axle semitrailers and a tandem dolly.</p> <p>The vehicle combination is classified as operational on a category 5.3 concessional network.¹</p>	

¹ MRWA 2020, Tandem Drive – Prime Mover Concessional Network Level 3 Heavy Vehicle Services.



<p>45 ft tri-axle walking floor trailer</p>	<p>The walking floor trailer combination consists of a 3-axle prime mover and a tri-axle semitrailer.</p> <p>The hydraulically controlled floor (walking floor or moving floor) pushes the load outwards when unloading.</p> <p>The vehicle combination is classified as operational on a category 2.3 network.¹</p>	
---	---	--

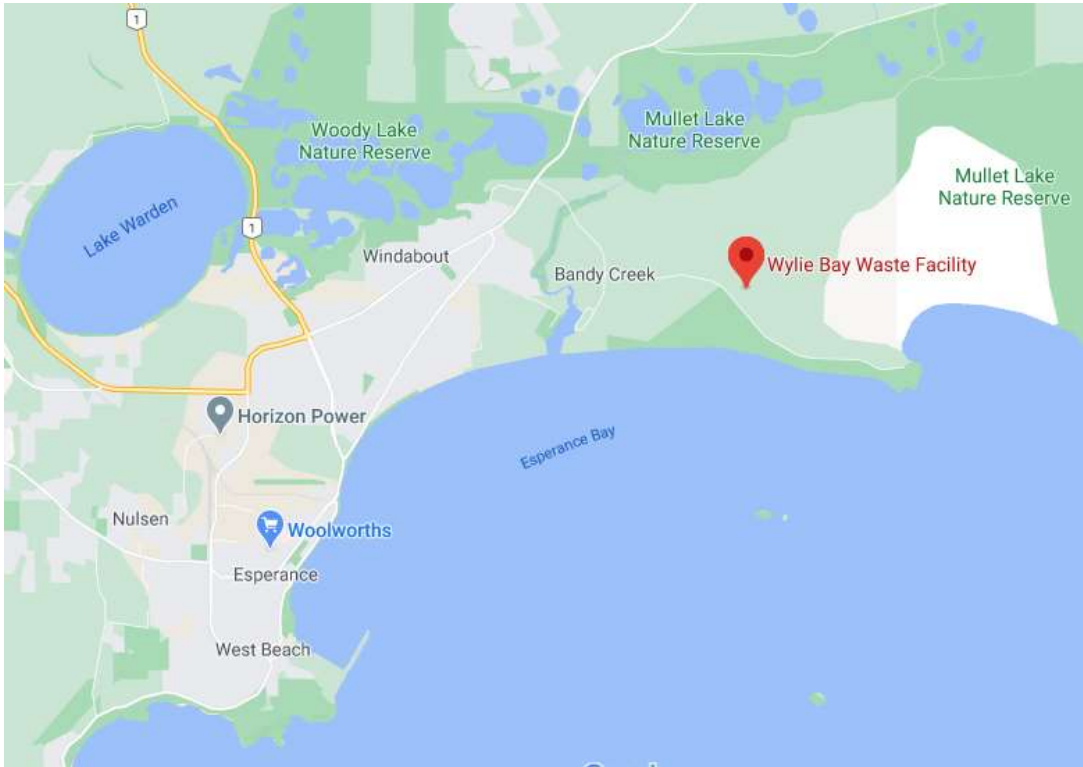
5.3 Origin and destination

The Shire have identified two destination landfill locations to be examined as part of this study.

Under each scenario, waste will be transported from:

- Wylie Bay Waste Management Facility, Wylie Bay Rd, Bandy Creek WA 6450 (Figure 2).

Figure 2 - Wylie Bay Waste Management Facility, Origin Location



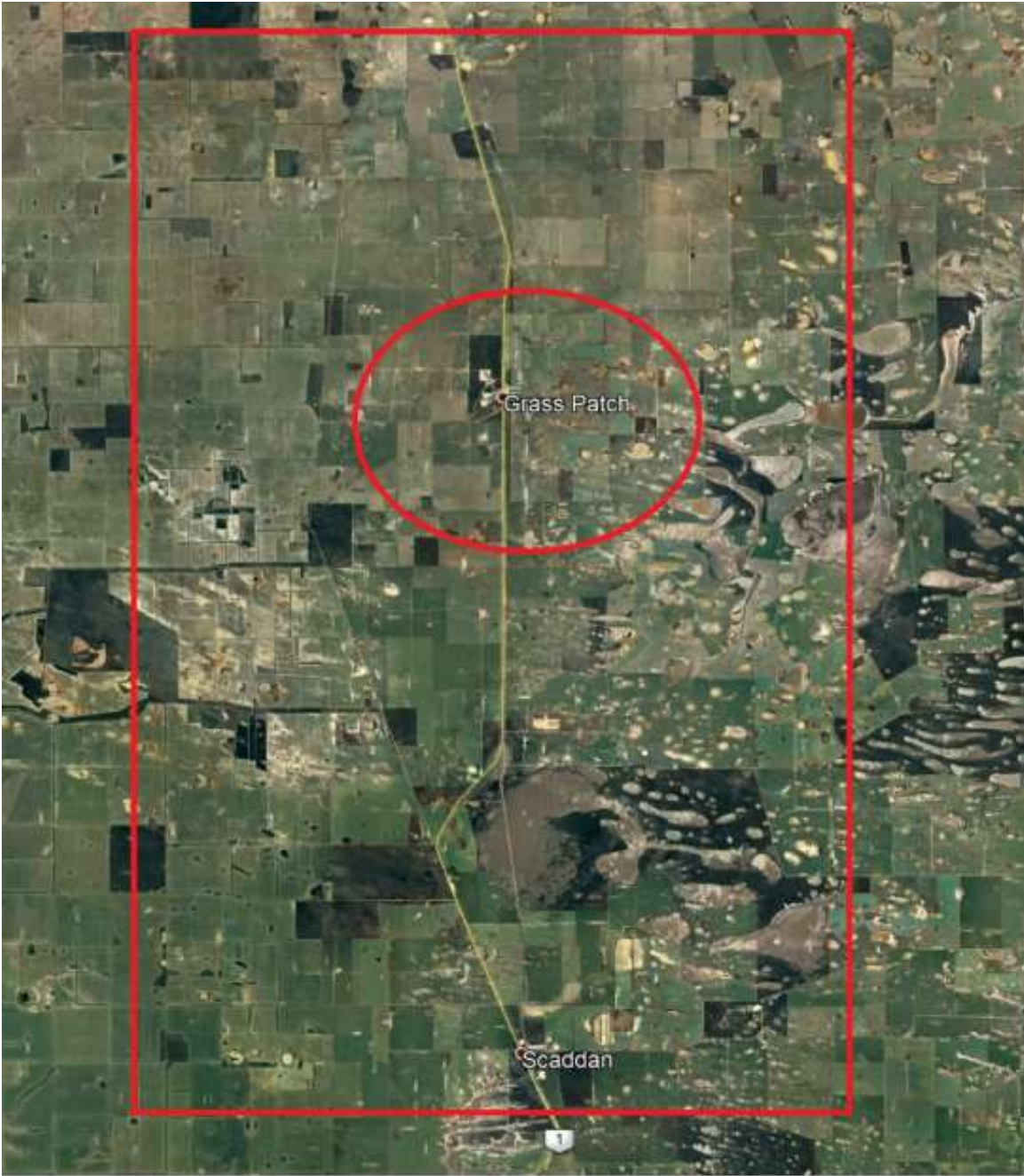
The potential target landfill locations for waste material include:

- Coolgardie (Figure 3)
- 80 km North of Esperance (Figure 4)

Figure 3 - Possible destination for waste material; Coolgardie landfill



Figure 4 - Indicative local landfill destination for waste, approximately 80 km North of Esperance



Note that the locality indicated in Figure 4 is intended to approximate transport distance and does not suggest this locality is actually suitable for establishing a new landfill site. The selection of a new landfill site is the focus of a separate study.

5.4 Scenarios

GHD has modelled the costs of two operational approaches for the two origin-destination pairs. Under the first three scenarios, it is assumed that the Shire will purchase the transport assets and run the operations. Under the fourth scenario, the assets will be leased and operations conducted in a 3PL arrangement.

For the transport of waste from WBWMF to Coolgardie:

- Scenario 1: Costs are modelled for 1 set-up consisting of a 30 m A-Double combination with the provision of a spare trailer.
- Scenario 2: Costs are modelled for 1 set-up consisting of a 30 m A-Double combination, with four trailers operating in tandem. Two trailers will be filled at WBWMF. Within the time taken to travel to Coolgardie and return, two empty trailers are being loaded so that the time associated with loading in Wylie Bay is excluded from the trucking operations.

For the transport of waste from WBWMF to 80 km North of Esperance:

- Scenario 3: Costs are modelled for 1-set up consisting of a single prime mover and a walking floor trailer.
- Scenario 4: Costs are modelled for 1-set up consisting of a single prime mover and a walking floor trailer. A 10% OPEX profit margin for the 3PL operator has been introduced under this scenario. All other assumptions remain firm.

6. Transport network

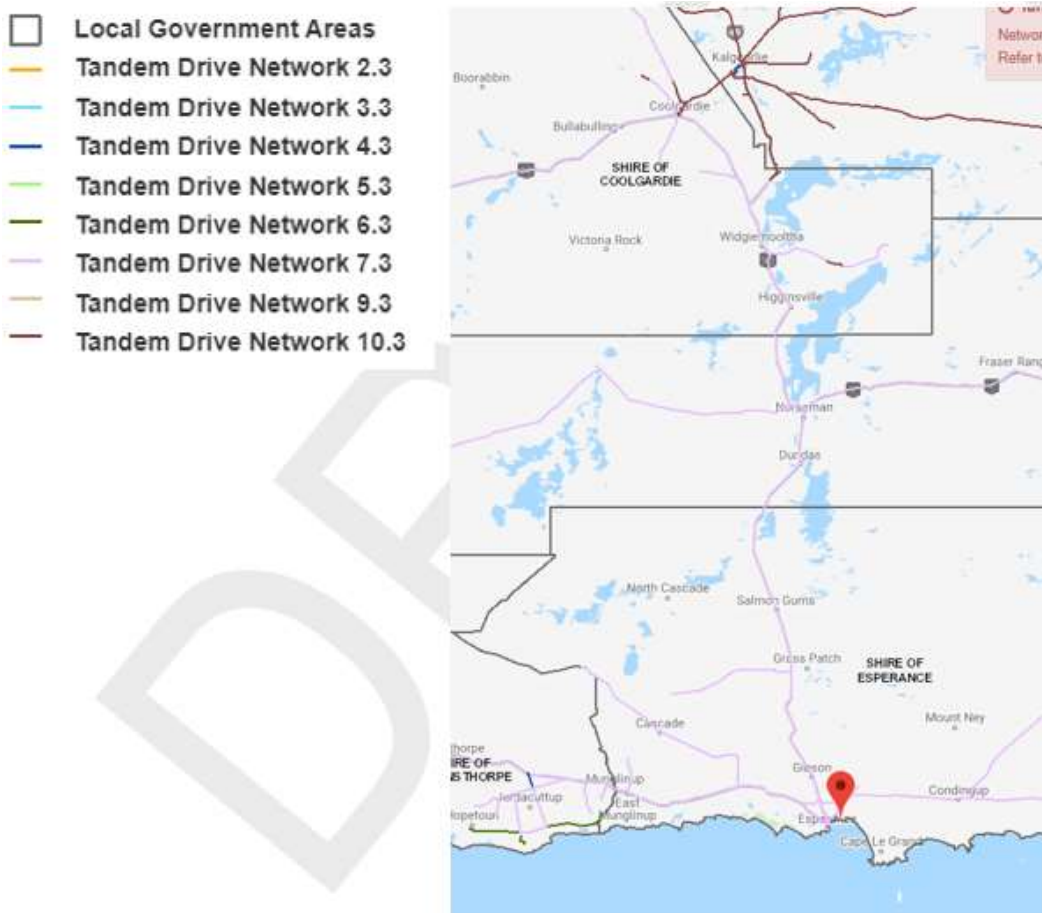
6.1 Road Mass Limits

The road network that provides access to each of the origin and destination locations has limitations on the vehicle combinations and load limits. The type of vehicles (combination, mass and length) permitted are defined by the operating conditions imposed by MRWA. These operating conditions have been informed by road assessments, where ratings for vehicle combinations determine if the roads are safe to access under mass and length.

In this study, the 30 m A-Double proposed for transport of waste to Coolgardie is classified as a tandem drive category 5.3. The walking floor trailer proposed for the operation 80 km North of Esperance is classified as a tandem drive category 2.3.

The main arterial route connecting WBWMF to both landfill sites is the Coolgardie-Esperance Highway. The highway grants access to both vehicle configurations, with a maximum tandem drive network rating of 7.3 (Figure 5).

Figure 5 - Road network classifications along Coolgardie-Esperance Highway connection

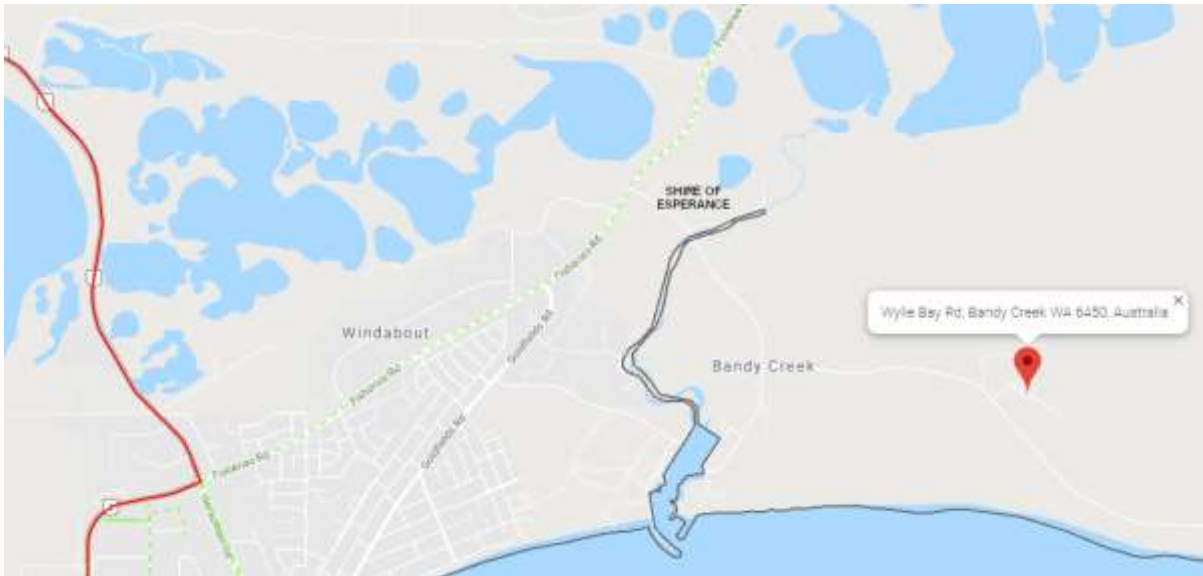


There are three feeder roads connecting WBWMF to the Coolgardie-Esperance highway that are not currently approved for both category 2.3 and 5.3 vehicles and one with conditions. Non-approved roads in the 'first mile' are:

- Landfill Road
- Wylie Bay Road
- Bandy Creek Road.

Fisheries Road, between Bandy Creek Road and the Coolgardie-Esperance Highway has the following operating conditions for both vehicle classifications, "Headlights to be switched on at all times" and "No operation on unsealed road segment when visibly wet, without road owner's approval."

Figure 6 - First mile road network classification



Similarly in the last-mile, the road connecting the Great Eastern Highway to the Coolgardie landfill site is currently not approved for the vehicle classifications proposed in this study.



In consultation with MRWA, as the roads mentioned are not currently approved the Shire will have to gain approval prior to being able to operate their waste vehicles. To overcome this barrier there are two options:

- The transport operator can submit a “road owner support to add or amend a road on a RAV network” form (Appendix B). This can take up to 3 months.
 - If the road owner rejects the application to upgrade/amend the road to enable safe operations for the required vehicle combinations, then;
- The transport operator can apply for a restricted local access permit. These permits allow the transport operator to use sections of roads under specific conditions.

For this transport task, as the Shire of Esperance is acting as both the transport operator (unless operations are undertaken in a 3PL arrangement) and the road owner of the non-approved roads, gaining local access permits should be achievable.

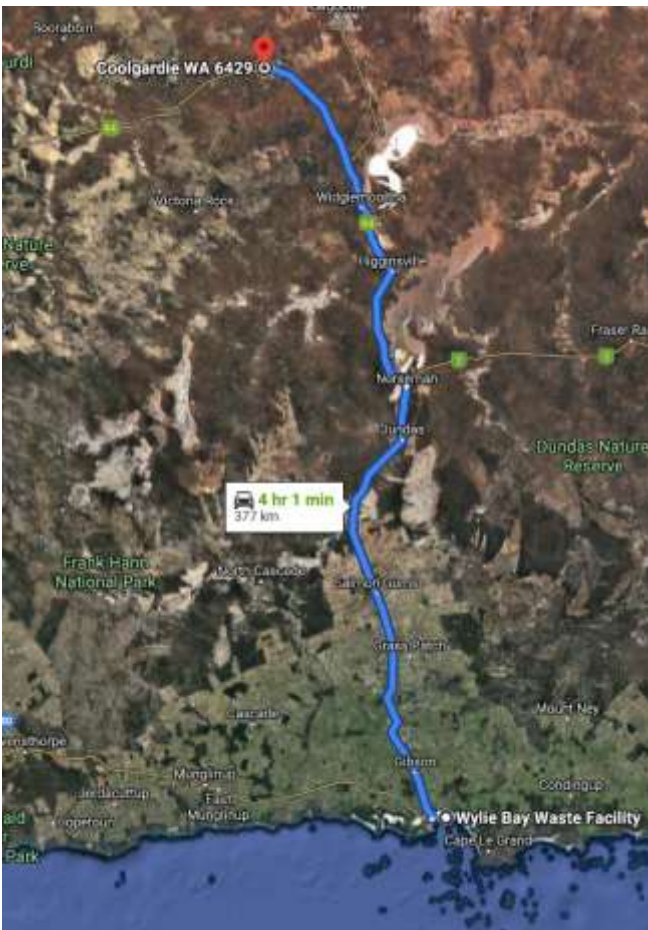
6.2 Transport routes

There are two origin-destination pairs as a part of this study

- Wylie Bay Waste Management Facility to Coolgardie Landfill site
- Wylie Bay Waste Management Facility to 80 km North of Esperance

Both routes traverse along the Coolgardie-Esperance Highway for the bulk of the journey (Figure 7). From WBWMF, the Coolgardie landfill site is approximately 377 km (one way), while the proposed location 80 km North of Esperance would exit off the highway near Grass Patch.

Figure 7- Transport route to Coolgardie landfill location



6.3 Operational limitations and constraints

In addition to the limitations placed on road classifications, there are several other constraints, particularly with respect to driver hours, that influence transport operations.

National road regulations enforce compulsory rest periods for both solo and dual driver operations, across both 12 hour shifts and 24 hour periods. An excerpt from the NHVR regulations on standard hours for fatigue management (

Table 2), has been used to guide the operating hours of a vehicle per day, and the crew size required to meet operational needs.

Table 2 - Driver hours and rest requirements²

Time	Work	Rest
In any period of...	A driver must not work for more than a maximum of...	And must have the rest of that period off work with at least a minimum rest break of...
Solo Drivers		
11 hours	10 hours work time	60 minutes rest time in blocks of 15 continuous minutes
24 hours	12 hours work time	7 continuous hours stationary rest time*
7 days	72 hours work time	24 continuous hours stationary rest time
Two-up drivers		
11 hours	10 hours work time	60 minutes rest time in blocks of 15 continuous minutes
24 hours	12 hours work time	5 continuous hours stationary rest time* or 5 hours continuous rest time in an approved sleeper berth while the vehicle is moving
52 hours		10 continuous hours stationary rest time
7 days	60 hours work time	24 continuous hours stationary rest time and 24 hours stationary rest time in blocks of at least 7 continuous hours of stationary rest time

² NHVR 2020 - Safety, Accreditation and Compliance: Work and rest requirements, standard hours

7. Logistics cost modelling

7.1 Approach

To estimate freight costs as part of this study, GHD's TLM has been used. The model framework provides the ability to capture total supply chain costs based on a first principles approach. Application of the TLM for this assessment has been built on the most up to date transport input costs available to GHD and reflect the operational constraints that influence the transport operation - identified during earlier sections of this study.

7.2 Assumptions

There are several key assumptions that influence the operational and commercial values and rules in the modelling process, some of these include:

- 12 x 7 transport operations
- 350 days per year operating days
- Drivers assist during loading, unloading and refuelling of own vehicle – therefore do not count as rest
 - Noting exception in Scenario 1 (2), where two sets of trailers operate in tandem with the loading time of empty trailers occurring while full trailers are on the road to Coolgardie.
- Driver shifts start and end at WBWMF, acting as a truck depot.
- Handling facilities at both origin and destination have 24 x 7 access
- Shire of Esperance owns their own fleet (except in Scenario 4 - discussed).

Additional assumptions used in the cost modelling process are provided in Appendix A..

7.3 Operational Outcomes

Based on the modelling process, key operational outcomes have been captured in Table 3 for each of the route options. As shown in the summary outcomes, the shorter haul distance to 80 km North of Esperance, allows for approximately 3 cycles per day, resulting in a capacity per vehicle around 26,000 tonnes per annum. In contrast, transportation to Coolgardie (approximately more than 300 km further travel distance one way) incurs a reduced cycle times to approximately 1 per day, with a subsequent reduction in capacity per vehicle of 16,500 to 18,000 per vehicle.

Table 3 - Route operational outcomes (one-way freight)

	Scenario 1	Scenario 2	Scenario 3 and 4
Distance – round trip (km)	754	754	160
Truck payload (tonnes)	47	47	23
Truck trips achievable per day	1.0	1.1	3.0
Annual payload capacity per set-up (tonnes)	16,500	18,000	24,000
Number of set-ups required	1	1	1
Freight tonne kilometres (km)	5,655,000	5,655,000	1,200,000
Vehicle kilometres (km)	240,638	240,638	104,348
Driving crew required	1.5	1.5	1.5
Round trips required	319	319	652

Despite the impact of the increased travel distance to Coolgardie, the low annualized tonnage of waste requiring transportation does not impact the need for a greater number of driving crew to undertake the operation when compared to the shorter distance option. It does however incur more than a fourfold increase in freight kilometres. Although there are less vehicle kilometres travelled in scenarios 3 and 4, the lower payload results in more than twice as many round trips in comparison to scenario's 1 and 2.

7.4 GHD Cost Outcomes

Based on the operational outcomes of the modelling (Table 3), cost outcomes for each route were calculated (Table 4). The lowest cost outcome for the operational scenarios where the Shire would own and operate the assets was achieved for the shortest haulage distance, at approximately \$24 per tonne. Despite having the highest freight unit rate per kilometre, as the impact of loading and unloading time as a proportion of each journey, the modelled cost was significantly lower than the Coolgardie scenarios, around \$46 - \$48 per tonne.

For the first two scenarios between WBWMF and Coolgardie, the main reason for the difference in cost per tonne is scenario two assumes an additional trailer cost under the tandem operation. The additional trailer incurs more registration fees, insurance and overheads.

The low volume of annual waste (15,000 tonnes maximum) to be transported requires less than 1 vehicle combination under each scenario. The cost of operating less than one vehicle is possibly lower when outsourcing the operations to a 3rd party (scenario 4). Under an own and operate model, the Shire would purchase at a minimum 1 vehicle combination, however as it would not be used all the time it is considered 'under-utilised'.

Based on the underlying assumptions and parameters of the model, the walking floor trailer owned by the Shire in Scenario 3 is only used 63% of the time. It is assumed that the remainder of the time the prime mover/trailer is sitting idle. Alternatively, Scenario 4 depicts the costs of the same operation if it were to be outsourced to a 3PL operator. As a single truck combination is only required 63% of the time, it is assumed that the vehicle will be used for other operations. As such, GHD modelling suggests a reduction of around \$5/tonne.

Table 4 - Cost outcomes of operations per route (excl. GST)

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Freight unit rate (cents per tonne kilometre)	\$11.98	\$12.72	\$29.10	\$22.50
Freight cost per tonne	\$46.00	\$48.00	\$24.00	\$19.00
Annual transport cost	\$680,000	\$720,000	\$350,000	\$270,000

Appendices

Appendix A – GHD Logistics Cost Modelling Assumptions

1. Trucking Parameters

Truck Parameters	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Truck type	30m A-Double	30m A-Double	45 ft Walking Floor Trailer	45 ft Walking Floor Trailer
Average travel speed (km/h)	90		80	
Load rate (tph)	47	47	46	46
Unload rate (tph)	47	47	92	92
Truck payload (tph)	47	47	23	23
Number of trailers per set-up	2	2	1	1
Lifespan of trailers (yrs)	15			
Cost per trailer (\$AUD)	232,500	232,500	210,000	210,000
Provision for spares	1	2	0	0
Rate of return of trailers ³ (%)	10			
Residual value of trailers ⁴ (%)	10			
Maintenance rate on trailers (\$/km)	0.067	0.067	0.033	0.033
Rate of return of prime movers ³ (%)	10			
Residual value of prime movers ⁴ (%)	10			
Maintenance rate on prime mover (\$/km)	0.30			
Annual wage per driver (\$/per annum)	90,000			
Diesel price ⁵ (\$/litre)	1.3491			
Diesel fuel rebate (\$/litre)	0.165			
Fuel consumption (ltr/km)	0.68	0.68	0.47	0.47

³ Annual payment of annuity for life of asset

⁴ Percentage of original purchase price

⁵ Source: Australian Institute of Petroleum, 2019 Terminal Gate Price Average - Perth

Overheads and supervision ⁶ (%)	10			
Vehicle registration (\$ per annum)	13,525	13,525	6,795	6,795
OPEX Profit margin (%)	n/a	n/a	n/a	n/a
Insurance (%)	3.5			

General Parameters	
Days per annum	365
Operating days per annum – general	350
Hours per day	12

Vehicle refuelling parameters	30m A-double combination	45ft Walking floor combination
Tank capacity (litres)	700	
Range (kms)	1028.15	1489.36
Ultra-high flow rate pump (lpm)	120	
Truck refill time (minutes)	6	
Time allowance – change tanks, admin, vehicle check, and wait time if occupied	20	
Refuelling time allowance (minutes)	26	

2. Transport Scenario Assumptions

Scenario	Approved truck type	Travel distance (round trip kms)	Drivers per prime mover	Number of shifts required for operation
Scenario 1	30m A-Double	754	1	1.5
Scenario 2	30m A-Double	754	1	1.5
Scenario 3	Walking Floor Trailer	160	1	1.5
Scenario 4	Walking Floor Trailer	160	1	1.5

⁶ As percentage of direct operating costs

Appendix B – Application and Road Owner Support to Add or Amend a Road on a Restricted Access Vehicle Network



Application and Road Owner Support to Add or Amend a Road on a Restricted Access Vehicle Network

Main Roads Heavy Vehicle Services will consider adding a road to the Restricted Access Vehicle (RAV) Network provided support from the relevant road owner is obtained. This application must be completed by the applicant and forwarded to Main Roads who will liaise directly with the relevant road owner to ensure they have no objections to the access.

Applicant Details

Operator Name/ Company			
Contact Name	Contact Phone Number		
Mobile Phone Number	Contact Fax Number		
Email Address			

RAV Networks to be assessed

Tandem Drive RAV Categories 2-10 Refer to the **Prime Mover, Trailer or Truck, Trailer** operating conditions for approved combinations on our website .

Tri Drive Categories 1-5 Refer to the **Tri Drive Prime Mover, Trailer or Tri Drive Truck, Trailer** operating conditions for approved combinations on our website.

Other Categories (i.e. Oversize Road Train) Refer to the operating conditions of the particular **Permit Product** for approved combinations on our website

Concessional Networks to be assessed

Vehicle combinations operating on Level 1 must only operate on the relevant RAV Network that is permitted for the equivalent vehicle combination under the Prime Mover, Trailer or Truck, Trailer Combinations.

For Concessional Levels 2 and 3 please select the relevant category below

Requested Axle Mass Level		
	Tandem Axle Group	Tri Axle Group
Level 1	17.0t	21.St
Level2	17.0t	22.St
Level3	17.St	23.St

Tandem Drive Concessional RAV Categories 2-10 Refer to the **AMMS Page** for approved combinations.

Tri Drive Concessional Categories 1-5 Refer to the **AMMS Page** for approved combinations.

Roads to be assessed Please list all requested roads where RAV Access is required (including start and end points) and attach maps.



Application and Road Owner Support to Add or Amend a Road on a Restricted Access Vehicle Network

Main Roads will liaise directly with the relevant road owner to complete this section.

Road Owner

Road Name

Road Number

Contact Details

Contact Name

Position

Contact Phone Number

Contact Fax Number

Mobile Phone Number

Email Address

Required Traffic Data

Please provide the AADT, Speed Limit and if the road is on a School Bus Route. If the application is for more than one road, please provide the AADT, speed limit and if the roads are on a School Bus Route for each road in comments box provided below.

Posted Speed Limit

School Bus Route ?

 Yes

 No

AADT

Annual Average Daily Traffic is determined by the total yearly two-way traffic volume divided by 365, expressed as vehicles per day (VPD). Please tick box below.

<input type="checkbox"/> 0 to 5 vpd	<input type="checkbox"/> 6 to 30 vpd	<input type="checkbox"/> 31 to 50 vpd	<input type="checkbox"/> 51 to 75 vpd	<input type="checkbox"/> 75 to 150 vpd	<input type="checkbox"/> 150 to 500 vpd	<input type="checkbox"/> 500 to 1000 vpd	<input type="checkbox"/> 1000+ vpd
-------------------------------------	--------------------------------------	---------------------------------------	---------------------------------------	--	---	--	------------------------------------

Comments:

Please detail any community concerns, required conditions and other relevant information.

If RAV access is endorsed, as the road owner please specify any access conditions that you would like Main Roads to consider (i.e. No operation on unsealed road when visibly wet, without road owner's approval, Headlights to be switch on at all times etc.)

If RAV access is not endorsed please provide reasoning behind your decision.

NOTE - If condition CAO? (Current written support from the Road Asset Owner, endorsing use of the road, must be obtained, carried in the vehicle and produced upon request.) is required, the road owner is responsible for the administration of condition CAO?.

Road Owner Support

As the road owner you are required to conduct a preliminary assessment of the requested road/s to ensure there are no obvious issues that would deem RAV access unsuitable.

support the above decisions, subject to Main Roads final approval.

On behalf of

Signature

Date

Email completed form to: hvsrouteassessment@mainroads.wa.gov.au

Heavy Vehicle Services Main Roads WA

PO Box 374 | WELSHPOOL DC | WA 6986 | Telephone 138 HVO (486) | Fax (08) 9475 8455

www.mainroads.wa.gov.au



Level 10 999 Hay Street Perth WA 6000 Australia PO Box 3106 Perth WA 6832 Australia

61 8 6222 8222
permail@ghd.com

© GHD 2017. This document is and shall remain the property of GHD Advisory. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Rev.No.	Author	Reviewer		Approved for Issue		Date
		Name	Signature	Name	Signature	
0	Chris Chiappazzo	T Jones		M Gravett		10/02/2021



Appendix B – Transfer Station construction cost breakdown



Appendix B
Table B1
Esperance Transfer Station - CAPEX

INDICATIVE COST ESTIMATE					
Project Number:	12541765	GHD Project Director:	Martin Gravett		
Client:	Shire of Esperance	GHD Project Manager:	Reinhard Wilkes		
Job:	Esperance transfer station (included in cost comparison)	GHD Approver:	Martin Gravett		
Scope of Work (Description)	Cost comparison - Coolgardie Waste Transport Cost vs Local Landfilling Assessment				
Item	Activity Description	Qty	Unit	Comments	TOTAL
1	Preliminaries - Includes:				\$ 537,300.00
	Insurances	-	-		-
	Survey information, control and setting out of the works	-	-	Note that Contractors Management and Supervision and Set up & Maintenance of Contractor's site facilities is considered that will be assumed by the client.	-
	Allowance for Contractor's overheads and profit	-	-		-
	Mobilisation and demobilisation	-	-		-
2	Design fees				\$ 68,000.00
	Design fees include civil and building services design	1	Item		\$ 68,000.00
3	Civil works				\$ 780,000.00
	40 Mpa Concrete pavement 200 mm thickness	4500	m2	Assumed 200 mm / 40 Mpa	\$ 720,000.00
	Storm water drainage - Soakwells	20	Item	Assumption: Drainage method - Soakwells (sandy area) 250 m2 per soakwell - 20 soakwells approx	\$ 60,000.00
	Miscellaneous - signage, pavement marking, fencing, etc.	-	-	PS allowance	\$ 2,500.00
4	Building services				\$ 70,000.00
	Communications	-	-	PS allowance	\$ 5,000.00
	Odour management system	-	-	PS allowance and subject to design and approval requirements.	\$ 50,000.00
	Additional water storage	-	-	Assumption: 2 tanks of 20m3 each for general purposes (cleaning...) + 10m3 for potable water (as existing) - https://westcoastpoly.com.au/all-products/ (indicative price)	\$ 15,000.00
5	Environmental Approvals submission				\$ 39,000.00
	Works Approval application and supporting doc devt - Includes:	-	-	Excluding any required technical studies.	\$ 5,000.00
	Commissioning plan	-	-	Assuming technical input by waste team.	\$ 3,000.00
	Odour studies	-	-		\$ 20,000.00
	Dust studies	-	-		\$ 6,000.00
	Noise studies	-	-		\$ 5,000.00
6	Development Approval (DA) submission				\$ 16,000.00
	Developing planning submission - Includes:	-	-		\$ 5,000.00
	Traffic Impact Assessment	-	-	Allowance made for SIDRA analysis only and traffic surveys if required.	\$ 7,500.00
	Joint Development Assessment Panel (JDAP) submission	-	-		\$ 1,000.00
	Allowance for clarifications and representations to Council/JDAP	-	-		\$ 2,500.00



Appendix B
Table B1
Esperance Transfer Station - CAPEX

INDICATIVE COST ESTIMATE					
Project Number:	12541765	GHD Project Director:	Martin Gravett		
Client:	Shire of Esperance	GHD Project Manager:	Reinhard Wilkes		
Job:	Esperance transfer station (included in cost comparison)	GHD Approver:	Martin Gravett		
Scope of Work (Description)	Cost comparison - Coolgardie Waste Transport Cost vs Local Landfilling Assessment				
Item	Activity Description	Qty	Unit	Comments	TOTAL
7	Building - Includes:				\$ 818,000.00
	<ul style="list-style-type: none"> - Engineering & Drafting - Shire fees & Fire Brigade submissions - Bushfire assessment levy - Water Corp submissions - Building Certifier approvals - Survey set out - Earthworks, Cut to fill & Compaction - Slab preparation, Concrete footings & Concrete floors 170mm tk with reinforcing to engineers design - Concrete L block walls to 2 sides x 4m ht & Structural steelwork to suit 9m clear height - Purlins & girts - Standard colorbond roof & walls - Colorbond flashings, mouldings, gutters & downpipes. - 300mm throat vent ridge. - 2 Roller shutter doors 6m ht x 4.5m w & PA doors x 2 (Steel clad with Lockwood industrial exit hardware). - Electrical lighting to suit & Exit & emergency lighting. - Power supply via 5 kva generator. - Fire hose reels, Fire hydrant to suit & Fire tanks & pumps to NCC requirements - Mobilisations, Travelling, Cartage accommodation & Supervision. 			Based on a 25m w x 25m long x 9m clear height building. As per budget pricing from Auspan.	
8	Fixed & mobile plant and equipment				\$ 706,500.00
	S8000X & Hopper (installed)	1	No.	Per budget pricing from Wastech.	\$ 380,000.00
	Incline Conveyor, chain driven rubber with steel cleats	1	No.	Per budget pricing from Wastech.	\$ 326,500.00
TOTAL					\$ 3,034,800.00
Total excl plant and equip					\$ 2,328,300.00

General comments / assumptions

Contingency not considered as it is only for cost comparison purposes.
 Fire detection system excluded.
 Doors included in building.
 Cabling for power supply considered included in building.
 Earthworks - No information available about contours on site - balanced cut to fill assumed.
 Mist sprays for dust suppression in roof of Transfer Building - assumed not needed as not processing construction waste.

Appendix C – Esperance Landfill cost modelling



Proposed Esperance Landfill - Whole-of-life CAPEX

INDICATIVE COST ESTIMATE						
Project number:	12541765	GHD Project Director:	Martin Gravett			
Client:	Shire of Esperance	GHD Project Manager:	Reinhard Wilkes			
Job:	Waste Transport vs Landfilling Cost Assessment	GHD Approver:	Reinhard Wilkes			
Scope of Work (Description)	Proposed Esperance Landfill Whole-of-life - CAPEX					
Project expenditure	Value	Units	Rate	Reference/Comments	Sub total	Total
Acquisition						
Land purchase	100	ha	\$ 4,500.00		\$ 450,000.00	
						\$ 450,000.00
Site establishment						
Perimeter security fencing and gate	1	item	\$ 6,000.00		\$ 6,000.00	
Weighbridge and gatehouse	1	item	\$ 200,000.00		\$ 200,000.00	
Access roads	1	item	\$ 40,000.00		\$ 40,000.00	
Staff buildings	1	item	\$ 10,000.00		\$ 10,000.00	
Machinery				Not required - assume existing machinery can be utilised.	\$ -	
Stormwater infrastructure (site perimeter drains, diversion drains and sediment basin)	1	item	\$ 150,000.00		\$ 150,000.00	
Leachate infrastructure (leachate evaporation basin)	1	item	\$ 120,000.00		\$ 120,000.00	
Environmental monitoring infrastructure (groundwater monitoring wells, perimeter soil gas wells)	1	item	\$ 20,000.00		\$ 20,000.00	
						\$ 546,000.00
Cell 1 works						
<i>Cell 1 detailed design</i>						
Cell liner detailed design	1	item	\$ 40,000.00		\$ 40,000.00	
Cell landfill cap detailed design	1	item	\$ 40,000.00		\$ 40,000.00	
						\$ 80,000.00
<i>Cell 1 construction</i>						
Cell excavation	27,804	cum	\$ 7.95	Excavate to reduce levels and deposit in spoil heaps within 1km (Rawlinsons 2018, p674)	\$ 221,041.80	
Cell liner (surface preparation, separation geotextile, leachate drainage layer [consisting of cushioning geotextile, 1.5 mm double textured HDPE, GCL and drainage aggregate], leachate drainage pipework, 1,000 mm soil layer)	9,959	sqm	\$ 160.00		\$ 1,593,504.00	
						\$ 1,814,545.80



INDICATIVE COST ESTIMATE						
Project number:	12541765	GHD Project Director:	Martin Gravett			
Client:	Shire of Esperance	GHD Project Manager:	Reinhard Wilkes			
Job:	Waste Transport vs Landfilling Cost Assessment	GHD Approver:	Reinhard Wilkes			
Scope of Work (Description)	Proposed Esperance Landfill Whole-of-life - CAPEX					
Project expenditure	Value	Units	Rate	Reference/Comments	Sub total	Total
<i>Cell 1 progressive capping</i>						
Daily cover (150 mm soil layer)	15,221	cum	\$ 9.38		\$ 142,769.12	
Intermediate cover layer (500 mm soil layer)	3,099	cum	\$ 9.38		\$ 29,070.50	
Final capping layer (gas collection, cover material, LLDPE geomembrane, subsoil and topsoil)	10,358	sqm	\$ 65.00		\$ 673,296.00	
						\$ 845,135.61
<i>Cell 1 formal stormwater drains</i>						
Construction of diversion bunds, down batter drains and general drains	1	item	\$ 25,000.00		\$ 25,000.00	
						\$ 25,000.00
<i>Cell 2 works</i>						
<i>Cell 2 detailed design</i>						
Cell liner detailed design	1	item	\$ 25,000.00		\$ 25,000.00	
Cell landfill cap detailed design	1	item	\$ 25,000.00		\$ 25,000.00	
						\$ 50,000.00
<i>Cell 2 construction</i>						
Cell excavation	27,804	cum	\$ 7.95	Excavate to reduce levels and deposit in spoil heaps within 1km (Rawlinsons 2018, p674)	\$ 221,041.80	
Cell liner (surface preparation, separation geotextile, leachate drainage layer [consisting of cushioning geotextile, 1.5 mm double textured HDPE, GCL and drainage aggregate], leachate drainage pipework, 1,000 mm soil layer)	9,959	sqm	\$ 160.00		\$ 1,593,504.00	
						\$ 1,814,545.80
<i>Cell 2 progressive capping</i>						
Daily cover (150 mm soil layer)	15,221	cum	\$ 9.38		\$ 142,769.12	
Intermediate cover layer (500 mm soil layer)	3,099	cum	\$ 9.38		\$ 29,070.50	
Final capping layer (gas collection, cover material, LLDPE geomembrane, subsoil and topsoil)	10,358	sqm	\$ 65.00		\$ 673,296.00	
						\$ 845,135.61
<i>Cell 2 formal stormwater drains</i>						
Construction of diversion bunds, down batter drains and general drains	1	item	\$ 25,000.00		\$ 25,000.00	
						\$ 25,000.00



Proposed Esperance Landfill - Whole-of-life CAPEX

INDICATIVE COST ESTIMATE						
Project number:	12541765	GHD Project Director:	Martin Gravett			
Client:	Shire of Esperance	GHD Project Manager:	Reinhard Wilkes			
Job:	Waste Transport vs Landfilling Cost Assessment	GHD Approver:	Reinhard Wilkes			
Scope of Work (Description)	Proposed Esperance Landfill Whole-of-life - CAPEX					
Project expenditure	Value	Units	Rate	Reference/Comments	Sub total	Total
Cell 3 works						
<i>Cell 3 detailed design</i>						
Cell liner detailed design	1	item	\$ 25,000.00		\$ 25,000.00	
Cell landfill cap detailed design	1	item	\$ 25,000.00		\$ 25,000.00	
						\$ 50,000.00
<i>Cell 3 construction</i>						
Cell excavation	27,804	cum	\$ 7.95	Excavate to reduce levels and deposit in spoil heaps within 1km (Rawlinsons 2018, p674)	\$ 221,041.80	
Cell liner (surface preparation, separation geotextile, leachate drainage layer [consisting of cushioning geotextile, 1.5 mm double textured HDPE, GCL and drainage aggregate], leachate drainage pipework, 1,000 mm soil layer)	9,959	sqm	\$ 160.00		\$ 1,593,504.00	
						\$ 1,814,545.80
<i>Cell 3 progressive capping</i>						
Daily cover (150 mm soil layer)	15,221	cum	\$ 9.38		\$ 142,769.12	
Intermediate cover layer (500 mm soil layer)	3,099	cum	\$ 9.38		\$ 29,070.50	
Final capping layer (gas collection, cover material, LLDPE geomembrane, subsoil and topsoil)	10,358	sqm	\$ 65.00		\$ 673,296.00	
						\$ 845,135.61
<i>Cell 3 formal stormwater drains</i>						
Construction of diversion bunds, down batter drains and general drains	1	item	\$ 25,000.00		\$ 25,000.00	
						\$ 25,000.00
Cell 4 works						
<i>Cell 4 detailed design</i>						
Cell liner detailed design	1	item	\$ 25,000.00		\$ 25,000.00	
Cell landfill cap detailed design	1	item	\$ 25,000.00		\$ 25,000.00	
						\$ 50,000.00



Proposed Esperance Landfill - Whole-of-life CAPEX

INDICATIVE COST ESTIMATE						
Project number:	12541765	GHD Project Director:	Martin Gravett			
Client:	Shire of Esperance	GHD Project Manager:	Reinhard Wilkes			
Job:	Waste Transport vs Landfilling Cost Assessment	GHD Approver:	Reinhard Wilkes			
Scope of Work (Description)	Proposed Esperance Landfill Whole-of-life - CAPEX					
Project expenditure	Value	Units	Rate	Reference/Comments	Sub total	Total
Cell 4 construction						
Cell excavation	27,804	cum	\$ 7.95	Excavate to reduce levels and deposit in spoil heaps within 1km (Rawlinsons 2018, p674)	\$ 221,041.80	
Cell liner (surface preparation, separation geotextile, leachate drainage layer [consisting of cushioning geotextile, 1.5 mm double textured HDPE, GCL and drainage aggregate], leachate drainage pipework, 1,000 mm soil layer	9,959	sqm	\$ 160.00		\$ 1,593,504.00	
						\$ 1,814,545.80
Cell 4 progressive capping						
Daily cover (150 mm soil layer)	15,221	cum	\$ 9.38		\$ 142,769.12	
Intermediate cover layer (500 mm soil layer)	3,099	cum	\$ 9.38		\$ 29,070.50	
Final capping layer (gas collection, cover material, LLDPE geomembrane, subsoil and topsoil)	10,358	sqm	\$ 65.00		\$ 673,296.00	
						\$ 845,135.61
Cell 4 formal stormwater drains						
Construction of diversion bunds, down batter drains and general drains	1	item	\$ 25,000.00		\$ 25,000.00	
						\$ 25,000.00
Cell 5 works						
Cell 5 detailed design						
Cell liner detailed design	1	item	\$ 25,000.00		\$ 25,000.00	
Cell landfill cap detailed design	1	item	\$ 25,000.00		\$ 25,000.00	
						\$ 50,000.00
Cell 5 construction						
Cell excavation	27,804	cum	\$ 7.95	Excavate to reduce levels and deposit in spoil heaps within 1km (Rawlinsons 2018, p674)	\$ 221,041.80	
Cell liner (surface preparation, separation geotextile, leachate drainage layer [consisting of cushioning geotextile, 1.5 mm double textured HDPE, GCL and drainage aggregate], leachate drainage pipework, 1,000 mm soil layer	9,959	sqm	\$ 160.00		\$ 1,593,504.00	
						\$ 1,814,545.80



Proposed Esperance Landfill - Whole-of-life CAPEX

INDICATIVE COST ESTIMATE						
Project number:	12541765	GHD Project Director:	Martin Gravett			
Client:	Shire of Esperance	GHD Project Manager:	Reinhard Wilkes			
Job:	Waste Transport vs Landfilling Cost Assessment	GHD Approver:	Reinhard Wilkes			
Scope of Work (Description)	Proposed Esperance Landfill Whole-of-life - CAPEX					
Project expenditure	Value	Units	Rate	Reference/Comments	Sub total	Total
Cell 5 progressive capping						
Daily cover (150 mm soil layer)	15,221	cum	\$ 9.38		\$ 142,769.12	
Intermediate cover layer (500 mm soil layer)	3,099	cum	\$ 9.38		\$ 29,070.50	
Final capping layer (gas collection, cover material, LLDPE geomembrane, subsoil and topsoil)	10,358	sqm	\$ 65.00		\$ 673,296.00	
						\$ 845,135.61
Cell 5 formal stormwater drains						
Construction of diversion bunds, down batter drains and general drains	1	item	\$ 25,000.00		\$ 25,000.00	
						\$ 25,000.00
Cell 6 works						
Cell 6 detailed design						
Cell liner detailed design	1	item	\$ 25,000.00		\$ 25,000.00	
Cell landfill cap detailed design	1	item	\$ 25,000.00		\$ 25,000.00	
						\$ 50,000.00
Cell 6 construction						
Cell excavation	27,804	cum	\$ 7.95	Excavate to reduce levels and deposit in spoil heaps within 1km (Rawlinsons 2018, p674)	\$ 221,041.80	
Cell liner (surface preparation, separation geotextile, leachate drainage layer [consisting of cushioning geotextile, 1.5 mm double textured HDPE, GCL and drainage aggregate], leachate drainage pipework, 1,000 mm soil layer)	9,959	sqm	\$ 160.00		\$ 1,593,504.00	
						\$ 1,814,545.80
Cell 6 progressive capping						
Daily cover (150 mm soil layer)	15,221	cum	\$ 9.38		\$ 142,769.12	
Intermediate cover layer (500 mm soil layer)	3,099	cum	\$ 9.38		\$ 29,070.50	
Final capping layer (gas collection, cover material, LLDPE geomembrane, subsoil and topsoil)	10,358	sqm	\$ 65.00		\$ 673,296.00	
						\$ 845,135.61
Cell 6 formal stormwater drains						
Construction of diversion bunds, down batter drains and general drains	1	item	\$ 25,000.00		\$ 25,000.00	
						\$ 25,000.00



Proposed Esperance Landfill - Whole-of-life CAPEX

INDICATIVE COST ESTIMATE						
Project number:	12541765	GHD Project Director:	Martin Gravett			
Client:	Shire of Esperance	GHD Project Manager:	Reinhard Wilkes			
Job:	Waste Transport vs Landfilling Cost Assessment	GHD Approver:	Reinhard Wilkes			
Scope of Work (Description)	Proposed Esperance Landfill Whole-of-life - CAPEX					
Project expenditure	Value	Units	Rate	Reference/Comments	Sub total	Total

Assumptions

The Shire is able to source 50% of the required subsoil from on-site stockpile material.
 The Shire is able to receive subsoil for \$15/m³, when tendered as a bulk volume.
 The Shire is able to receive topsoil for \$60/m³, when tendered as a bulk volume.

General notes

This estimate is at preliminary level, based on the proposed final capping profile and GHD's general understanding of the site. The design drawings are considered to be at preliminary status.
 This estimate uses a low and high unit rate for each item to reflect the current range of probable as-installed costs.
 This cost estimate incorporates the assumption that some on-site materials can be reusable for construction of some components of the cap.
 Quantities of geosynthetic materials, LLDPE, for this estimate have been increased by 10% from design quantities to allow for wastage/overlaps.
 GST not included in this estimate.
 All costs in current (2020) dollars, based on Rawlinsons 2016 Australian Construction Handbook with 15% markup on prices.



Table C2

Proposed Esperance Landfill - Whole-of-life OPEX

INDICATIVE COST ESTIMATE						
Project Number:	12541765	GHD Project Director:	Martin Gravett			
Client:	Shire of Esperance	GHD Project Manager:	Reinhard Wilkes			
Job:	Waste Transport vs Landfilling Cost Assessment	GHD Approver:	Reinhard Wilkes			
Scope of Work (Description)	Proposed Esperance Landfill Whole-of-life - high-level OPEX cost estimate					
Project expenditure	Value	Units	Rate	Reference/Comments	Sub total	Total
Expense						
<i>Staff</i>						
One full-time staff member	1	person/annum	\$ 100,000.00	Based on Shire's 2020/21 budget	\$ 100,000.00	
						\$ 100,000.00
<i>Administration</i>						
Administration	1	\$/annum	\$ 15,000.00		\$ 15,000.00	
Special projects	0.1	\$/annum	\$ 490,000.00		\$ 49,000.00	
Overhead	1	\$/annum	\$ 10,000.00		\$ 10,000.00	
						\$ 74,000.00
<i>Landfill related</i>						
Operations	0.3	\$/annum	\$ 20,500.00	Based on Shire's 2020/21 budget, assumed to include environmental monitoring	\$ 6,150.00	
Refuse	0.1	\$/annum	\$ 524,000.00	Based on Shire's 2020/21 budget	\$ 52,400.00	
Recycling	0.1	\$/annum	\$ 367,000.00	Based on Shire's 2020/21 budget	\$ 36,700.00	
Other Sanitation	0.1	\$/annum	\$ 71,000.00	Based on Shire's 2020/21 budget	\$ 7,100.00	
Building maintenance	0.3	\$/annum	\$ 160,000.00	Based on Shire's 2020/21 budget	\$ 48,000.00	
Maintenance	0.5	\$/annum	\$ 363,000.00	Based on Shire's 2020/21 budget	\$ 181,500.00	
						\$ 331,850.00
Total						\$ 505,850.00
<i>Post closure activities (1 - 5 years post closure)</i>						
<i>Environmental monitoring</i>						
Quarterly water quality monitoring	1	\$/annum	\$ 4,800.00	\$1,200 per monitoring event	\$ 4,800.00	
Monthly landfill gas monitoring	1	\$/annum	\$ 18,000.00	\$1,500 per monitoring event	\$ 18,000.00	
Quarterly environmental monitoring reports	1	\$/annum	\$ 14,000.00	\$3,500 per quarter	\$ 14,000.00	\$ 36,800.00
<i>Site maintenance</i>						
Maintenance	1	\$/annum	\$ 18,000.00		\$ 18,000.00	\$ 18,000.00
Total						\$ 54,800.00
<i>Post closure activities (6 - 10 years post closure)</i>						
<i>Environmental monitoring</i>						
Quarterly water quality monitoring	1	\$/annum	\$ 4,800.00	\$1,200 per monitoring event	\$ 4,800.00	
Quarterly landfill gas monitoring	1	\$/annum	\$ 6,000.00	\$1,500 per monitoring event	\$ 6,000.00	
Quarterly environmental monitoring report	1	\$/annum	\$ 14,000.00	\$3,500 per quarter	\$ 14,000.00	\$ 24,800.00
<i>Site maintenance</i>						
Maintenance	1	\$/annum	\$ 10,000.00		\$ 10,000.00	\$ 10,000.00
Total						\$ 34,800.00



Proposed Esperance Landfill - Whole-of-life OPEX

INDICATIVE COST ESTIMATE							
Project Number:	12541765	GHD Project Director:	Martin Gravett				
Client:	Shire of Esperance	GHD Project Manager:	Reinhard Wilkes				
Job:	Waste Transport vs Landfilling Cost Assessment	GHD Approver:	Reinhard Wilkes				
Scope of Work (Description)	Proposed Esperance Landfill Whole-of-life - high-level OPEX cost estimate						
Project expenditure	Value	Units	Rate	Reference/Comments	Sub total	Total	
Post closure activities (11 - 20 years post closure)							
<i>Environmental monitoring</i>							
Biannual water quality monitoring	1	\$/annum	\$ 2,400.00	\$1,200 per monitoring event	\$ 2,400.00		
Biannual landfill gas monitoring	1	\$/annum	\$ 3,000.00	\$1,500 per monitoring event	\$ 3,000.00		
Annual environmental monitoring report	1	\$/annum	\$ 4,000.00	\$4,000 per year	\$ 4,000.00	\$ 9,400.00	
<i>Site maintenance</i>							
Maintenance	1	\$/annum	\$ 4,000.00		\$ 4,000.00	\$ 4,000.00	
Total						\$ 13,400.00	



INDICATIVE COST ESTIMATE														
Project Number:	12541765	GHD Project Director:	Martin Gravett											
Client:	Shire of Esperance	GHD Project Manager:	Reinhard Wilkes											
Job:	Waste Transport vs Landfilling Cost Assessment	GHD Approver:	Reinhard Wilkes											
Scope of Work (Description)	Indicative 30 year cost program													
Year	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35
Site operations														
Landfilled waste (tonnes)		15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Landfilled waste (m3)		17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647
Landfilled waste (cumulative m3)		17,647	35,294	52,941	70,588	88,235	105,882	123,529	141,176	158,824	176,471	194,118	211,765	229,412
Operating period (months)		12	12	12	12	12	12	12	12	12	12	12	12	12
Capex														
Acquisition (\$)	\$ 450,000													
Site establishment (\$)	\$ 546,000													
Cell detailed designs (\$)	\$ 80,000				\$ 50,000				\$ 50,000					
Cell construction (\$)	\$ 1,814,546					\$ 1,814,546					\$ 1,814,546			
Cell progressive capping (\$)		\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027
Stormwater infrastructure construction (\$)						\$ 25,000					\$ 25,000			
SUM	\$ 2,890,546	\$ 169,027	\$ 169,027	\$ 169,027	\$ 219,027	\$ 2,008,573	\$ 169,027	\$ 169,027	\$ 169,027	\$ 219,027	\$ 2,008,573	\$ 169,027	\$ 169,027	\$ 169,027
Opex														
Expenses (\$)		\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850
SUM	\$ -	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850
Total annual cost (\$)	\$ 2,890,546	\$ 674,877	\$ 674,877	\$ 674,877	\$ 724,877	\$ 2,514,423	\$ 674,877	\$ 674,877	\$ 674,877	\$ 724,877	\$ 2,514,423	\$ 674,877	\$ 674,877	\$ 674,877
30 year cost expenditure	\$ 32,609,588													
Average annual cost expenditure	\$ 1,086,986													
Average annual cost expenditure/tonne	\$ 72.50													



Table C3
Proposed Esperance Landfill - Indicative 30 year cost program

INDICATIVE COST ESTIMATE																
Project Number:	12541765	GHD Project Director:	Martin Gravett													
Client:	Shire of Esperance	GHD Project Manager:	Reinhard Wilkes													
Job:	Waste Transport vs Landfilling Cost Assessment	GHD Approver:	Reinhard Wilkes													
Scope of Work (Description)	Indicative 30 year cost program															
2035-36	2036-37	2037-38	2038-39	2039-40	2040-41	2041-42	2042-43	2043-44	2044-45	2045-46	2046-47	2047-48	2048-49	2049-50	2050-51	2051-52
Site operations																
15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647	17,647
247,059	264,706	282,353	300,000	317,647	335,294	352,941	370,588	388,235	405,882	423,529	441,176	458,824	476,471	494,118	511,765	529,412
12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Capex																
\$ 50,000					\$ 50,000					\$ 50,000						
	\$ 1,814,546					\$ 1,814,546					\$ 1,814,546					
\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027
	\$ 25,000					\$ 25,000					\$ 25,000					\$ 25,000
\$ 219,027	\$ 2,008,573	\$ 169,027	\$ 169,027	\$ 169,027	\$ 219,027	\$ 2,008,573	\$ 169,027	\$ 169,027	\$ 169,027	\$ 219,027	\$ 2,008,573	\$ 169,027	\$ 169,027	\$ 169,027	\$ 169,027	\$ 194,027
Opex																
\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850
\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850	\$ 505,850
\$ 724,877	\$ 2,514,423	\$ 674,877	\$ 674,877	\$ 674,877	\$ 724,877	\$ 2,514,423	\$ 674,877	\$ 674,877	\$ 674,877	\$ 724,877	\$ 2,514,423	\$ 674,877	\$ 674,877	\$ 674,877	\$ 674,877	\$ 699,877

GHD

Level 10
999 Hay Street
Perth WA 6000

T: 61 8 6222 8222 F: 61 8 9463 6012 E: permail@ghd.com


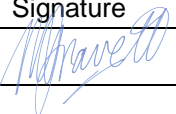
© GHD 2021

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

12541765-28519-

22/https://projectsportal.ghd.com/sites/pp18_03/esperancewastetransp/ProjectDocs/12541765-REP-0_Waste Transport Cost vs Landfilling Assessment Report_Shire of Esperance.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	N Ambrey	R Wilkes J Cramer		M Gravett		10/02/2021

www.ghd.com

