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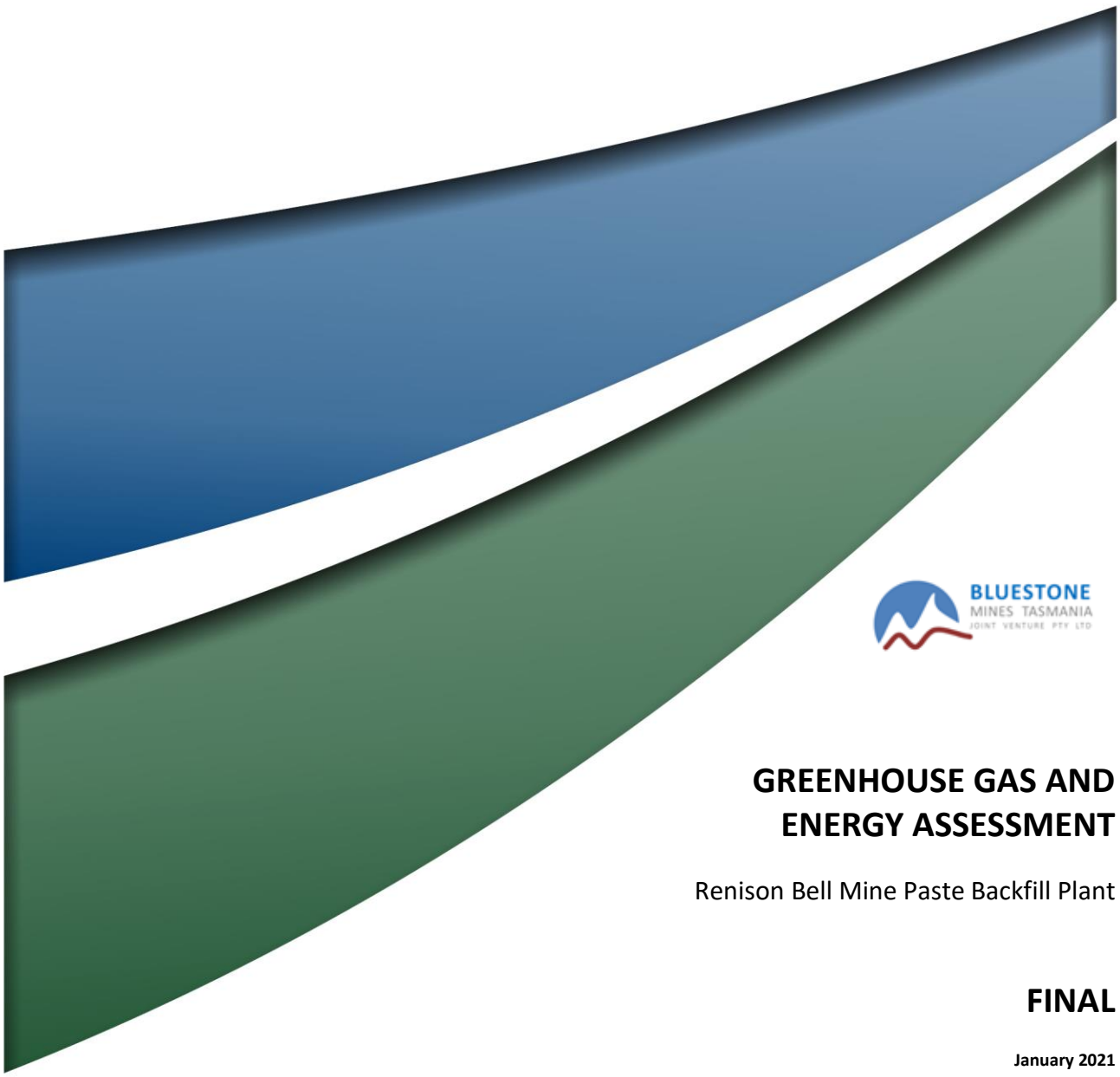

BLUESTONE
MINES TASMANIA
JOINT VENTURE PTY LTD

GREENHOUSE GAS AND ENERGY ASSESSMENT

Renison Bell Mine Paste Backfill Plant

FINAL

January 2021

GREENHOUSE GAS AND ENERGY ASSESSMENT

Renison Bell Mine Paste Backfill Plant

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
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Technical Director: Malcolm Sedgwick
Report No. 211027/R01
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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	Malcolm Sedgwick	4/01/2021	Malcolm Sedgwick	4/01/2021

Executive Summary

Bluestone Mines Tasmania Joint Venture (BMTJV) is seeking to develop a Paste Backfill Plant (PBP) adjacent to the existing tin processing plant at Renison Bell Tin Mine (Renison). The proposed PBP will enable BMTJV to repurpose tailings as a stable cement paste, suitable for backfilling on-site underground stopes.

BMTJV has submitted a Development Application for the proposed PBP to the West Coast Council, and Notice of Intent to EPA Tasmania. EPA Tasmania has deemed the proposed PBP to be a Level 2 Activity requiring a class 2B environmental approval process, which requires an Environmental Impact Statement (EIS).

This report has been prepared to support the preparation of the EIS and includes greenhouse gas emission projections and an evaluation of greenhouse gas mitigation options. To meet the requirements of the Guidelines for Preparing an Environmental Impact Statement (EPA Tasmania 2019), the scope of the greenhouse gas and energy assessment (GHGEA) includes:

- Calculating Scope 1, 2 and 3 greenhouse gas emissions for the proposed PBP
- Describing the direct and indirect effects of the proposed PBP on greenhouse gas production
- Describing any greenhouse benefits of the proposed PBP
- Describing cost-effective greenhouse mitigation measures planned for the proposed PBP
- Evaluating the effectiveness of greenhouse mitigation measures planned for the proposed PBP
- Providing a brief justification of why best practice greenhouse mitigation measures are not planned for the proposed PBP (if relevant)
- Describing how the proposed PBP aligns with Tasmania's Climate Change Action Plan 2017 - 2021
- Evaluating whether the proposed PBP will generate additional National Greenhouse and Energy Reporting Act or Safeguard mechanism risks for BMTJV

The GHGEA found that the proposed PBP can be associated with the following greenhouse gas emissions.

Annual Greenhouse Gas Emissions of the proposed PBP		
	(t CO_2-e)	(%) of total emissions
Scope 1	32	0.5
Scope 2	226	4.0
Scope 3	5,544	95.5
TOTAL	**5,802**	**100**

In terms of greenhouse gas emissions, the proposed PBP is a relatively small development. The assessment found the proposed PBP could generate up to 260 t CO_2-e of operational Scope 1 and 2 emissions per annum. The assessment also found the proposed PBP could be associated with approximately 5,600 t CO_2-e of operational Scope 3 emissions per annum. The proposed PBP's Scope 3 emissions are largely driven by the consumption of Portland cement.

The construction of the proposed PBP can be associated with approximately 700 t CO_2-e Scope 3 emissions. The Scope 3 emissions footprint is relatively small and most of the Scope 3 emissions will be generated by producers of steel and cement.

The assessment found that high impact mitigation measures may include:

- Using an alternative binder to Portland cement
- Upgrading electric motors (planned)
- Purchasing 100% renewable electricity

The assessment found that the proposed PBP is not expected to impact or impair the objectives of the Tasmania's Climate Change Action Plan or generate greenhouse gas related regulatory risks.

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1.0 Introduction

Bluestone Mines Tasmania Joint Venture (BMTJV) is seeking to develop a Paste Backfill Plant (PBP) adjacent to the existing tin processing plant at Renison Tin Mine (Renison). The PBP will enable BMTJV to repurpose tailings as a stable cement paste, suitable for backfilling on-site underground stopes.

The proposed development will enable the:

- Construction of a suitable platform for the proposed PBP facility
- Construction of an all-weather gravel road to the development site
- Relocation and reconfiguration of the Henty Gold Mine Paste Plant, or the construction of a new PBP
- Installation of pipelines and other services to connect the PBP to existing facilities and operations
- Upgrading the relocated Henty Paste Plant equipment (if required)
- Processing tailings to produce up to 80m^3 of filter cake per hour
- Storing filter cake
- Receiving and storing binder
- Mixing binder and filter cake to produce cement paste
- Transferring cement paste to underground slopes.

Table 1.1 includes the key features of the proposed PBP that will impact greenhouse gas emissions.

Table 1.1 Key features of the proposed PBP that will impact Greenhouse Gas Emissions

Stage	Key Project Component
Construction	Site preparation Transporting and relocating the Henty Gold Mine PBP Constructing the PBP and associated infrastructure Upgrading the PBP, including replacing motors, pumps, compressors, dryers and transfer systems
Operation	Electricity use to operate plant, pumps and transfer systems Diesel use to operate loaders Consumption of binder Transport of flocculant and binder

2.0 Assessment Framework

2.1 Objectives

BMTJV has submitted a Development Application for the proposed PBP to the West Coast Council, and Notice of Intent to EPA Tasmania. EPA Tasmania has deemed the proposed PBP to be a Level 2 Activity requiring a class 2B environmental approval process, which requires an Environmental Impact Statement (EIS).

The objective of this assessment is to evaluate the greenhouse gas and energy use implications of the proposed PBP, in a manner that satisfies EPA Tasmania. This report has been prepared to support the preparation of the EIS and includes greenhouse gas emission projections and an evaluation of greenhouse gas mitigation options.

2.2 Scope

To meet the requirements of the Guidelines for Preparing an Environmental Impact Statement (EPS Tasmania 2019), the scope of the greenhouse gas and energy assessment (GHGEA) includes:

- Calculating Scope 1, 2 and 3 greenhouse gas emissions for the proposed PBP
- Describing the direct and indirect effects of the proposed PBP on greenhouse gas production
- Describing any greenhouse benefits of the proposed PBP
- Describing cost-effective greenhouse mitigation measures planned for the proposed PBP
- Evaluating the effectiveness of greenhouse mitigation measures planned for the proposed PBP
- Providing a brief justification of why best practice greenhouse mitigation measures are not planned for the proposed PBP (if relevant)
- Describing how the proposed PBP aligns with Tasmania's Climate Change Action Plan 2017 - 2021
- Evaluating whether the proposed PBP will generate additional *National Greenhouse and Energy Reporting Act 2007* or Safeguard mechanism risks for BMTJV.

2.3 Definitions

Table 2.1 contains concepts and a glossary of terms relevant to this GHGEA.

Table 2.1 Glossary of Terms[1]

Concept	Definition
Greenhouse gases	The greenhouse gases referred to in this GHGEA include: • Carbon dioxide • Methane • Nitrous oxide • Hydrofluorocarbons • Perfluorocarbons • Sulphur hexafluoride.

[1] The GHG Protocol 2004

Concept	Definition
Scope 1 emissions	Direct emissions that occur from sources that are owned or controlled by the Proponent (e.g. fuel use). Scope 1 emissions are emissions over which the Proponent has a high level of control.
Scope 2 emissions	Emissions from the generation of purchased electricity consumed by the proposed PBP.
Scope 3 emissions	Indirect emissions that are a consequence of the activities of the proposed PBP, but occur at sources owned or controlled by other entities (e.g. outsourced services). Scope 3 emissions can include emissions generated upstream of the proposed PBP by providers of energy, materials and transport.

2.4 Impact Assessment Methodology

The GHGEA framework is based on the methodologies and emission factors contained in the National Greenhouse Accounts (NGA) Factors 2020 (DISER 2020) (the NGA Factors). The assessment framework also incorporates the principles of The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (WRI/WBCSD 2004) (the GHG Protocol).

The GHG Protocol provides an internationally accepted approach to greenhouse gas accounting. The GHG Protocol provides guidance on setting reporting boundaries, defining emission sources and dealing with issues such as data quality and materiality.

Scope 1 and 2 emissions were calculated based on the methodologies and emission factors contained in the NGA Factors 2020 (DISER 2020). Scope 3 emissions associated with product transport were calculated based on emission factors contained in the *National GHG Inventory: Analysis of Recent Trends and GHG Indicators* (AGO 2007). Scope 3 emissions associated with constructing materials were calculated based on emission factors contained in the *Inventory of Carbon and Energy* (University of Bath 2011). Other Scope 3 emissions were calculated using methodologies and emission factors contained in the NGA Factors.

All methodologies and calculations have been made assuming that all operations will continue as described in **Section 1.0**.

2.5 Data Sources

The calculations in this report are based on activity data developed by the Proponent. **Table 2.2** contains the source of activity data.

Table 2.2 Source of Activity Data Used for the Assessment

Activity data	Source
On-site fuel consumption	BMTJV
Electricity consumption	BMTJV
Materials consumption	BMTJV
Transport distances	BMTJV

A detailed description of activity data and calculations are provided in **Appendix A**.

2.6 Assessment Boundary

The GHGEA boundary was developed to include all significant Scope 1, 2 and 3 emissions. **Figure 2.1** demonstrates how the assessment boundary interacts with the potential emission sources under the Proponent's operational control and other emission sources associated with the proposed PBP.

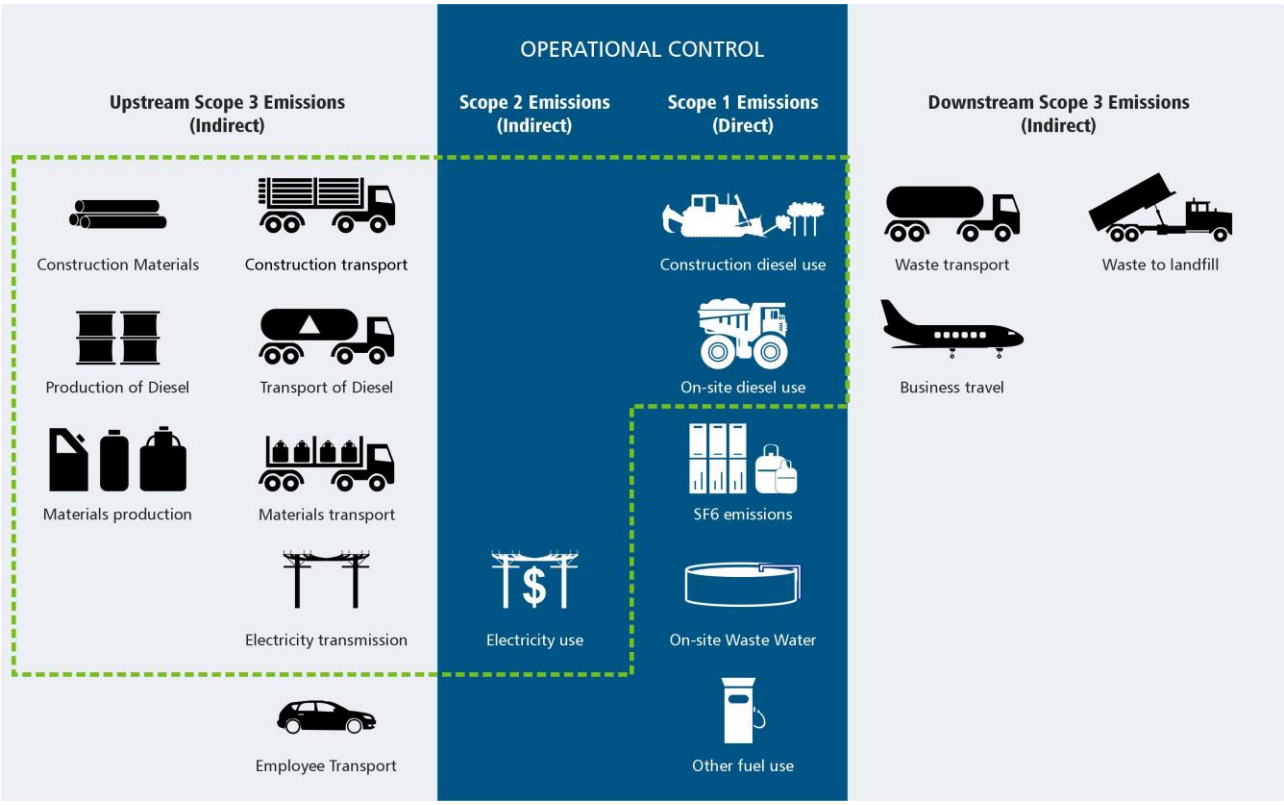


Figure 2.1 Greenhouse Gas Assessment Boundary

2.7 Data Exclusions

The GHG Protocol requires inventory data and methodologies to be relevant, consistent, complete, transparent and accurate. The relevance principle states that the greenhouse gas inventory should appropriately reflect greenhouse gas emissions and serve the decision-making needs of users – both internal and external [to the proposed PBP] (WRI/WBCSD 2004).

The proposed PBP has a number of potential emission sources, however, the dominant emission sources often targeted by mitigation measures and stakeholders can be summarised as:

- diesel use
- electricity use
- materials use
- materials transport.

The completeness principle states that all relevant emission sources within the chosen inventory boundary need to be accounted for so that a comprehensive and meaningful inventory is compiled (WRI/WBCSD 2004).

The emission sources listed in **Table 2.3** have been excluded from the GHGEA as activity data is not readily available, and modelling activity data for these sources is unlikely to generate sufficient emissions to materially change impacts or influence the decision making outcomes of stakeholders.

Table 2.3 Data Exclusions

Emission source	Scope	Description
Combustion of fuel for energy	Scope 1	Small quantities of fuels such as petrol and LPG.
Industrial processes	Scope 1	Sulphur hexafluoride (high voltage switch gear). Hydrofluorcarbon (commercial and industrial refrigeration).
Waste water handling (industrial)	Scope 1	Methane emissions from waste water management.
Solid waste	Scope 3	Solid waste to landfill.
Business travel	Scope 3	Employees travelling for business purposes.
Employee travel	Scope 3	Employees travelling between their place of residence and the Renison site.
Materials transport	Scope 3	Replacement equipment (e.g. new motors) shipped from Melbourne has not been included in the assessment.

Greenhouse gas emissions resulting from land use, land use change and forestry (LULUCF) were also excluded from the GHGEA. While it is acknowledged that emissions resulting from LULUCF may be an important emission source for decision makers, the proposed PBP is not likely to generate measurable land use change.

3.0 Impact Assessment Results

Greenhouse gas and energy use estimates have been calculated for the construction and operational stages of the proposed PBP. The greenhouse gas estimates referenced in this document only relate to the proposed PBP. Estimates in this document do not include emissions associated with Renison.

3.1 Constructing the proposed PBP

The following information was used to estimate the greenhouse gas emissions associated with the construction phase of the proposed PBP:

- All activities associated with constructing and relocating the proposed PBP will be outsourced to third party contractors (i.e. not completed by BMTJV)
- All PBP equipment will be relocated from Henty Gold mine
- Two steel sheds will be built using new framework and cladding
- Concrete will be trucked 45 km one way
- Steel will be trucked 250 km one way
- PBP equipment will be relocated via 10 trips between Henty Gold Mine and Renison
- PBP equipment will be trucked 50 km one way.

The proposed PBP's construction related greenhouse gas emissions are summarised in **Table 3.1**.

Table 3.1 Construction greenhouse gas emission summary

Stage	Scope	Source	Source Totals (t CO_2-e)	Scope Totals (t CO_2-e)
Construction	Scope 3 (Indirect)	Diesel use - Construction	37	692
		Diesel use - Materials transport	13	
		Materials use	642	
Total emissions for major construction activities				**692**

(Refer to **Appendix A** for further detail)

3.1.1 Direct emissions

All activities associated with the construction of the proposed PBP will be outsourced to third party contractors. The proposed PBP will not generate direct Scope 1 emissions for the Proponent during the construction phase.

3.1.2 Indirect emissions

The construction of the proposed PBP can be associated with approximately 700 t CO_2-e Scope 3 emissions. The Scope 3 emissions footprint is relatively small and most of the Scope 3 emissions will be generated by producers of steel and cement.

Table 3.1 demonstrates that approximately 93% of construction related emissions are attributable to the consumption of construction materials. **Table 3.1** also demonstrates that energy consumption contributes 5% of construction emissions, and transport contributes 2% of construction emissions.

3.2 Operating the proposed PBP

The operational phase of the proposed PBP is assessed at its upper annual production limits. The assessment aims to identify the potential annual greenhouse gas emissions associated with the proposed PBP. The assessment is not supposed to represent planned annual activity.

The following information was used to estimate the greenhouse gas emissions associated with the annual operation of the proposed PBP.

- The proposed PBP has the capacity to process up to 88,500 tonnes (t) of tailings per annum
- The proposed PBP has the capacity to process 47 t of tailings per hour
- At full load the proposed PBP will consume 800 kW of electricity per hour
- At full load the proposed PBP will consume 1.1 m^3 of flocculant per hour
- At full load the proposed PBP will consume 3 t of cement per hour
- Mobile plant and equipment will consume up to 12 kL of diesel per annum
- Binder will be trucked 150 km one way
- Flocculant will be trucked 250 km one way
- Diesel will be trucked 45 km one way
- Truck payload will average 32 t.

The annual greenhouse gas emissions associated with the proposed PBP are summarised in **Table 3.2**.

Table 3.2 Summary of annual operating greenhouse gas emissions

Stage	Scope	Source	Source Totals (t CO_2-e)	Scope Totals (t CO_2-e)
Operation	Scope 1 (Direct)	Diesel use	32	32
	Scope 2 (Indirect)	Electricity	226	226
	Scope 3 (Indirect)	Associated with energy extraction and distribution	40	5,544
		Materials transport	137	
		Binder	5,367	
Annual operational emissions associated with the proposed PBP				**5,802**

(Refer to **Appendix B** for further detail)

3.2.1 Direct emissions

The proposed PBP is forecast to generate approximately 32 t CO_2-e of Scope 1 emissions per annum. Scope 1 emissions will be generated by mobile equipment (FEL) and stationary engines (pumps/generators) consuming diesel. The direct greenhouse gas emissions attributable to the Proponent are very small.

3.2.2 Indirect emissions

The proposed PBP can be associated with approximately 226 t CO_2-e of Scope 2 emissions per annum. Scope 2 emissions are generated by purchasing electricity from the Tasmanian grid.

The proposed PBP can also be associated with approximately 5,550 t CO_2-e of Scope 3 emissions per annum. The primary source of Scope 3 emissions is purchasing and consuming cement. Scope 3 emissions are also expected to be generated by trucks transporting materials (cement, flocculant and diesel), and processes which produce and distribute energy (diesel and electricity).

The proposed PBP's greenhouse gas inventory is dominated by Scope 3 emissions. Approximately 96% of the proposed PBP's greenhouse gas emissions will be generated by the Proponent's suppliers. The Proponent may influence the proposed PBP's Scope 3 emissions through its purchasing policies.

Approximately 4% of the greenhouse gas emissions associated with the proposed PBP are related to on-site energy use (Scope 1 and 2 emissions).

4.0 Benefits of the Proposed PBP

The proposed PBP will enable the Proponent to divert tailings from the tailings dam and repurpose tailings as a stable rehabilitation medium for backfilling stopes. Assuming the Proponent has an obligation to rehabilitate the final tailings dam and stopes, then the proposed PBP offers the following benefits:

- Reduces or eliminates any requirement to expand the tailings dam
- Increases the adaptive capacity of the tailings dam to manage extreme climatic events
- Reduces any demand to import stable backfill for stopes
- Increases the stability and safety of underground mining operations
- Reuses the existing Henty PBP.

From a greenhouse gas perspective, the proposed PBP has the potential to avoid or reduce future greenhouse gas emissions associated with:

- Importing stable backfill material (i.e. may reduce transport diesel consumption)
- Rehabilitating the final tailings dam (i.e. may reduce diesel consumption associated with rehabilitation)
- Constructing a new PBP using 100% virgin materials (i.e. may reduce the demand for embodied emissions in steel).

5.0 Alignment with Tasmania's Climate Change Action Plan 2017 – 2021

Table 5.1 evaluates the proposed PBP against Tasmania's Climate Change Action Plan 2017 – 2021. The Table describes how the proposed PBP might align with the Action Plan's key priorities.

Table 5.1 Priorities of the Tasmanian Climate Change Action Plan 2017 – 2021

Action plan priorities	Alignment of the proposed PBP to priority
Understanding Tasmania's future climate	The priority aims to ensure Tasmania can forecast its future climate using the best available climate science. The proposed PBP is not expected to impact or impair this priority.
Advancing our renewable energy capability	The priority aims to maximise the generation of renewable energy, and drive energy use efficiency. The proposed PBP is not expected to impact or impair this priority.
Reducing our transport emissions	The priority aims to promote transport fleet fuel use efficiency, public transport and demand for electric vehicles. The proposed PBP is not expected to impact or impair this priority. The proposed PBP is expected to drive a marginal increase in transport diesel demand, until truck transport moves to alternative fuels (refer to **Section 3.0**).
Growing a climate ready economy	The priority aims to support business reduce emissions intensity, adopt innovative practices and manage climate risks. The proposed PBP is not expected to impact or impair this priority. The proposed PBP should reduce tailings storage demand and increase the climate resilience of the existing tailings dam. The proposed PBP should also reduce the energy use intensity of sourcing backfill material (refer to **Section 4.0**).
Building climate resilience	The priority aims to build a resilient community that is prepared for, and responds well to, extreme events. The proposed PBP is not expected to impact or impair this priority. The proposed PBP should reduce tailings storage demand and increase the climate resilience of the existing tailings dam (refer to **Section 4.0**).
Supporting community action	The priority aims to promote energy efficiency, protect health and legislate a net zero emissions target for 2050. The proposed PBP is not expected to impact or impair this priority. The proposed PBP is expected to generate additional greenhouse gas emissions, but any additional emissions are unlikely to influence Tasmania's net zero emission aspirations (refer to **Section 3.0**).

6.0 Greenhouse Gas Mitigation Measures

The key emission sources of the proposed PBP, in order of importance, are:

- On-site diesel use, generating Scope 1 emissions
- On-site electricity use, generating Scope 2 emissions
- The consumption of Portland cement, generating Scope 3 emissions
- Transport of input materials, generating Scope 3 emissions.

Tables 6.1 to **6.4** outline a range of mitigation measures for each key emission source.

Table 6.1 Diesel use greenhouse gas mitigation measures

Mitigation measure	Planned for PBP	Effectiveness and justification
Diesel use efficiency	Yes	Operational and technological measures to improve diesel use efficiency could reduce Scope 1 greenhouse gas emissions by 10 - 20% (i.e. 3-6 t CO_2-e per annum).
Switching to biofuel	No	Switching to biodiesel has the potential to reduce Scope 1 greenhouse gas emissions by approximately 30 t CO_2-e per annum. The measure is unlikely due to a lack of segregated biofuel storage at Renison. Mine sites are reluctant to use biofuels due to concerns about consistent supply. Unless the whole site switches to biodiesel, then the measure will not be implemented.
Switch to an electric FEL	No	Switching to an electric loader has the potential to reduce Scope 1 greenhouse gas emissions by approximately 20 - 30 t CO_2-e per annum. The cost of purchasing an electric loader can not be justified to reduce greenhouse gas emissions by 20 - 30 t CO_2-e per annum.

Table 6.2 Electricity use greenhouse gas mitigation measures

Mitigation measure	Planned for PBP	Effectiveness and justification
Upgrade electric motors, pumps, compressors and dyers	Yes	Operational and technological measures to improve electricity use efficiency could reduce Scope 2 greenhouse gas emissions by 20 - 30% (i.e. 45 - 70 t CO_2-e per annum). The Proponent is planning to upgrade equipment during the construction process.
Install variable speed drives (VSD) on electric motors	Yes	VSD technology can be very effective at improving electricity use efficiency, especially when electric motors are exposed to variable loads. The proposed PBP is likely to experience a range of loads given its only expected to operate intermittently.
Purchasing 100% renewable electricity	No	Purchasing 100% renewable electricity could reduce Scope 2 greenhouse gas emissions by up to 226 t CO_2-e per annum. The Proponent could only consider purchasing 100% renewable electricity when its cost meets parity with the Tasmanian grid.
Install on-site renewable electricity	No	The Renison site may have suitable areas to site and generate solar PV electricity. The intermittent electricity demand of the proposed PBP is not well suited to operate on 100% solar.

Table 6.3 Cement consumption greenhouse gas mitigation measures

Mitigation measure	Planned for PBP	Effectiveness and justification
Use an alternative binder than Portland cement	No	Using an alternative binder to Portland cement could reduce Scope 3 emissions by up to 5,000 t CO_2-e per annum. Alternatives have been considered however Portland cement is the preferred option to achieve the required stope geotechnical stability.

Table 6.4 Materials transport greenhouse gas mitigation measures

Mitigation measure	Planned for PBP	Effectiveness and justification
Select suppliers to reduce transport distances	Yes	The Proponent will select suppliers to minimise transport distances where practical. Minimising transport distances will reduce transport costs and increase supply flexibility. Reducing transport distances may reduce Scope 3 emissions by 10 - 20% (14 - 28 t CO_2-e per annum).
Select suppliers providing low emission transport options	No	Transport providers which offset transport emissions or provide low carbon services could reduce transport related emissions by up to 130 t CO_2-e per annum. It is unlikely that these services are currently offered to the Proponent.

7.0 Regulatory Risks

The following sections evaluate whether the proposed PBP will generate additional *National Greenhouse and Energy Reporting Act 2007* or Safeguard Mechanism risks for BMTJV.

7.1 National Greenhouse Gas and Reporting Scheme

The NGER Scheme is a national system for reporting and disseminating company information about greenhouse gas emissions, energy production and energy consumption. The NGER Scheme is established by the *National Greenhouse and Energy Reporting Act 2007* and supported by a range of regulations and guidelines. The NGER Scheme is only applicable to corporations which exceed a corporate or facility level reporting threshold. **Table 7.1** includes the facility level reporting thresholds and forecast annual activity data for the proposed PBP. **Table 7.1** demonstrates that the proposed PBP in isolation is not expected to trigger NGER reporting requirements.

Table 7.1 Facility level NGER reporting thresholds

Activity	Annual Threshold	Proposed PBP
Greenhouse gas emissions (Scope 1 and 2)	25,000 t CO_2-e	258 t CO_2-e
Energy production	100 TJ	0 TJ
Energy consumption	100 TJ	6 TJ

The greenhouse gas emissions and energy use associated with the proposed PBP are likely to form part of the Renison facility. It is possible that additional greenhouse gas emissions and energy use associated with the proposed PBP may cause the Renison facility to trigger NGER reporting requirements, if the current Renison facility is very close to triggering NGER reporting requirements.

7.2 The Safeguard Mechanism

The Safeguard Mechanism sets a maximum emissions cap (a Safeguard Number) for all Australian facilities that emit over 100,000 t CO_2-e of Scope 1 emissions per year. If an Australian facility exceeds its Safeguard Number, it is nominally required to offset its exceedance by surrendering Australian Carbon Credit Units to the Clean Energy Regulator (CER).

The Renison facility is not covered by the Safeguard Mechanism and the proposed PBP is only forecast to generate an additional 32 t of Scope 1 emissions at full operating capacity. It is unlikely the proposed PBP will generate Safeguard Mechanism risks.

8.0 Conclusion

The proposed PBP is a relatively small development, which could generate up to 260 t CO_2-e of operational Scope 1 and 2 emissions per annum. An additional 260 t CO_2-e of Scope 1 and 2 emissions would have a very small impact on the total greenhouse gas emissions generated by the Australian mining industry.

The proposed PBP can also be associated with approximately 5,600 t CO_2-e of operational Scope 3 emissions per annum. The proposed PBP's Scope 3 emissions are largely driven by the consumption of Portland cement.

The construction of the proposed PBP may generate up to 700 t CO_2-e of Scope 3 emissions. An additional 700 t CO_2-e of Scope 3 emissions would have a very small impact on the total greenhouse gas emissions generated by the Australian construction industry. The proposed plan to reuse the existing Henty PBP could save significant Scope 3 emissions associated with steel production.

This assessment found that high impact mitigation measures may include:

- Using an alternative binder to Portland cement
- Upgrading electric motors (planned)
- Purchasing 100% renewable electricity.

This assessment found that the proposed PBP is not expected to impact or impair the objectives of the Tasmania's Climate Change Action Plan 2017 – 2021.

This assessment found that the proposed PBP is not expected to generate NGER Scheme or Safeguard Mechanism risks.

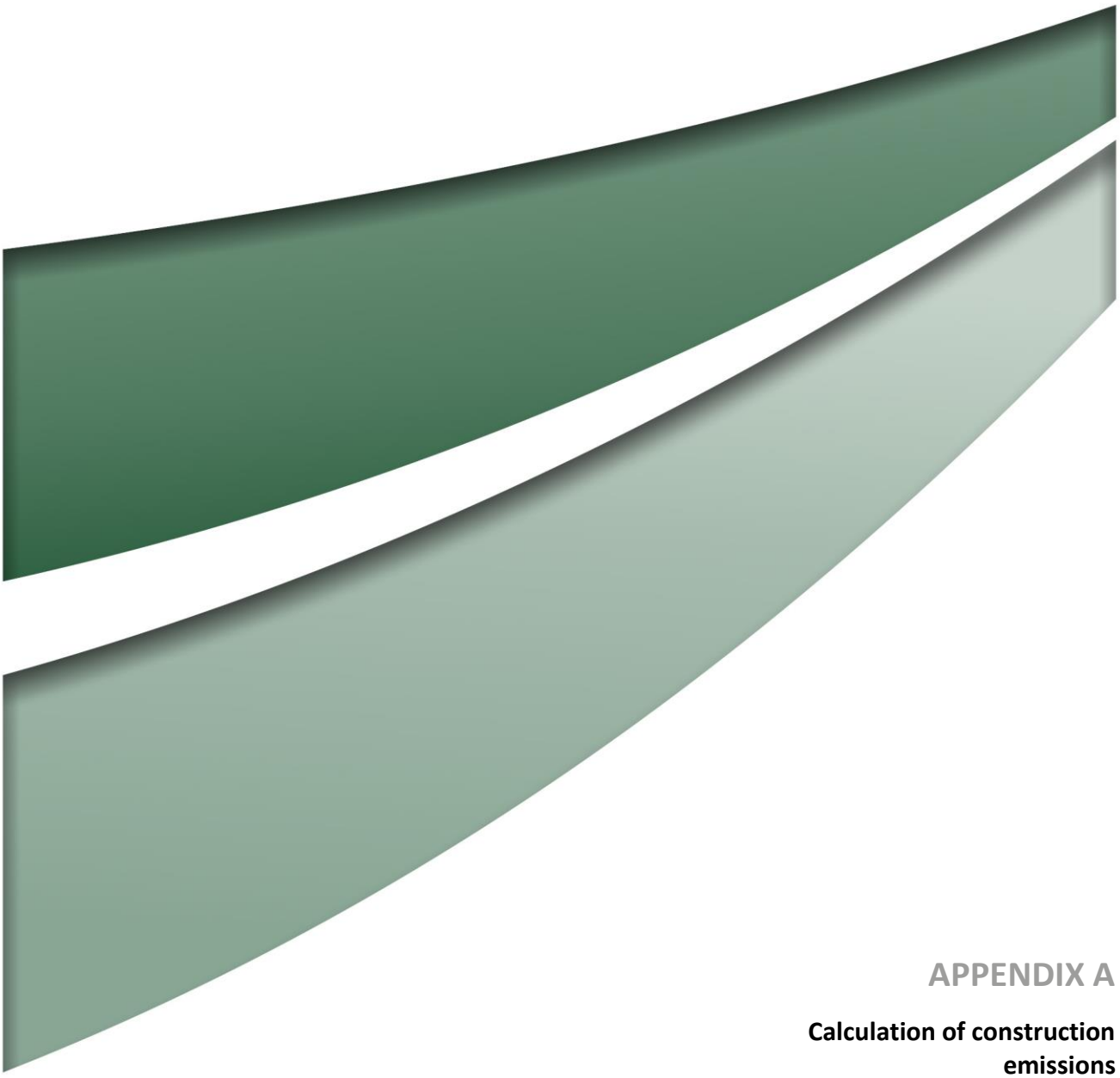
9.0 References

Australian Greenhouse Office (2007). National Greenhouse Gas Inventory: Analysis of Recent Trends and Greenhouse Gas Indicators.

Australian Government Department of Industry, Science, Energy and Resources (DISER) (2020). National Greenhouse Accounts (NGA*)* Factors October 2020.

University of Bath (2011). Inventory of Carbon and Energy v 2.0.

World Resources Institute and the World Business Council for Sustainable Development (WRI/WBCSD) (2004). The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard.



APPENDIX A

Calculation of construction emissions

Construction materials

Activity Data	Emission Factors[2]			GHG Emissions
Material Type	Usage	Unit	t CO_2-e/Unit	t CO_2-e
Reinforced concrete (32/40 MPa)	1,200	t	0.1628[3]	195
Steel cladding	220	t	2.03	447
			Total GHG emissions (t CO_2-e)	642

Materials Transport

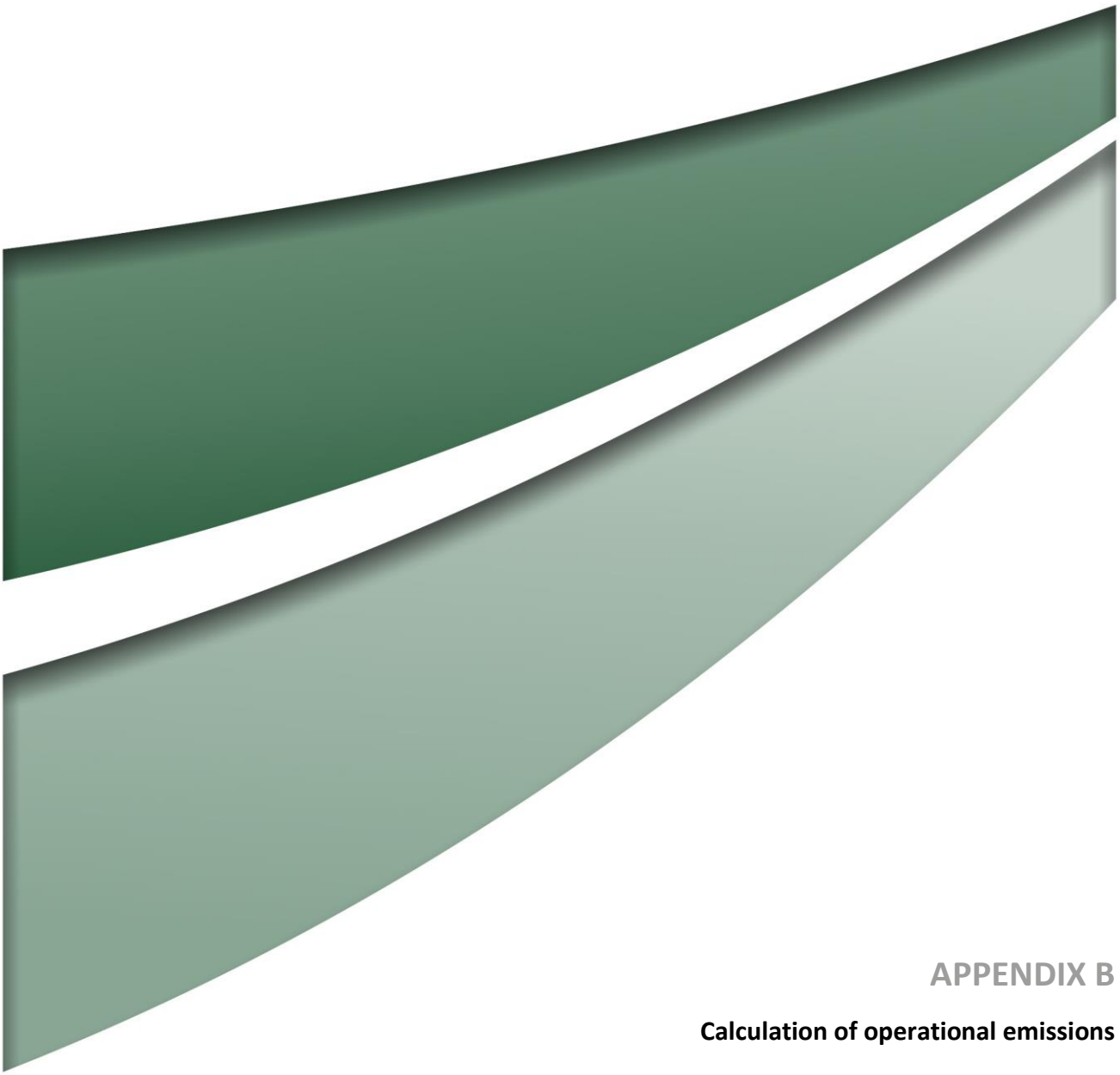
Activity Data	Emission Factors			Full Life Cycle
Transport mode	Usage	Units	GJ	kg CO2-e/GJ
Truck – Concrete (90 Km)	1.856	kL	71.6	74.01
Truck – PBP relocation (100 Km)	0.550	kL	21.2	74.01
Truck – Steel (500 Km)	2.063	kL	79.6	74.01
Truck – Diesel (100 Km)	0.022	kL	0.8	74.01
				t CO_2-e
			Total GHG emissions (t CO_2-e)	13

Energy use

Activity Data	Emission Factors			Full Life Cycle
Energy source	Usage	Units	GJ	kg CO_2-e/GJ
Diesel	13	kL	501.8	73.80
				t CO_2-e
			Total GHG emissions (t CO_2-e)	37

[2] Emission factors sources from the University of Bath, Inventory of Carbon and Energy (ICE) v2.0, 2011.

[3] Emission factor for concrete 32/40 (0.132 t CO2-e / tonne) plus a reinforcing modification factor of 0.077 * 0.4 (40 Kg of steel per m3 of concrete)



APPENDIX B

Calculation of operational emissions

Stationary Diesel Use - FEL

Activity Data	Energy Use		Emission Factors		
			CO_2	CH_4	N_20
kL	GJ/kL	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
12	38.6	463.2	69.9	0.1	0.2
			t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)			32	0	0
				Total GHG Emissions (t CO_2-e)	**32**

Electricity Use

Activity Data	Energy Use	Emission Factors		
		CO_2	CH_4	N_20
kWh	GJ	kg CO_2-e/kWh	kg CO_2-e/kWh	kg CO_2-e/kWh
1,506,400	5,423	0.15	N/A	N/A
		t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)		226	N/A	N/A
			Total GHG Emissions (t CO_2-e)	**226**

Extraction, Production and Distribution of Energy Purchased

Activity Data		Emission Factors		
		CO_2	CH_4	N_20
Purchased energy	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Diesel	463.2	3.6	N/A	N/A
Electricity	5,423	7	N/A	N/A
		t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)		40	N/A	N/A
			Total GHG Emissions (t CO_2-e)	**40**

Materials - Binder

Activity Data			Emission Factors[4]	GHG Emissions
Material Type	Usage	Unit	t CO_2-e/Unit	t CO_2-e
Portland cement	5,650	t	0.95	5,367
			Total GHG emissions (t CO_2-e)	5,367

Materials Transport

Activity Data	Emission Factors			Full Life Cycle
Transport mode	Usage	Units	GJ	kg CO_2-e/GJ
Truck – Diesel (90 Km)	0.020	kL	0.772	74.01
Truck – Binder (300 Km)	29.130	kL	1,124.42	74.01
Truck – Flocculant (500 Km)	18.910	kL	729.93	74.01
				t CO_2-e
			Total GHG emissions (t CO_2-e)	137

[4] Emission factors sources from the University of Bath, Inventory of Carbon and Energy (ICE) v2.0, 2011.

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