Graphinex – Esmeralda Graphite Project Environmental Impact Statement

Appendix B – Greenhouse Gas Assessment and Decarbonisation Plan

GRAPHINEX

Esmeralda Graphite Project: Greenhouse Gas Assessment and Decarbonisation Plan

Prepared for:

Qld Aus Graphite Pty Ltd

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FINAL

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Glossary

Term	Definition
°	degrees
°C	degrees Celsius
GJ	gigajoules
ha	Hectare
kg	kilograms
kL	kilolitres
km	kilometres
km/h	kilometres per hour
kt	kilotonnes
kWh	kilowatt per hour
m	metres
mbgl	metres below ground level
m^3	cubic metres
Mt	million tonnes
Mt CO_2-e	megatonnes of carbon dioxide equivalent
MVA	Megavolt-ampere
MW	megawatt
MWp	megawatt peak
pa	per annum
t	tonnes
t c	tonnes of carbon
t CO_2-e	tonnes of carbon dioxide equivalent
TJ	terajoules

Nomenclature	Definition
CH_4	methane
CO_2	carbon dioxide
CO_2-e	carbon dioxide equivalents
H_2O	water
HFCs	hydro fluorocarbons
MIBC	methyl isobutyl carbinol
N_2O	nitrous oxide
PFCs	Perfluorocarbons
SF_6	sulphur hexafluoride

Abbreviation	Definition
ACCU	Australian Carbon Credit Unit Scheme
AR5	IPCCs 5th Assessment Report
AV	Articulated Vehicle
BAM	Battery anode material
BESS	Battery Energy Storage System
BEV	Battery electric vehicle
BoM	Bureau of Meteorology
BVG	Broad Vegetation Group
CC Act	*Climate Change (Consequential Amendments) Act* 2022
CCCA Act	*Climate Change Act* 2022
CEJ Act	*Clean Economy Jobs Act* 2024
CSIRO	The Commonwealth Scientific and Industrial Research Organisation
DETSI	Department of the Environment, Tourism, Science, and Innovation
EA	Environmental Authority
EEO	Energy Efficiency Opportunities

Term	Definition
EF	Emission Factor
EI	Emissions Intensity
EIS	Environmental Impact Statement
Energy Act	*Energy (Infrastructure Facilitation) Act* 2024
EP Act	*Environmental Protection Act* 1994
EPA	Environment Protection Authority
EPBC	*Environment Protection and Conservation Act* 1999
ERA	Environmentally Relevant Activity
ESG	Environmental, Social, and Governance
EV	Electric Vehicle
FID	Final investment decision
FMS	Fuel management system
FullCAM	Full Carbon Accounting Model
GHG	Greenhouse Gases
GHG Guideline	*Guideline Greenhouse gas emissions ESR/2024/6819*
Graphinex	Graphinex Pty Ltd
GVM	Gross Vehicle Mass
GWP	Global Warming Potential
HDV	Heavy Duty Vehicle
HOFF	Hydrocarbons Off
IPCC	Intergovernmental Panel on Climate Change
IRI	International Roughness Index
KPI	Key Performance Indicator
KRA	Key Result Area
LULUCF	Land-use, Land-use Change, and Forestry
LOP	Life of Project
NABERS	National Material Emission Factors Database
NDC	Nationally Determined Contribution
NEM	National Electricity Market
NEPC	National Environment Protection Council
NGER	National Greenhouse and Energy Reporting
NGER Act	*National Greenhouse and Energy Reporting Act* 2007
NGER Determination	*National Greenhouse and Energy Reporting (Measurement) Determination*
NWMP	North West Minerals Province
OEM	Original Equipment Manufacturer
PBG	Petroleum Based Greases
PBO	Petroleum Based Oils
PBOGs	Petroleum Based Oils and Greases
PMLU	Post Mine Land Use
PPA	Power Purchase Agreement
PV	Photovoltaic
Qld	Queensland
ROM	Run Of Mine
SPP	State Planning Policy
ToR	Terms of Reference
TSF	Tailings Storage Facility
UNFCCC	United Nations Framework Convention on Climate Change

EXECUTIVE SUMMARY

Introduction

Katestone Environmental Australia Pty Ltd (Katestone) was commissioned by AARC Environmental Solutions Pty Ltd (AARC), on behalf of Qld Aus Graphite Pty Ltd (Graphinex, the Proponent) to complete a Greenhouse Gas (GHG) Assessment of the Esmeralda Graphite Project (the Project). The assessment addresses the GHG Terms of Reference for the Project's Environmental Impact Statement (EIS) under the *State Development and Public Works Organisation Act 1971*. It was prepared in accordance with the Queensland Government's *Guideline: Greenhouse gas emissions* (ESR/2024/6819).

The Project

The Project is an open cut graphite mine located approximately 70 kilometres south of Croydon, Queensland. Graphinex will mine the Esmeralda Granite unit and produce up to 3.5 Mtpa of run-of-mine (ROM) ore. The ore will be processed on site to a graphite concentrate for off-site shipment over an operational life of approximately 53 years. The concentrate will supply the manufacture of battery anode material (BAM), a critical input to lithium-ion batteries for electric vehicles and energy storage.

Emissions profile

The Project's expected Scope 1 emissions exceed 25,000 t CO_2-e per year. It is therefore classified as a medium to high emitter under the GHG Guideline, which requires a Scope 3 inventory and a GHG Abatement Plan. All electricity will be generated on site, so the Project has no Scope 2 emissions.

Emissions (t CO_2-e)	Unabated LOP	Unabated annual avg	Abated LOP	Abated annual avg
Scope 1	6,567,130	121,614	4,599,146	85,169
Scope 3, within Australia	2,378,093	44,039	1,866,010	34,556
Scope 3, outside Australia	102,155,779	1,891,774	102,155,779	1,891,774
Scope 3 total	**104,533,872**	**1,935,812**	**104,021,789**	**1,926,329**

Nearly all Scope 3 emissions (97.58%) come from processing the graphite concentrate into BAM overseas (Category 10). The rest are mainly from the downstream distribution of concentrate (1.18%) and upstream liquid fuel production (1.10%, Category 3).

The facility is not subject to the Safeguard Mechanism under the current threshold, with committed abated (i.e. planned operations) NGER Scope 1 emissions of 94,294 t CO_2-e projected in year 41.

Abatement

Graphinex has set a target to reduce net Scope 1 emissions by 30% relative to the unabated reference case, applying the Guideline's hierarchy of avoid, reduce, substitute and offset. The main measure is a 21.3 MWp solar farm with battery energy storage (BESS), dispatched ahead of diesel generation. This allows diesel

generators to be switched off for about 28% of operating hours and lowers the power system's emissions intensity. Further reductions come from:

- optimising mobile fleet haulage, payload and idle time
- maintaining plant at optimal efficiency
- minimising land clearing

Future substitution options to be investigated include:

- an in-pit to plant electric conveyor
- battery-electric or hybrid mining fleet
- connection to the National Electricity Market (NEM) with a renewable power purchase agreement
- renewable diesel or biodiesel blends

The committed abatement measures result in LOP Scope 1 emissions falling by 2.21 Mt CO_2-. The lower diesel use also reduces in-Australia Scope 3 emissions by 0.51 Mt CO_2-e.

Context and contribution to emission reduction targets

The Project's abated average annual emissions within Australia amount to:

- 0.089% of Queensland's 2024 emissions
- 0.026% of Australia's 2024 emissions
- 0.0041% of 2023 global emissions

Between 2027 and 2050, cumulative abated emissions within Australia equal about 0.29% of Queensland's carbon budget aligned with its targets. They equal 0.068–0.076% of Australia's target-aligned budget, a range covering both the 62% and 70% pathways to the 2035 target. Globally, cumulative abated emissions within and outside Australia equal 0.036% of the remaining 1.5 °C budget and 0.0046% of the remaining 2 °C budget.

By supplying natural graphite for battery supply chains, the Project supports decarbonisation in the transport and energy sectors.

Commitments

Graphinex will implement a GHG Abatement Plan with interim and long-term targets, monitor and publicly report emissions against those targets, and regularly review emerging technologies for further abatement. Graphinex will also report under the National Greenhouse and Energy Reporting (NGER) scheme.

1. INTRODUCTION

Katestone Environmental Pty Ltd (Katestone) was commissioned by AARC Environmental Solutions Pty Ltd (AARC) on behalf of Qld Aus Graphite Pty Ltd to conduct a Greenhouse Gas (GHG) Assessment for the Esmeralda Graphite Project. The site is located approximately 70 km south of Croydon in Queensland. Graphinex Pty Ltd (through its subsidiary Qld Aus Graphite Pty Ltd) will mine the Esmeralda Granite unit and concentrate graphite ore on-site for shipment.

This GHG assessment and abatement plan has been developed to meet the GHG terms of reference (ToR) to be addressed in an environmental impact statement (EIS) for the Project under the *State Development and Public Works Organisation Act 1971* (SDPWO Act). Sections addressing the requirements of the GHG ToR are listed in Table 1.

Table 1 GHG Terms of Reference requirements

ToR reference	Requirement	Section
27.1	Queensland Government, Guideline - *Greenhouse gas emissions,* ESR/2024/6819 (GHG Guideline)	3.3.3
27.2	Existing environment and nearby activities that may emit GHG emissions	2
27.3	Emissions inventory	5 Appendix B
27.4	GHG emissions and energy production and consumption consistent with requirements of *National Greenhouse and Energy Reporting Act 2007* (Cwlth) and its subordinate legislation, including methodology, assumptions, emissions factors, activity data and calculations used to estimate the Project's GHG emissions	3 4 5 Appendix B
27.5	Project contribution to Queensland's GHG emission reduction targets as legislated in the *Clean Economy Jobs Act 2024* over LOP	7
27.6	GHG emissions assessment including: a) Estimated projected annual and cumulative Scope 1 and Scope 2 CO_2 equivalent emissions over LOP including unabated emissions and emissions after all avoidance and abatement measures have been accounted b) Estimated annual and cumulative Scope 3 emissions and total Scope 3 emissions over LOP	5
27.7	Risks and likely magnitude of impacts to environmental values from abated Scope 1, 2 and 3 emissions	7
27.8	Medium to high emitting projects: mitigation measures and GHG abatement plan that meets the requirement of the GHG Guideline, Appendix A. The GHG abatement plan addresses: a) Summary of evaluated Project alternatives for emissions reduction b) Identification of voluntary initiatives and research undertaken to reduce lifecycle and embodied carbon intensity of the Project's processes and products c) Comparison of estimated annual and cumulative abated project GHG emissions with the global, national and state estimated annual emissions and remaining emission budgets up to 2050, including Scope 3 emissions identified in Project estimate when comparing with the remaining global comparison, and relevant Scope 3 emissions for national and Queensland comparisons d) Where offsets have been identified as the primary option for compliance, a comprehensive carbon offsets management plan e) Projects proposing to offset more than 30% of their emissions limits or offset outside of Queensland, provide an independent review f) When multi-year emissions reduction targets proposed to consider emerging technologies over that period, ensure the same emissions result will be delivered at the end of the multi-year period such that the trajectory of the Queensland emissions target are met g) Calculation baseline following methodology outline in the *National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015*	6 7
27.9	Low emitting projects: proposed GHG management practices demonstrating reasonable and practical measures to manage GHG emissions	N/A

In addition, for medium to high emitting projects, the ToR requires provision of a GHG abatement plan that meets the requirements of the Queensland *Guideline Greenhouse gas emissions ESR/2024/6819* (GHG Guideline). Sections addressing the requirements of Appendix A of the GHG Guideline are listed in Table 2, with further detail listed in section 3.3.3.

Table 2 GHG guidelines assessment and decarbonisation requirements

Requirement	Section
a. Project details	2
b. Emissions projections and commencing abatement measures: i. Emission inventory and estimates as developed in section 3.1 of the GHG Guideline ii. Management practices proposed to be implemented at commencement to reduce GHG emissions as per section 3.3 of the GHG Guideline	5 6
c. GHG emissions reference point: i. Outline the level of emissions against which ongoing reduction of GHG emissions will be assessed throughout the life of the Project (reference point) (based on projected GHG emissions prior to implementation of the GHG abatement plan) ii. **Provide** justification for the reference points proposed	6.1
d. Emission reduction targets: i. Identify interim Scope 1 and Scope 2 GHG emission reduction targets to be applied throughout the life of the Project ii. Identify long-term overall Scope 1 and Scope 2 GHG emission reduction targets. iii. Provide justification for the emission reduction trajectory and targets proposed and how they support the Queensland Government's GHG emission reduction targets	6.2 7
e. GHG emission reduction program (as detailed in section 3.3 and Appendix A (Part B) of the GHG guideline), including: i. Implementation details including timeframes for implementation and estimated reduction of emissions expected ii. Risk assessment details including cost, practicality, effectiveness, and risks of each measure iii. Justification for each measure including a comparison of each proposed measure with relevant best practice environmental management standards iv. Estimates of emissions expected to be abated by each measure v. Any ongoing monitoring proposed to be undertaken to ensure the success of emission reduction measures	6
f. Advancing technologies and opportunities: i. Include provisions for regularly reviewing new technologies to identify opportunities to further reduce emissions and energy efficiency	6.7
g. Monitoring and auditing program	6.6
h. Reporting: i. A program for periodic public reporting on progress towards the GHG emission reduction targets outlined in the GHG abatement plan, including details about how public reporting will be undertaken if necessary	6.6

2. PROJECT DESCRIPTION

The Project will construct and develop an open cut graphite mine, located approximately 70 km south of Croydon in north-west Queensland (Figure 1). It will mine the Esmeralda Granite unit and concentrate graphite on-site for shipment.

High-grade graphite is recognised as a “critical mineral” by both the Queensland and Commonwealth Governments, given its strategic significance and global scarcity. The advancement of the Project will contribute significantly to establishing a sustainable, long-term local supply of high-grade graphite, essential for a wide range of renewable energy applications including electric vehicles (EVs) and will benefit the global renewable energy transition. The development and emergence of a domestic critical minerals industry, complete with downstream processing, strongly aligns with government policies and plans.

The Project will produce up to 3.5 Mtpa of Run-of-Mine (ROM) ore over an operational mine life of approximately 53 years. Mining is via conventional truck and excavator methods to a depth of 250 m below ground level (mbgl). Ore extraction requires controlled blasting techniques. Mine construction is scheduled to span 18 months, with mining ramping up to 3.5 Mtpa ROM over the first three years.

Graphite ore (~6% total graphite) will be trucked to the on-site mineral processing plant for stockpiling and concentration via conventional flotation methods. The processing method (Figure 2) includes an initial crushing and milling circuit that liberates the graphite as a < 300-micron product. Crushed ore is fed to a flotation circuit with several stages (Figure 2). A combination of standard flotation reagents such as diesel, sodium silicate, and methyl isobutyl carbinol (MIBC) will be used. Flotation tailings produced from the mineral processing circuit will be transferred to one of three purpose designed storage facilities, that will be constructed in stages over the production life of the mine.

The majority of product concentrate from the Project will be exported to the United States of America (USA) for refinement, battery anode production, and subsequent sale to Europe, Korea, and Japan.

Domestic refinement will continue to be explored based on capacity, capability, and economic context. Graphinex has constructed a Battery Anode Demonstration Facility in Townsville to demonstrate capabilities to produce battery anodes from graphite concentrate. 300 tonnes of concentrate will be sent to the facility for technical purposes. The quantity of concentrate that will be produced by the mine will significantly exceed the capacity of the facility to process it, so the facility is not expected to receive commercial volumes.

The Project is situated in an isolated inland location dominated by low stock grazing. Although there are no immediately adjacent industrial activities that are expected to represent significant local point sources of GHG emissions, several existing and proposed resource developments occur within the broader North West Minerals Province (NWMP) region and may contribute cumulatively to regional GHG emissions. Existing projects have been captured within the Australian/ State emissions budgets.

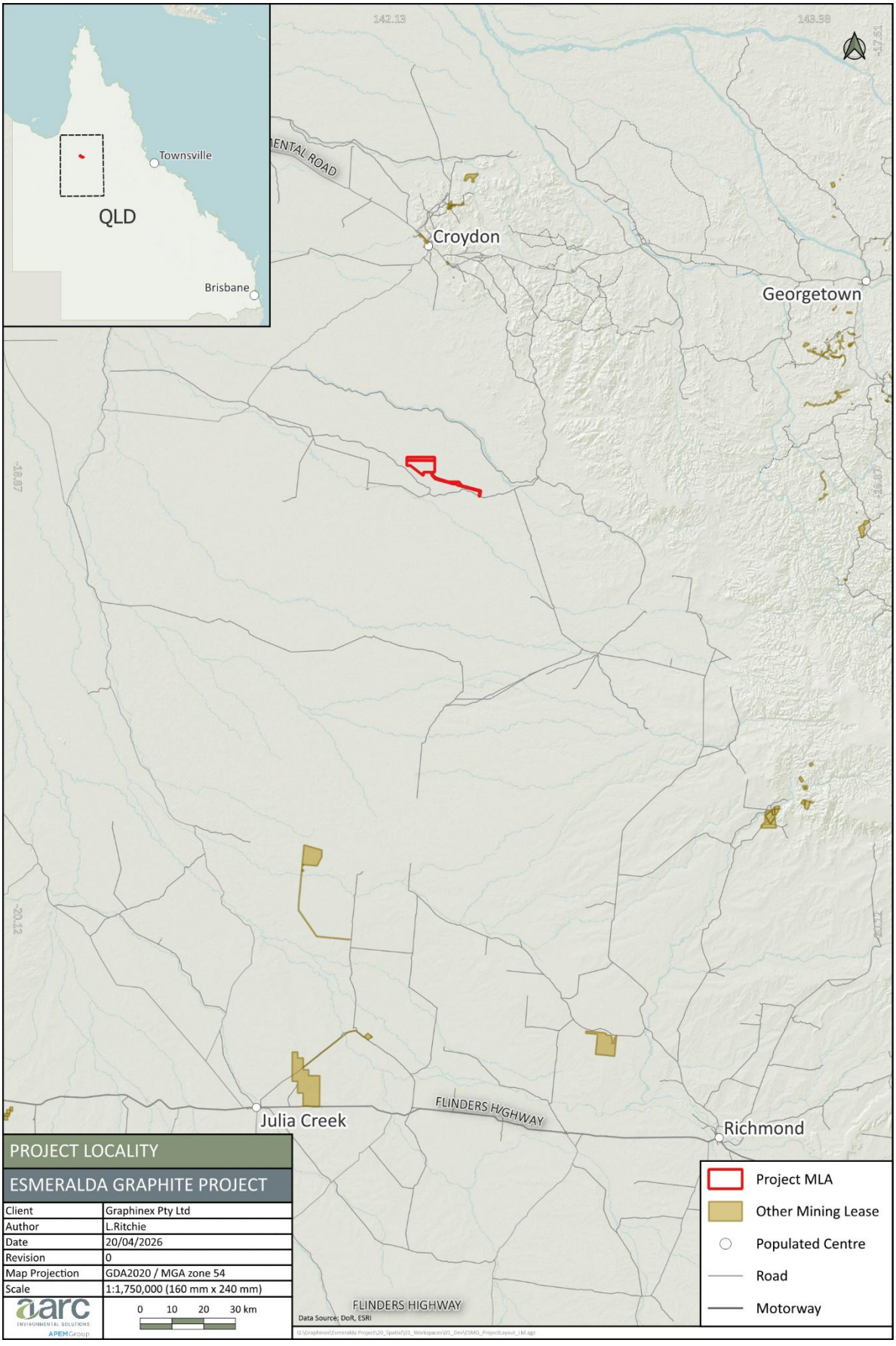


Figure 1 **Location of the Esmeralda Graphite Project**

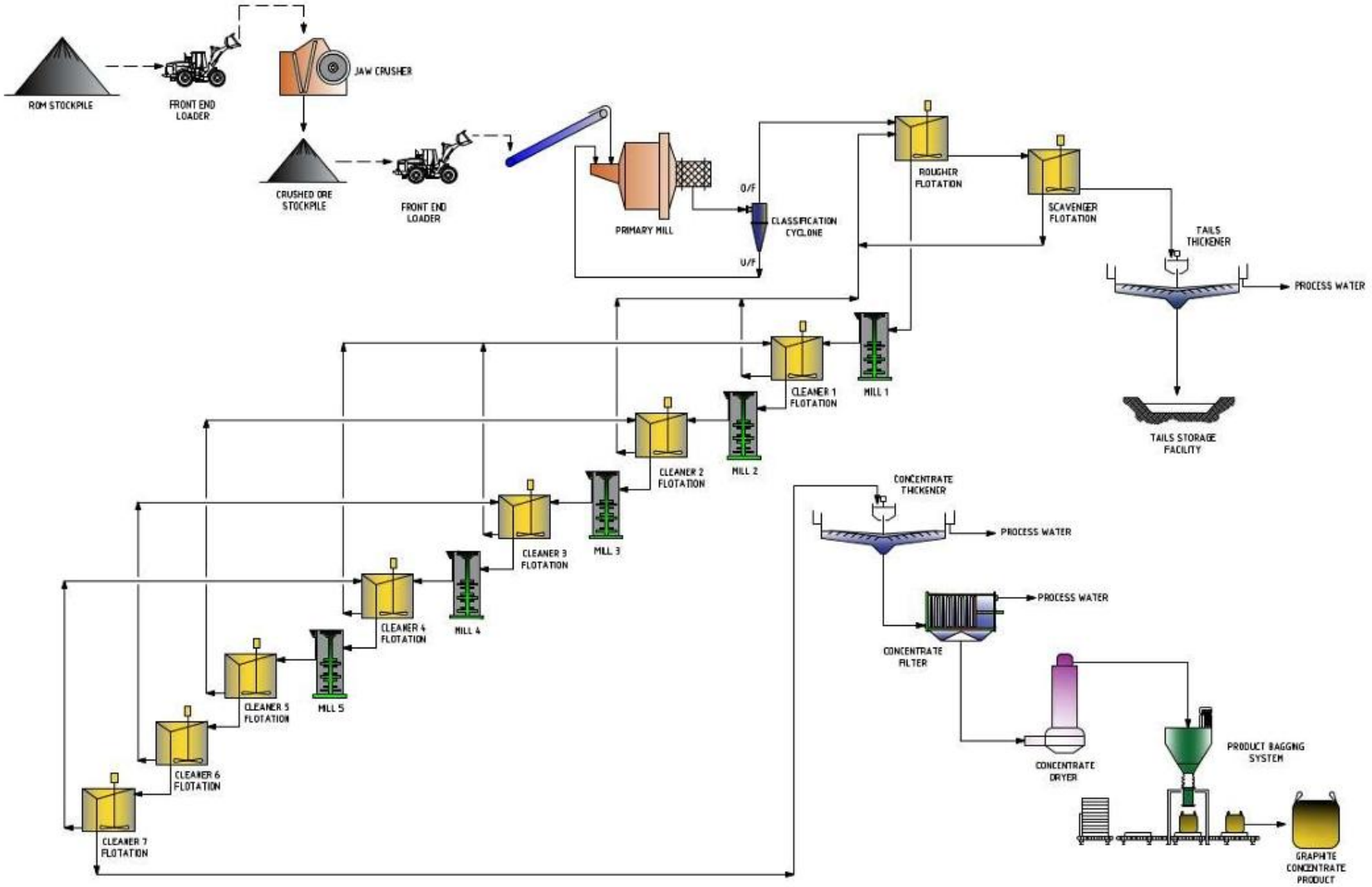


Figure 2 **Flow Diagram of the Graphite Concentration Process**

3. REGULATORY ENVIRONMENT

3.1 International Agreements

3.1.1 Paris Agreement

The Australian Government is party to the Paris Agreement[1] to take actions to keep global warming to 'well below' 2°C and strive to limit warming to 1.5°C. The current Australian target (Nationally Determined Contribution) is to reduce net emissions to 43% below 2005 levels by 2030, and 62 - 70% below 2005 levels by 2035, including land use, land use change, and forestry (LULUCF) and using Global Warming Potential (GWP) values from the IPCC's Fifth Assessment Report (AR5). The intention is to have net zero GHG emissions by 2050.

3.2 Legislation and Regulation

3.2.1 Climate Change Act 2022 (Cwlth)

The *Climate Change Act 2022* (CC Act) provides the legislative framework to implement Australia's net-zero commitments and codifies Australia's 2030, 2035 and 2050 net GHG emissions reductions targets under the Paris Agreement. The legislated targets are to reduce net GHG emissions to 43% below 2005 levels by 2030, and 62 - 70% below 2005 levels by 2035, and to reduce net GHG emissions to zero by 2050. The CC Act establishes the 2030 GHG emissions reduction target as a national point target and an emissions budget. The CC Act does not impose obligations directly on companies, but it does signal sector-based reforms to achieve the GHG emissions reduction targets.

3.2.2 Climate Change (Consequential Amendments) Act 2022 (Cwlth)

The *Climate Change (Consequential Amendments) Act 2022* (CCCA Act) embeds the GHG emissions reduction targets into fourteen Commonwealth Acts, including the *Clean Energy Regulator Act 2011*, *Infrastructure Australia Act 2008*, *National Greenhouse and Energy Reporting Act* 2007, and the *Renewable Energy (Electricity) Act* 2000.

3.2.3 National Greenhouse and Energy Reporting Act 2007 (Cwlth)

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) established a national framework for corporations to report GHG emissions and energy consumption.

NGER registration and emissions reporting are mandatory for corporations or facilities that have energy production, energy use, or GHG emissions that exceed specified thresholds (Table 3). These entities are required to report on their Scope 1 and Scope 2 emissions, where:

- Scope 1 emissions – the release of GHG into the atmosphere from a facility as a direct result of an activity or series of activities (including ancillary activities) that constitute the facility. GHG emissions associated with land clearing are effectively a Scope 1 emission but are not included in the NGER scheme.
- Scope 2 emissions –the release of GHG into the atmosphere as a direct result of one or more activities that generate electricity, heating, cooling, or steam at another facility and that is consumed by the facility.

Scope 3 emissions are defined as indirect GHG emissions, other than Scope 2 emissions, that are generated in the wider economy by a facility's supply chain or value chain. They occur because of the activities of a facility, but

[1] https://unfccc.int/process-and-meetings/the-paris-agreement

from sources not owned or controlled by that facility's business. They are not included in NGER reporting due to the potential for double counting.

Table 3 NGER annual reporting thresholds – GHG emissions and energy

Threshold level	Threshold type	
	GHG ($ktCO_2$-e)	Energy production and/or consumption (TJ)
Facility	25	100
Corporate	50	200
Table Notes: *kt CO_2-e = kilotonnes of carbon dioxide equivalent. TJ = terajoules.*		

3.2.4 National Greenhouse and Energy Reporting (Measurement) Determination 2008

The National Greenhouse and Energy Reporting (Measurement) Determination 2008 (NGER Determination) provides methods, criteria, and measurement standards for calculating greenhouse gas emissions and energy data under the NGER Act. It covers Scope 1 and Scope 2 emissions as well as energy production and consumption.

3.2.5 Safeguard Mechanism (Crediting) Amendment Act 2023 (Cwlth)

The Safeguard Mechanism provides a framework for Australia's largest emitters to measure, report and manage their emissions. It does this by requiring large facilities, whose net emissions exceed the Safeguard threshold of 100,000 t CO_2-e per year, to keep their emissions at or below emissions baselines set by the Clean Energy Regulator. The Clean Energy Regulator is the government body responsible for accelerating carbon abatement for Australia through the administration of the National Greenhouse and Energy Reporting scheme, Renewable Energy Target, and the Emissions Reduction Fund.

3.2.6 State Development and Public Works Organisation Act 1971 (Qld)

The purpose of the *State Development and Public Works Organisation Act 1971* (SDPWO Act) in Queensland is to facilitate large-scale, complex development projects while managing their environmental, social, and economic impacts. It enables the Coordinator-General to declare "coordinated projects," require environmental impact statements (EIS), and streamline approvals to drive economic development.

3.2.7 Clean Economy Jobs Act 2024 (Qld)

The purpose of the *Clean Economy Jobs Act 2024* (CEJ Act)[2] is to reduce GHG emissions in Queensland by legislating emissions reduction targets. The CEJ Act sets a target of net zero emissions by 2050, with an emissions reduction target of 75% below 2005 emissions by 2035. The initial target of a reduction by 30% of 2005 levels by 2030 has already been achieved. Queensland's emissions in 2005 were 197.3 mega tonnes of carbon dioxide equivalents ($MtCO_2$-e) meaning that annual emissions will need to be reduced to 49.3 $MtCO_2$-e or below by 2035.

3.2.8 Energy (Infrastructure Facilitation) Act 2024 (Qld)

The *Energy (Infrastructure Facilitation) Act 2024* (Energy Act) aims to streamline energy infrastructure development in Queensland, replacing previous renewable energy targets with a focus on market-driven solutions and public

[2] https://www.legislation.qld.gov.au/view/pdf/inforce/current/act-2024-016

ownership of assets. The Energy Act is part of a broader Energy Roadmap that outlines the state's approach to achieving affordable, reliable, and sustainable energy.

3.2.9 Energy Roadmap Amendment Act 2025 (Qld)

The *Energy Roadmap Amendment Act 2025* was introduced to align Queensland's energy legislation with the strategic objectives of the Queensland Energy Roadmap 2025, focusing on delivering affordable, reliable, and sustainable energy for the state. The Act formally removes previous statutory renewable energy generation targets, shifting the focus toward emissions reduction and a market-driven approach to energy planning. Queensland remains committed to achieving net-zero emissions by 2050.

3.2.10 Environmental Protection Act 1994 (Qld)

The *Environmental Protection Act 1994* (EP Act)[3] seeks to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.

The EP Act provides the approval framework for the Project, given effect by the *Guideline Greenhouse gas emissions* ESR/2024/6819.

The CC Act, CCCA Act, and the CEJ Act provide the statutory emissions reduction targets, and the NGER Act and its subordinate instruments, and the Safeguard Mechanism, provide the reporting and accountability framework for approved projects that meet the statutory thresholds.

3.3 Policy, Guidelines, and Strategy

3.3.1 State Planning Policy

Queensland's State Planning Policy (SPP) expresses the State's interests in land use planning and development. The SPP notes that Queensland's largest source of GHG emissions comes from energy generation and that planning to enable the development of renewable energy will play a key role in reducing emissions.

3.3.2 Environmentally Relevant Activities (ERA) Guidelines

Environmentally relevant activities (ERAs) are prescribed activities with the potential to release emissions which can impact on the environment and surrounding land uses.

3.3.3 DETSI Guideline Greenhouse Gas Emissions

The DETSI *Guideline Greenhouse gas emissions ESR/2024/6819* (GHG Guideline) describes requirements under the EP Act and provides information about how to meet these requirements in relation to GHG emissions for new and amended environmental authority (EA) applications.

The GHG Guideline sets out the minimum expectations for GHG emissions information to be provided with applications and supports rigorous, defensible, and transparent decision-making in relation to these emissions. The required information includes:

[3] https://www.legislation.qld.gov.au/view/pdf/inforce/current/act-1994-062

- An inventory of expected GHG emissions resulting from the Project including the stage at which the emissions will occur and a breakdown by source (Section 4.3, Section 5.1, Section 5.2.4, Section 5.2, Section 5.3, Appendix B)
- An estimate of projected Scope 1 and Scope 2 CO_2-e emissions over the Life of Project (LOP), including an unabated (Section 5.2) and abated emissions scenario (Section 6)
- An estimate of annual Scope 3 emissions and total Scope 3 emissions over the LOP (Section 5.3)
- A description of the method used for estimating GHG emissions (Section 4.4, Section 4.5)
- A GHG abatement (decarbonisation) plan in alignment with requirements of Appendix A of the GHG Guideline (Section 6)
- A description of risks and the likely magnitude of impacts on environmental values resulting from the Project, including qualitatively describing the impacts of climate change on environmental values and the likely magnitude of such impacts based on the relative scale of the Project's net GHG emissions (Section 7).

The GHG Guideline identifies expected GHG emission rates for activities as:

- **Low emitters** if expected annual GHG emissions are less than 25,000 t CO_2-e.
- **Medium to high emitters** if expected annual GHG emissions are 25,000 t CO_2-e or more for any year during the LOP.

3.3.4 Corporate Value Chain (Scope 3) Accounting and Reporting Standard

The Greenhouse Gas Protocol *Corporate Value Chain (Scope 3) Accounting and Reporting Standard* (WRI , 2011) is the only internationally accepted method for Scope 3 emissions accounting and is applied here.

Scope 3 emissions refer to all indirect emissions occurring in the value chain of a reporting company, including upstream and downstream emissions, that are not included in the reporting company's Scope 1 and 2 inventory. Examples of Scope 3 emissions include emissions resulting from the production and transport of purchased goods, processing and use of sold products, and purchased services such as fuel-intensive activities or transportation.

Scope 3 emissions may be 'double-counted', when two companies account for the same emissions – this is recognised as a beneficial scenario because each company may have different and mutually exclusive opportunities to influence the sources of emissions. While a reporting company has no direct control over its Scope 3 emissions, it may exert influence over its Scope 3 inventory through strategic partnerships, policy-setting, and procurement decisions.

3.3.5 Queensland Battery Industry Strategy

The Queensland Battery Industry Strategy is a comprehensive five-year plan aimed at transforming Queensland into a global leader in battery manufacturing. It includes a $570 million investment to support battery industry innovation, commercialisation, investment, and supply-chain growth. The strategy focuses on developing advanced manufacturing capabilities in battery materials, cells, pack assembly, installation, and recycling. It also aims to establish Queensland as a hub for battery production and advanced materials on the international market.

3.3.6 Queensland Critical Minerals Strategy

The Queensland Critical Minerals Strategy aims to develop a sustainable, globally competitive critical minerals sector, driving economic growth, job creation, and downstream processing industries. It is designed to position Queensland as a leading supplier of critical minerals essential for technologies such as electric vehicles (EVs), renewable energy, and advanced manufacturing. It aligns with broader state initiatives to decarbonise the

economy, foster research and innovation, and create sustainable economic prosperity. The strategy outlines four main objectives:

- Accelerate the downstream value chain by promoting local processing and manufacturing of critical minerals to increase value-added production
- Foster research and innovation by supporting technological development and ESG (environmental, social, and governance) excellence
- Create sustainable economic growth by generating secure jobs, particularly in regional areas, and supporting orderly transition from carbon-intensive industries
- Strengthen global supply chain participation, ensuring that Queensland becomes a reliable supplier of high-purity critical minerals for international markets.

4. METHOD

4.1 Definitions

4.1.1 Greenhouse Gases

The Intergovernmental Panel on Climate Change (IPCC) describes GHGs as gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of radiation emitted by the Earth's surface, by the atmosphere itself, and by clouds. This property causes the greenhouse effect.

The GHGs required to be assessed under NGER and QLD GHG guidelines are:

- carbon dioxide (CO_2)
- methane (CH_4)
- nitrous oxide (N_2O)
- sulphur hexafluoride (SF_6)
- hydrofluorocarbons (HFCs)
- perfluorocarbons (PFCs)

For reporting purposes, emissions of each gas are expressed as carbon dioxide equivalents (CO_2-e) by multiplying the mass of each gas by its global warming potential (GWP) relative to CO_2 over the selected time horizon.

4.1.2 Emission Scopes

GHG emissions are calculated and reported according to the Scope in which they occur.

Scope 1 GHG emissions are those emissions released to the atmosphere as a direct result of the activity conducted at a facility and that are under the direct control of the facility or operation.

Scope 2 GHG emissions are those associated with the production of electricity that is purchased and used by the facility.

Scope 3 GHG emissions are those associated with the provision of goods and services purchased by the facility or operation but that are not owned or controlled by the entity responsible for the facility or operation. Emissions are categorised according to Scope 3 Standard (section 4.5).

4.2 Method for Calculation of GHG Emissions

4.2.1 Emissions assessment boundary

The emissions assessment boundary sets the boundary of which emissions are to be reported for Graphinex Pty Ltd (Graphinex).

The GHG assessment boundary includes:

- Operational activities of the Project under the operational control of Graphinex (Scope 1)
- Waste generated in operations (Scope 1)
- Purchased goods and services used by the Project (Scope 3)
- Capital goods purchased for the Project (Scope 3)

- Upstream production of purchased fuels (well-to-pump) and upstream electricity network losses (Scope 3)
- Upstream transportation and distribution (Scope 3)
- Downstream transportation and distribution (Scope 3)
- Use of sold products (Scope 3)

4.3 Project Activities that cause GHG Emissions

Project activities that will lead to GHG emissions are presented in Table 4. These are differentiated by their scope and the Project phase in which they occur. There are no Scope 2 emissions resulting from the Project, as all electricity will be generated on-site. Decommissioning and rehabilitation will involve very little vehicle movements or additional emissions, as most will be covered by the operations phase i.e. the truck movements to backfill the pit and remove three of the four tailing storage facilities (TSF) are captured by operation, and supports the eventual rehabilitation of the site.

Table 4 Project activities that result in GHG emissions

Phase	Scope 1	Scope 3
Construction	Vegetation Clearing	Infrastructure and construction activities Infrastructure and construction materials
Operation	Diesel combustion by mine plant Diesel combustion by support plant Diesel combustion by ancillary plant Diesel combustion by ore processing plant Diesel for explosives Diesel combustion for generation of electricity Combustion of petroleum-based oils and greases	Diesel production and combustion for transport of materials and products Upstream fuel extraction and processing Production of purchased goods and services, and capital goods
Decommissioning	Diesel combustion for rehabilitation activities	Upstream fuel extraction and processing End use of recycled and disposed plant and facilities

4.4 Scope 1 Emissions - Method

Projected annual Scope 1, Scope 2, and Scope 3 GHG emissions for the Project during construction and operation are calculated from projected activity data provided by Graphinex by applying the methods, fuel consumption and emissions factors described in the following resources:

- NGER Determination
- The National Greenhouse Accounts Factors (to date)
- The Greenhouse Gas Protocol (WRI/WBCSD, 2004)
- FullCAM (Richards, 2001)
- National Material Emission Factors Database (NABERS, 2026)

4.4.1 Scope 1 emissions from diesel combustion and PBOGs

Scope 1 emissions (t CO_2-e) from the combustion of diesel and petroleum-based oils and greases (PBOGs) are calculated with Method 1, as outlined in the NGER Determination.

The formula is:

$$\frac{\mathbf{Q} \times \mathbf{ECF} \times \mathbf{EF}}{\mathbf{1000}},$$

where Q is the quantity of the emission source (e.g., with units kilolitres, kL), ECF is the energy content factor of the emission source (e.g., with units GJ/kL) (Table 5), EF is the emission factor that describes the total amount of equivalent carbon dioxide emissions associated with the emission source (i.e., with units kg CO_2-e/GJ) (Table 5), and the 1000 returns the correct units for the emissions (Table 5).

4.4.2 Scope 1 emissions from diesel used in explosives

The ANFO explosives contain approximately 6% diesel by mass. There is no Scope 1 emissions factor applied to ANFO in the NGER Measurement Determination. Combustion of diesel in the explosion is only recorded as energy consumed and produced.

Primary products of diesel combustion in ANFO detonation are nitrogen (N_2), carbon dioxide (CO_2), and water vapour (H_2O). Nitrogen oxides (NO_x) may be produced when detonation is not optimal, i.e. if the mixture is under fuelled (Biessikirski et al., 2024). As the mixture is marginally over fuelled in mining operations, this avoids significant production of NO_x including nitrous oxide (N_2O) (Lashgari et al., 2013). N_2O is not typically quantified in ANFO emissions reporting because it represents a small fraction of the total 0-17 ppm of measured nitrogen oxide (NO_2) (Campos et al., 1999 and Rowland & Mainiero, 2000).

CO_2-e can be estimated from the diesel EF for Qld EIS purposes, but the resulting quantity of N_2O and CH_4 is negligible. The quantity of diesel combusted was calculated by multiplying the total explosives usage by 0.06. Emissions were then estimated using Method 1 as described in the NGER Determination, section 4.4.1 (above) and the diesel (stationary) EF (Table 5).

4.4.3 Scope 1 emissions from waste

Graphinex total projected waste tonnage disposed of to landfill is categorised by broad category waste streams and multiplied by the corresponding published EF (Table 5). The downstream emissions of waste did not include transportation to the waste processing facility.

4.4.4 Scope 1 emissions from vegetation clearance

The Full Carbon Accounting Model (FullCAM) is the standard method used to assess the carbon stocks in vegetation and soil due to land use change (Richards, 2001) and is used to assess the effects of land use, land use change, and forestry (LULUCF) in Australia's National Greenhouse Gas Accounts.

FullCAM estimates the carbon stock change in ecosystems at a grid scale of 25 m x 25 m including:

- above and belowground biomass
- standing and decomposing debris
- soil carbon resulting from land use and management activities

Table 5 Summary of energy content and emission factors for Scope 1 and Scope 3 assessment

Emission Source	Energy Content	Emission Factor	
		Scope 1	Scope 3
Diesel (transport) [1, 2]	38.6 GJ/kL	70.4 kgCO_2-e/GJ	17.3 kg CO_2-e/GJ
Diesel (stationary) [1, 2]	38.6 GJ/kL	70.2 kgCO_2-e/GJ	17.3 kg CO_2-e/GJ
Petroleum Oil [1, 2]	38.8 GJ/kL	13.9 kgCO_2-e/GJ	18.0 kg CO_2-e/GJ
Petroleum Grease [1, 2]	38.8 GJ/kL	3.5 kgCO_2-e/GJ	18.0 kg CO_2-e/GJ
Eucalyptus Woodland [3]	-	43.52 t C/ha	-
Melaleuca Forest and Woodland [3]	-	42.45 t C/ha	-
Eucalyptus Low Open Forest [3]	-	59.83 t C/ha	-
Eucalyptus Open Forest [3]	-	42.45 t C/ha	-
Commercial and industrial waste [1]	-	2.082 t CO_2-e/t	-
Bulk Carrier Shipping Average [4]	-	-	0.00353 kg CO_2-e/t.km
Articulated HGV (>33 t, average laden) [4]	-	-	0.00007576 t CO_2-e/km
Rigid 17 t and above (average laden) [4]	-	-	0.00017146 t CO_2-e/km
Concrete - >32 to >40 MPa [5]	-	-	0.232 t CO_2-e/m^3
Spend-based building and infrastructure [6]	-	-	0.21 kg CO_2-e/ AUD
Aurizon Operational Emissions Intensity[7]	-	-	0.000013080 t CO_2-e/t.km
Graphite concentrate to BAM [8]			10 kg CO_2-e / kg BAM

Table notes:
1. DCCEEW, 2025
2. National Greenhouse and Energy Reporting (Measurement) Determination 2008, Compilation 20
3. Full Carbon Accounting Model (FullCAM) (Richards, 2001)
4. Department of Energy Security and Net Zero, 2025
5. National Material Emission Factors Database, 2026
6. Calculating upfront carbon: Australia's spend-based factor for calculating Scope 3 construction emissions (Slattery Australia Pty Ltd., 2025)
7. Aurizon Sustainability Report (2025)
8. Gao* et al. *(2018)

It returns the total tonnes of carbon per hectare (t C / ha) for the vegetation type (Table 5). The t C values are converted to t CO_2-e by multiplying them by the ratio of the molecular weight of carbon dioxide to that of carbon (i.e., 44/12). The t CO_2-e is then multiplied by the vegetation type area (in hectares) cleared. Land clearing is assumed and modelled as occurring entirely in Year 1, with the pre-clearing carbon stock assumed as being emitted in the same calendar or financial year.

The clearing footprint 2,413.7 (ha), supplied by Graphinex as a shapefile, was classified by regional ecosystem (RE) type using The Vegetation Queensland, Description of Broad Vegetation Groups Version 6.0. Broad vegetation groups (BVG) for the site were matched to the applicable FullCAM vegetation type (Appendix A) and the total carbon stock loss over the LOP, following clearing, was calculated by running FullCAM simulations of 100% clearing for each FullCAM vegetation type.

4.4.5 Scope 1 emissions intensity of production

The Scope 1 emissions intensity of production is calculated by the total CO_2-e from NGER emission sources divided by the tonnes of ROM ore produced. This is a benchmark that can be used to assess operational efficiency, compare performance across different scales, and guide decarbonisation efforts.

4.5 Scope 3 Emissions - Method

Scope 3 emissions are calculated under the GHG Protocol Corporate Value Chain (Scope 3) Standard, using the Technical Guidance for Calculating Scope 3 Emissions to select the appropriate calculation method (supplier-specific, hybrid, average-data, or spend-based) for each of the categories. Materiality of each Scope 3 category is determined by screening all 15 categories against the GHG Protocol's relevance criteria, i.e., size (magnitude relative to total emissions), influence (the reporting company's ability to reduce emissions in that category), risk, stakeholder interest, outsourcing potential, and sector guidance, rather than by calculating precise emissions for every category upfront.

Categories judged material (or where relevance can't be ruled out) are quantified using the best available data and method, while immaterial categories are excluded with the screening rationale documented for transparency.

Emission factors (Table 5) are drawn from secondary databases and government sources appropriate to each activity and location, i.e., for Australia, the National Greenhouse Accounts (NGA) Factors (DCCEEW); for the USA, EPA eGRID and the EPA GHG Emission Factors Hub; and, where a supplier-specific or industry factor isn't available, recognised life-cycle inventory databases. Factor selection follows the GHG Protocol's data quality hierarchy, prioritising supplier-specific primary data over industry-average secondary data, with the basis and vintage of each factor documented for transparency.

The majority of Scope 3 emissions have been conservatively assumed to occur within Australia, apart from emissions associated with shipping saleable graphite to overseas customers (Category 9 GHG emissions) and the processing of sold product (Category 10).

4.5.1 Category 1 and 2: Purchased goods and services and capital goods

A variation of Method 1 is used to calculate Scope 3 emissions (t CO_2-e) of purchased goods and services and capital goods, i.e.:

$$\frac{\mathbf{Q} \times \mathbf{EF}}{\mathbf{1000}},$$

where Q is the volume (metres cubed, m^3), mass (tonnes) or cost ($) of the materials and services, and EF is the published emissions factor (Table 5).

4.5.2 Category 3: Fuel and energy related activities

EFs from the National Greenhouse Accounts Factors (Table 5) for the upstream extraction and processing of liquid fuels (diesel oil and PBOGs) were applied to diesel consumption data provided by Graphinex to evaluate total Scope 3 GHG emissions resulting from the production of liquid fuels for the Project.

4.5.3 Category 4: Upstream transportation and distribution

Upstream transportation and distribution emissions were estimated using freight activity data based on the number of vehicle trips, one-way transport distances and estimated goods carrying capacities for each vehicle type. These inputs were used to estimate total annual freight activity in tonne kilometres (t.km). Emissions were then calculated by applying the relevant vehicle EFs provided in Table 5. The estimated goods carrying capacities applied for each vehicle type are summarised in Table 6.

Table 6 Freight vehicle carrying capacities

Vehicle	Concrete Mixer	Class 3	Low Loader	Class 9 AV	B-Double
Carrying Capacity (t)	15	32	45	12	44

For the construction phase, upstream freight activity includes concrete mixer trucks travelling approximately 105 km from Croydon to the Project site, based on 2,920 trips. Class 3 vehicles, low loaders, Class 9 AVs (Class 9 articulated vehicle), and B-doubles were assumed to travel approximately 750 km from Townsville to the Project site, based on 4,380, 730, 1,460 and 9,490 trips, respectively.

For the operation phase, supplied freight data were split into two stages. Stage 1, covering Project Years 1 to 3, includes 662 B-double trips per year from Townsville to the Project site. Stage 2, covering Project Years 4 to 53, includes 819 B-double trips per year from Townsville to the Project site. A one-way transport distance of approximately 750 km was applied for both stages.

4.5.4 Category 5: Waste generated in operations (immaterial)

Waste streams such as tailings, process residues, or on-site treated wastewater are already managed within the operational boundary — where any associated emissions (e.g., from on-site waste treatment, decomposition, or incineration under the company's operational control) are captured directly under Scope 1. Counting these same emissions again under Category 5 would result in double-counting between Scope 1 and Scope 3. Category 5 can reasonably be assessed as immaterial as off-site disposal is minor in volume and emissions-intensity relative to the operation's core process emissions, and most waste-related emissions are accounted for in Scope 1 because treatment occurs on-site.

4.5.5 Category 6: Business travel (immaterial)

Travel will be limited to periodic corporate, technical, and regulatory-liaison trips; workforce activity is concentrated on-site rather than travel-intensive, making this category small relative to the operation's core energy- and process-driven emissions.

4.5.6 Category 7: Employee commuting (immaterial)

Site-based mining and processing operations will involve a relatively small workforce commuting or on rostered/FIFO arrangements, and the associated emissions are minor compared to the extraction, beneficiation, and processing emissions that dominate the inventory.

4.5.7 Category 8: Upstream leased assets (immaterial)

Where the operation owns and operationally controls its mining equipment, plant, and processing infrastructure (already captured under Scope 1), any leased assets will typically be minor in scale or already reflected in the operational boundary, making separate quantification immaterial and avoiding double-counting.

4.5.8 Category 9: Downstream transportation and distribution (material)

The Project will produce graphite concentrate for end product use in battery anodes for energy storage and/or use in electric vehicles. The distribution of the graphite concentrate involves the transportation of product via B-double road trucks (single trips only) and then shipping to the USA. 300 tonnes of material will be processed at the Graphinex Battery Anode Demonstration Facility in Townsville.

Emissions from road freight were calculated applying a similar methodology described in section 4.5.3. Total product tonnage was multiplied by the one-way distance from the Project site to Townsville, approximately 750 km, to estimate freight activity in tonne kilometres. The Articulated HDV >33t EF in Table 5 was then applied. Data on road freight and shipping locations along with respective tonnage of product graphite transported to each destination are provided in Appendix C, Table C1. The downstream distribution of the Project involves the shipping of the end use graphite concentrate from the Port of Townsville to international receiving ports in the USA. Although subsequent distribution to European, Korean and Japanese markets is anticipated, this has been excluded from the assessment due to data unavailability and uncertainty in the associated product weights.

Emissions resulting from shipping of end product used The Department of Energy Security and Net Zero's (2025) average bulk carrier emission factor (Table 5). The respective tonnage of product and distance per destination was multiplied by the EF (Table 5). The respective tonnage of end product graphite and distance was multiplied by the EF. All shipping was conservatively assumed to occur via the Port of Townsville due to limited information on export port allocation by destination.

4.5.9 Category 10: Processing of sold products (material)

Life cycle GHG emissions for natural graphite battery anode material (BAM) production range between 5-10 kg CO_2-e per kg graphite BAM (Gao *et al*. 2018). Conversely, synthetic graphite production has an emission factor of 29.7 – 30.5 kg CO_2-e/kg BAM, due primarily to the graphetisation of calcined petroleum coke or coal-tar pitch (Pandey *et al*. 2025).

The upper EF of 10 kg CO_2-e / kg BAM has been applied in this assessment.

4.5.10 Category 11: Use of sold products (immaterial)

Graphite concentrate and battery anode material are intermediate inputs incorporated into a further-manufactured product (battery cells), rather than end-use products that themselves consume energy or generate direct emissions during use by a consumer. The graphite itself is inert once incorporated into an anode, i.e., it doesn't combust, degrade, or draw energy over its service life, so any use-phase emissions belong to the downstream battery or end-product manufacturer's Category 11 assessment, not to the company.

4.5.11 Category 12: End-of-life treatment of sold products (immaterial)

Graphite concentrate and anode material are intermediate mineral products incorporated into long-lived battery systems; the company has limited visibility or control over eventual battery end-of-life treatment, and the graphite itself, as an inert mineral, generates negligible emissions at disposal or recycling.

4.5.12 Category 13: Downstream leased assets (immaterial)

This category applies only where the company leases assets to other entities as a lessor. The company will retain and operate its own assets rather than leasing them out, making the category not applicable.

4.5.13 Category 14: Franchises (not applicable)

The Project does not operate under a franchise business model.

4.5.14 Category 15: Investments (not applicable)

This category is most relevant to financial institutions and companies with material equity holdings or joint ventures outside the consolidated reporting boundary. The company is an entity without unconsolidated investments, therefore emissions from this category are not applicable.

5. GREENHOUSE GAS EMISSIONS INVENTORY

5.1 Summary

Unabated and abated GHG emissions associated with the Project for Scope 1 and Scope 3 emissions over the construction, operational, and rehabilitation phases of the mine are presented in Table 7. The abated case denotes actual operation (i.e. committed abatement measures) whilst the unabated case denotes forecast emissions if these measures were not committed.

Table 7 Summary of unabated and abated LOP and average annual GHG emissions (t CO_2-e rounded to nearest tonne)

Scope	Metric	Unabated emissions	Abated emissions
Scope 1	Average annual	121,614	85,169
	Total emissions	6,567,130	4,599,146
Scope 3	Average annual (within Australia only)	44,039	34,556
	Average annual (outside Australia only)	1,891,774	1,891,774
	Total emissions (within Australia only)	2,378,093	1,866,010
	Total emissions (outside Australia only)	102,155,779	102,155,779
	Total emissions	104,533,872	104,021,789
Totals	Total GHG emissions	111,101,003	108,620,935
	Total average annual (within Australia)	165,652	119,725
	Total average annual (within and outside Australia)	2,057,426	2,011,499
Contributions	Total average annual emissions (within Australia) as % of Queensland current annual emissions	0.12%	0.089%
	Total average annual emissions (within Australia) as % of Australia current annual emissions	0.036%	0.026%
	Total average emissions (within and outside Australia) of global current annual emissions	0.0042%	0.0041%

The GHG assessment estimated the total unabated Life of Project (LOP) Scope 1 emissions at 6,567,130 tonnes of carbon dioxide equivalent (t CO_2-e) with average annual Scope 1 emissions of 121,614 t CO_2-e (Table 7). There are no Scope 2 emissions associated with the Project as all electricity will be generated on-site. Total unabated LOP Scope 3 emissions are estimated at 104,533,872 t CO_2-e, with average annual emissions of 1,935,812 t CO_2-e. Total unabated Scope 3 emissions within Australia are 2,378,093 t CO_2-e with an annual average of 44,039 t CO_2-e. Total Scope 3 emissions outside Australia for the abated and unabated case are 102,155,779 t CO_2-e, with an average annual of 1,891,774 t CO_2-e (Table 7).

Total average annual emissions within Australia are 0.089% of Queensland's latest (2024) emissions inventory[4], 0.026% of Australia's latest (2024) emissions inventory[4], and 0.0041% of the latest (2023) global emissions inventory[5].

Following application of the abatement measures in section 6, the Life of Project (LOP) Scope 1 emissions are estimated at 4,599,146 t CO_2-e (~30% reduction) with average annual Scope 1 emissions of 85,169 t CO_2-e. Total abated LOP Scope 3 emissions are estimated at 104,021,789 t CO_2-e, with average annual emissions of 1,926,329 t CO_2-e. Total abated Scope 3 emissions within Australia are 1,866,010 t CO_2-e, with average annual emissions of 34,556 t CO_2-e. The reduction in these values compared to the unabated case is due to the reduction in diesel consumed.

5.2 Abated Scope 1 emissions

5.2.1 NGER and Safeguard Mechanism obligations

The NGER facility level thresholds of 25 kt CO_2-e and of 100 TJ are exceeded in all project years and will need to be accounted for in annual corporate NGER scheme reporting in accordance with the *NGER Act 2007* and supporting legislation.

The facility is not subject to the Safeguard Mechanism under the current threshold, with maximum committed abated Scope 1 emissions of 94,294 t CO_2-e projected in year 41 (Table B2).

5.2.2 NGER reportable emissions

The committed abated and thus NGER reportable LOP emissions are estimated at 4,203,072 t CO_2-e (Table 8).

- Diesel emissions from generator use are expected to be the largest contributor to the reportable inventory at 2,748,274 t CO_2-e (~65%)
- Diesel combustion for stationary plant and machinery is expected to be the second largest contributor of Scope 1 emissions, totaling 1,407,835 t CO_2-e (~33%)
- Diesel combustion for transport vehicles is expected to contribute 31,627 t CO_2-e (~1%) to Scope 1 emissions
- PBOGs contribute 15,337 t CO_2-e (<1%) to Scope 1 emissions.

Table 8 Abated Scope 1 emissions (t CO_2-e rounded to nearest tonne)

Source	GHG emissions (t CO_2-e)				NGER reportable emissions (t CO_2-e)
	CO_2	CH_4	N_2O	Total	
Diesel (stationary excl. generators)	1,401,818	2,005	4,011	1,407,835	1,407,835
Diesel (generators only)	2,736,529	3,915	7,830	2,748,274	2,748,274
Diesel (transport)	31,397	4	225	31,627	31,627
PBOs	12,252	-	-	12,252	12,252
PBGs	3,085	-	-	3,085	3,085

[4] https://pure.iiasa.ac.at/id/eprint/20986/1/essd-2025-659.pdf
[5] https://ageis.climatechange.gov.au/

Onsite Waste Treatment [1]	-	-	122	122	-
Land Clearing [1]	377,148	-	-	377,148	-
Diesel (explosives) [1]	18,724	27	54	18,804	-
Total Scope 1	**4,580,954**	**5,952**	**12,241**	**4,599,146**	**4,203,072**

[1] ***Not reported under NGER***

5.2.3 Non-NGER-reportable emissions

Vegetation clearing during construction accounts for 377,148 t CO_2-e (Table 8), while emissions from explosives account for 18,804 t CO_2-e over the LOP, with a maximum of 933 t CO_2-e (Table 8) emitted in year 1 (Table B2, Appendix B). On-site waste treatment accounts for 122 t CO_2-e over the LOP.

5.2.4 NGER reportable energy consumption

The total energy consumption for the abated LOP is estimated at 67,780,564 GJ (Table 9). Diesel used in generators is the dominant energy source, accounting for ~58% of LOP energy consumption, followed by diesel used in stationary plant and machinery (excluding generators) at ~30% and then diesel used in the reagents process and is not combusted accounts for ~9%. Diesel combusted in road registered transportation vehicles, petroleum-based oils and petroleum-based greases all account for ~1% of LOP energy consumption. The Project will generate electricity on-site and will not be purchasing power from the national electricity market (NEM).

Table 9 Energy consumed by NGER category for LOP (abated)

Source	Energy Consumed (GJ)
Diesel - stationary (excl. generators)	20,054,625
Diesel - stationary (incl. generators)	39,149,201
Diesel - transport	449,177
Diesel - explosives	267,867
Diesel - reagent (not combusted)	6,096,870
Oils	881,412
Greases	881,412
Total	**67,780,564**

5.3 Scope 3 Emissions

Scope 3 emissions for the committed abatement case are primarily due to the downstream processing of graphite to battery anode material (BAM) (97.59% of the total, Category 10); the downstream distribution of the concentrate (1.17% of the total; Category 9) and the upstream production of fuels (1.10% of the total; Category 3). Annual Scope 3 emissions for the LOP by category may be viewed in Appendix B, Table B3.

6. MANAGEMENT CONTROLS TO ABATE GHG EMISSIONS

The following management controls will be applied to the Project, where practicable and cost-effective, to achieve GHG emissions abatement. They are structured by the key result areas (KRA) of the GHG Guidelines abatement hierarchy, i.e., avoid, reduce, substitute, and offset. The indicative risks and opportunities, and potential emissions reduction associated with each management control are presented in Table 10.

6.1 GHG emissions reference point

The GHG emissions reference point for the Project represents the level of emissions against which ongoing reduction of GHG emissions will be assessed throughout the life of the Project, based on projected GHG emissions (excluding land clearing and diesel used in explosives) prior to the implementation of GHG abatement measures. The GHG reference points concern only the operational phase of the Project, whereby graphite ore is mined and concentrated.

The total unabated Scope 1 GHG emissions arising from the operational phase (Project year 2 – 50) of the Project are 5,624,233 t CO_2-e, with average annual Scope 1 GHG emissions of 114,780 t CO_2-e. These form the Project baseline and reference point for NGER reporting.

The average emission intensity of operations is 0.03 t CO_2-e / t ROM ore.

Progressive emission reductions will be measured against the GHG emission reference points at maximum operation and the respective emission intensities.

6.2 Project Scope 1 emission reduction target

Graphinex commits to reducing net Project Scope 1 emissions by 30% relative to the unabated reference case through the implementation of the following abatement measures.

This target aligns with the goal of achieving net-zero by 2050 trajectory outlined in the *Clean Energy Jobs Act 2024*.

6.3 Project alternatives for emissions reduction – evaluation

Table 10 sets out the emissions reduction measures identified for the Project, following the GHG abatement hierarchy (avoid, reduce, substitute, offset). The measures address the Project's principal Scope 1 sources, i.e., diesel for power generation and the mobile fleet, and land clearing. The measures that could be defined at the current stage of design are committed, have SMART targets, and are included in the Project's emissions estimates. These are the hybrid solar–diesel–battery power station (A1), renewable-first dispatch (R1), fleet and equipment efficiency (R2), and clearing restricted to the approved footprint (A3).

The hybrid power station was selected over diesel-only supply and is expected to reduce power-generation emissions by 40–45%. Other alternatives depend on future design and commercial and network decisions that have not yet been made, so their abatement potential, cost and technical feasibility have not yet been quantified. These include expanded renewable capacity (S1), an in-pit electric conveyor (S2), a low-emission light vehicles and heavy fleet (S3), NEM connection with renewable electricity supply (S4) and renewable diesel (S5). For each of these, the proponent commits to a defined assessment (a feasibility study, trial or review) by 2030. Each assessment will quantify net emissions reduction (t CO_2-e/yr), cost, and feasibility, and will apply rigorous decision criteria.

The Abatement Plan will be updated with the outcome of each assessment, and the outcome will be reported publicly with the reasons for adopting or not adopting each measure. The emission reduction target (T1) is currently only dependent on the committed abatement measures and will be updated if a measure is found feasible in each five-year review.

Consequently, some targets and metrics in Table 10 are yet to be determined and will be developed through the feasibility studies that will inform final investment decisions (FID). The abatement plan will then be updated accordingly.

6.4 Abatement hierarchy key result areas

The management controls below follow the GHG Guideline's abatement hierarchy. Each committed control has a defined action, performance measure, target, monitoring criteria and timeframe as set out in Table 10. Graphinex will implement them through the GHG Abatement Plan.

6.4.1 Avoid

The objective is to avoid GHG emissions through design and planning decisions made before operations begin.

- **Hybrid power station (A1).** The main avoidance measure is a 21.3 MWp solar PV farm and 1.6 MWh BESS integrated with the diesel power station. It will be commissioned before first ore processing, so the Project will never operate on diesel alone. The power station is sized to an average demand of approximately 16 MW, which avoids oversizing and unnecessary fuel use.
    - Performance targets. The hybrid system is designed to achieve at least 38.7% renewable penetration and a system emissions intensity of 0.44 kg CO_2-e/kWh. Both will be verified from metered data each reporting year. Compared with a diesel-only supply, this reduces diesel power generation emissions by about 41%.
- **Land clearing (A2).** Clearing will be limited to the approved disturbance footprint of 2,413.7 ha and carried out in the year of construction. Mine planning and site layout also minimise haul distances and vehicle movements.

6.4.2 Reduce

Where emissions can't be avoided, the objective is to reduce the emissions intensity of operations.

- **Renewable-first dispatch (R1).** An energy management system will dispatch solar and battery power ahead of diesel. It will shut down generators when renewable supply allows, known as hydrocarbons-off (HOFF) operation, and keep running generators at efficient loads. The hours of operation and resulting diesel combusted by the power supply will be monitored monthly whilst the effectiveness of the energy management system will be reviewed annually for potential optimisations.
- **Fleet and equipment efficiency (R2).** A fleet management system will monitor idle time, payloads and haul routes, and equipment will be serviced to Original Equipment Manufacturer (OEM) schedules. The target is to reduce Scope 1 emissions from mobile fleet and stationary equipment by 5% within five years, against a baseline set from the first full year of steady-state mining.

Table 10 GHG abatement plan SMART management controls

Key Result Area	Management Control (SMART)	Timeframe	Risk assessment (risks, cost, practicality, effectiveness)	Indicative Opportunities	Justification and best practice comparison	Emissions reduction estimate for Project
Targets	**T1. Reference point and emission reduction targets** **Action:** Adopt a net Scope 1 reference point equal to projected unabated emissions as set out in Table 7 and manage emissions to the targets below. **Measure:** Annual Scope 1 emissions (t CO_2-e) calculated using NGER methods and compared with the reference point for the same year and stage; emissions intensity (t CO_2-e per t graphite concentrate). **Target:** Scope 1 emissions 30% below the reference point by Project Year 5, with targets reviewed thereafter.	• Reference point fixed in first version of GHG Abatement Plan • Net Scope 1 emissions calculated annually	• Production variability changes absolute emissions. The reference point is stage-specific and is restated if production differs from plan by more than 10% • If Scope 1 exceeds 100,000 t CO2-e/yr, the Safeguard Mechanism baseline replaces the reference point for Scope 1	• Links every measure to a target year	• Application of best practice emissions reduction options for energy generation based on feasibility assessment	• Reference point: 121,614 t CO_2-e/yr at steady state; 6,567,130 t CO_2-e over the life of the project (LOP) • LOP emission reduction : 1,967,984 t CO_2-e; annual average emission reduction 36,444 t CO_2-e
Avoid	**A0. Project alternatives considered** **Action:** Document the design and site alternatives considered to avoid emissions, including power supply (diesel-only, hybrid, grid), purification process route, haulage method, plant location and footprint, and the alternative of not proceeding. State the option selected and why. **Measure:** Alternatives assessment included in the EIS GHG chapter **Target:** Completed for EIS submission.	• Before EIS submission	• An information request is likely if alternatives not considered • Alternatives not feasible at FID (NEM connection, conveyor) are carried forward as S2 and S4	• Shows that the hybrid power station (A1) was selected over diesel-only supply on emissions and cost grounds	• Guideline s3.3 (Avoid): explain feasible alternatives considered to avoid or reduce emissions, including not proceeding	• Principal contributor to site-wide emissions reduction (see below)
	A1. Hybrid solar–diesel–BESS power station **Action:** Design, construct and commission a 21.3 MWp solar farm and 1.6 MWh BESS integrated with the diesel power station, so that no part of the operating phase relies on diesel-only generation.	• PV and BESS commissioned before first ore processing • Performance verified at end of first full operating year	• Increased generator emissions intensity from part-load operation and managing residual diesel generation • Variability in renewable penetration from seasonal and weather-related intermittency • High initial installation cost	• Energy security and independence • Reduced diesel consumption and exposure to fuel price volatility • Low operating and maintenance costs	• Hybrid PV–BESS–diesel supply is established practice for off-grid Australian mines • Selected over diesel-only supply (A0)	• ~41% reduction in power-generation Scope 1 emissions relative to diesel-only supply. • Average reduction of 35,159 t CO_2-e/yr or 1,898,595 t CO_2-e for the LOP.

	Measure: Annual renewable penetration (% of site electricity from PV/BESS) and system emissions intensity (kg CO_2-e/kWh), from metered generation and fuel data. **Target:** ≥38.7% renewable penetration and 0.44 kg CO_2-e/kWh, averaged over each reporting year. **Monitoring:** PV, BESS and generator output, and fuel use logged continuously by the EMS; annual performance report.		• Battery degradation, storage performance and/or equipment failure • Control system integration challenges	• Predictable generation profile supporting forecasting and future grid integration • Peak shaving and load shifting via BESS		• Principal contributor to the site-wide 30% target
	A2. Minimise land clearing and carbon stock loss **Action:** Restrict clearing to the approved disturbance footprint **Measure:** Area cleared (ha) against approved footprint and schedule; clearing emissions (t CO2-e) estimated using FullCAM or NGA methods **Target:** Zero clearing outside the approved footprint **Monitoring:** Clearing permits and as-cleared surveys; reported following construction	• From start of construction (2027) • From start of construction	• May increase the complexity of mine scheduling and access to high value resources • Cost: Low • Practicality: High • Effectiveness: Limits clearing emissions in the inventory estimate	• Reduced clearing means reduced rehabilitation requirements, PMLU obligations, and costs • May improve ability to sequester extra carbon in the PMLU	• Clearing emissions are within the Guideline scope (land use assessment, s2.2) although not reported under NGER • Footprint control is standard practice for vegetation management	• Maximum clearing emissions of 377,148 t CO_2-e included in Scope 1 inventory
Reduce	**R1. Renewable-first dispatch and generator efficiency** **Action:** Operate an energy management system (microgrid controller) that dispatches PV and BESS ahead of diesel, shuts down generators when renewable supply allows (HOFF), and loads running generators within their efficient operating range. **Measure:** Hours of diesel generation and the resulting kL combusted **Target:** 42.5% reduction in emissions resulting from the combustion of diesel for electricity generation **Monitoring:** EMS data; monthly KIP report; annual check of meter calibration	• Energy management system commissioned with PV/BESS • Annual review of energy management system effectiveness	• Part-load operation raising generator emissions intensity • Seasonal and weather intermittency reducing HOFF • Battery degradation or equipment failure • Control system integration challenges • Cost: Included in A1 capex • Practicality: High • Effectiveness: High • Technology risk: Low	• Maximises return on renewable investment • Fewer generator run-hours and lower maintenance • Predictable energy pattern for forecasting	• Automated renewable-first dispatch and generator loading control is standard for hybrid microgrids	• Delivers the A1 reduction

	R2. Mobile fleet and stationary equipment efficiency **Action:** Implement a fleet management system (FMS) with idle-time alerts, payload monitoring and haul-route optimisation. Service engines, generators and compressors to OEM schedules with performance monitoring. **Measure:** Fleet fuel intensity (L diesel per tonne of material moved); idle time (% of engine hours); average payload (% of rated); fuel use per unit output for stationary equipment. **Target:** Reduce fleet fuel intensity by 5% against a baseline set from the first full year of steady-state mining, to be achieved within five years of the baseline being established **Monitoring:** FMS and fuel dispensing records; annually reports (at a minimum)	• FMS operational from start of mining • Baseline set from the first full year of steady-state mining • Target to be achieved 5 years after the baseline	• Operational coordination complexity with haul routes, scheduling and mine utilisation • Reduced flexibility in operational timing, especially during peak production • Maintenance constraints • Cost: Payback from fuel savings expected within three years • Practicality: High • Effectiveness: Medium • Technology risk: Low	• Reduced fuel consumption and operating costs • Improved equipment efficiency and maintenance standards • Lower emissions intensity per unit of material moved	• FMS, idle control and payload management are standard practice in Australian open-cut mining	• 5% reduction in Diesel emissions from Project Years 5 to 53; equivalent to 1,285 t CO_2-e/yr (on an average basis) or 69,389 t CO_2-e for the LOP.
Substitute	**S1. Renewable capacity expansion** **Action:** Assess expanding PV and BESS capacity at each five-yearly Abatement Plan review **Commitment:** review previous and future committed; installation conditional on the decision criteria. **Decision criteria:** available land constraints and levelised cost ≤ diesel generation cost **Measure:** annual renewable penetration (%) and site power demands **Target:** To be determined based on feasibility review	• Review every 5 years	• Land availability and capital cost • Curtailment without additional storage • Cost: To be determined per additional MWp / MWh • Practicality: High • Effectiveness: High; limited by storage • Technology risk: Low	• Further diesel reduction • Lower exposure to fuel price volatility	• Guideline App. A (f): regular review of new technologies and opportunities	• To be quantified in feasibility study
	S2. In-pit electric conveyor **Action:** Complete a feasibility study for an electric conveyor from the mine pit to the process plant, replacing diesel haul trucks. Study to include net emissions after	• Feasibility study completed by Project year 3 • Implementation subject to study outcome	• High upfront capital • Technology readiness and operational disruption during transition • Added electricity demand met partly by diesel generation,	• Displaces haul truck diesel • Higher energy efficiency than diesel haulage • Lower operating costs	• In-pit crushing and conveying is an established lower-emission alternative to truck haulage	• To be quantified in the feasibility study

	allowing for the additional site electricity demand **Commitment:** feasibility study; implementation conditional **Decision criteria**: proceed if net present value is better than the haul truck case; T1 targets unchanged if not adopted. **Measure:** Study completed and decision recorded; diesel displaced (L/yr) after commissioning **Target:** Feasibility study by end of Project Year 3		reducing net benefit unless renewables expand (S1) • Cost: capex to be determined • Practicality: depends on pit geometry and mine life • Effectiveness: medium to high; net benefit depends on S1/S4 • Technology risk: low (proven); site-specific risk moderate			
	S3. Low-emission mining and light vehicle fleet **Action:** Evaluate battery-electric or hybrid light vehicles and battery-electric, hybrid or trolley-assist options for the heavy mining fleet at each fleet replacement cycle. **Criteria:** Procure low-emission options where OEM equipment is commercially available and offers a lower lifecycle cost inclusive of ancillary infrastructure (on a net present value basis) than diesel equivalents. **Commitment:** Evaluation studies	• Evaluate low-emission mining and light vehicle fleet at each fleet replacement cycle	• Charging infrastructure and capital cost • Disruption during transition between diesel and electric systems • Cost: light vehicles low; heavy fleet high • Practicality: high (light); uncertain (heavy) • Technology risk: medium to high for heavy fleet	• Progressive integration of emerging technologies	• Fleet electrification is cited in Guideline App. C	• To be determined from evaluation
	S4. NEM connection and renewable PPA **Action:** Complete a NEM connection feasibility assessment **Commitment:** When connection becomes available **Target:** Connection decision within 12 months of capacity becoming available and feasibility assessed;	• Feasibility study when connection becomes available • Connection subject to network availability	• Introduces Scope 2 emissions • Uncertain network timing and connection cost • Uncertain availability, cost and additionality of renewable PPAs • Cost: To be determined for FID • Effectiveness: High • Technology risk: Low; availability risk high	• Enables wider electrification (S2, S3) • Substantially lower diesel consumption	• Scope 2 to reduce as grid decarbonises	• Up to 100% of generator Scope 1 emissions, partly replaced by Scope 2 at the Queensland grid factor, declining over time, unless covered by a renewable PPA
	S5. Renewable diesel and biodiesel blends **Action:** Complete a feasibility study for adoption of renewable diesel (HVO) or biodiesel blends in mobile or stationary equipment.	• When supply is reliable, OEM warranties would be maintained, and cost premium could be abated	• Supply availability in regional Queensland • Cost premium and sustainability certification • Engine compatibility • Cost: Fuel premium	• Drop-in fuel for existing equipment with little capital • Reduced exposure to diesel price volatility	• Recognised substitution measure (Guideline s3.3, lower-carbon fuels)	• CO_2 reduced in proportion to the renewable fraction of the fuel

	Commitment: Feasibility assessment once renewable diesel and biodiesel blends are commercially available.		• Practicality: High (drop-in) • Technology risk: Low; supply risk high			
Review, monitoring, and reporting	**G1. Abatement Plan review and public reporting** **Action**: Review the Abatement Plan every five years, including an assessment of new technologies and progress against targets. Publish an annual progress report against the Plan targets. First review of dates following approval and commissioning. **Monitoring and auditing:** annual Scope 1 emissions calculated using NGER methods; independent audit against T1 by an appropriately qualified person every [2] years. **Reporting:** annual public report on Proponent's website covering emissions against T1, status of each measure (including decisions on S1–S5 with reasons) and offsets used. **Measure:** Review completed; annual public report published **Target:** Review every five years; annual report published by 31 December each year	• Review of target dates following project approval and commissioning • Annual reporting from first NGER year FY28 • Five-yearly reviews • Audit every three years	• Reporting burden • Public scrutiny if targets are missed	• Meets Guideline requirements for technology review and public reporting • Supports ESG and climate disclosure obligations	• Guideline App. A (f) technology review, (g) monitoring and auditing, (h) public reporting	• Enabling measure; no direct reduction claimed

6.4.3 Substitute

The objective is to progressively replace diesel with lower-emissions energy sources and technologies. Each option below has a decision point, so it will be either adopted or ruled out on defined criteria.

- **Renewable expansion (S1).** Additional solar and battery capacity will be assessed at each five-yearly Abatement Plan review. The current system is expected to generate about 52,960 MWh of renewable electricity each year.
- **Electric conveyor (S2).** A feasibility study for an in-pit to plant electric conveyor to replace diesel haul trucks will be completed by Project year 3. The study will calculate the net emissions benefit and net present value after allowing for the extra electricity demand.
- **Low-emission fleet (S3).** Battery electric and hybrid options for light vehicles, and battery electric, hybrid and trolley-assist options for mining machinery, will be evaluated at each fleet replacement.
- **Grid connection (S4).** Grid connection will be assessed once sufficient network capacity is available, such as on completion of CopperString 2032, with a decision made within 12 months of capacity becoming available. Connection would replace on-site diesel generation but introduce Scope 2 emissions, as Queensland's grid emissions factor currently exceeds that of the Project's diesel generation. This gap is expected to narrow as the grid decarbonises. A renewable power purchase agreement will be evaluated on connection
- **Renewable fuels (S5).** A feasibility study for renewable diesel and biodiesel blends in mining equipment will be completed once supply is reliable, OEM warranties are maintained, and the cost premium over conventional diesel is commercially acceptable.

6.4.4 Offset

Offsets will only be purchased if the Project becomes subject to the Safeguard Mechanism, which applies where Scope 1 emissions exceed 100,000 t CO_2-e per year. In that event, the Project's Safeguard baseline will become the reference point, and offsets will be used only as a last resort to address residual emissions above the baseline that cannot be reduced through on-site abatement. Preference will be given to Australian Carbon Credit Units (ACCUs) generated by Queensland-based projects, subject to availability

6.5 Mitigating Scope 3 emissions

Graphinex will regularly review options for GHG abatement measures across the highest emitting parts of its supply chain. Scope 1 abatement measures implemented for the Project will reduce associated upstream Scope 3 emissions from the extraction, production and transport of fuels consumed by the Project.

Current Scope 3 abatement measures are focused on upstream and downstream transportation and distribution, which are presently assumed to rely on road freight between Townsville and the Project site. Graphinex is reviewing the potential of using the Mount Isa line system to reduce long distance road haulage. Under this option, freight would be transported by road-train trucks approximately 285 km between the Project site and Julia Creek, then by rail approximately 650 km between Julia Creek and the Port of Townsville.

Replacing the assumed all-road freight route with the road and rail option is estimated to reduce:

- Downstream transportation and distribution emissions by approximately 271,273 t CO_2-e over the LOP

- Upstream transportation and distribution emissions by approximately 86,204 t CO_2-e over the LOP. This estimate does not assume rail freight is used during Project Year 1, as construction phase freight is assumed to be transported by road.

Graphinex will also apply other Scope 3 abatement opportunities where practicable, including:

- Lower emission capital goods (low carbon steel and green concrete)
- Logistics optimisation
- Ongoing Scope 3 monitoring and evaluation by working with suppliers and customers to reduce carbon footprint
- Research initiatives into reducing the lifecycle and embodied carbon intensity of the Project's sold products for opportunities to contribute to lifecycle improvements of products

The largest Scope 3 emissions are due to the processing of the graphite into BAM by international third-parties (Table B3). Graphinex does not have control over these emissions, but notes a) BAM is a critical input to lithium-ion batteries for electric vehicles and energy storage, and b) the production of BAM from natural graphite is significantly less emissions intensive than synthetic graphite production (section 4.5.9).

International shipping to end-use countries is expected to remain the second largest Scope 3 emission source (Table B3). These emissions are influenced by shipping routes, vessel availability, and market demand therefore are outside of Graphinex's direct control.

6.6 Monitoring, Evaluation, and Reporting

Graphinex will review the Abatement Plan every five years, including an assessment of new technologies (G1). Progress against the Plan's targets (Table 10) will be reported publicly each year by 31 December.

A first review of target dates will be conducted following project approval and commissioning to allow for delays in project commencement.

6.7 Assessment of decarbonisation pathways for the mining sector

Decarbonisation of the mining sector is a rapidly changing space, driven in large part by the Safeguard Mechanism requirements. Expected best practice includes planning, designing, constructing, and operating mine sites for the efficient use of diesel, whilst ultimately electrification of plant and equipment is emerging as best practice (Davies, 2024). However, there are still limitations in market availability and cost-competitiveness against traditional diesel options.

Graphinex is continually investigating a range of improved diesel-use efficiency and electrification options, and these will be periodically reviewed and implemented where feasible for the Project.

Practicable and economically feasible emission reduction, abatement, or offsetting options will be considered for implementation when the business case is met. Each option will have its effectiveness monitored and reported if necessary.

7. RISKS AND LIKELY MAGNITUDE OF IMPACTS ON ENVIRONMENTAL VALUES

The increasing concentration of greenhouse gases in the atmosphere, primarily due to the combustion of fossil fuels and deforestation, is leading to the warming of oceans, land, and atmosphere. This warming increases the heat energy available in the climate system leading to changed weather patterns including more frequent and intense extreme weather events.

The Project is located ~70 km south of Croydon in the Gulf region, Queensland. The Gulf region is in the wet-dry tropics (savanna) and is generally hot to very hot throughout the year. Key climate risks for this region include (Department of Energy and Climate, 2024):

- increased frequency of hot days (>35ºC) and very hot days (>40ºC)
- increased likelihood of extreme bushfire weather
- increased likelihood of variable rainfall, affected by local factors such as topography and vegetation, and broader scale weather patterns e.g. The El Niño - Southern Oscillation
- increased frequency and severity of drought
- increased pan evaporation rates, which in turn affects drought and fire conditions
- less frequent but more intense tropical cyclones
- warmer and more acidic ocean
- rising sea levels and more frequent coastal and open ocean extreme events.

The Project is not expected to prevent Queensland from achieving the emissions reduction targets in the *Clean Economy Jobs Act 2024* (section 3.2.7). Consistent with the abatement hierarchy in the GHG Guideline (ESR/2024/6819), emissions have been avoided and minimised at the design stage, and the GHG Abatement Plan commits to further reductions by Queensland's critical milestones, offsetting residual emissions only after these measures are exhausted, if necessary (Table 11).

Table 11 Project contribution to Queensland's emissions reduction targets

Milestone	State target	Project commitment
Commissioning	-	Design decisions: optimisation of power infrastructure; optimisation of mine layout and operations; planning for future grid connection; planning for future electrification of material handling systems; protection of high carbon value vegetation
2030	- 30% vs 2005	Implementation of PV + BESS
2035	- 75% vs 2005	Connection to NEM if practicable for ≤ 100% substitution of diesel; procurement of electrical material handling equipment where practicable
2050	Net zero	Residual emissions only, covered by ACCUs as a last resort if the Project is subject to the Safeguard Mechanism

Separately, the Project supplies natural graphite concentrate for battery anode material production, supporting electrification supply chains.

The Project's cumulative abated GHG emissions occurring within Australia were compared against remaining Queensland and Australian budgets for the period 2027 to 2050. All cumulative abated emissions were compared to the global carbon budgets for the 2027 to 2050 period. The period represents the likely Project commencement year and the 2050 net zero end point. Project emissions occurring after 2050 were excluded from this comparison.

Queensland and Australia's remaining emissions budgets were estimated as target-aligned CO_2-e budgets to net zero by 2050, rather than as temperature-target carbon budgets. Australia's pathway was based on its nationally determined contribution under the Paris Agreement and *Climate Change Act 2022* (section 3.2.1), while Queensland's pathway was based on the state targets outlined in the *Clean Economy Jobs Act* 2024 (section 3.2.7). Historical annual emissions data from Australia's National Greenhouse Accounts (Department of Climate Change, Energy, the Environment and Water, n.d.) were used to define the 2005 baseline and relevant actual emissions values used in the budget calculations.

Queensland's remaining budget was estimated by linearly interpolating from 2024 actual emissions to the 2035 target, and then from the 2035 target to net zero in 2050. As Queensland's 2024 emissions were already below the 2030 target, the 2030 target was not used as an interpolation point to avoid assuming an increase in emissions to the 2030 threshold. Scope 1 and Scope 3 emissions occurring in Australia only were used in this assessment (Table 12).

Similarly, Australia's remaining budget was estimated using linear interpolation between the relevant single-year target points. Emissions were projected from 2024 actual emissions to the 2030 target, then to each of the two possible 2035 targets, before declining linearly to net zero in 2050. Scope 1 and Scope 3 emissions occurring in Australia only were used in this assessment (Table 12).

Table 12 Project's Abated Emissions Contribution to Queensland, Australia, and Global Budgets

Comparison	Remaining Budget	Project Emissions (Mt CO_2-e)	Project Contribution
To Limit Global Warming by 1.5°C	127,800 Mt CO_2	46.33	0.036%
To Limit Global Warming by 2.0°C	1,012,800 Mt CO_2		0.0046%
Australia, 70% 2035 Pathway	4,022 Mt CO_2-e	3.05	0.076%
Australia, 62% 2035 Pathway	4,508 Mt CO_2-e		0.068%
Queensland	1,058 Mt CO_2-e		0.29%

Remaining global carbon budgets were based on the 50% probability budgets reported by Friedlingstein *et al.* (2025) for limiting warming to 1.5°C and 2°C. As these budgets are reported from the beginning of 2026, one year of global CO_2-emissions was subtracted to align the budgets with the Project commencement year, using the 2025 global CO_2-emissions estimate as a proxy for 2026 emissions. All Scope 1 and Scope 3 emissions were included in this assessment (Table 12). The global comparison is considered indicative however, as the carbon budget is reported in t CO_2 (Friedlingstein *et al.* 2025), while the Project emissions inventory is reported in t CO_2-e.

The Project's cumulative abated emissions from 2027 (approximate Project commencement) to 2050 (net zero) represent 0.29% of the Queensland budget, 0.068% to 0.076% of the Australian budget, and 0.036% and 0.0046% of the remaining global 1.5°C and 2.0°C carbon budgets, respectively.

8. SUMMARY AND CONCLUSIONS

Katestone Environmental Australia Pty Ltd (Katestone) was commissioned by AARC Environmental Solutions Pty Ltd (AARC) on behalf of Qld Aus Graphite Pty Ltd (Graphinex, the Proponent) to complete a Greenhouse Gas (GHG) Assessment of the Esmeralda Graphite Project (the Project). This assessment was developed to meet the GHG terms of reference (ToR) for the Project's environmental impact statement (EIS) under the *State Development and Public Works Organisation Act 1971* (SDPWO Act).

The GHG assessment was conducted in accordance with the requirements of the *Guideline Greenhouse gas emissions ESR/2024/6819* (GHG Guideline) and classified the Project as a medium to high emitter with annual emissions >25,000 t CO_2-e, requiring a Scope 3 inventory and an abatement plan to support Queensland's emission reduction targets.

The Project is an open cut graphite mine, located approximately 70 kilometres south of Croydon, Queensland. Graphinex will mine the Esmeralda Granite unit and concentrate graphite ore for on-site shipment and produce up to 3.5 Mtpa of Run-of-Mine (ROM) ore over an operational life of approximately 53 years. By supplying natural graphite for battery supply chains, the Project supports decarbonisation in the transport and energy sectors.

The GHG assessment estimated the total unabated Life of Project (LOP) Scope 1 emissions at 6,567,130 tonnes of carbon dioxide equivalent (t CO_2-e) with average annual Scope 1 emissions of 121,614 t CO_2-e. There are no Scope 2 emissions associated with the Project as all electricity will be generated on-site. Total unabated LOP Scope 3 unabated emissions are estimated at 104,533,872 t CO_2-e, with average annual emissions of 1,935,812 t CO_2-e. Total unabated Scope 3 emissions within Australia are 2,378,093 t CO_2-e with an annual average of 43,039 t CO_2-e. Total Scope 3 emissions outside Australia are 102,155,779 t CO_2-e, with an average annual of 1,891,774 t CO_2-e.

Scope 3 emissions are primarily due to the downstream processing of graphite to battery anode material (BAM) (97.58%, Category 10); the downstream distribution of the concentrate (1.18%; Category 9) and the upstream production of fuels (1.10%; Category 3).

Graphinex's Scope 1 emissions reduction target is 30% relative to the unabated reference case. This will be achieved through the following management controls, aligned with the GHG Guideline hierarchy of avoid, reduce, substitute and offset.

Avoid

- Optimise project design
- Undertake operational avoidance
- Minimise land clearing and associated carbon stock loss

Reduce

- Reduce diesel consumption for power generation through:
    - Integration of 21.3 MWp solar farm and BESS
    - Prioritise solar and BESS dispatch over diesel
    - Reduction in emissions intensity in a system-level hybrid configuration combining solar power and diesel generators
    - Ensure smart dispatch with renewables, improving generator efficiency
    - Reduce diesel usage in mobile mining fleet through process tuning, and optimising payload capacity
- Operational efficiency and optimisation of mobile fleet and stationary equipment through:

- Reduce idle time
- Optimise haul routes and vehicle movements
- Maintain engines, generators, and compressors at optimal operating efficiency through routine servicing and performance monitoring

Substitute

- Transition to lower-emissions energy sources, fuels, and technology where practicable through:
  - Expand on renewables over time if demand grows and capacity is possible
  - Replace diesel haul trucks with electric conveyor system from mine pit to mineral processing plant if cost effective and feasible
  - Substitute mining fleet with battery electric or hybrid vehicles where practicable
  - Connect to National Electricity Market (NEM) when available where diesel generators will be substituted for grid electricity
  - When/if connected to NEM, potential for renewable power purchase agreement (PPA)
  - Transition to biodiesel blends or renewable diesel where viable

Offset

- Offset residual emissions as a last resort if captured by the Safeguard Mechanism

Following these abatement measures, the Life of Project (LOP) Scope 1 emissions are estimated at 4,599,146 t CO_2-e (~30% reduction) with average annual Scope 1 emissions of 85,169 t CO_2-e. Total abated LOP Scope 3 emissions are estimated at 104,021,789 t CO_2-e, with average annual emissions of 1,926,329 t CO_2-e. Total abated Scope 3 emissions within Australia are 1,866,010 t CO_2-e with an annual average of 34,556 t CO_2-e. The reduction in these values compared to the unabated case is due to the reduction in diesel consumed. Total Scope 3 emissions outside Australia are 102,155,779 t CO_2-e, with an average annual of 1,891,774 t CO_2-e.

Abated average annual emissions within Australia are 0.089% of Queensland's latest (2024) emissions inventory, 0.026% of Australia's latest (2024) emissions inventory, and 0.0041% of the latest (2023) global emissions inventory.

The Project's cumulative abated emissions that occur within Australia over the 2027 to 2050 assessment period (i.e., from approximate Project commencement date to net zero date) are expected to be approximately 0.29% of Queensland's target-aligned carbon budget, and 0.068% to 0.076% of Australia's target-aligned carbon budget. The Australian range reflects the two pathways assessed for Australia's 2035 emissions reduction target, being 62% and 70% below 2005 levels. Globally, the Project emissions occurring within and outside of Australia will contribute approximately 0.036% of the remaining 1.5°C carbon budget and 0.0046% of the remaining 2.0°C carbon budget.

Graphinex commits to a process of continuous improvement informed by engaged staff monitoring, evaluation, research, and development. New and emerging technologies will be considered as they evolve and are feasible. Graphinex will report on its emissions and emission reduction targets through annual NGER and GHG Abatement Plan processes.

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APPENDIX A REGIONAL ECOSYSTEMS AND FULLCAM VEGETATION TYPES

Table A1 Mapping Regional Ecosystems to FullCAM vegetation types and areas to be cleared for Project

Regional Ecosystem	FullCAM Vegetation Type	Area Cleared (ha)
BVG 18a Dry woodlands to open woodlands, dominated by bloodwoods (*Corymbia dallachiana*, *C. terminalis* (western bloodwood), *C. plena*, or *C. leichhardtii* (rustyjacket)) or ironbarks (*Eucalyptus quadricostata* (Pentland ironbark), *E. crebra* (narrow-leaved red ironbark) or *E. exilipes* (fine-leaved ironbark)), often with *E. acmenoides* (narrow-leaved white stringybark), *Angophora leiocarpa* (rusty gum) and *Callitris glaucophylla* (white cypress pine) in the Brigalow Belt, on sandy plateaus and plains	Eucalyptus Woodland	188
BVG 21a *Melaleuca* spp. dry woodlands to open woodlands on sandplains or depositional plains, Low woodlands and low open woodlands dominated by *Melaleuca viridiflora* (coarse-leaved paperbark) on depositional plains	Melaleuca Forest and Woodland	1,309
BVG 21b *Melaleuca* spp. dry woodlands to open woodlands on sandplains or depositional plains, Low open woodlands and tall shrublands of *Melaleuca citrolens* or *M. stenostachya* or other *Melaleuca* spp.	Melaleuca Forest and Woodland	736
BVG 34d Palustrine wetlands. Freshwater swamps or billabongs on floodplains ranging from permanent and semi-permanent to ephemeral, waterholes and billabongs on drainage lines and circular waterholes on floodplains, often have fringing woodlands of *Eucalyptus camaldulensis* or *E. coolabah* or *E. microtheca*. Frequent graminoids include *Pseudoraphis spinescens*, *Eleocharis sphacelata*, and *Cynodon dactylon*. Frequent forbs are *Ludwigia peploides* subsp. *montevidensis, Alternanthera denticulata*, *Azolla pinnata*, *Aeschynomene indica*, *Marsilea mutica*, *M. hirsuta*, *Ammannia multiflora*, *Najas tenuifolia* and *Glinus lotoides*.	Eucalyptus Low Open Forest	105
BVG16a Open forests and woodlands dominated by *Eucalyptus camaldulensis* (river red gum) (or *E. tereticornis* (blue gum)) and/or *E. coolabah* (coolibah) (or *E. microtheca* (coolabah)) fringing drainage lines. Associated species may include *Melaleuca* spp., *Corymbia tessellaris* (carbeen), *Angophora* spp., *Casuarina cunninghamiana* (river she-oak). Does not include alluvial areas dominated by herblands or grasslands or alluvial plains that are not flooded	Eucalyptus Open Forest	37
BVG16d Riverbeds, open water or sand, or rock, frequently not vegetated	Non-remnant	39
Total		**2,414**

APPENDIX B ANNUAL ACTIVITY DATA AND ANNUAL EMISSIONS

Table B1 Abated Activity data for calculation of energy consumption (GJ) and Scope 1 emissions (t CO_2-e) by year and emissions source

Project Year	Stationary Diesel (kL)	Transport Diesel (kL)	Land Clearing (ha)	PBOs (kL)	PBGs (kL)	Explosives (kL diesel)	Reagents (kL diesel)	Generators Diesel (kL)	Onsite Wastewater (persons)	ROM Graphite Ore (t)	ROM Graphite Concentrate (t)
Construction	6,799	234	2,413.7	388	388	0	2,925	18,782	0	-	-
1	7,966	234	0	400	400	344	2,925	18,782	192	3,500,000	100,000
2	9,406	234	0	414	414	214	2,925	18,782	192	3,500,000	100,000
3	10,106	234	0	421	421	244	2,925	18,782	192	3,500,000	100,000
4	9,227	234	0	412	412	217	2,925	18,782	192	3,500,000	200,000
5	9,620	222	0	421	421	226	2,925	18,782	192	3,500,000	200,000
6	10,771	222	0	433	433	233	2,925	18,782	192	3,500,000	200,000
7	10,653	222	0	432	432	253	2,925	18,782	192	3,500,000	200,000
8	11,400	222	0	440	440	232	2,925	18,782	192	3,500,000	200,000
9	10,565	222	0	431	431	248	2,925	18,782	192	3,500,000	200,000
10	12,309	222	0	449	449	236	2,925	18,782	192	3,500,000	200,000
11	13,601	222	0	463	463	222	2,925	18,782	192	3,500,000	200,000
12	12,507	222	0	452	452	252	2,925	18,782	192	3,500,000	200,000
13	13,880	222	0	466	466	227	2,925	18,782	192	3,500,000	200,000
14	13,708	222	0	464	464	238	2,925	18,782	192	3,500,000	200,000
15	8,280	222	0	407	407	164	2,925	18,782	192	3,500,000	200,000
16	5,166	222	0	374	374	93	2,925	18,782	192	3,500,000	200,000
17	5,341	222	0	376	376	93	2,925	18,782	192	3,500,000	200,000
18	8,260	222	0	407	407	122	2,925	18,782	192	3,500,000	200,000

Project Year	Stationary Diesel (kL)	Transport Diesel (kL)	Land Clearing (ha)	PBOs (kL)	PBGs (kL)	Explosives (kL diesel)	Reagents (kL diesel)	Generators Diesel (kL)	Onsite Wastewater (persons)	ROM Graphite Ore (t)	ROM Graphite Concentrate (t)
19	7,788	222	0	402	402	139	2,925	18,782	192	3,500,000	200,000
20	5,971	222	0	383	383	112	2,925	18,782	192	3,500,000	200,000
21	4,929	222	0	372	372	98	2,925	18,782	192	3,500,000	200,000
22	4,857	222	0	371	371	95	2,925	18,782	192	3,500,000	200,000
23	4,916	222	0	372	372	95	2,925	18,782	192	3,500,000	200,000
24	5,433	222	0	377	377	134	2,925	18,782	192	3,500,000	200,000
25	6,187	222	0	385	385	139	2,925	18,782	192	3,500,000	200,000
26	5,235	222	0	375	375	120	2,925	18,782	192	3,500,000	200,000
27	5,274	222	0	375	375	116	2,925	18,782	192	3,500,000	200,000
28	7,223	222	0	396	396	137	2,925	18,782	192	3,500,000	200,000
29	7,503	222	0	399	399	137	2,925	18,782	192	3,500,000	200,000
30	7,524	222	0	399	399	136	2,925	18,782	192	3,500,000	200,000
31	8,379	222	0	408	408	138	2,925	18,782	192	3,500,000	200,000
32	8,258	222	0	407	407	136	2,925	18,782	192	3,500,000	200,000
33	6,854	222	0	392	392	173	2,925	18,782	192	3,500,000	200,000
34	7,019	222	0	394	394	175	2,925	18,782	192	3,500,000	200,000
35	7,483	222	0	399	399	151	2,925	18,782	192	3,500,000	200,000
36	12,556	222	0	452	452	140	2,925	18,782	192	3,500,000	200,000
37	14,268	222	0	470	470	98	2,925	18,782	192	3,500,000	200,000
38	12,615	222	0	453	453	113	2,925	18,782	192	3,500,000	200,000
39	12,204	222	0	448	448	130	2,925	18,782	192	3,500,000	200,000
40	10,598	222	0	431	431	155	2,925	18,782	192	3,500,000	200,000

Project Year	Stationary Diesel (kL)	Transport Diesel (kL)	Land Clearing (ha)	PBOs (kL)	PBGs (kL)	Explosives (kL diesel)	Reagents (kL diesel)	Generators Diesel (kL)	Onsite Wastewater (persons)	ROM Graphite Ore (t)	ROM Graphite Concentrate (t)
41	15,673	222	0	485	485	169	2,925	18,782	192	3,500,000	200,000
42	14,780	187	0	475	475	46	2,925	18,782	192	3,500,000	200,000
43	14,972	187	0	477	477	0	2,925	18,782	192	3,500,000	200,000
44	15,409	187	0	482	482	0	2,925	18,782	192	3,500,000	200,000
45	11,970	187	0	446	446	0	2,925	18,782	192	3,500,000	200,000
46	10,280	187	0	428	428	0	2,925	18,782	192	3,500,000	200,000
47	13,190	187	0	458	458	0	2,925	18,782	192	3,500,000	200,000
48	13,133	187	0	458	458	0	2,925	18,782	192	3,500,000	200,000
49	11,077	187	0	436	436	0	2,925	18,782	192	2,000,000	200,000
50	11,077	187	0	436	436	0	2,925	18,782	192	-	200,000
51	11,077	187	0	436	436	0	2,925	18,782	192	-	200,000
52	11,077	187	0	436	436	0	2,925	18,782	192	-	200,000
53	3,198	187	0	353	353	0	2,925	18,782	192	-	50,000
Total	519,550	11,637	**2,413.7**	**22,717**	**22,717**	**6,940**	157,950	**1,014,228**	**192**	**170,000,000**	**10,150,000**

Table notes: The unabated case considers:

- a 5% increase in stationary and transport diesel (kL) Project Years 5 – 53
- a 40.86% increase in generator diesel across all years resulting in 31,757 kL of diesel per year

Table B2 Abated Scope 1 emissions from the Project (t CO_2-e rounded to nearest tonne) by year and emissions source

Project Year	Stationary Diesel	Transport Diesel	Land Clearing	PBOs	PBGs	Explosives	Generators Diesel	Onsite Waste Treatment	Total Scope 1	Total Reportable to NGER Scheme
Construction	18,423	636	377,148	209	53	0	50,894	0	447,362	70,214
1	21,586	636	0	215	54	652	50,894	2	74,321	73,386
2	25,488	636	0	223	56	405	50,894	2	77,878	77,297
3	27,384	636	0	227	57	462	50,894	2	79,862	79,198
4	25,002	636	0	222	56	411	50,894	2	77,401	76,810
5	26,067	604	0	227	57	428	50,894	2	78,463	77,849
6	29,186	604	0	234	59	441	50,894	2	81,609	80,976
7	28,867	604	0	233	59	479	50,894	2	81,344	80,657
8	30,892	604	0	237	60	440	50,894	2	83,318	82,686
9	28,630	604	0	233	59	471	50,894	2	81,094	80,418
10	33,355	604	0	242	61	446	50,894	2	85,797	85,156
11	36,854	604	0	250	63	420	50,894	2	89,267	88,664
12	33,890	604	0	244	61	477	50,894	2	86,377	85,692
13	37,611	604	0	251	63	431	50,894	2	90,042	89,423
14	37,144	604	0	250	63	450	50,894	2	89,601	88,955
15	22,437	604	0	220	55	310	50,894	2	74,655	74,209
16	13,998	604	0	202	51	176	50,894	2	66,003	65,749
17	14,471	604	0	203	51	176	50,894	2	66,477	66,223
18	22,382	604	0	219	55	231	50,894	2	74,487	74,154
19	21,104	604	0	217	55	264	50,894	2	73,253	72,873

Project Year	Stationary Diesel	Transport Diesel	Land Clearing	PBOs	PBGs	Explosives	Generators Diesel	Onsite Waste Treatment	Total Scope 1	Total Reportable to NGER Scheme
20	16,178	604	0	206	52	213	50,894	2	68,242	67,935
21	13,357	604	0	201	50	185	50,894	2	65,374	65,106
22	13,160	604	0	200	50	179	50,894	2	65,167	64,908
23	13,321	604	0	200	50	179	50,894	2	65,329	65,070
24	14,722	604	0	203	51	253	50,894	2	66,839	66,475
25	16,764	604	0	208	52	263	50,894	2	68,901	68,522
26	14,184	604	0	202	51	227	50,894	2	66,263	65,935
27	14,292	604	0	202	51	219	50,894	2	66,360	66,044
28	19,571	604	0	214	54	260	50,894	2	71,711	71,336
29	20,331	604	0	215	54	259	50,894	2	72,470	72,098
30	20,389	604	0	215	54	257	50,894	2	72,526	72,156
31	22,705	604	0	220	55	262	50,894	2	74,855	74,478
32	22,378	604	0	219	55	258	50,894	2	74,522	74,151
33	18,571	604	0	211	53	328	50,894	2	70,806	70,334
34	19,019	604	0	212	53	332	50,894	2	71,261	70,783
35	20,278	604	0	215	54	285	50,894	2	72,455	72,045
36	34,023	604	0	244	61	266	50,894	2	86,209	85,826
37	38,663	604	0	254	64	186	50,894	2	90,748	90,479
38	34,183	604	0	244	61	213	50,894	2	86,294	85,987
39	33,069	604	0	242	61	245	50,894	2	85,223	84,870
40	28,717	604	0	233	59	294	50,894	2	80,928	80,506

Project Year	Stationary Diesel	Transport Diesel	Land Clearing	PBOs	PBGs	Explosives	Generators Diesel	Onsite Waste Treatment	Total Scope 1	Total Reportable to NGER Scheme
41	42,469	604	0	262	66	321	50,894	2	94,755	94,294
42	40,048	509	0	256	65	88	50,894	2	91,900	91,772
43	40,571	509	0	257	65	0	50,894	2	92,298	92,296
44	41,755	509	0	260	65	0	50,894	2	93,485	93,483
45	32,435	509	0	240	61	0	50,894	2	84,141	84,138
46	27,857	509	0	231	58	0	50,894	2	79,551	79,548
47	35,742	509	0	247	62	0	50,894	2	87,456	87,454
48	35,586	509	0	247	62	0	50,894	2	87,300	87,298
49	30,015	509	0	235	59	0	50,894	2	81,714	81,712
50	30,015	509	0	235	59	0	50,894	2	81,714	81,712
51	30,015	509	0	235	59	0	50,894	2	81,714	81,712
52	30,015	509	0	235	59	0	50,894	2	81,714	81,712
53	8,666	509	0	190	48	0	50,894	2	60,309	60,307
Total	**1,407,835**	**31,627**	**377,148**	**12,252**	**3,085**	**18,804**	**2,748,274**	**122**	**4,599,146**	**4,203,072**

Table B3 Abated Scope 3 emissions (t CO2-e rounded to nearest tonne) by category

Project Year	Category 1 & 2 Purchased Goods and Services and Capital Goods	Category 3 Manufacturing of Fuel and Energy	Category 4 Upstream Distribution	Category 9 Downstream Distribution	Category 10 Processing of Sold Product	Total Scope 3 (in Australia)	Total Scope 3 (Global)
Construction	3,704	19,192	35,340	0		58,236	58,236
1	0	20,201	1,667	12,143	1,000,000	27,551	1,034,011
2	0	21,075	1,667	12,143	1,000,000	28,425	1,034,886
3	0	21,563	1,667	12,143	1,000,000	28,912	1,035,373
4	0	20,958	2,063	24,286	2,000,000	34,385	2,047,307
5	0	21,219	2,063	24,286	2,000,000	34,645	2,047,567
6	0	21,992	2,063	24,286	2,000,000	35,419	2,048,340
7	0	21,927	2,063	24,286	2,000,000	35,353	2,048,275
8	0	22,412	2,063	24,286	2,000,000	35,839	2,048,760
9	0	21,865	2,063	24,286	2,000,000	35,292	2,048,214
10	0	23,021	2,063	24,286	2,000,000	36,448	2,049,370
11	0	23,874	2,063	24,286	2,000,000	37,301	2,050,222
12	0	23,164	2,063	24,286	2,000,000	36,590	2,049,512
13	0	24,064	2,063	24,286	2,000,000	37,491	2,050,413
14	0	23,956	2,063	24,286	2,000,000	37,383	2,050,305
15	0	20,282	2,063	24,286	2,000,000	33,709	2,046,631
16	0	18,156	2,063	24,286	2,000,000	31,582	2,044,504
17	0	18,272	2,063	24,286	2,000,000	31,699	2,044,621

Project Year	Category 1 & 2 Purchased Goods and Services and Capital Goods	Category 3 Manufacturing of Fuel and Energy	Category 4 Upstream Distribution	Category 9 Downstream Distribution	Category 10 Processing of Sold Product	Total Scope 3 (in Australia)	Total Scope 3 (Global)
18	0	20,241	2,063	24,286	2,000,000	33,668	2,046,590
19	0	19,938	2,063	24,286	2,000,000	33,364	2,046,286
20	0	18,706	2,063	24,286	2,000,000	32,133	2,045,054
21	0	18,001	2,063	24,286	2,000,000	31,428	2,044,349
22	0	17,950	2,063	24,286	2,000,000	31,377	2,044,299
23	0	17,990	2,063	24,286	2,000,000	31,417	2,044,338
24	0	18,361	2,063	24,286	2,000,000	31,788	2,044,710
25	0	18,868	2,063	24,286	2,000,000	32,295	2,045,217
26	0	18,220	2,063	24,286	2,000,000	31,646	2,044,568
27	0	18,243	2,063	24,286	2,000,000	31,670	2,044,592
28	0	19,559	2,063	24,286	2,000,000	32,985	2,045,907
29	0	19,745	2,063	24,286	2,000,000	33,172	2,046,094
30	0	19,759	2,063	24,286	2,000,000	33,186	2,046,107
31	0	20,332	2,063	24,286	2,000,000	33,758	2,046,680
32	0	20,250	2,063	24,286	2,000,000	33,676	2,046,598
33	0	19,336	2,063	24,286	2,000,000	32,763	2,045,685
34	0	19,448	2,063	24,286	2,000,000	32,875	2,045,797
35	0	19,742	2,063	24,286	2,000,000	33,168	2,046,090
36	0	23,122	2,063	24,286	2,000,000	36,549	2,049,471

Project Year	Category 1 & 2 Purchased Goods and Services and Capital Goods	Category 3 Manufacturing of Fuel and Energy	Category 4 Upstream Distribution	Category 9 Downstream Distribution	Category 10 Processing of Sold Product	Total Scope 3 (in Australia)	Total Scope 3 (Global)
37	0	24,238	2,063	24,286	2,000,000	37,664	2,050,586
38	0	23,143	2,063	24,286	2,000,000	36,570	2,049,492
39	0	22,880	2,063	24,286	2,000,000	36,307	2,049,228
40	0	21,824	2,063	24,286	2,000,000	35,251	2,048,173
41	0	25,223	2,063	24,286	2,000,000	38,650	2,051,571
42	0	24,521	2,063	24,286	2,000,000	37,948	2,050,869
43	0	24,619	2,063	24,286	2,000,000	38,045	2,050,967
44	0	24,911	2,063	24,286	2,000,000	38,337	2,051,259
45	0	22,614	2,063	24,286	2,000,000	36,040	2,048,962
46	0	21,486	2,063	24,286	2,000,000	34,912	2,047,834
47	0	23,429	2,063	24,286	2,000,000	36,855	2,049,777
48	0	23,390	2,063	24,286	2,000,000	36,817	2,049,739
49	0	22,017	2,063	24,286	2,000,000	35,444	2,048,366
50	0	22,017	2,063	24,286	2,000,000	35,444	2,048,366
51	0	22,017	2,063	24,286	2,000,000	35,444	2,048,366
52	0	22,017	2,063	24,286	2,000,000	35,444	2,048,366
53	0	16,756	2,063	6,071	500,000	21,660	524,890

Project Year	Category 1 & 2 Purchased Goods and Services and Capital Goods	Category 3 Manufacturing of Fuel and Energy	Category 4 Upstream Distribution	Category 9 Downstream Distribution	Category 10 Processing of Sold Product	Total Scope 3 (in Australia)	Total Scope 3 (Global)
Average [6]	**69**	**21,150**	**2,657**	**22,824**	**1,915,094**	**34,556**	**1,926,329**
Total	**3,704**	**1,142,107**	**143,476**	**1,232,502**	**101,500,000**	**1,866,010**	**104,021,789**

[6] Average values reflect the full Life of Project (LOP) period of 54 years

APPENDIX C END USERS OF PROJECT GRAPHITE AND LEVEL OF DECARBONISATION COMMITMENTS

Table C1 Summary ranking of destination country by quantity (%) of graphite sold by the Project

Destination Country	Quantity of graphite concentrate (t)	% of LOP Graphite
United States of America	10,149,700	**99.997%**
Australia	300	0.003%
Total	**10,150,000**	**100%**

Table C2 Nationally Determined Contributions (NDC) by End User Countries

Destination Country	Paris signatory (Y/N)	Nationally Determined Contribution
USA	N	-
Australia	Y	Reduce GHG levels by 43% below 2005 levels by 2030; reduce GHG levels below 2005 levels by 63-70% by 2035; reduce GHG levels to net zero by 2050