Callan Coking Coal Bulk Sampling Project Greenhouse Gas Assessment

Prepared for:

Vitrinite Pty Ltd

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Final

Prepared by:

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Contents

Tables

Figures

Glossary

Term	Definition
GJ	Gigajoule
kg CO_2-e/GJ	Kilograms of carbon dioxide equivalent per gigajoule
kL	Kilolitres
t	Tonnes
t CO_2-e	Tonnes of carbon dioxide equivalent
Nomenclature	**Definition**
CH_4	Methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2-e	carbon dioxide equivalents
N_2O	nitrous oxide
Abbreviation	**Definition**
CC Act	*Climate Change Act 2022*
CCCA Act	*Climate Change (Consequential Amendments) Act 2022*
CFI	Carbon Farming Initiative
DESI	Department of Environment and Science and Innovation
EA	Environmental Authority
EF	Emission factor
EP Act	*Environmental Protection Act 1994*
FY	Financial year
GHG	Greenhouse gases
KR	Key result
KPI	Key performance indicator
LOM	Life of mine
NGER	National Greenhouse and Energy Reporting
NGER Determination	*National Greenhouse and Energy Reporting* (Measurement) *Determination 2008*
QLD	Queensland
SOP	Standard Operating Procedures

EXECUTIVE SUMMARY

Katestone Environmental Pty Ltd (Katestone) was commissioned by Mining and Energy Technical Services Pty Ltd (METserve) on behalf of Vitrinite Pty Ltd (Vitrinite) to conduct a greenhouse gas (GHG) assessment for the Callan Coking Coal Bulk Sampling Project (CCC BSP) (the Project) located approximately 27 km from Dysart and between the existing Middlemount and Lake Vermont open cut coal mines within the Isaac Regional Shire of central Queensland.

The CCC BSP plans to extract a coal sample of approximately 942 kt of low volatile PCI coal from a small-scale open cut pit on Mineral Development Licence (MDL) 454. The proposed disturbance area within MDL454 is approximately 231 ha. Vitrinite Pty Ltd (Vitrinite) holds MDL 454 and the associated environmental authority (EA) EPSX00560813. Currently, EPSX00560813 does not authorise bulk sample activities and Vitrinite is seeking approval of a site-specific EA Amendment Application for the CCC BSP. An EA amendment application is required to authorise Environmentally Relevant Activity (ERA) 10 (investigating the potential development of a mineral resource by large bulk sampling or constructing an exploratory shaft, adit or open pit) under Schedule 3 of the Environmental Protection Regulation 2019.

The Department of Environment, Science, and Innovation (DESI) *Guideline Greenhouse gas emissions* ESR/2024/6819 (GHG Guideline) details the requirements of the GHG assessment for the Project. Scope 1, 2 and 3 emissions have been assessed for the Project as required by the GHG Guideline given its categorisation as a medium to high emitter. The GHG Guideline further requires a GHG abatement plan (Decarbonisation Plan) (including Scope 3 emissions where possible) and a risk assessment that outlines the contribution of the Project's emissions inventory to climate change and its impacts on Queensland's environmental values.

Scope 1 and 3 GHG emissions have been estimated using data provided by Vitrinite via METserve. No Scope 2 emissions are projected as no electricity will be purchased from the grid.

Total life of mine (LOM) Scope 1 emissions including land clearing are estimated to be 74,736 t CO_2-e (44,577 t CO_2-e in the first project year and 30,159 t CO_2-e in the second project year). The CCC BSP will be subject to NGER reporting but will not trigger the Safeguard Mechanism threshold and subsequent GHG emissions reduction obligations.

Scope 3 GHG emissions for the LOM are estimated to be 2,612,427 t CO_2-e with the major source of emissions being the downstream combustion of product coal (2,602,140 t CO_2-e or 99.6% of the total Scope 3 emissions).

The following areas of opportunity were identified to reduce emissions associated with the CCC Bulk Sampling Project:

- Minimising GHG emissions resulting from mobile and stationary plant
- Minimising fugitive methane emissions from mining operations
- Staff engaging in energy efficient practices
- Optimising rehabilitation on land affected by mining operations to promote carbon sequestration

A comprehensive GHG assessment including Scope 1, 2 and 3 emissions and a detailed decarbonisation plan will be developed in alignment with the GHG Guideline should the Project lead to a full-scale mining operation.

1. INTRODUCTION

Katestone Environmental Pty Ltd (Katestone) was commissioned by Mining and Energy Technical Services Pty Ltd (METserve) on behalf of Vitrinite Pty Ltd (Vitrinite) to conduct a greenhouse gas (GHG) assessment for the Callan Coking Coal Bulk Sampling Project (CCC BSP) located approximately 27 km from Dysart and between the existing Middlemount and Lake Vermont open cut coal mines within the Isaac Regional Shire of central Queensland.

The CCC BSP plans to extract a sample of approximately 942 kt of low volatile coal from a small-scale open cut pit on Mineral Development Licence (MDL) 454. The proposed disturbance area within MDL454 is approximately 231 ha. Vitrinite Pty Ltd (Vitrinite) holds MDL 454 and the associated environmental authority (EA) EPSX00560813. Currently, EPSX00560813 does not authorise bulk sample activities and Vitrinite is seeking approval of a site-specific EA Amendment Application for the CCC BSP. An EA amendment application is required to authorise Environmentally Relevant Activity (ERA) 10 (investigating the potential development of a mineral resource by large bulk sampling or constructing an exploratory shaft, adit or open pit) under Schedule 3 of the Environmental Protection Regulation 2019.

Works associated with the CCC BSP will include:

- Land clearing and stripping and stockpiling of topsoil
- Conventional open cut mining methods including drilling and blasting, excavating, dozing, grading, hauling and stockpiling of coal product and overburden waste rock
- Construction of site infrastructure including worker accommodation, offices, coal handling and processing plant and energy infrastructure
- Hauling of product coal between the mine site and the sampling complex located at the German Creek coal mine
- Use of diesel generators for onsite power

This report contains the GHG assessment which is required for the CCC BSP EA application.

1.1 Project Description

1.1.1 Location

MDL454 is located approximately 27 km to the east of Dysart and approximately 19 km north of Middlemount in Queensland's Bowen Basin. MDL454 has an area of 18,952 ha and stretches almost 40 km from Leichhardt Station in the north to Turon Downs in the south (refer to Figure 1).

1.1.2 Justification for Project

Exploration and mining concept studies completed to-date indicate that MDL454 contains a significant resource of low volatile coal, amenable to open cut mining methods. The exploration efforts have provided valuable data on the target coal seams; however the bulk sampling activities are required for a more comprehensive evaluation of the resource's washability and marketability potential. The bulk sample material will undergo comprehensive metallurgical testing to determine its suitability for processing. The results of the testing will provide insights into the recoverability of valuable material from the bulk sample and specifically, how that material may perform as a blend.

1.1.3 Bulk sampling activities

Vitrinite propose to extract a bulk sample of approximately 942 kt of coal from a bulk sample open cut pit (BSP). Overburden will initially be stored in an ex-pit waste rock dump (WRD) until in-pit dumping becomes available. The BSP, Ex-pit WRD, mine infrastructure area (MIA) and run-of-mine (ROM) coal pad will be located on MDL454 (refer to Figure 2).

The footprint of the proposed open cut pit is approximately 60 ha. The pit will extend to a maximum depth of 60 m, to target the Leichardt seam subcrop area of the Rangal Coal Measures. The coal seam at the BSP location is on average 4 m thick. Mine scheduling will initially focus on removal of overburden from the Leichhardt subcrop in the west and dumping this material in an ex-pit WRD. Topsoil will be stripped to an approximate depth of 300 mm ahead of overburden removal and stored in stockpiles, with maximum height 2 m. Drilling and blasting of overburden will be required, with a total of 40 planned blasts expected to be undertaken in campaigns over the life of the BSP. Overburden will be transported approximately 2.5 km to the ex-pit WRD, utilising an internal access road of 40 m width. The ex-pit WRD will have a maximum height of 50 m and will be reshaped with an overall maximum design slope of 15 percent.

The mine will progress from west to east, and once enough overburden and coal has been removed, in pit dumping of overburden will commence, backfilling the pit. In pit dumps will be rehabilitated progressively as the areas become available for reshaping and topsoil respreading. The bulk sampling will be carried out using a combination of excavator and truck/shovel. A dozer will be used for clean-up, scraper assistance, ripping and stockpile management.

Coal removed from the pit will be hauled to the ROM pad via access roads established on the MDL. The ROM pad has been designed for a maximum stockpile height of 7 m. A front-end loader will load ROM coal into AB-triple road trains.

Sample coal will be trucked from the Project to the CapCoal Complex via the Fitzroy Development Road and the Dysart Middlemount Road, for testing. Offsite trucking will be operated on a 24/7 continuous roster and in accordance with any applicable restrictions and road user agreements (refer to Figure 3). Each road train will transport approximately 65 t of coal, with an anticipated peak daily requirement of 12 truck movements each way per day. No coal washing will occur on the BSP site.

Stormwater and wash water on site will be managed through no-discharge mine-affected water dam and sediment dam infrastructure.

1.1.4 Mine infrastructure and equipment

The proposed Mine Infrastructure Area (MIA) for the bulk sample pit is located on the western side of the project area. It consists of an ex-pit dump, topsoil stockpiles, ROM stockpile, internal roads, office, crib room, workshop facility, fuel bay, wash pad, warehouse, and laydown. Stormwater and wash water on site will be managed through no-discharge mine-affected water dam and sediment dam infrastructure.

The indicative mining equipment fleet will be comprised of the following:

- 2 x Hitachi EX-3600 400t excavator;
- 6 x CAT 793 haul trucks;
- 1 x CAT 785 water cart;
- 2 x CAT D10 dozers;
- 1 x CAT D11 dozer;
- 2 x CAT 18M graders;
- 1 x WA900 front end Loader;
- 10 x light vehicles;
- 1 x CAT 777 service truck.

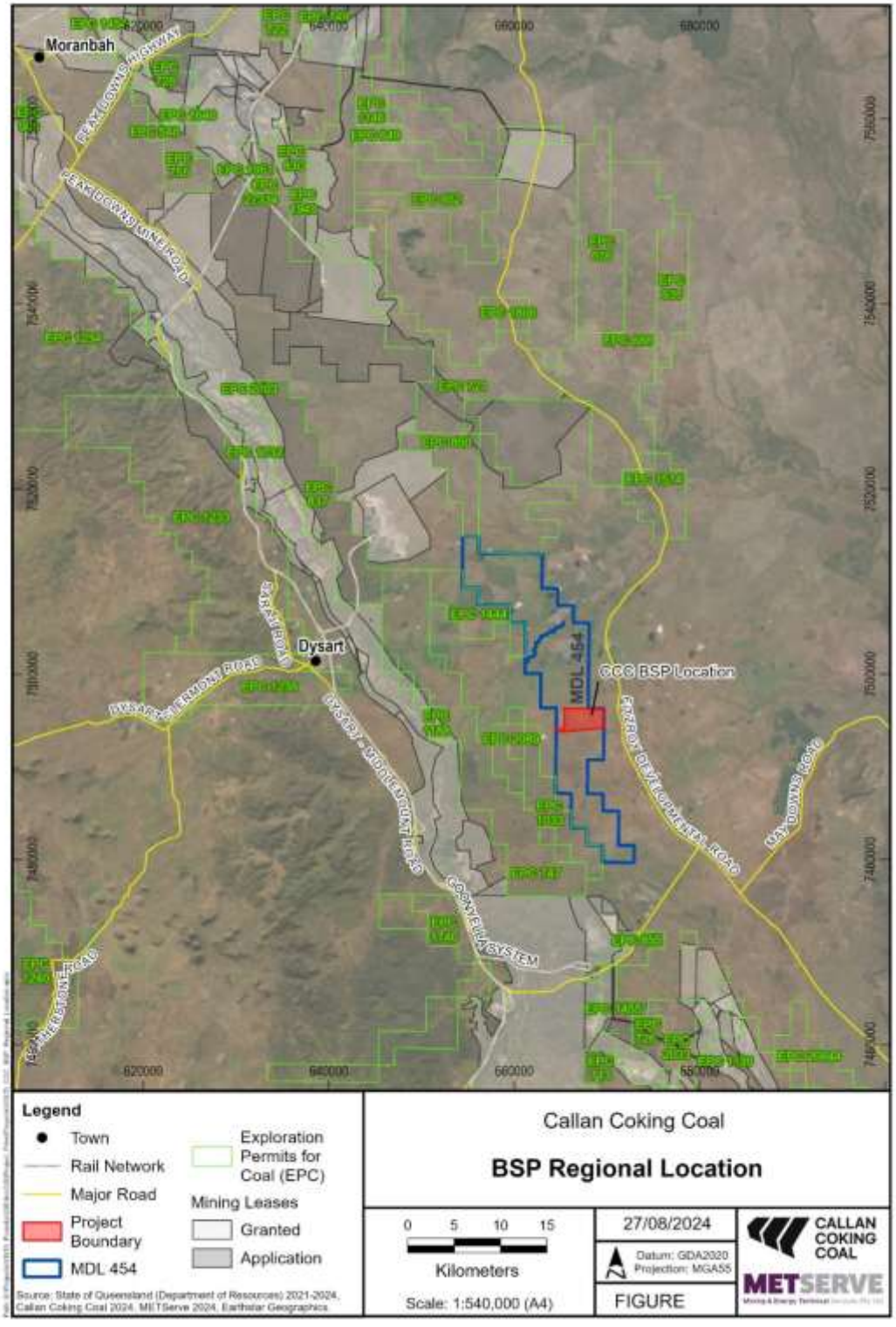

Figure 1 CCC BSP Regional Location

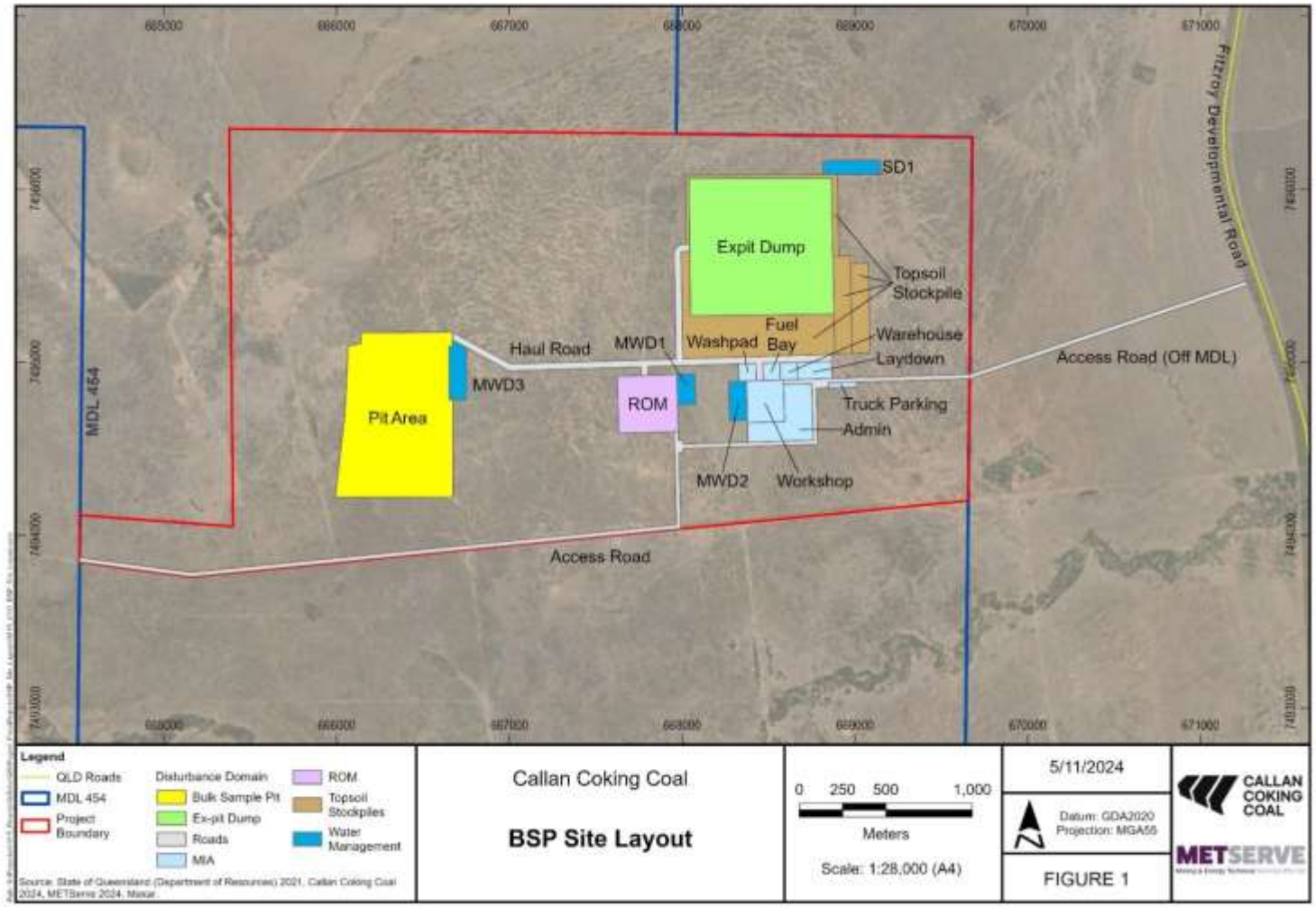

Figure 2 Proposed site layout

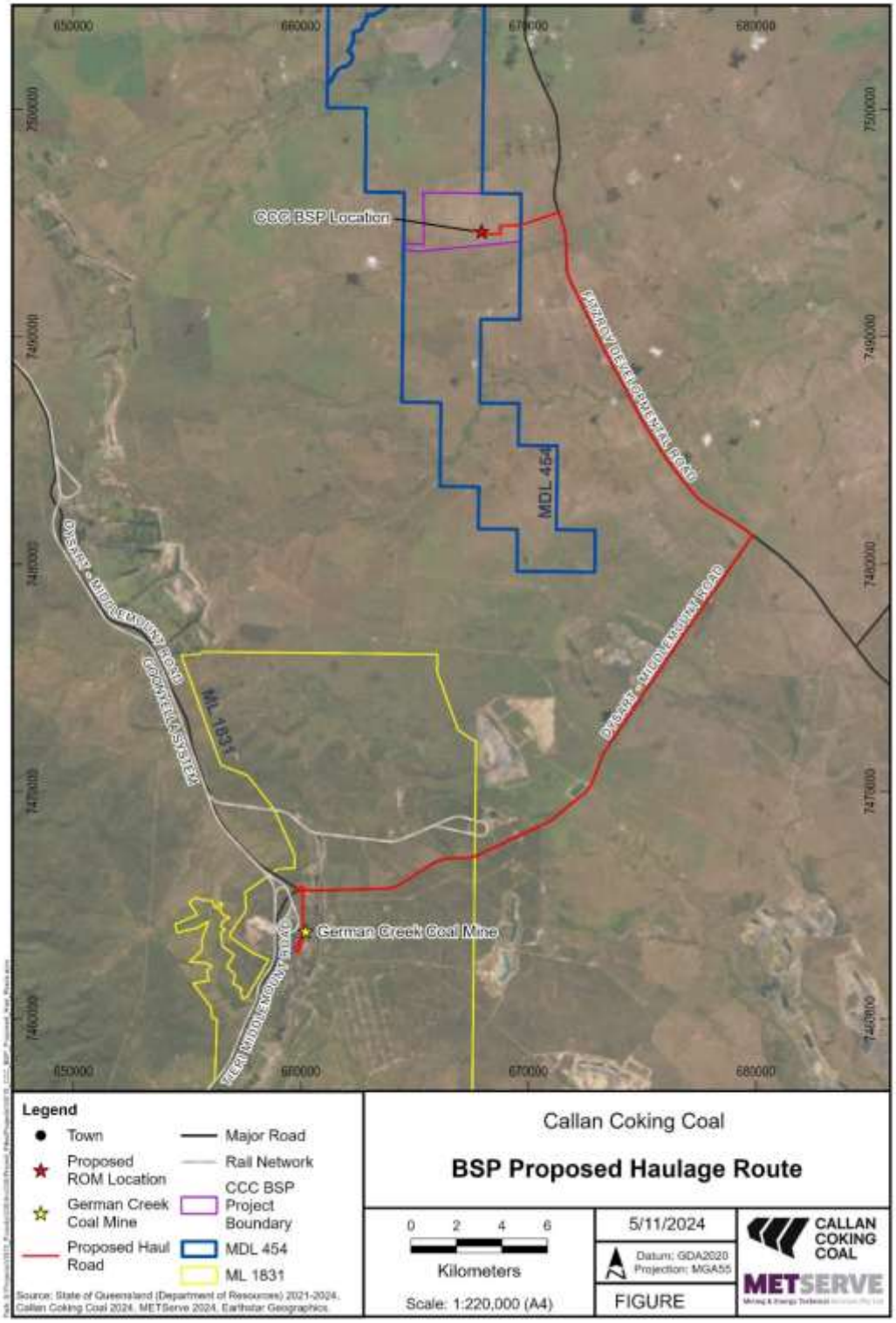

Figure 3 CCC BSP Haul Route

1.1.5 Disturbance areas

The areas (in hectares) of disturbance from the CCC BSP are provided in Table 1. All disturbance is located on the Blackwood Station – Lot 5 CNS48.

Table 1 CCC BSP Disturbance Areas

Disturbance Domain	Area (ha)
Bulk Sample Pit	59.20
Ex-pit Waste Rock Dump	65.48
Topsoil Stockpiles	38.09
ROM Area	11.45
MIA	18.47
Water Infrastructure	10.04
Roads Internal to MDL454	28.30
Total Disturbance - MDL454	**231.03**
Roads external to MDL454	4.23

1.1.6 Rehabilitation

The CCC BSP is composed of different domains which require different rehabilitation strategies, including:

- Ex-pit and Inpit Waste Rock Dumps
- MIA and ROM
- Haul Roads (internal to MDL and external).

1.1.6.1 Rehabilitation of the Waste Rock Dumps

Construction of the BSP will require establishment of an ex-pit waste rock dump that will be rehabilitated once it is completed, and in-pit dumps which will be rehabilitated progressively as the open pit is developed in strips. The following actions will be completed to ensure the rehabilitated landforms are safe, stable, non-polluting, and self-sustaining:

- The landform profile will be formed as the WRD is constructed. However, some reshaping will be conducted to ensure the required landform design is achieved. The surface will be free draining.
- Subsoils (or crushed waste rock if suitable) will be placed over the surface of the WRD.
- Erosion and sediment control structures will be installed in accordance with the Erosion and Sediment Control Plan prepared by an appropriately qualified and experienced person.

- Any erosion rills or gullies will be remediated before topsoil is spread.
- Topsoil will be spread to an appropriate depth over the prepared surface of the WRD together with any ameliorants required. The topsoil will have characteristics and composition suitable for growing the target vegetation.
- A seed mix of native species that has been designed by an appropriately qualified person will be applied at the design rate. The seed mix will reflect the topsoil applied and the pre-existing regional ecosystems present within and surrounding the footprint of the WRD and BSP.
- The success of revegetation will be monitored by an appropriately qualified person and supplementary replanting or seeding will be conducted within one year of the site failing to establish vegetation. This is to ensure that at least one suitable season for the growth of the vegetation has occurred.

1.1.6.2 Rehabilitation of the MIA and ROM

The following actions will be completed to rehabilitate the MIA and ROM domains:

- Services will be disconnected, and all buildings removed.
- Hard stand materials such as gravel or bitumen will be removed.
- Machinery and equipment will be removed.
- Storage tanks and pipelines will be drained into a containment if necessary and removed.
- Surface water drainage and fencing that is not required will be removed.
- Remaining waste and rubbish will be removed in accordance with relevant government requirements.
- A contaminated land investigation will be conducted by an approved auditor.
- The surface of the area will be reprofiled if necessary to ensure it is free draining.
- Topsoil will be re-spread and contour ripped or ploughed. The topsoil will have characteristics and composition suitable for growing the target vegetation.
- A seed mix of native species that has been designed by an appropriately qualified person will be applied at the design rate. The seed mix will reflect the topsoil applied and the pre-existing regional ecosystem present within and surrounding the MIA/ROM footprint.
- The success of revegetation will be monitored by an appropriately qualified person and supplementary replanting or seeding will be conducted within one year of the site failing to establish vegetation. This is to ensure that at least one suitable season for the growth of the vegetation has occurred.

1.1.6.3 Rehabilitation of the haul and access roads

The internal haul roads between the individual work sites on the MDL will be rehabilitated in a similar manner to the MIA and ROM area. It is possible that the landholder will negotiate the handover of some of the roads. In the case where all or a portion of the haul roads requires rehabilitation, the following actions will be completed:

- Any bitumen or gravel brought into the site will be removed.
- Additional disturbance because of road rehabilitation will be avoided.
- Erosion and sediment control structures installed for operation of the road will be inspected by an appropriately qualified person to determine if they should be removed or left in situ.
- The surface of the area will be reprofiled if necessary to ensure it is free draining.

- Topsoil will be re-spread and contour ripped or ploughed. The topsoil will have characteristics and composition suitable for growing the target vegetation.
- A seed mix of native species that has been designed by an appropriately qualified person will be applied at the design rate. The seed mix will reflect the pre-existing regional ecosystems along the length of the haul road.
- The success of revegetation will be monitored by an appropriately qualified person and supplementary replanting or seeding will be conducted within one year of the site failing to establish vegetation. This is to ensure that at least one suitable season for the growth of the vegetation has occurred.

1.1.7 Bulk Sampling Schedule

The project is expected to commence in the second quarter of CY2025 and will initially involve the establishment of the site infrastructure. Clear & grub activities are forecast to commence in the third quarter of CY2025, closely followed by topsoil removal and storage. Truck & excavator removal of overburden is forecast to commence in the fourth quarter of CY2025 with first coal also planned during the quarter. Production operations are scheduled for 18 months.

Table 2 BSP Schedule

		Total	Year 1	Year 2
Waste Volume	*BCM*	10,678,743	6,525,899	4,152,845
Ex-pit Dump	*%*	70		
In-pit Dump	*%*	30		
Ex-pit Waste Volume	*BCM*	7,475,120	6,525,899	949,222
In-pit Waste Volume	*BCM*	3,203,623	0	3,203,623
Coal Volume	*ROM t*	942,497	523,609	418,888
Topsoil Volume	*BCM*	84,601	84,601	0
In-pit Haulage Rate	*BCM/hr*	400	400	400
Ex-pit Haulage Rate	*BCM/hr*	250	250	250
Coal Haulage Rate	*BCM/hr*	250	250	250

1.1.8 Workforce requirements

Bulk sampling is proposed to be undertaken with two 12-hour shifts (day/night) on a 7-day rotation. The anticipated frontline workforce includes:

Table 3 BSP Workforce Requirements

	Crew 1	Crew 2	Crew 3	Crew 4	Subtotal
Roster: 7/7 DS/NS					
Excavator operator	3	2	3	2	10
Haul truck operator	6	6	6	6	24
Dozer operator	3	3	3	3	12
Grader operator	1	1	1	1	4
Water cart operator	1	1	1	1	4
Road haulage operator	12	12	12	12	48
ROM Operator	2	2	2	2	8
Drill and Blast	8	0	8	0	16
Maintenance	5	5	5	5	20
ERT	2	2	2	2	8
Supervision & OCE	3	3	3	3	12
Total	**46**	**37**	**46**	**37**	**166**

The workforce will be a mix of DIDO and FIFO. DIDO and hiring locally will be prioritised, with the workforce accommodated in Middlemount or Dysart in private accommodation or existing accommodation camps.

1.1.9 Approvals

Approval to construct the CCC BSP will be contingent on obtaining the following:

- Approval from the Department of Environment, Science and Innovation of a site-specific Environmental Authority that specifically addresses the environmental management requirements for the bulk sample activities;
- Amendment to licence conditions from the Department of Resources for the MDL based on a work program and rationale to incorporate the bulk sample activities;
- Estimated Rehabilitation Calculation for the environmental authority;
- An Indigenous Land Use Agreement (ILUA) with the Barna Barada Indigenous Group who hold a Native Title claim over the area of the proposed bulk sample and associated activities ;
- Updated Conduct and Compensation Agreements with landowners whose properties will be affected by the bulk sample including compensation arrangements;

- Approval from Isaac Regional Council (Saraji Road) and the Department of Transport and Main Roads (Fitzroy Development Road and Dysart-Middlemount Road) to utilise existing haul routes to existing CHPP and rail loading facility;
- Approval from the owner/operator to utilise the CHPP and rail loading facilities for delivery to export or domestic end-users;
- Agreements and approved delivery methods for product coal to any other domestic or end users for testing purposes.
- Approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth), as required.

1.2 Scope of Works

This GHG assessment has been conducted to address the requirements of the GHG Guideline (section 2.3.1) in support of the EA amendment application for the Project. Table 4 identifies sections of this Greenhouse Gas Assessment report addressing requirements of the GHG Guideline.

The following has been provided in alignment with the GHG Guideline:

- An inventory of expected GHG emissions resulting from the Project including the year at which the emissions will occur and a breakdown by source
- An estimate of projected Scope 1 emissions over the life of the project
- A high-level estimation of Scope 3 emissions resulting from the Project
- A description of the method used for estimating GHG emissions
- GHG abatement (decarbonisation) guidance in alignment with recommendations made in Appendix A of the GHG Guideline
- 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.

Table 4 Sections of the Greenhouse Gas Assessment addressing requirements of the GHG Guideline

Application requirements	Section
a. GHG emissions inventory (including Scope 1 and 3)	Section 4
b. GHG emission mitigation and management practices (including Scope 3 where possible)	Section 5.1.3
c. GHG abatement plan	Section 5

d. A risk assessment that outlines the Project's relative contribution to climate change impacts on Queensland's environmental values	Section 6

2. REGULATORY FRAMEWORK

2.1 International Agreements

2.1.1 Paris Agreement

The Australian Government signed the legally binding Paris Agreement (UNFCC 2016) 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 emissions by 43% below 2005 levels by 2030, 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.

2.2 Legislation and Regulation

2.2.1 Clean Energy and Jobs Act 2024 (Qld)

The *Clean Energy and Jobs Act 2024* (CEJ Act) was introduced to parliament in February 2024. The objective of the CEJ Act is to reduce GHG emissions in Queensland by stating emissions reduction targets. The emissions reduction targets are the following:

- by 30 June 2030, net greenhouse gas emissions in Queensland are reduced to an amount that is at least 30% below the net greenhouse gas emissions in Queensland for 2005
- by 30 June 2035, net greenhouse gas emissions in Queensland are reduced to an amount that is at least 75% below the net greenhouse gas emissions in Queensland for 2005
- by 30 June 2050, net greenhouse gas emissions in Queensland are reduced to zero (the ***2050 net zero emissions target***).

The CEJ Act includes recommendations regarding interim GHG reductions targets, the methodology for calculating GHG emissions inventories, the provision of annual progress statements towards stated goals, and stipulations regarding emissions reductions plans. A Clean Energy Expert Panel will also be established as a result of the CEJ Act to provide advice about achieving emissions reductions targets in Queensland.

2.2.2 *Queensland Climate Transition Bill 2023* (Qld)

The *Queensland Climate Transition Bill 2023* was introduced to Parliament in March 2023. The objective of the Bill is to support Queensland to meet its obligations under the Paris Agreement to keep global heating below 2°C, preferably 1.5°C, above pre-industrial levels, by 1 reducing Scope 1, 2 and 3 greenhouse gas emissions. It establishes a new statutory authority to develop and implement a strategic climate transition plan that ensures consultation, compensation, training and job opportunities for workers and local communities affected by the transition away from fossil fuels.

2.2.3 Energy (Renewable Transformation and Jobs) Act 2024 (Qld)

The *Energy (Renewable Transformation and Jobs) Act 2024* (Energy Act) was passed in April 2024. The Energy Act provides a clear pathway to clean, reliable and affordable power by enshrining key commitments from the plan to law. The key commitments of the Energy Act include legislating Queensland's renewable energy targets, enshrining a commitment to public ownership of energy assets in law, and establishing a Job Security Guarantee Fund in law to support affected energy workers. The Energy Act further establishes frameworks for building Queensland's SuperGrid; necessary high voltage transmission networks to enable the deployment of renewable energy infrastructure; and for Renewable Energy Zones that unlock and coordinate investment in renewable energy

generation. The Energy Act also establishes governance and advisory boards to support a coordinated energy transition.

2.2.4 Environmental Protection Act 1994 (Qld)

The *Environmental Protection Act 1994* (EP Act)[1] 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 does not explicitly regulate the emission of GHG, other than with reference to the storage of GHG regulated under the *Greenhouse Gas Storage Act 2009*. However:

- Regarding air emissions, a contaminant can be a gas (11(a))
- GHG emissions may constitute an environmental harm (14(1)(2)), i.e., "… any adverse effect, or potential adverse effect (whether temporary or permanent and of whatever magnitude, duration or frequency) on an environmental value …" "whether the harm is a direct or indirect result of the activity; or whether the harm results from the activity alone or from the combined effects of the activity and other activities or factors".

2.2.5 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 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 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.

2.2.6 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*.

2.2.7 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 50,000 tonnes carbon dioxide equivalent (t CO_2e) or 25,000 t CO_2e, respectively, per year. These entities are required to report on their Scope 1 and Scope 2 emissions. Scope 3 emissions are not included in NGER reporting due to the potential for double counting.

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

2.2.8 National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Cwlth)

The National Greenhouse and Energy Reporting (Measurement) Determination 2008 (NGER Measurement 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 and energy production and consumption.

2.2.9 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_2e per year, to keep their emissions at or below emissions baselines set by the Clean Energy Regulator. The Safeguard Mechanism is administered through the NGER scheme.

2.3 Policy and Guidelines

2.3.1 DESI Guideline Greenhouse Gas Emissions

The DESI *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 GHG emissions. The required information described by the GHG Guideline includes:

- An inventory of expected GHG emissions resulting from the Project including the stage at which the emissions will occur and a breakdown by source
- An estimate of projected Scope 1 and Scope 2 CO_2-e emissions over the life of the project, including an unabated and abated emissions scenario
- An estimate of annual Scope 3 emissions and total Scope 3 emissions over the life of the Project
- A description of the methodology used for estimating GHG emissions
- A GHG abatement (decarbonisation) plan in alignment with recommendations made in Appendix A of the GHG Guideline
- 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.

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

The Greenhouse Gas Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard (Scope 3 Standard) (GHG Protocol, 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', where 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. METHOD

3.1 Definitions

The following gases are considered to be GHGs (section 7A NGER Act):

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)

Scope 1 GHG emissions are produced from sources within the boundary of an organisation and because of that organisation's activities (DCCEEW, 2024). They include emissions from the combustion of liquid fuel, e.g., diesel, to do work or produce electricity. Scope 1 emissions are calculated at the point of emission release.

Scope 2 GHG emissions are indirect emissions that occur from the generation of electricity outside of the boundary of an organisation but that are consumed by the organisation (DCCEEW, 2024).

Scope 3 GHG emissions are indirect emissions that occur outside of the boundary of an organisation but that occur because of actions by the organisation (GHG Protocol, 2011; DCCEEW, 2024).

The purpose of monitoring and reporting GHG emissions is threefold:

- Allow Queensland and Australian governments to determine an annual inventory of GHG emissions against international agreements and legislated emissions reduction targets.
- Allow a company or organisation to manage or offset its Scope 1 and Scope 2 emissions to meet corporate or regulatory targets.
- Allow a company or organisation to influence Scope 3 emissions reduction through procurement or supply decisions.

The assessment has been conducted using data provided by Vitrinite via METserve. Katestone makes no claim as to the accuracy of this data.

3.2 Project Activities that Result in GHG Emissions

Project activities that will lead to Scope 1 GHG emissions are:

- Diesel combustion for generation of electricity, by mine plant (stationary), from hauling trucks (stationary) and by light vehicles (transport)
- Diesel oil consumed during blasting
- Fugitive methane emissions during mining
- Vegetation clearance at the onset of the Project.

There are no projected Scope 2 emissions resulting from the Project as no electricity will be purchased from the National Electricity Market (NEM).

The source of Scope 3 emissions considered in this assessment are:

- The combustion of sold coal
- Downstream distribution of coal from site to the CapCoal sampling facility at the German Creek coal mine.
- Upstream manufacturing and transportation of purchased diesel combusted on-site.

Due to the short timeframe and sampling nature of the Project, Scope 3 emissions resulting from worker commuting and purchased goods and services are considered immaterial and have not been included in this assessment.

3.3 Calculating GHG Emissions

The NGER Act establishes a national framework for corporations to report GHG emissions and energy consumption. Scope 1 emissions have been calculated using the allowable calculation methods contained in the *National Greenhouse and Energy Reporting Regulations 2008* (NGER Regulation), the *National Greenhouse and Energy Reporting* (Measurement) *Determination 2008* (NGER Determination)[2].

The Scope 1 GHG Assessment focuses on projected consumption of diesel by mine plant equipment, on-site generators, haul trucks, light vehicles and diesel consumed during blasting. Fugitive methane emissions were also included. The assessment was conducted using data provided by Vitrinite via METserve. Emissions factors in Schedule 1, NGER Determination Table 5 were applied.

The method for determining emissions from vegetation clearance is outlined in section 3.3.2.

Emissions factors may change in the future, which may affect the magnitude of emissions that are estimated in future years. Consequently, whilst the results are the best estimates that can be made at this time, they should be viewed for future years as approximate relative to 2024-2025 and may change subject to updated fuel usage data.

GHG emissions are typically calculated using Method 1, which applies emission factors and the energy content of the emission source. The formula for Method 1 is:

$$E = \frac{Q \times ECF \times EF}{1000},$$

Where:

E represents the total emissions in t CO_2-e,

Q is the quantity of the emission source (e.g., with units kL)

ECF is the energy content factor of the emission source (e.g., with units GJ/kL)

EF is the emission factor that describes the total amount of equivalent carbon dioxide emissions associated with the emission source (e.g., with units kg CO_2-e/GJ)

1000 returns the correct units for the emissions.

In the NGER Determination, each emission source has an emission factor associated with CO_2, CH_4, and NO_2. The total emissions are given by the sum of these three quantities applied in the above formula.

3.3.1 Emissions Factors

Table 5 summarises the energy contents and emission factors used to determine Scope 1 and 3 emissions.

[2] https://www.legislation.gov.au/Series/F2008L02309

Table 5 Summary of energy content and emissions factors for Scope 1 and 3 components

Emission source	Energy content	Units	Emission factor		Units
			Scope 1	Scope 3	
Diesel (transport)[1]	38.6	GJ/kL	70.4	17.3	kg CO_2-e/GJ
Diesel (stationary)[1,2]	38.6	GJ/kL	70.2	17.3	kg CO_2-e/GJ
Fugitive methane [3]	-	-	0.031	-	t CO_2-e/t ROM coal
Coking coal [1]	30.0	GJ/t	92.03	-	kg CO_2-e/GJ

[1] (DCCEEW, 2024)
[2] includes non-road-registered vehicles
[3] Subdivision 3.2.3.2 NGER determination 2008

3.3.2 Emissions from Vegetation Clearance

The Full Carbon Accounting Model (FullCAM) (Richards 2001) is used to assess the carbon stock (tonnes carbon per hectare (tC/ha)) of vegetation within the proposed areas for land clearing resulting from the Project. 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.

FullCAM is the standard method for measuring change in carbon stocks due to land use change and is used to assess the effects of LULUCF in Australia's National Greenhouse Gas Accounts. The carbon stock is multiplied by an emissions factor to give the tonnes of carbon dioxide equivalent (CO_2-e) that would be emitted if all the carbon stock was converted to carbon dioxide.

It is conservatively assumed that cleared vegetation is comprised of hummock woodlands with low rainfall to provide a worst-case scenario for emissions arising from land clearing. It is assumed land clearing occurs evenly across each project year.

3.3.3 Emissions from Downstream Distribution of Coal

Emissions resulting from incoming freight were estimated by multiplying the industry published fuel consumption of AB triple road trains and the projected transport distance. This assumed a daily rate of 12 trips each way of 50km from the mine site to the coal sampling facility at the German Creek coal mine via Fitzroy Development Road, and Dysart Middlemount Road. The fuel consumption (L/100km) of the AB triple road trains was calculated according to the *Australian Transport Assessment and Planning Guidelines* (ATAP, 2020) using a maximum vehicle weight limit of 107.5 t designated by the *Australian Heavy Vehicle Regulator* (NHVR, 2016). Emissions factors in Schedule 1, NGER Determination (Table 5) were applied to evaluate total GHG emissions resulting from fuel consumption. For Scope 3 emissions estimations due to transportation of freight it is assumed that outgoing vehicles were loaded to capacity weight, while incoming vehicles were unloaded.

3.3.4 Emissions from Upstream Processing of Purchased Diesel

Diesel will be consumed throughout the project for fuelling vehicles and generators. Emissions factors in the National Greenhouse Accounts Factors (Table 5) for the upstream extraction and processing of diesel oil were applied to diesel consumption data provided by Vitrinite via METserve to evaluate total Scope 3 GHG emissions resulting from the production of diesel for the Project.

4. GREENHOUSE GAS ASSESSMENT RESULTS

4.1 Scope 1 Emissions

GHG emissions associated with the Project have been considered and estimated on an annual basis for the life of the Project. A summary of estimated Scope 1 emissions associated with mining operations, expressed as t CO_2-e per annum, is presented in Table 6. The total LOM emissions resulting from the Project are estimated to be 74,736 t CO_2-e including land clearing.

The combustion of diesel represents the highest source of emissions for the Project, estimated to be 33,500 t CO_2-e for the LOM. Fugitive methane emissions are the second highest source of emissions for the Project, estimated to be 29,217 t CO_2-e for the LOM. The combined emissions resulting from the combustion of diesel and fugitive methane represent 84% of total GHG emissions for the Project (including land clearing).

Maximum annual GHG emissions associated with the Project occur in its first year. Emissions in project year 1 have been estimated to be:

- 44,577 t CO_2-e including GHG emissions resulting from land clearing
- 38,849 t CO_2-e excluding GHG emissions resulting from land clearing.

Table 6 Summary of estimated annual Scope 1 GHG emissions (t CO_2-e) for the Project

Project Year	Scope 1				Total	
	Diesel combustion	Fugitive methane	Blasting	Land clearing	Including land clearing	Excluding land clearing
	t CO_2-e					
1	22,435	16,070	344	5,728	44,577	38,849
2	11,065	13,148	219	5,728	30,159	24,431
LOM total	**33,500**	**29,217**	**563**	**11,457**	**74,736**	**63,280**

4.2 Scope 3 Emissions

The Scope 3 emissions inventory for the CCC BSP is provided in Table 7. The significant majority of Scope 3 emissions result from the combustion of sold coal (2,602,140 t CO_2-e and 99.6% of total). Emissions resulting from the upstream manufacturing and transportation of purchased diesel combusted on-site is the second highest source of Scope 3 emissions for the Project (8,394 t CO_2-e and 0.3% of total). Downstream distribution of coal to the sampling facility on AB triple road trains represents the remainder of Scope 3 emissions (1,893 t CO_2-e and 0.1% of total).

Table 7 Scope 3 emissions inventory (t CO_2-e) for the CCC BSP.

Project Year	Sold coal combustion	Downstream distribution	Upstream processing of purchased diesel	Total
	t CO_2-e			
1	1,445,632	947	5,613	**1,452,192**
2	1,156,508	947	2,781	**1,160,235**

Total	**2,602,140**	**1,893**	**8,394**	**2,612,427**
% of total	99.6%	0.1%	0.3%	100%

4.3 GHG Emitter Category for the Project

Maximum annual GHG Scope 1 emissions for the Project are estimated as 44,577 t CO_2-e, which exceeds the 25,000 t CO_2-e per annum threshold of GHG emissions. It is therefore considered a medium to high emitter under the GHG Guideline. Medium to high emitting projects are required to provide a Scope 3 emissions inventory, a GHG abatement plan, and a risk assessment with respect to climate change.

Recognising the short LOM constraints of the Project, a high-level Scope 3 emissions inventory and decarbonisation plan have been included in this report. The decarbonisation plan in Section 5 provides a description of relevant GHG emissions mitigation measures for the Project. A comprehensive decarbonisation plan with short, medium, and long-term targets will be developed should the Project lead to a full-scale mining operation.

4.4 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 prior to implementation of the GHG abatement plan. The emissions intensity for the Project has been determined in alignment with the method described in the National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015. The emissions intensity for the Project has been determined using the equation:

$$emissions\ intensity\ (t\ CO_2\ e/t\ product\ coal) = \frac{emissions\ (t\ CO_2 e)}{product\ coal\ (t)}$$

$$\frac{74{,}736\ t\ CO_2 e}{942{,}497\ t} = 0.0732\ t\ CO_2\ e/t\ product\ coal$$

The emissions intensity of 0.0793 t CO_2-e/tonne of product coal can be considered the GHG emissions reference point for the Project.

Progressive emissions reductions should be measured against this GHG emissions reference point for emissions intensity of coking coal production.

4.5 NGER Obligations

GHG emissions and energy use/production associated with the Project would need to be accounted for in annual corporate NGER scheme reporting in accordance with the *NGER Act 2007* and supporting legislation.

At a facility level:

- The NGER scheme facility reporting threshold of 25 kt CO_2-e of GHG emissions is exceeded in both project years.
- The NGER scheme facility reporting threshold of 100 TJ of energy consumption is exceeded in both project years.

4.5.1 Safeguard Mechanism

Scope 1 GHG emissions associated with the Project are not expected to exceed the Safeguard Mechanism facility threshold of 100 kt CO_2-e/yr. The Project would not be subject to the requirements of the Safeguard Mechanism in

its current format. This may change if the project becomes a full-scale operating mine. The Safeguard Mechanism is likely to change over time to encourage deeper GHG emissions reductions at a national level.

5. GREENHOUSE GAS ABATEMENT PLAN

This GHG Abatement Plan addresses requirements of the recently updated GHG Guideline for GHG management in line with Queensland's emission reduction and renewable energy targets, supporting Vitrinite in their application for environmental approval (Table 8).

Table 8 Sections of GHG Abatement Plan addressing the GHG Guideline

Requirement	Section
a. Project details	Section 1.1
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	Section 4 and Section 5.1
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	Section 4.4
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	Section 5.3
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 [1] 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	Section 5.1, Table 9

f. Advancing technologies and opportunities: i. Include provisions for regularly reviewing new technologies to identify opportunities to further reduce emissions and energy efficiency	Section 5.4
g. Monitoring and auditing program	Section 5.5
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	Section 5.6
[1] **An estimation of expected reduction of emissions has not been included due to the short time frame of the Project and the resulting limitations imposed on mitigation options.**	

5.1 GHG Emission Reduction Program

The objective, key results, and actions proposed for the Project GHG emission reduction program (Decarbonisation Plan) are summarised in Table 9. The Decarbonisation Plan focuses on Scope 1 emissions for the Project. High level mitigation measures for Scope 3 emissions are described in Section 5.1.3.5.

5.1.1 Goal

Vitrinite's goal is to have an energy efficient bulk sampling operation that minimises GHG emissions for the life of the project and establishes best practice GHG emissions reduction options for a future mining operation.

5.1.2 Objective, Key Results, and Actions

Table 9 shows the objective, key result areas (Opportunities 1–4) and management controls proposed for the Project's Decarbonisation Plan.

Table 9 Scope 1 Emissions Opportunities and Commitments

Opportunities	Commitments
Opportunity 1: Minimise GHG emissions resulting from mobile and stationary plant	• Optimise mine layout and run of mine for diesel use efficiency • Conduct real time monitoring and control of diesel use efficiency • Review options for service providers that offer services with lower GHG emission intensities
Opportunity 2: Measure gas content of coal seams to inform fugitive methane risk of future mining operations	• Engage a third-party contractor to sample coal seam gas composition to inform review of options for minimisation of fugitive emissions from future open cut coal mining operations • Implement best practice fugitive methane management where feasible

Opportunity 3: Project staff are engaged in energy efficiency and emissions reduction	• Standard Operating Procedures (SOP) are established for energy efficiency and emissions reduction • Staff are trained in SOPs for energy efficiency and emissions reduction
Opportunity 4: Optimise rehabilitation and revegetation of land affected by mining operations to promote carbon sequestration	• Rehabilitation and revegetation of disturbed areas to commence as soon as practicable

5.1.3 Management Controls to Reduce GHG Emissions

5.1.3.1 Opportunity 1: Mine site optimisation

Vitrinite will apply best practice and design loading, transit, and unloading areas to minimise unnecessary slowing or stopping of heavy trucks and optimise operational efficiency (Crittenden *et al*., 2016). This will include:

- Planning and scheduling to minimise material handling and double handling
- Optimising payload
- Minimising the slope of haul roads
- Minimising rolling resistance.

Vitrinite will investigate electrification alternatives to reduce GHG emissions resulting from haulage requirements should the project progress from bulk sampling to full-scale mining. Trolley assist (TA), in-pit crushing and conveying (IPCC), and battery electric vehicle (BEV) represent opportunities to reduce diesel consumption associated with operation of mining fleet (Bao, 2023). Generally, TA and IPCC electrification alternatives have high initial capital expenditures and reduce the flexibility of operations of traditional diesel-powered truck and shovel solutions, however, offer lower operational expenditures, emissions, longer service life, and significantly improved energy efficiencies (Bao, 2023). Emerging technologies in the mining sector continue to improve the potential savings position financially and regarding GHG emissions. Vitrinite will prioritise highest emitting operating equipment in decision-making, such as haul trucks and excavators, given these also represent highest operating expenditures via fuel consumption.

Vitrinite is responsible for emissions of any on-site contractors within its operational control under the NGER Act. Consequently, Vitrinite will require contractors and plant suppliers to meet diesel use efficiency measures, which may include:

- Use of most fuel-efficient vehicles or plant, including alternative drive trains, e.g., diesel-electric hybrids or battery electric vehicles.
- Engine, gearing, and/or timing controls for efficiency
- Training in efficient operation/driving and monitoring of operator/driver behaviour
- Use of premium diesel or biodiesel if available
- Automation where practicable.

5.1.3.2 Opportunity 2: Fugitive methane emissions

Vitrinite recognises the importance of developing an *in-situ* gas model to assess fugitive methane emissions resulting from open cut coal mining in accordance with the NGER Determination to:

- inform feasibility of fugitive methane emissions mitigation options
- prepare for the possibility of legislation that requires the development of site-specific fugitive methane emissions models in accordance with ACARP report C20005 and the NGER Determination.

Vitrinite will engage a third-party contractor to assess the gas content of targeted coal seams in the mining area in accordance with requirements of Method 2 of the NGER Determination.

Fugitive methane represents the second highest source of Scope 1 emissions for the CCC BSP Project. It is technically possible to pre-drain coal seam gas ahead of open cut mining where coal seams are thick enough and where gas pressure and methane content makes it practical to extract the gas. The following options are available and will be assessed:

- Gas drainage with flaring
- Gas drainage with power generation
- Gas drainage with compressed natural gas (CNG) conversion for use in retrofit haul trucks
- Gas drainage with liquified natural gas (LNG) conversion for offtake
- Optimised gas drainage with CNG conversion for use in retrofit haul trucks

5.1.3.2.1 Gas drainage with flaring

Vitrinite will investigate gas drainage with flaring as a potential option to reduce fugitive methane emissions. This approach involves capturing methane from coal seams ahead of mining activities and flaring it when it cannot be economically utilized. Through the flaring process, methane is combusted and converted into carbon dioxide and water vapor with lower net GHG emissions. By exploring this method, the Project aims to assess how effectively it could contribute to reducing Scope 1 emissions.

5.1.3.2.2 Gas drainage with power generation

Vitrinite will investigate gas drainage with power generation as a strategy for reducing fugitive methane emissions. In this approach, methane captured from coal seams ahead of mining activities is directed to power generation systems, where it serves as a fuel source to generate electricity. This process offers the co-benefit of reducing Scope 1 emissions and providing a source of energy to power on-site operations.

5.1.3.2.3 Gas drainage with compressed natural gas (CNG) conversion for use in retrofit haul trucks

The Queensland coal mining sector is exploring compressed natural gas (CNG) as a method to reduce diesel emissions. Mine Energy Solutions offers CNG conversion technology for retrofitting haul trucks from all major original equipment manufacturers (OEMs), allowing these trucks to use dual fuel technology with both CNG and diesel. Vitrinite will investigate the feasibility of CNG-powered trucks at the CCC BSP Project, where CNG production could be utilized to support the trial and may significantly reduce diesel emissions at the site.

5.1.3.2.4 Gas drainage with liquified natural gas (LNG) conversion for offtake

The process of transforming coal mine methane into LNG using a micro-LNG plant includes several steps. Initially, methane is captured through pre-drainage and subsequently purified to eliminate impurities such as carbon dioxide, nitrogen, and water vapor, ensuring it meets LNG specifications. During the liquefaction stage, the purified methane gas is cooled to around -162°C using cryogenic cooling techniques, converting it into liquid natural gas (LNG). Once liquefied, the LNG is stored in cryogenic tanks, preparing it for transportation while taking advantage of its reduced volume for more efficient distribution. This approach facilitates the conversion of coal mine methane into LNG for offtake. Vitrinite will investigate the feasibility of implementing LNG conversion infrastructure for management of coal mine methane.

5.1.3.3 Opportunity 3: Project staff education

Vitrinite will implement key performance indications (KPI) at the appropriate levels of management for its management controls on emissions reductions. Vitrinite is committed to having a workforce that understands the importance of energy efficiency and emissions reduction to the success of the business and will implement training of staff to ensure that management controls are effective and monitored. Vitrinite will incorporate energy efficiency in standard operating procedures and will promote a process of constant improvement.

5.1.3.4 Opportunity 4: Land rehabilitation

The Carbon Farming Initiative (CFI) is a voluntary carbon offsets scheme that allows land managers to earn carbon credits by changing land use or management practices to store carbon or reduce greenhouse gas emissions. Vitrinite will investigate and identify best management practices to increase the carbon stock in soil and vegetation in land owned by the company and will implement a CFI project if appropriate. Options such as the production of biochar from locally grown biomass and wood waste and sequestration of this in soil will be investigated.

Vitrinite will also consider whether rehabilitation activities on the mine site can be optimised for added carbon sequestration.

5.1.3.5 Scope 3 Emissions

Vitrinite will regularly review options for GHG abatement measures across the highest emitting parts of its supply chain, including:

- transportation of incoming and outgoing freight by transportation services with lower emissions intensity per tonne-kilometre
- emission reduction measures implemented during the combustion of sold coal.

5.2 Assessment of proposed GHG abatement measures

An assessment of proposed GHG abatement measures for the Project is provided in Table 10 and considers key risks, a comparison with relevant best practice environmental management standards and consideration of whether the inclusion of an ongoing monitoring program for the abatement measure is necessary.

'Approaching best practice' indicates the abatement measure is dependent on the degree of implementation. An 'embedded' monitoring program requirement indicates the abatement measure should become standard operating procedure once implemented.

Table 10 Assessment of proposed GHG abatement measures for the Project

Abatement measure	Risks	Comparison with relevant best practice environmental management standards	Ongoing monitoring program
Diesel efficiency	• High investment cost • Equipment reliability & serviceability issues	Approaching best practice	Required
Fugitive methane reduction	• Reduced capacity to mitigate fugitive methane emissions	Approaching best practice	Required
Project staff are engaged in energy efficiency and emissions reduction	• Low risk	Best practice	Embedded
Optimised rehabilitation practices	• Less carbon sequestration than projected due to physical climate impacts	Approaching best practice	Required
Regularly scope for new technologies	• Low risk	Best practice	Embedded

5.3 Emission reduction targets

Vitrinite will publish and report on the success of the emissions reduction targets described in Table 9 and summarised below:

- a reduction in total diesel use
- measurement of methane composition of coal seam strata to inform review of options for future fugitive emissions mitigation
- implementation and reporting of KPIs at the appropriate levels of management for its management controls on emissions reductions
- improved processes and reporting of GHG emissions and management controls detailed in this Greenhouse Gas Assessment report.

5.4 Advancing technologies and opportunities

Vitrinite will regularly review market progress and cost-effective opportunities in relation to opportunities detailed in Table 9, including:

- alternate drive-train technology and other energy efficiency measures for highest emitting mine plant equipment
- improvements in methods for managing fugitive methane emissions

- optimisation of rehabilitation practices for cleared land.

5.5 Monitoring and Auditing

The status of commitments outlined in Table 9 will be periodically audited and reviewed.

5.6 Reporting

Vitrinite is subject to annual NGER reporting of its Scope 1 emissions, however, does not trigger emissions reduction obligations of the Safeguard Mechanism for the Project.

6. RISKS AND LIKELY MAGNITUDE OF IMPACTS ON ENVIRONMENTAL VALUES

6.1 Impacts of GHG emissions on environmental values

The term greenhouse gas (GHG) comes from the 'greenhouse effect', which refers to the natural process that warms the Earth's surface. GHGs in the atmosphere absorb the solar radiation released by the Earth's surface and then radiate some heat back towards the ground, increasing the surface temperature. Human activity, especially burning fossil fuels and deforestation, is increasing the concentration of GHG in the atmosphere and hence increasing the absorption of outgoing heat energy. Even a small increase in long-term average surface temperatures has numerous direct and indirect consequences for climate.

The main GHG associated with the project is carbon dioxide (CO_2), with smaller contributions from methane (CH_4) and nitrous oxide (N_2O). These gases vary in effect and longevity in the atmosphere, however a system named Global Warming Potential (GWP) allows them to be described in terms of CO_2 (the most prevalent greenhouse gas) called carbon dioxide equivalents (CO_2-e). A unit of one tonne of CO_2-e is the basic unit used in carbon accounting. In simple terms the greenhouse gas emissions associated with the project can be expressed as the sum of the emission rate of each greenhouse gas multiplied by its associated GWP (denoted in squares). For example:

tonnes $\mathbf{CO_2}$**-e** = tonnes $\mathbf{CO_2}$ x 1 + tonnes $\mathbf{CH_4}$ x 28 + tonnes $\mathbf{N_2O}$ x 265

Global risks due to climate change include more frequent and intense extreme weather events, causing widespread adverse impacts and related losses and damages to nature and people. Risks are often complex, compounding, and potentially cascade across sectors and regions.

The Project is located in North Queensland. Key climate change hazards for this region include:

- increased frequency of hot days (>35ºC) and very hot days (>40ºC)
- increased likelihood of bushfire weather
- increased likelihood of short duration high intensity rainfall
- increased pan evaporation rates
- increased frequency and severity of drought
- less frequent but more intense tropical cyclones.

6.2 Contribution of the Project to State, Commonwealth, and Global emissions inventories

Australia is required to provide the UNFCCC with National Inventory Reports annually, biennial reports every 2 years, and National Communications every 4 years. These reports include details on total and sectoral GHG emissions, progress against reduction targets, and mitigation actions. The Global GHG emissions inventory is available from Climate Watch[3] as a compilation of data from a range of sources, including but not limited to the International Energy Agency (IEA), the U.S. Environmental Protection Agency, the U.N. Food and Agriculture Organization, and the Global Carbon Project.

[3] https://www.climatewatchdata.org/ghg-emissions?chartType=area&end_year=2021&regions=WORLD&source=Climate%20Watch&start_year=1990

The maximum annual contribution of the Project's Scope 1 GHG emissions to the annual GHG emissions inventory of Australia and Queensland (updated Dec 2023) is 0.010% and 0.036%, respectively (Table 11). The maximum annual contribution of the Project's Scope 1 GHG emissions inventory to the Global GHG emissions inventory (updated 2021) is 8.99 x 10^{-5} % (Table 11). While few, if any, individual projects would make a noticeable change to the Earth's climate, the accumulation of GHG in the atmosphere due to human activities does.

Scope 3 emissions are not included in State, National or Global GHG emissions inventories as they represent the Scope 1 and 2 emissions of another domestic or international reporting entity. The maximum annual contribution of the Project's Scope 1, 2 and 3 GHG emissions to the annual GHG emissions inventory of Australia and Queensland (updated Dec 2023) is 0.335% and 1.170%, respectively (Table 11). The maximum annual contribution of the Project's Scope 1, 2 and 3 GHG emissions to the annual Global GHG emissions inventory (updated 2021) is 2.93 x 10^{-3} % (Table 11). There is potential for double counting of emissions when comparing Scope 3 emissions with State, National or Global GHG emissions inventories, and there is uncertainty in emissions values due to a lack of regulated or consistent calculation methods for some sources of Scope 3 emissions.

Table 11 Maximum annual contribution of the project to annual GHG emissions inventory

Category	Project[1]	Australia[2]		Queensland[2]		Global[3]	
	Emissions (Mt CO_2-e)	Emissions (Mt CO_2-e)	Project (%)	Emissions (Mt CO_2-e)	Project (%)	Emissions (Mt CO_2-e)	Project (%)
Maximum annual inventory (Scope 1)	0.0446	432.9	0.010	124.1	0.036	49,600	0.0000899
Maximum annual inventory (including Scope 3)	1.452	432.9	0.335	124.1	1.170	49,600	0.00293

Notes: [1]Estimated maximum annual GHG emissions including Land Use and Land Use Change [2]National Greenhouse Gas Inventory – Paris Agreement Inventory, Inventory Year: 2023 (DCCEEW 2023) including Land Use and Land Use Change [3]Climate Watch Global Historical Emissions as of 2021

6.3 Potential net emissions reductions due to the Project's effect on emissions generated by other parties

The Project is a bulk sample pit (BSP) located at a site amenable to open cut mining operations and identified as containing a significant resource of low volatile coal. While it is unlikely to directly generate emissions reductions in other parties, the Project will produce high quality product that is expected to be primarily used in steel production, enabling the manufacturing of products that are critical to society. Domestic and international steel production is necessary for development of existing and emerging renewable energy projects. Some incidental coal may be encountered during the recovery of the target seams, which may be unsuitable for steel production. Such coal may therefore be made available as a thermal by-product suitable for electricity generation. In that instance the Project can add value to an already mined by-product by contributing to a reliable electricity grid during the transition to low emissions electricity generation.

Operation of the Project may inform future coal mining operations in the site area and learnings with regard to mine site optimisation and gas content of coal seams may enable emissions reductions by improving the emissions intensity of coal mining for longer-term coal extraction projects.

7. SUMMARY

This document outlines a GHG assessment for the CCC Bulk Sampling Project.

The total LOM emissions resulting from the Project are estimated to be 74,736 t CO_2-e (including land clearing). The maximum annual GHG emissions resulting from the Project are estimated to be 44,577 t CO_2-e (including land clearing) and is therefore considered a medium to high emitter under the GHG Guideline. Vitrinite will estimate and report GHG emissions annually under NGER. The Project will not be subject to the Australian Government's Safeguard Mechanism.

Scope 3 GHG emissions for the LOM are estimated to be 2,612,427 t CO_2-e with the majority source of emissions resulting from the downstream combustion of product coal (2,602,140 t CO_2-e or 99.6% of total).

The following areas of opportunity are identified to reduce emissions associated with the CCC Bulk Sampling Project:

- Minimising GHG emissions resulting from mobile and stationary plant
- Minimising fugitive methane emissions from mining operations
- Staff engaging in energy efficient practices
- Optimising rehabilitation on land affected by mining operations to promote carbon sequestration.

Vitrinite commits to a process of continuous improvement informed by engaged staff, monitoring, and research and development. A comprehensive decarbonisation plan with short, medium, and long-term targets will be developed should the Project lead to a full-scale mining operation.

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