Mahalo North Coal Seam Gas Project – Greenhouse Gas Assessment

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FINAL

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Glossary

Term	Definition
GJ	gigajoules
kL	kilolitres
MJ	megajoules
m	metres
m^3	cubic metres
km	kilometres
Nm^3	normal cubic metre
t	tonnes
tCO_2-e	tonnes carbon dioxide equivalents
Nomenclature	**Definition**
CH_4	Methane
CO_2	carbon dioxide
N_2O	nitrous oxide
Abbreviations	**Definition**
CC Act	*Climate Change Act* 2022
CCCA Act	*Climate Change (Consequential Amendments) Act* 2022
CSG	Coal seam gas
Cwth	Commonwealth
DES	Department of Environment and Science
EA	Environmental Authority
EF	Emission factor
GHG	Greenhouse gases
LULUCF	Land Use, Land Use Change and Forestry
NEM	National electricity market
NGER	National Greenhouse and Energy Reporting
NGER Act	*National Greenhouse and Energy Reporting Act* 2007
PL	Petroleum lease
QLD	Queensland

EXECUTIVE SUMMARY

Katestone Environmental Pty Ltd (Katestone) was commissioned by Epic Environmental to conduct a greenhouse gas assessment of the Mahalo North Coal Seam Gas Project (the Project) to assist Comet Ridge Mahalo North Pty Ltd (Comet Ridge) with an application for the Environmental Authority (EA).

Comet Ridge plans to construct and operate a greenfield coal seam gas facility on land that is covered by Petroleum Lease (PL) 1128. The site is located approximately 41 km northeast of Springsure, in the Bowen Basin. The Project is expected to comprise of up to 68 wells (34 lateral and 34 vertical), gas gathering lines, and a gas compression facility. Diesel generators will power wellhead pumps at every wellhead site for the first 12 months after each well comes online, and two natural gas generators will power equipment such as gas compression units, gas dehydration and separation units, and other ancillary equipment at the gas compression facility.

The entire project lifetime is expected to be up to 30 years, with wells drilled progressively over an 11-year period. Wells are expected to be operational for 12-15 years before depletion and capping.

Most Scope 1 emissions are produced through the combustion of gas at the Facility, with diesel combustion contributing 1-10% of the emissions during the 10-year construction period. Annual Scope 1 emissions are less than the 25,000 tCO_2-e threshold for reporting, peaking at 13,628 tCO_2-e in 2030. However, energy consumption by the Facility is greater than the 100,000 GJ NGER threshold between 2024 and 2032 and will need to be reported.

Upstream Scope 3 emissions from construction materials are a small fraction of total Scope 3 emissions which are dominated by emissions from the combustion or use of supplied CSG for electricity generation or ammonia production, respectively. Nearly 10% fewer emissions are produced in the scenario where 90% of Project CSG is used for ammonia production and only 10% combusted for electricity generation. The emissions intensity of electricity produced from CSG (0.42 – 0.62 tCO_2-e/MWh) is less than that of coal-fired electricity production (0.86 – 0.99 tCO_2-e/MWh) and within the range of electricity produced by combustion of natural gas (0.39 – 0.79 tCO_2-e/MWh).

The Project will contribute only a small fraction to national and State GHG emissions inventory at <0.0027% and <0.008% per annum respectively.

1. INTRODUCTION

Katestone Environmental Pty Ltd (Katestone) was commissioned by Epic Environmental (Epic) to complete a greenhouse gas (GHG) assessment of the Mahalo North Coal Seam Gas Project (the Project). Epic has been engaged by Comet Ridge Mahalo North Pty Ltd (Comet Ridge) to prepare the Environmental Authority (EA) application to authorise petroleum activities within the petroleum lease (PL 1128). This greenhouse gas assessment will form part of the EA application.

Comet Ridge plans to construct and operate a greenfield coal seam gas (CSG) facility on land located approximately 41 km northeast of Springsure, in the Bowen Basin. The Project is expected to comprise of the following:

- Up to 68 wells (34 lateral and 34 vertical)
- Diesel fuelled generators at each wellhead
- Gathering lines
- Gas compression facility (GCF), including two gas-powered generators.

The entire Project lifetime is expected to be up to 30 years, with wells drilled progressively over an 11-year period. Wells are expected to be operational for 12-15 years. This assessment estimates the Scope 1 and Scope 3 GHG emissions generated over the lifetime of the Project, based on activity data provided by Comet Ridge, and includes projected energy use and gas production. Scope 2 GHG emissions are not assessed as there will be no electricity purchased from the National Electricity Market (NEM).

2. POLICY AND LEGISLATIVE CONTEXT

2.1 National and State policy

2.1.1 Commonwealth

The Australian Government has committed that Australia will reduce greenhouse gas (GHG) emissions by 43% below 2005 levels by 2030 and will achieve net zero GHG emissions by 2050. Each Australian state has also made a commitment to reach net zero by 2050, or earlier.

The amended Safeguard mechanism is a key plank in the Australian Government's emissions reduction strategy. This mechanism requires facilities that emit more than 100,000 tonnes of carbon dioxide equivalent (tCO_2-e) Scope 1 emissions in a year to progressively reduce their emissions on an annual basis until 2030 and thereafter in 5-year blocks. The Safeguard mechanism will apply a sectoral baseline of 198 million tonnes CO_2-e across all electricity generators connected to Australia's main electricity grids, Individual grid-connected electricity generators are not required to reduce their emissions under the Safeguards mechanism unless the sector's total emissions exceed the sectoral baseline.

2.1.2 Queensland Climate Action Plan

The Queensland Climate Action Plan highlights the intentions of the Queensland Government to achieve greenhouse gas emissions reductions in line with the national policy. The plan outlines the following targets:

- 50% renewable energy by 2030
    - 70% renewable energy by 2032
    - 80% renewable energy by 2035
- 30% emissions reduction below 2005 levels by 2030
- Zero net emissions by 2050.

2.2 Climate Change Act 2022 (Cwth)

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 that 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.

2.3 Climate Change (Consequential Amendments) Act 2022 (Cwth)

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.

2.4 National Greenhouse and Energy Reporting (NGER) (Cwth)

The *National Greenhouse and Energy Reporting Act* 2007 (NGER Act) established a national framework for corporations to report GHG emissions and energy consumption. The NGER Act is administered by the Clean Energy Regulator with details of the scheme and allowable calculation methodologies contained in the:

- *National Greenhouse and Energy Reporting Regulations 2008* (NGER Regulation); and
- *National Greenhouse and Energy Reporting Determination 2008* (NGER Determination).

The *NGER Regulation* recognises Scope 1 and Scope 2 emissions as follows:

- Scope 1 emissions – in relation to a facility, means the release of GHG into the atmosphere as a direct result of an activity or series of activities (including ancillary activities) that constitute the facility;
- Scope 2 emissions – in relation to a facility, means the release of GHG into the atmosphere as a direct result of one or more activities that generate electricity, heating, cooling or steam that is consumed by the facility but that do not form part of the facility.

Scope 3 emissions are not reported by a facility under the NGER Act as they are the Scope 1 emissions of another facility and would be considered double counting.

Registration and reporting are mandatory for corporations that have energy production, energy use or GHG emissions that exceed specified thresholds. GHG emission threshold include Scope 1 and Scope 2 emissions. Current NGER reporting thresholds are summarised in Table 1.

Table 1 NGER reporting thresholds - energy and GHG

Threshold level	Threshold type		
	GHG (tCO_2-e)	Energy consumption (GJ)	Energy production (GJ)
Facility	25,000	100,000	100,000
Corporate	50,000	200,000	200,000

2.5 Safeguard Mechanism (Crediting) Amendment Act 2023 (Cwth)

The *Safeguard Mechanism (Crediting) Amendment Act* 2023 amended the NGER Act and other legislation to establish a framework to give effect to the Safeguard mechanism reforms. The detail of the Safeguard mechanism is provided by the *National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015*.

Net emissions from all Safeguard facilities should not exceed 100 million tonnes of CO_2-e in 2029-30 and zero from 2049-50. The electricity generation sector, for example, cannot exceed the baseline of 198 million tonnes CO_2-e per year.

2.6 Queensland Climate Transition Bill 2023

The objective of the Queensland Climate Transition 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 intends to establish 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.

3. METHODOLOGY

3.1 Emissions estimation

GHG emissions associated with the Project have been estimated for every year of operation. The construction phase of the Project happens over the operational years and therefore has been absorbed into the operational years. A summary of estimated emissions, expressed as tonnes per annum expressed in terms of tonnes CO_2 equivalent (tCO_2-e) is presented. Reporting obligations based on a conservative estimate of annual GHG emissions are summarised, along with measures to mitigate GHG emissions through avoidance and minimisation.

The methodologies used to estimate the GHG emissions resulting from the Project are consistent with:

1. *National Greenhouse and Energy Reporting (Measurement) Determination 2008*
2. The Greenhouse Gas Protocol
3. Air – EIS Information Guideline

For emissions estimation regarding the combustion of fuels, the methodology is consistent with a Method 1 approach as detailed in the *NGER Determination*. In general, the formula applied is:

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

where E represents the total emissions in tCO_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 $kgCO_2$-e/GJ), and the 1000 returns the correct units for the emissions.

For calculating fugitive emissions, Method 1 as per Division 3.3.6A of the *NGER Determination* is

$$E = \sum_j (Q_j \times EF_j \times S_j),$$

where E represents the fugitive emissions released at the wellhead tCO_2-e, j represents either CO_2 of CH_4, Q is the total quantity of gas that passes through the wellhead (in tonnes), EF is the emission factor, S is the measured share of each gas type.

For Scope 3 emissions, it is assumed that all gas is combusted for power generation rather than a proportion being used for other purposes, e.g., ammonia production. This ensures that the conservative scenario is considered for the purposes of reporting Scope 3 emissions.

Table 2 provides the energy content and emissions factors used in the calculation of GHG emissions. The total emission factors are presented, which are calculated from summing the individual emission factors for carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

Table 2 Summary of energy content and emission factors relevant to the Project

Emission source	Energy content	Units	Emission Factor		Units
			Scope 1	Scope 3	
Diesel (stationary)	38.6[(a)]	GJ/kL	70.20[(a)]	-	$kgCO_2$-e/GJ
Diesel (transport)	38.6[(a)]	GJ/kL	70.41[(a)]	-	$kgCO_2$-e/GJ
Natural gas distributed in a pipeline	0.0393[(a)]	GJ/m^3	51.53[(a)]	-	$kgCO_2$-e/GJ
Fugitive carbon dioxide	-	-	2.60E-6[(a)]	-	tCO_2-e/t of gas
Fugitive methane	-	-	1.32E-3[(a)]	-	tCO_2-e/t of gas
Cement	-	-	-	498.5[(b)]	$kgCO_2$-e/t
Steel	-	-	-	1,910[(c)]	$kgCO_2$-e/t

Table notes:
[(a)] *National Greenhouse and Energy Reporting (Measurement) Determination 2008, Compilation 14*
[(b)] IPCC, https://www.ipcc-nggip.iges.or.jp/EFDB/find_ef.php?ipcc_code=2.A.1&ipcc_level=2
[(c)] World Steel Organisation, https://worldsteel.org/steel-topics/sustainability/sustainability-indicators

3.2 Activity data

Projected Scope 1 and Scope 3 emissions for the Project during construction and operation have been estimated from projected activity data provided by Comet Ridge and the methods and factors described in the following resources:

- National Greenhouse and Energy Reporting (Measurement) Determination 2008

There are no Scope 2 emissions associated with the Project as there will be no electricity purchased from the grid (NEM).

Comet Ridge has no control over the use of the gas once it has been exported[1]. Scope 3 calculations are provided for 100% combustion of the gas for power production (Scenario 1), and for 10% combustion for power generation and 90% for use as a chemical feedstock in urea production (Scenario 2).

The values in Table 3 describe the sources of Scope 1 and Scope 3 emissions. Wells are drilled progressively over the lifetime of the Project. Both cement and steel will be used at each wellhead during construction and will contribute to Scope 3 emissions.

A diesel generator will supply power for the pump infrastructure at each wellhead to collect gas and will contribute to Scope 1 emissions. Wells will only run at 100% load for approximately six months before being scaled back.

There will also be a gas compression facility where gas will be gathered and compressed ready for pipeline distribution. Two natural gas-powered generators will supply power to the compression infrastructure, also contributing to Scope 1 emissions.

Other Scope 1 emissions include diesel usage for machinery when constructing wellhead infrastructure, transport for miscellaneous purposes and fugitive emissions from wellhead sites. The locations of the wellheads are shown in Figure 1.

The expected gas composition will be 95.59% methane, 4.27% nitrogen, and 0.14% carbon dioxide with an energy content factor of 32.45 MJ/Nm^3. This energy content factor is used for the purposes of calculating Scope 3

[1] CSG sold on the domestic market can be used for different purposes, including the two scenarios outlined in this report.

emissions from combustion of the collected gas. Pipeline quality natural gas is assumed and energy content factors in the *NGER Determination* are used to calculate GCF emissions.

Table 3 Summary of activity data for the Project

Project Year	Cement (t)	Steel (t)	Diesel (kL)			Natural gas – site power generation (Nm^3)	Gas sent to pipeline (Nm^3)
			Machinery	Transport	Power generation		
2024	86.1	208.3	272.3	1.4	219.0	2,943,360	16,919,914
2025	86.1	208.3	272.3	1.4	219.0	4,415,040	93,644,818
2026	17.2	41.7	54.5	1.4	43.8	5,886,720	120,654,096
2027	34.5	83.3	108.9	1.4	87.6	5,886,720	112,278,432
2028	34.5	83.3	108.9	1.4	87.6	5,886,720	120,948,370
2029	17.2	41.7	54.5	1.4	43.8	5,886,720	120,131,489
2030	103.4	249.9	326.7	1.4	262.8	5,886,720	112,511,602
2031	0	0	0	1.4	0	4,415,040	92,391,047
2032	51.7	125.0	163.4	1.4	131.4	4,415,040	77,225,052
2033	68.9	166.6	217.8	1.4	175.2	2,943,360	64,255,165
2034	86.1	208.3	272.3	1.4	219.0	2,943,360	54,041,037
2035	0	0	0	1.4	0	2,943,360	46,097,723
2036	0	0	0	1.4	0	2,060,352	39,941,013
2037	0	0	0	1.4	0	2,060,352	34,745,236
2038	0	0	0	1.4	0	2,060,352	30,571,765
2039	0	0	0	1.4	0	2,060,352	27,097,344
2040	0	0	0	1.4	0	2,060,352	24,245,708
2041	0	0	0	1.4	0	2,060,352	21,706,004
2042	0	0	0	1.4	0	2,060,352	19,595,023
2043	0	0	0	1.4	0	2,060,352	17,779,046
2044	0	0	0	1.4	0	1,471,680	16,249,825
2045	0	0	0	1.4	0	1,471,680	13,295,669
2046	0	0	0	1.4	0	1,471,680	11,478,161
2047	0	0	0	1.4	0	1,471,680	10,331,587
2048	0	0	0	1.4	0	1,471,680	9,576,568
2049	0	0	0	1.4	0	1,471,680	7,714,921
2050	0	0	0	1.4	0	1,471,680	5,355,718
2051	0	0	0	1.4	0	1,471,680	4,697,468
2052	0	0	0	1.4	0	1,471,680	3,715,775
2053	0	0	0	1.4	0	1,471,680	2,255,557
2054	540.6	0	0	1.4	0	0	264,944

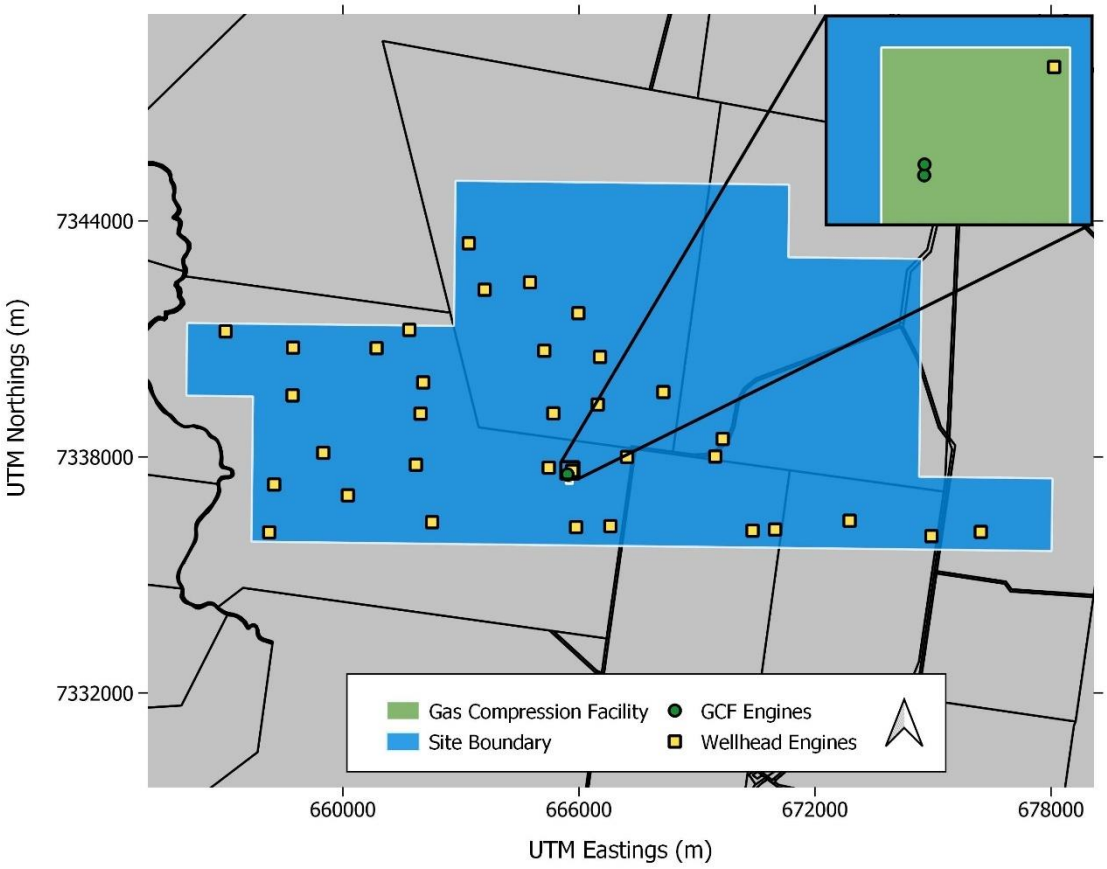

Figure 1 Location of emission sources

4. ASSESSMENT RESULTS

4.1 Emissions and energy projections

A summary of anticipated annual GHG emissions along with estimated energy consumption and production is summarised in Table 4. A full emissions breakdown by source is provided in Table A1 as well as a breakdown of energy use and production in Table A2.

Scope 1 emissions over the 30-year life of the Project are projected to be 183,869 tCO_2-e, or an average of 5,931 tCO_2-e per annum. Scope 1 emissions are highest during the construction years (2024 to 2030 and 2032 to 2034) due to the combustion of diesel by machinery and for electricity generation along with the combustion of CSG for electricity generation at the facilities, reaching 13,628 tCO_2-e in 2030. Scope 1 emissions are less in subsequent years, with the main contribution from gas combustion for electricity generation to run the facilities and a smaller fraction from fugitive methane released from well heads and pipelines. The fraction of Scope 1 emissions from gas combustion and fugitive gas has a stepwise decline until well decommissioning in 2054, when diesel combusted for transport becomes the sole source of Scope 1 emissions.

Total annual Scope 1 emissions are less than the threshold for a facility (Table 1) under the NGER Act.

Cement and steel used in construction of the well heads account for 89 – 529 tCO_2-e of upstream Scope 3 emissions per annum between 2024 and 2034, and 269 tCO_2-e during decommissioning in 2054.

Two scenarios are provided for downstream Scope 3 emissions. Total Scope 3 emissions for Scenario 1, where all gas is combusted to produce electricity, are 2,230,093 tCO_2-e for the life of Project while total Scope 3 emissions for Scenario 2, where 90% of the gas is used to produce ammonia, are approximately 225,000 tCO_2-e less at 2,003,905 tCO_2-e. Scope 3 emissions under either scenario peak in 2028, and then progressively decline until 2054. The relative proportions of Scope 1 and Scope 3 emissions for Scenario 1 and Scenario 2 are presented in Figure 2.

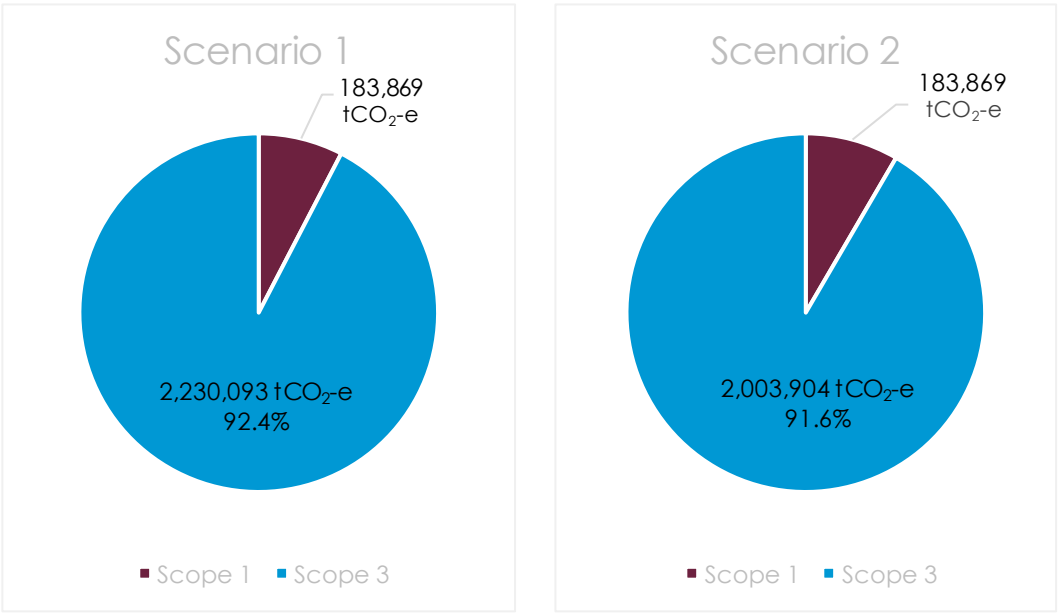

Figure 2 Relative contribution of Scope 1 and Scope 3 emissions under Scenario 1 all gas combusted for electricity generation and Scenario 2 90% of gas converted to ammonia and 10% combusted for electricity generation

Table 4 Summary of annual GHG emissions and energy consumption and production for the Project

Project Year	Scope 1 emissions (tCO_2-e)[2]	Scope 3 emissions[3] (tCO_2-e)	Scope 3 emissions[4] (tCO_2-e)	Energy Used (GJ)[5,6,7]	Energy Produced (GJ)[5,6,7]	Contribution to national emissions	Contribution to State emissions
		100% combustion for power generation	90% ammonia production / 10% combustion for power generation				
2024	7,311	28,733	25,859	134,691	44,686	0.00147%	0.00459%
2025	10,363	157,029	141,123	192,528	65,507	0.00208%	0.00651%
2026	12,304	201,840	181,347	235,195	83,894	0.00247%	0.00773%
2027	12,562	187,922	168,852	238,987	84,503	0.00252%	0.00789%
2028	12,571	202,420	181,877	238,987	84,503	0.00252%	0.00790%
2029	12,304	200,966	180,562	235,195	83,894	0.00247%	0.00773%
2030	13,628	188,665	169,555	254,157	86,937	0.00274%	0.00856%
2031	9,031	154,492	138,799	173,565	62,464	0.00181%	0.00567%
2032	9,816	129,396	116,280	184,943	64,290	0.00197%	0.00617%
2033	7,089	107,797	96,883	130,898	44,077	0.00142%	0.00445%
2034	7,346	90,805	81,627	134,691	44,686	0.00147%	0.00461%
2035	6,008	77,082	69,253	115,728	41,643	0.001206%	0.003773%
2036	4,214	66,787	60,003	81,026	29,150	0.000846%	0.002647%
2037	4,209	58,099	52,198	81,026	29,150	0.000845%	0.002644%
2038	4,205	51,121	45,928	81,026	29,150	0.000844%	0.002641%
2039	4,202	45,311	40,708	81,026	29,150	0.000844%	0.002639%
2040	4,199	40,542	36,424	81,026	29,150	0.000843%	0.002637%

[2] NGER threshold for reporting GHG emissions by a facility is 25,000 tCO_2-e per annum
[3] If 100% combustion of exported gas for power generation.
[4] If 10% combustion of exported gas for power generation and 90% use as chemical feedstock for ammonia production.
[5] NGER threshold for reporting is 100,000 GJ
[6] Energy produced refers to the electricity or motive power produced by the combustion of diesel or gas for facility operations and is a line item in NGER. It is less than energy content of the fuel due to the loss of heat energy to the environment. It does not refer to the energy in the CSG supplied to the market.
[7] NGER threshold for reporting energy consumption or energy production by a facility is 100,000 GJ per annum

2041	4,197	36,296	32,609	81,026	29,150	0.000843%	0.002636%
2042	4,195	32,766	29,438	81,026	29,150	0.000842%	0.002635%
2043	4,193	29,729	26,709	81,026	29,150	0.000842%	0.002634%
2044	2,999	27,172	24,412	57,891	20,821	0.000602%	0.001884%
2045	2,997	22,232	19,974	57,891	20,821	0.000602%	0.001882%
2046	2,995	19,193	17,244	57,891	20,821	0.000601%	0.001881%
2047	2,994	17,276	15,521	57,891	20,821	0.000601%	0.001880%
2048	2,993	16,013	14,387	57,891	20,821	0.000601%	0.001880%
2049	2,991	12,900	11,590	57,891	20,821	0.000601%	0.001879%
2050	2,989	8,956	8,046	57,891	20,821	0.000600%	0.001878%
2051	2,989	7,855	7,057	57,891	20,821	0.000600%	0.001877%
2052	2,988	6,213	5,582	57,891	20,821	0.000600%	0.001877%
2053	2,986	3,772	3,389	57,891	20,821	0.000600%	0.001876%
2054	4	713	668	54	0	0.000001%	0.000003%
Total	183,869	2,230,093	2,003,904	3,496,739	1,232,495		
Average	5,931	71,938	64,642	112,798	39,758		

Scope 1 emissions follow energy use by the Project for its construction and operations; energy use and energy produced are also reported under NGER and this is a measure of energy use efficiency by a facility, i.e. 35% on average for this Project. Energy used by the Project will be higher than the NGER threshold for energy used by a facility.

The Project will contribute <0.0027% to the current national emissions inventory and <0.008% to Queensland's emissions inventory, in any one year.

4.2 Reporting obligations

Under current energy use projections the Project will have to report under the NGER Act between 2024 and 2035, as energy used in any one of these years is >100,000 GJ (Table 1).

4.3 Emissions intensity

Queensland currently has 43 hydrocarbon fueled electricity generators connected to the NEM (Table 5). Coal fired generators have the greatest capacity to produce electricity and produce the greatest quantity of greenhouse gas emissions at between 2.3 and 9.8 million tonnes of CO_2-e per annum.

Table 5 Relative electricity production capacity (MW), Scope 1 emissions, and emissions intensity for hydrocarbon-fuelled electricity generators connected to the NEM in Queensland (2021-2022)

Electricity generation fuel (number operating)	Capacity (MW)	Total Scope 1 emissions ($MtCO_2$-e)	Emissions intensity (tCO_2-e/MWh)
Black Coal (8)	443 – 1,680	2.3 – 9.8	0.86 – 0.99
Diesel (2)	15 - 414	0.003	0.6 – 0.7
Natural Gas (6)	385	0.007 – 0.85	0.39 – 0.79
Waste coal mine gas (6)	15 - 64	0.04 – 0.19	0.52 – 0.67
Coal seam gas (6)	3 - 630	0.007 – 0.34	0.42 – 0.62
Landfill gas (13)	1 - 7	0.0003 – 0.004	0.07 – 0.1

CSG when used for electricity generation in Queensland has a lower emissions intensity than black coal but is equivalent, albeit at the lower end, to the emissions intensity of electricity produced by combustion of diesel, natural gas, and waste coal mine gas (Table 5, Figure 3). Landfill gas produces the lowest amount of electricity and has the lowest emissions intensity.

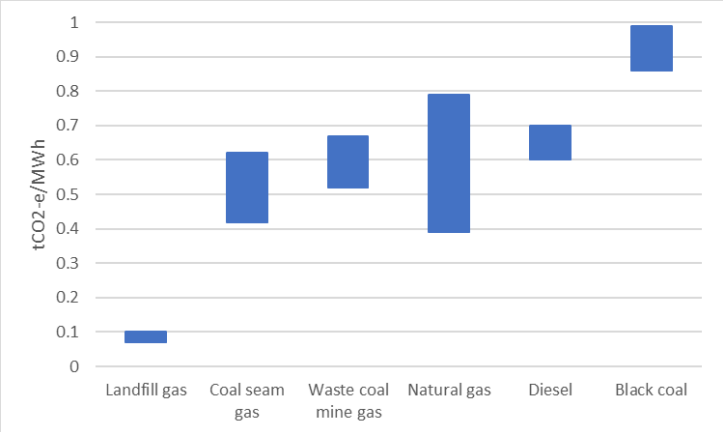

Figure 3 Comparison of emissions intensity (tCO_2-e/MWh) for hydrocarbon-fuelled electricity generators connected to the NEM in Queensland (2021-2022)

5. CONCLUSIONS

Katestone Environmental Pty Ltd (Katestone) was commissioned by Epic Environmental to conduct a greenhouse gas assessment of the Mahalo North Coal Seam Gas Project (the Project) to assist Comet Ridge Mahalo North Pty Ltd (Comet Ridge) with an application for the Environmental Authority (EA).

Comet Ridge plans to construct and operate a greenfield coal seam gas facility on land that is covered by Petroleum Licence (PL) 1128. The site is located approximately 41 km northeast of Springsure, in the Bowen Basin. The Project is expected to comprise of up to 68 wells (34 lateral and 34 vertical), gas gathering lines, and a gas compression facility. Diesel generators will power wellhead pumps at every wellhead site for the first 12 months after each well comes online, and two natural gas generators will power equipment such as gas compression units, gas dehydration and separation units, and other ancillary equipment at the gas compression facility.

The entire project lifetime is expected to be up to 30 years, with wells drilled progressively over an 11-year period. Wells are expected to be operational for 12-15 years before depletion and capping.

Most Scope 1 emissions are produced through the combustion of gas at the Facility, with diesel combustion contributing 1-10% of the emissions during the 10-year construction period. Annual Scope 1 emissions are less than the 25,000 tCO_2-e threshold for reporting, peaking at 13,628 tCO_2-e in 2030. However, energy consumption by the Facility is greater than the 100,000 GJ NGER threshold between 2024 and 2032 and will need to be reported.

Upstream Scope 3 emissions from construction materials are a small fraction of total Scope 3 emissions which are dominated by emissions from the combustion or use of supplied CSG for electricity generation or ammonia production, respectively. Nearly 10% fewer emissions are produced in the scenario where 90% of Project CSG is used for ammonia production and only 10% combusted for electricity generation. The emissions intensity of electricity produced from CSG (0.42 – 0.62 tCO_2-e/MWh) is less than that of coal-fired electricity production (0.86 – 0.99 tCO_2-e/MWh) and within the range of electricity produced by combustion of natural gas (0.39 – 0.79 tCO_2-e/MWh).

The Project will contribute only a small fraction to national and State GHG emissions inventory at <0.0027% and <0.008% per annum respectively.

6. REFERENCES

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APPENDIX A EMISSIONS AND ENERGY BREAKDOWN

Table A1 Breakdown of GHG emissions for every source (tCO_2-e)

Project Year	Scope 1					Scope 3			
	Diesel			Natural gas – onsite	Fugitive emissions from wellheads	Natural gas – sent offsite		Cement	Steel
	Machinery & Equipment	Transport	Electricity generation			100% combustion for electricity generation	10% combustion for electricity generation/ 90% ammonia production		
2024	738	4	593	5,961	16	28,293	25,419	43	398
2025	738	4	593	8,941	87	156,588	140,683	43	398
2026	148	4	119	11,921	113	201,752	181,259	9	80
2027	295	4	237	11,921	105	187,746	168,676	17	159
2028	295	4	237	11,921	113	202,244	181,701	17	159
2029	148	4	119	11,921	112	200,878	180,474	9	80
2030	885	4	712	11,921	105	188,136	169,026	52	477
2031	0	4	0	8,941	86	154,492	138,799	0	0
2032	443	4	356	8,941	72	129,132	116,015	26	239
2033	590	4	475	5,961	60	107,444	96,531	34	318
2034	738	4	593	5,961	50	90,365	81,186	43	398
2035	0	4	0	5,961	43	77,082	69,253	0	0
2036	0	4	0	4,172	37	66,787	60,003	0	0
2037	0	4	0	4,172	32	58,099	52,198	0	0
2038	0	4	0	4,172	29	51,121	45,928	0	0
2039	0	4	0	4,172	25	45,311	40,708	0	0
2040	0	4	0	4,172	23	40,542	36,424	0	0
2041	0	4	0	4,172	20	36,296	32,609	0	0
2042	0	4	0	4,172	18	32,766	29,438	0	0
2043	0	4	0	4,172	17	29,729	26,709	0	0
2044	0	4	0	2,980	15	27,172	24,412	0	0
2045	0	4	0	2,980	12	22,232	19,974	0	0
2046	0	4	0	2,980	11	19,193	17,244	0	0
2047	0	4	0	2,980	10	17,276	15,521	0	0
2048	0	4	0	2,980	9	16,013	14,387	0	0
2049	0	4	0	2,980	7	12,900	11,590	0	0
2050	0	4	0	2,980	5	8,956	8,046	0	0
2051	0	4	0	2,980	4	7,855	7,057	0	0
2052	0	4	0	2,980	3	6,213	5,582	0	0
2053	0	4	0	2,980	2	3,772	3,389	0	0
2054	0	4	0	0	0	443	398	269	0

Table A2 Breakdown of energy consumption and production for every source (GJ)

Project Year	Consumption				Production	
	Diesel			Natural gas – onsite	Diesel – electricity generation	Gas combustion – electricity generation
	Machinery & Equipment	Transport	Electricity Generation			
2024	10,509	54	8,453	115,674	3,043	41,643
2025	10,509	54	8,453	173,511	3,043	62,464
2026	2,102	54	1,691	231,348	609	83,285
2027	4,204	54	3,381	231,348	1,217	83,285
2028	4,204	54	3,381	231,348	1,217	83,285
2029	2,102	54	1,691	231,348	609	83,285
2030	12,611	54	10,144	231,348	3,652	83,285
2031	0	54	0	173,511	0	62,464
2032	6,305	54	5,072	173,511	1,826	62,464
2033	8,407	54	6,763	115,674	2,435	41,643
2034	10,509	54	8,453	115,674	3,043	41,643
2035	0	54	0	115,674	0	41,643
2036	0	54	0	80,972	0	29,150
2037	0	54	0	80,972	0	29,150
2038	0	54	0	80,972	0	29,150
2039	0	54	0	80,972	0	29,150
2040	0	54	0	80,972	0	29,150
2041	0	54	0	80,972	0	29,150
2042	0	54	0	80,972	0	29,150
2043	0	54	0	80,972	0	29,150
2044	0	54	0	57,837	0	20,821
2045	0	54	0	57,837	0	20,821
2046	0	54	0	57,837	0	20,821
2047	0	54	0	57,837	0	20,821
2048	0	54	0	57,837	0	20,821
2049	0	54	0	57,837	0	20,821
2050	0	54	0	57,837	0	20,821
2051	0	54	0	57,837	0	20,821
2052	0	54	0	57,837	0	20,821
2053	0	54	0	57,837	0	20,821
2054	0	54	0	0	0	0