Greenhouse Gas Report
Rover 1
Castile Resources LTD

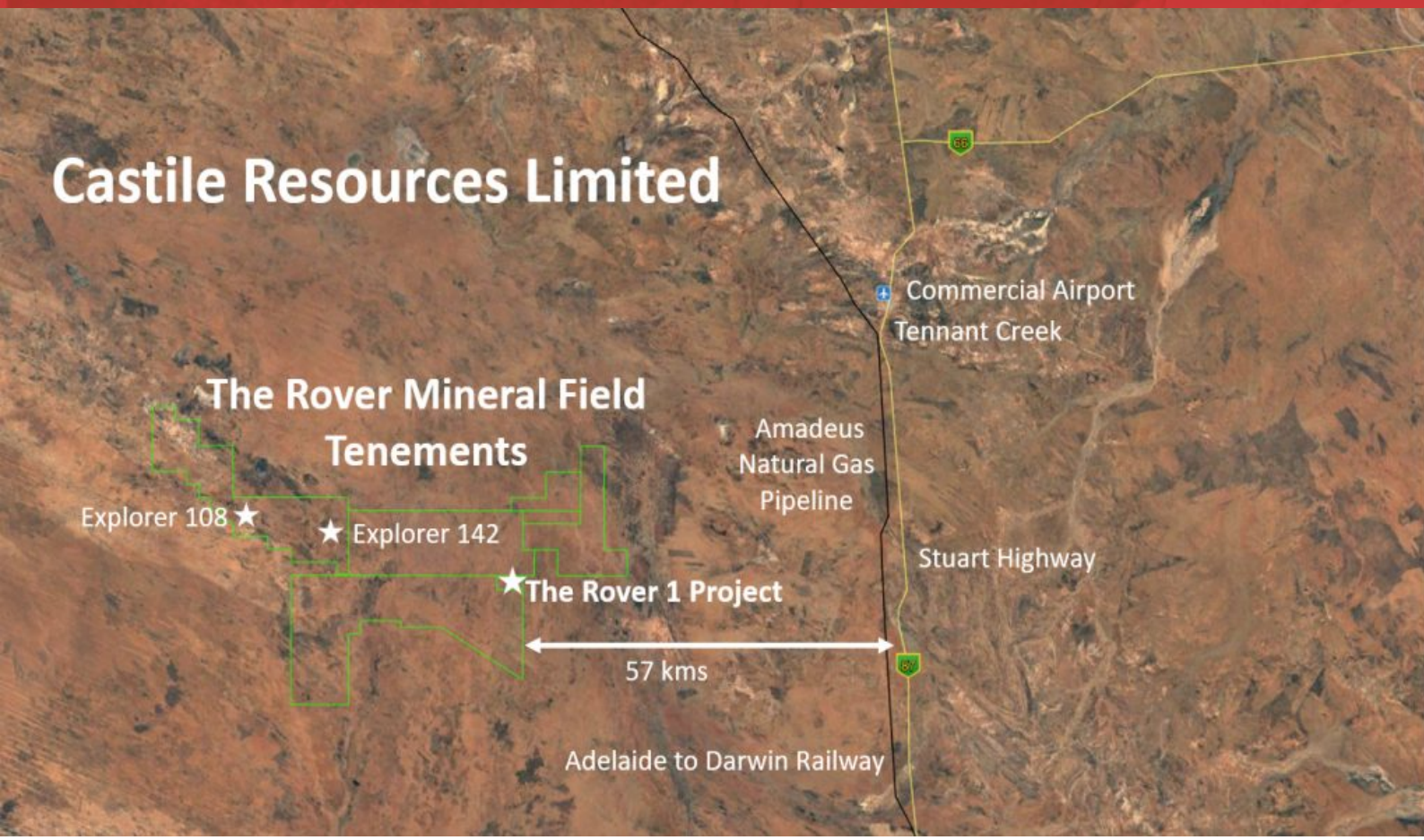

TABLE OF CONTENTS

Tables

Figures

Appendices

ACRONYMS

DFS	Definitive Feasibility Study
EPA	Environmental Protection Authority
FIFO	Fly in fly out
FullCAM	Full Carbon Accounting Model
GHG	Greenhouse gas
NGER	National Greenhouse and Energy Reporting
NT	Northern Territory
NTG	Northern Territory Government
PFS	Pre-Feasibility Study
POX	Pressure Oxidation
TSF	Tailing Storage Facility

1 INTRODUCTION

This document provides a preliminary estimate of Greenhouse Gas (GHG) emissions associated with the construction and operation of the Rover 1 Project (the Project). Estimates of Scope 1, Scope 2, and any relevant material scope 3 emissions are required to be provided in a Referral to the Northern Territory (NT) Environmental Protection Authority (EPA) under the Environmental Protection Act 2019 (the EP Act), in alignment with approved GHG estimation methods specified under the National Greenhouse and Energy Reporting Act 2007 (NGER Act) and national framework. The assessment will inform decision-making with respect to abatement measures and whether a formal GHG Abatement Plan is required.

1.1 Project overview

Castile Resources Limited (herein referred to as Castile), owns tenements within the Rover Mineral Field of the NT, of which the Rover 1 deposit is the most advanced. Castile proposes to develop an Iron Oxide Copper Gold (IOCG) mine and processing plant, approximately 70 km southwest of Tennant Creek, NT. Tenements ELR29957 and ELR29958 contain the high-grade iron oxide-copper-gold resource, which form part of the Rover Mineral Field.

Castile proposes to develop an underground operation, accessed through a portal and decline developed in competent rock of the Wiso Basin via a box cut. Additional key physical components include a waste rock dump (WRD), processing plant, paste plant, tailings storage facility (TSF), run-of mine (ROM) pad, and supporting infrastructure including accommodation village Figure 1-1. A prefeasibility study (PFS) has been completed for the Project.

Castile is considering options for power at the Project, the most preferred of which and assumed herein, is natural gas via an offtake from the Amadeus pipeline, and small onsite gas power station. Ore will be processed on site, and bulk product transported to Darwin via rail (and road to Tennant Creek).

The components of the Rover-1 project relevant to this GHG emissions assessment are listed below and shown in Figure 1-2:

- Site preparation – removal of vegetation
- Mine infrastructure construction and operations
    - access roads, and site infrastructure natural gas supply
    - designated waste rock dump and tailings storage facilities
    - decline box cut
    - processing plant construction
    - plant and site operations including
        - worker's accommodation, offices, workshops and associated infrastructure
        - electrical power and water supply
        - transport/ supply of production support materials and mine products and wastes
        - transport of personnel (FIFO)
- Project schedule
    - 18 months of construction
    - 10 years of operation; and
    - Assumed 9 months of decommissioning.

1.2 Purpose

The purpose of this GHG estimate is to identify and quantify material sources of GHG emissions over the life of the Project and provide an estimate of the nature and scale of GHG emissions for the Referral. The estimate will be used to inform the environmental approval process and allow assessment of the GHG emissions aspects of the Project, against the EP Act and relevant NT Government GHG policies and legislation.

GHG emission estimates will also inform project planning and design in relation GHG emission reduction and energy efficiency measures. The intent is that as the project progresses, the GHG estimate will be refined based on engineering design and project execution strategy.

To address the above requirements, this report presents:

- The scope and boundary of the GHG estimate
- The inputs, assumptions and methodologies used in GHG emissions estimation
- Results of GHG emissions estimation by project phase, activity and type of GHG emissions; and
- A review of emissions estimates against relevant NT Government GHG policies and legislation.

This report forms the GHG section of the environmental approval referral.

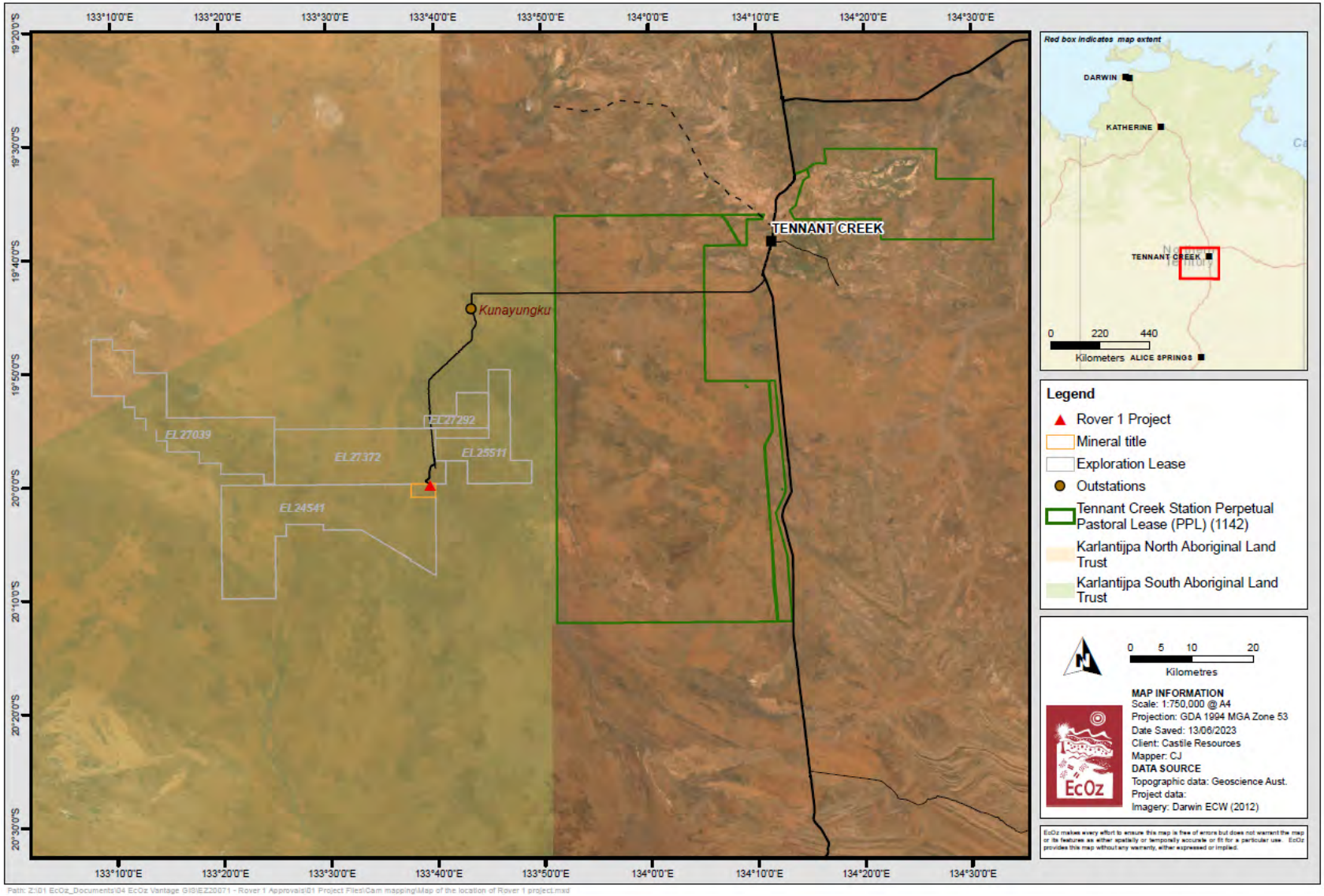

Figure 1-1. Locality of Rover 1 Project

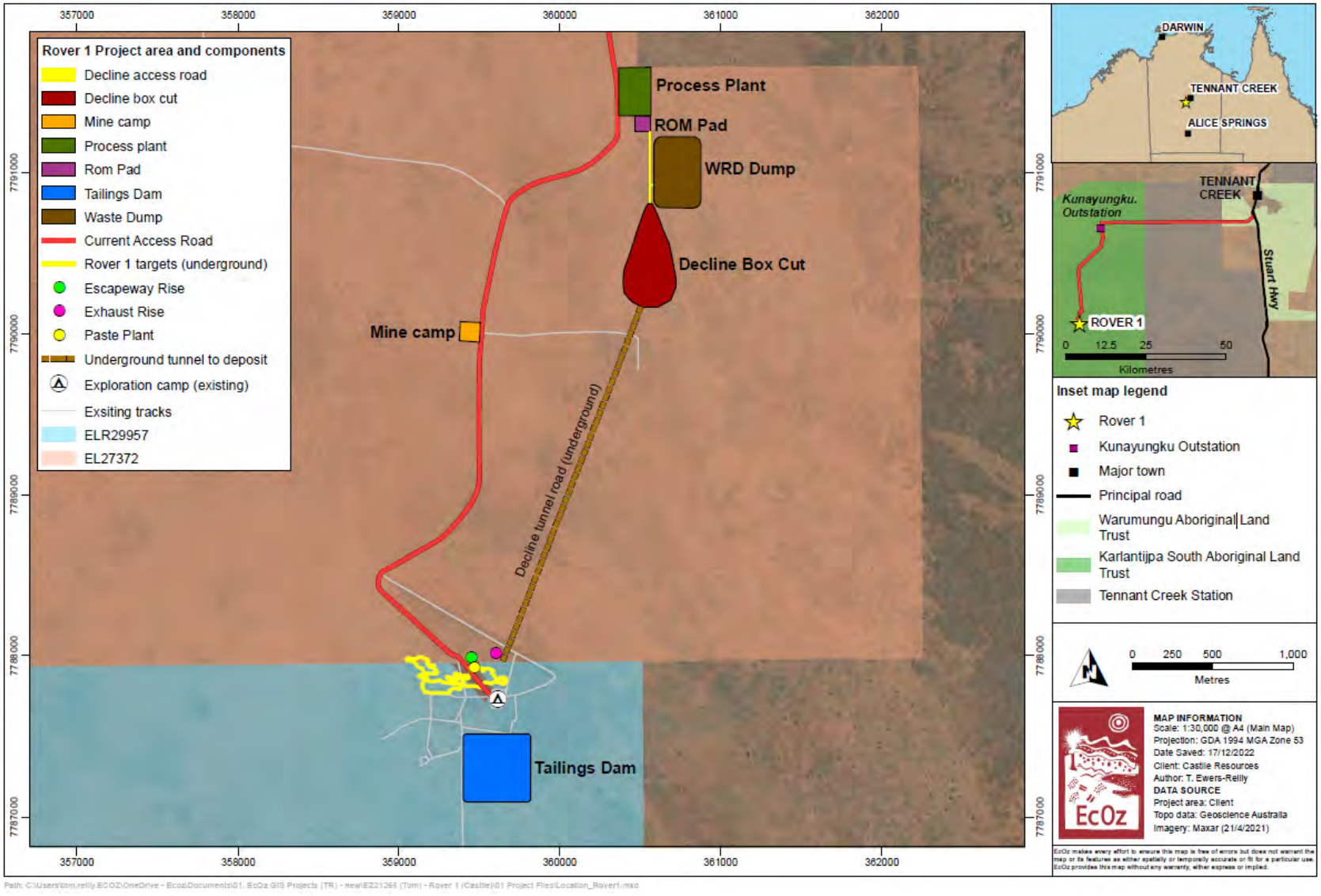

Figure 1-2. Components of Rover 1 Project

2 ASSESSMENT BOUNDARY

A GHG assessment boundary encompasses all primary effects (intended change) and significant secondary effects (unintended change) caused by activities that are under operational control (owned or controlled by the project proponent). Sources of GHG emissions are classified into scope 1, 2 or 3 emissions. Scope 1 emissions are direct emissions from activities or aspects of the project, scope 2 emissions are indirect emissions from energy consumption and scope 3 emissions are indirect emissions other than scope 2. The inclusion and/or exclusion of emissions from activities and aspects in the GHG assessment boundary are determined by the proponent's level of operational control over those activities e.g., 3rd party logistics, travel and waste are outside of the proponent's operational control and therefore excluded from the GHG assessment boundary.

2.1 Boundary

The boundary for the Project GHG estimate is illustrated in Figure 2-1 and includes activities and aspects under operational control. The estimate assesses the scope 1 and scope 2 emissions of the construction 18 months), operation (10 years) and decommissioning (< 1 year) phases of the Project, including those items detailed in section 2.2. GHG estimate boundary inclusions are outlined in section 2.2.42.2.3 and exclusions are noted in section 2.2.5.

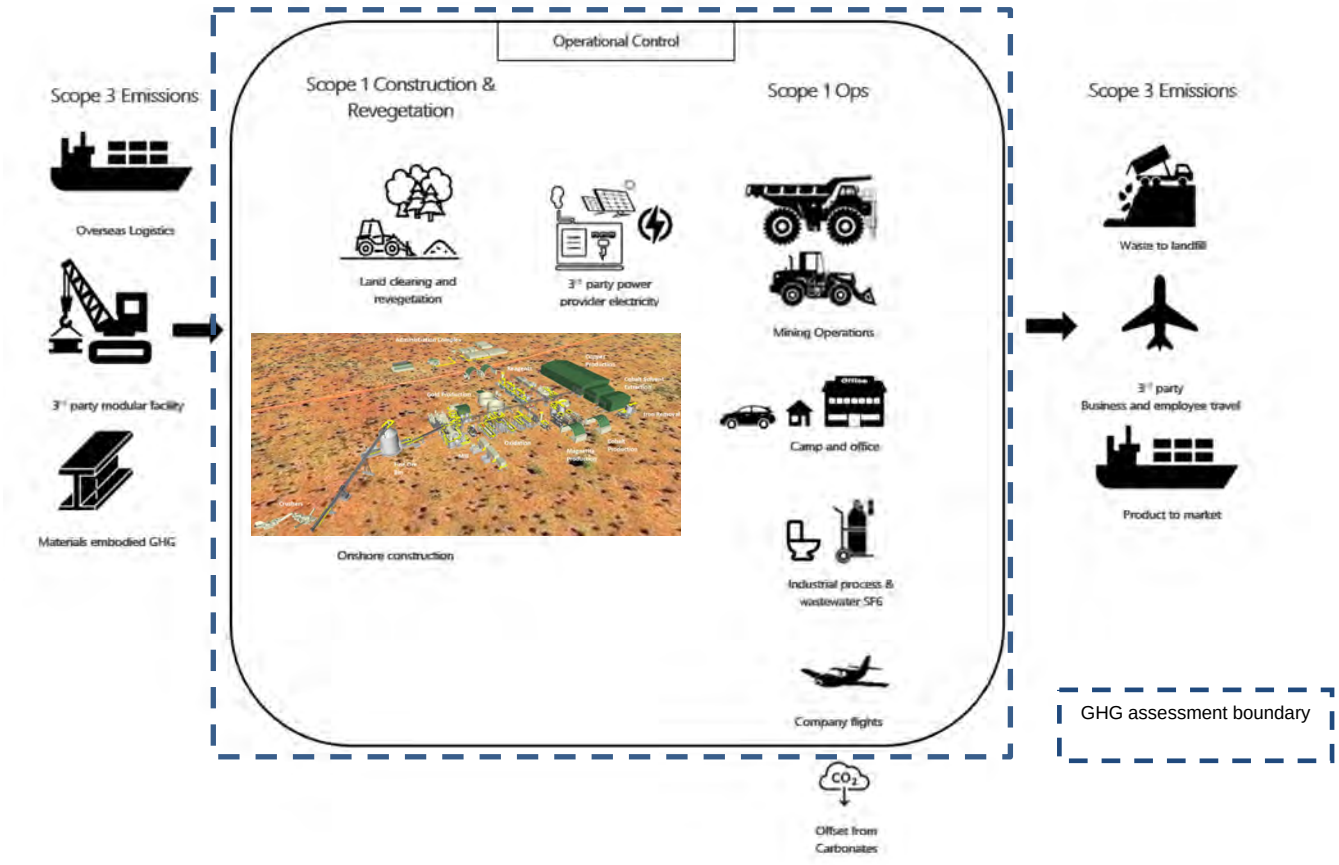

Figure 2-1. Boundary of GHG estimate and scope categories

2.2 GHG activities and aspects

GHG emissions are estimated for the construction, operation and decommissioning phases of the project. A description of each of the activities and aspects included in each phase is provided below.

2.2.1 Construction

The construction of the Project infrastructure including:

- Civil and construction – earthworks and use of construction machinery, construction of infrastructure, installation of process/ plant and electrical equipment.
- Vegetation and land use change – the reduction in carbon during the construction period associated with removal of vegetation (trees, shrubs, etc), dead woody material, roots and change in soil carbon due to the project activities.
- Diesel power generation
- Diesel consumed for logistics associated with the construction of facilities.
- Camp sewage treatment plant emissions
- Travel – Charter flights for construction workers.

2.2.2 Operations

- Mining – diesel consumed during mining/extraction of ore and associated logistics
- Mining – GHG emissions from ammonium nitrate (ANFO) used in underground mining as an explosive
- Processing Plant – use of natural gas (pipeline) in ore processing (e.g., furnaces)
- Electrical power consumption
- Site support operations - diesel consumed by site equipment and vehicles
- Travel – Charter flights for operations and maintenance workers.
- Sewage treatment – Methane and carbon dioxide emissions from the treatment of operations and maintenance personnel sewage.
- Vegetation and land use change – ongoing GHG emissions associated with removal of vegetation (trees, shrubs, etc), dead woody material, roots and change in soil carbon due to the project activities.
- Processing plant pressure oxidation (POX) neutralisation – GHG emissions from neutralisation with lime/limestone prior to tails storage.

2.2.3 Decommissioning

Decommissioning activities are not scoped at this stage in the project. Considering they represent construction in reverse, albeit less onerous in effort, GHG emissions in decommissioning were assumed to be 50% of construction emissions, in line with industry standards. No detail is available on revegetation activities.

2.2.4 Inclusions

The construction and operation activities and aspects are noted in Table 2-1, and are the basis for the GHG estimate boundary. Scope 1 and scope 2 emissions were identified within the assessment boundary and included in the GHG estimate.

Table 2-1. GHG Estimate Boundary Inclusion

Location	Item	Item Description (characteristics, length, area, materials etc)
Mining Plant	29.4 ha Area	Construction of mining plant including accommodation village.
Processing plant	6 ha Area	Construction of processing plant.
TSF	22 ha Area	Construction of TSF.
Gas Pipeline Corridor	120 ha Area	Construction of a 40km long x 30m wide corridor for a natural gas (domgas) supply pipeline
Road	Access road and haul road	Existing road in the right of way location.
Minesite	Equipment and existing machinery	Dozer, Wheel Loader, Flat Roller, Pad Footcrane, Welding, 50t Crane, 20t Franna Crane, Bobcat, 60ft EWP, 982 Front End Loader, CAT IT28, Tip truck, Light Truck, UTE's, Bus, 3t Forklift, Mobile Batch Plant, Grader, Water Cart, B Double Truck.
Minesite	Offices and accommodation	Operations offices and accommodation, capacity up to 120 people. Including sewage treatment plant.
Minesite	Box cut and vertical pit mining equipment	Jumbo, Loader, Trucks, Charge Rig, Service machine, UG Grader, Stope Drill, Shotcrete.
Minesite	Operations water supply	Dewatering – electric pumps included in natural gas (pipeline) power plant generation.
Minesite	Power supply	Natural gas (pipeline) 3rd party provider
Minesite	Material movement	Logistics movements of materials and product by B Double Truck and Rail.
Minesite	Explosives	Anfo used during underground mining
Offices and accommodation	Onsite potable water requirement	Electric pumped bore water included in natural gas (pipeline) power plant generation.

2.2.5 Exclusions

Table 2-2. outlines the items excluded from the GHG Estimate Boundary for the Project. Scope 3 emissions were outside the scope of this GHG estimate because the Project has no operational control over these activities.

Table 2-2. GHG Estimate Boundary Exclusion

Location	Item	Item Description (characteristics, length, area, materials etc)
Road	All weather roads	No new roads assumed.
All	Waste	Third party waste disposal emissions not included. No data.
All	Owner organisation office and engineering	Assumed all site based, other facilities not material.
All	Offsite supplied equipment	Offsite fabrication and international shipping of supplied equipment is not included in this estimate due to a lack of available data.
All	Decommissioning	No data on decommissioning activities available.
All	Overseas logistics	Shipping, road transport of materials of supply, plant machinery,
All	Shipping to market	Road transport, shipping, aviation associated with sale and distribution of gold and minerals.

2.2.6 GHG Estimate Boundary Assumptions

The following assumptions have been made in the calculation of GHG estimates.

1. Work front assumed to use electricity 24 hours a day during 18 month construction period and for life of mine.
2. 18-month construction phase activities breakdown (% represents % of time activities occur over the period):
    - Civil construction, earthworks and land clearing 100% in the first 12 months of construction
    - Mechanical, Structural and Electrical 100% over 18 months
    - Camp construction 100% over 18 months
3. 10-year operation phase activities breakdown:
    - Operations (excluding mining plant) 17% 1st year, 100% 2nd-9th year and 67% 10th year
    - POX processing plant 17% 1st year, 100% 2nd-9th year and 38% 10th year
    - Road Maintenance 50% 1st year, 100% 2nd-10th year
4. Construction and Operations assume a 30.5 day a month, 12 hours a day work front.
    - Workforce during construction assumed 52 people
    - Workforce during operations assumed 127 people
5. No specific assumptions made for decommissioning activities.
6. 1 flight a week Darwin to Rover-1 (1756 km return) assumed during construction, 2 flights a week Darwin to Tennant Creek (3512 km return) assumed during operations.
7. To simplify emissions calculation a single diesel emission factor has been used for transport. The conservative NGERs transport emissions factor was utilised, Diesel Oil Euro i.

2.2.7 Data Collection and Uncertainty

It is noted that this estimate uses the scope and project details as defined in the Castile Rover 1 PFS, Castile Resources LTD, dated November 2022, as the main input to this GHG estimate. The natural gas (pipeline) and diesel use profiles were provided by Castile (Michael Poepjes and Mark Savage, 5 April 2023). The PFS is a high-level document formed to support a pre-feasibility assessment level of detail. The level of design detail is low and typically factored from go-bys or high-level screening studies. As such an uplift of 20% is applied to the construction, operation and decommissioning emissions associated with the Project, except for emissions from land clearance. Soil carbon emissions and vegetation clearing for the Project and associated

infrastructure utilise a conservative set of assumptions on land use area and detailed vegetation and soil carbon data from the Australia Government Full Carbon Accounting model (FullCAM) vegetation and soil carbon model. See Appendix A for model inputs.

2.2.8 Data Improvement

It is recommended that this GHG emissions estimate be revised during the engineering definition of the Project, DFS, in line with the class of cost estimate to reduce uncertainty about GHG emissions and identify and implement GHG mitigation opportunities throughout design, construction and operation of the facility.

Exclusions and assumptions should also be revisited and validated in future estimates.

3 CALCULATION METHODS

The calculation methodology used in this report aligns with the following legislation, regulations, standards and guidelines:

1. ISO 14064 Greenhouse gases – Part 1: Specification with guidance at the organisation level for quantification and reporting of greenhouse gas GHG emissions and removals.
2. GHG Protocol a Corporate Accounting and Reporting Standard.
3. National and Territory GHG Legislation, regulations & policy:
    - National regulation and policy:
        - National Greenhouse and Energy Reporting Act 2007 (NGER Act).
        - National Greenhouse and Energy Reporting Regulations 2008 (as amended).
        - National Greenhouse and Energy Reporting (Measurement) Determination 2008 (as amended).
        - Australian National Greenhouse Accounts Factors for individuals and organisations estimating greenhouse gas emissions February 2023 (DCCEEW)
    - Northern Territory regulation and policy:
        - Greenhouse Gas Emissions Management for New and Expanding Large Emitters Policy.
4. Full Carbon Accounting Model (FullCAM).

The method for calculating emission followed the following steps:

1. Established a boundary for the GHG estimate using references 1, 2 and NGER guidance.
2. Conducted a carbon calculation input scoping exercise to define sources within the boundaries of the estimate by:
    a. Identifying activities contributing to GHG emissions for each project phase and aspect (e.g., logistics, personnel travel, etc).
    b. Defining the required input data to calculate an estimate of GHG emissions from each activity or aspect; and
    c. Identifying the source of the input data.
3. Sourced the input data and used appropriate assumptions where data gaps or a lack of definition existed.
4. Lastly, construct a calculation based on the inputs and assumptions sourced.

The specific methodologies applied are outlined in the sections below.

3.1 Scope 1 Emissions

Change in Land Use Vegetation and Soil Carbon Emissions

The estimate utilises the Department of Climate Change, Energy, Environment and Water FullCAM carbon accounting model. Model inputs were aligned with advice from the Australian Greenhouse Office FullCAM group.

The data inputs are summarised below and provided in full in Appendix A.

- The FullCAM model utilised the Forest System including soil and minerals with tree yield formula.

- The simulation was set to run from 1/1020 to 1/2500 with monthly simulations with model output recorded annually.
- The modelled location, consisting of a 177ha area, was averaged over a 100ha block located at (lat/long) -20.00215397821709S; 133.6580972708515E with original vegetation assumed to be native species regeneration>=500mm rainfall.

Emissions from Fuel Use

The Emissions calculation methodology of carbon dioxide, methane and nitrous oxide from the combustion of diesel is taken from Section 2.20 of *National Greenhouse and Energy Reporting (Measurement) Determination 2008.*

$$T\ CO_2e = Q \times ECi\ (EF1x\ EF3) / 1000$$

Where:

- T CO_2e is the emissions of gas type, being carbon dioxide, methane or nitrous oxide, from each fuel type released from the combustion of the product measured in CO_2-e tonnes.
- Q is the quantity of fuel type combusted (e.g. cubic metre, gigajoules or kilolitres).
- EC is the energy content factor of fuel type (gigajoule per cubic metre).
- EF1 is the scope 1 emission factor for each gas type released during the year (which includes the effect of an oxidation factor) measured in kilograms CO_2-e per gigajoule of fuel.
- EF3 is the scope 3 emission factor for each gas type released during the year (which includes the effect of an oxidation factor) measured in kilograms CO_2-e per gigajoule of fuel.

Activity	Purpose	Energy Content Factor	EF CO_2 $kgCO_2$-e/GJ	EF CH_4 $kgCO_2$-e/GJ	EF N_2O $kgCO_2$-e/GJ	Scope 3 EF $kgCO_2$-e/GJ
Diesel Oil – Euro i	Transport Fuel Emission	38.6	69.9	0.2	0.4	17.3
Kerosene for use as fuel in an aircraft	Aviation Fuel Emission	36.8	69.6	0.2	0.2	18

Note: All emission factors were sourced from Australian National Greenhouse Accounts Factors For individuals and organisations estimating greenhouse gas emissions February 2023, DCCEEW

Mining Plant (Natural Gas Use)

The Emissions calculation methodology of carbon dioxide, methane and nitrous oxide from the consumption of gaseous fuels is taken from Section 2.20 of National Greenhouse and Energy Reporting (Measurement) Determination 2008.

$$T\ CO_2e = Q \times EC\ (EF1x\ EF3) / 1000$$

Where:

- T CO_2e is the emissions of gas type, being carbon dioxide, methane or nitrous oxide, from each fuel type released from the combustion of the product measured in CO_2-e tonnes.
- Q is the quantity of fuel type combusted (e.g. cubic metre, gigajoules or kilolitres).

- EC is the energy content factor of fuel type (gigajoule per cubic metre).
- EF1 is the scope 1 emission factor for each gas type released during the year (which includes the effect of an oxidation factor) measured in kilograms CO_2-e per gigajoule of fuel.
- EF3 is the scope 3 emission factor for each gas type released during the year (which includes the effect of an oxidation factor) measured in kilograms CO_2-e per gigajoule of fuel.

Activity	Purpose	Energy Content Factor	EF CO_2 $kgCO_{2-}$ e/GJ	EF CH_4 $kgCO_{2-}$ e/GJ	EF N_2O $kgCO_{2-}$ e/GJ
Natural gas distributed in a pipeline	Gaseous Fuels Emission	0.0393	51.4	0.2	0.03

POX Emissions

Extraction of iron and copper from the pyrite and chalcopyrite ores is done via oxidation and produces large amounts of sulphuric acid as a by-product. $CaCO_3$ is used as a neutralising agent for the acid whereby CO_2 is produced as a byproduct,

The amount of CO_2 produced in the sulphuric acid neutralisation step was estimated by Castille using first principles (see equations below) and the ore assay indicating the % Fe, Cu and other metals in the ore.

Pyrite $2FeS_2 + 7O_2 + 2H_2O \rightarrow 2FeSO_4 + 2H_2SO_4$

$CaCO_3 + H_2SO_4 \rightarrow Ca\ SO_4 + H_2O + CO_2$

Chalcopyrite $4CuFeS_2 + 17O_2 + 4H_2O \rightarrow 4Cu^{2+} + 4SO4^{2-} + 2Fe_2O_3 + 4H_2SO_4$

$CaCO_3 + H_2SO_4 \rightarrow Ca\ SO_4 + H_2O + CO_2$

Sewage Treatment

This calculation uses a proprietary sewage emissions calculator from Current Environmental in line with NGERs methodology. The estimate assumes the Project will use a sequencing batch reactor for sewage treatment. The calculator comprises a spreadsheet based on NGER factors and includes simplifying assumptions for sewage treatment. It is considered fit for purpose for the estimation of sewage treatment GHG emissions, given sewage is likely to account for less than 1% of annual Project emissions.

3.2 Scope 2 Emissions

Electricity Use (Scope 2 Emissions)

Estimates of the GHG emissions associated with import and use of electrical energy from the Tennant Creek power plant follow the recommended method of estimation in the Australian National Greenhouse Accounts Factors for individuals and organisations estimating greenhouse gas emissions February 2023 (DCCEEW). This method accounts both for the Scope 2 component, related to the draw of electricity from the power supply network and transmission losses (Scope 3 component)

$$Y = Q \times (\text{Scope 2 EF} + \text{Scope 3 EF}) / 1000$$

Where:

- Y is the scope 2 emissions measured in CO2-e tonnes.
- Q is the quantity of electricity purchased from the electricity grid during the year and consumed from the operation of the facility measured in kilowatt hours. Electrical power estimates were derived from installed power and output capacity provided by Castile (Michael Poepjes and Mark Savage, 5 April 2023).
- The Scope 2 EF is the scope 2 emission factor, in kilograms of CO2-e emissions per kilowatt hour for the Darwin Katherine Interconnected System (DKIS). The Scope 2 EF value is 0.54 tCO2-e/MWh (DCCEEW, 2023)
- The Scope 3 EF is the scope 3 emission factor, in kilograms of CO2-e emissions per kilowatt hour for the Darwin Katherine Interconnected System (DKIS). The Scope 3 EF value is 0.07 tCO2-e/MWh (DCCEEW, 2023)

4 GHG ESTIMATE RESULTS

The Project GHG estimate provides a coarse quantification of GHG emissions in order to understand the nature and scale of GHG emissions. The numbers reported are early estimates, based off a prefeasibility level of detail and consequently, are in the order of +/- 50% definition. They should be considered with this level of accuracy in mind. The accuracy of the estimate will increase as the project definition increases. It is recommended that as the project engineering design develops the engineering contactor incorporates a GHG estimate in their scope of work.

Only material emissions or emissions recommended by NGER methods were included in the GHG estimate. Scope 3 emissions were outside the scope of this GHG estimate.

Scope 1 and 2 emissions for the construction, operation and decommissioning of the project are detailed in Table 4-1 and Figure 4-1 and are discussed below[1]. The full table of results is included in Appendix B.

Main findings are:

- Total emissions including construction (18 months), operation (10 years) and decommissioning total approximately 745,000 TCO_2e Table 4-1 and Figure 4-1. Construction accounts for 2% of emissions, operations 97% and decommissioning 1% (Figure 4-1).
- The majority of emissions across all phases and activities are the result of power consumption ~0.35$MTCO_2e$ over the life of the project, a Scope 2 emission (Table 4-2 and Figure 4-2). Accounting for 47.3% of total emissions.
- The other major source of emissions is from the use of POX in processing activities ~0.28$MTCO_2e$, a Scope 1 emission, accounting for 37.8% of total emissions. Emissions from all other activities each make up less than 5% of emissions.
- As the project emissions are largely driven by operations activities, annual emissions are higher and steady during this phase around ~82,000TCO_2e/yr except during the first and last year of operationsFigure 4-3.
- Total Scope 1 Emissions for the life of the project, excluding vegetation and soil carbon loss, total ~380,000 TCO_2e. Scope 1 emissions due to vegetation and soil carbon loss total ~3,000 TCO_2e, for the life of the project Table 4-3. GHG Emissions by Scope (1 or 2) and SourceTable 4-3 .

Table 4-1. Construction, Operation and decommissioning GHG Emissions by Scope (TCO_2e)

	Scope 1	Scope 2	Total
Construction	10,000	7,000	17,000
Operation	374,000	345,000	719,000
Decommission	5,000	4,000	9,000
Total	389,000	356,000	745,000

[1] Emission estimates are rounded to the nearest 1,000.

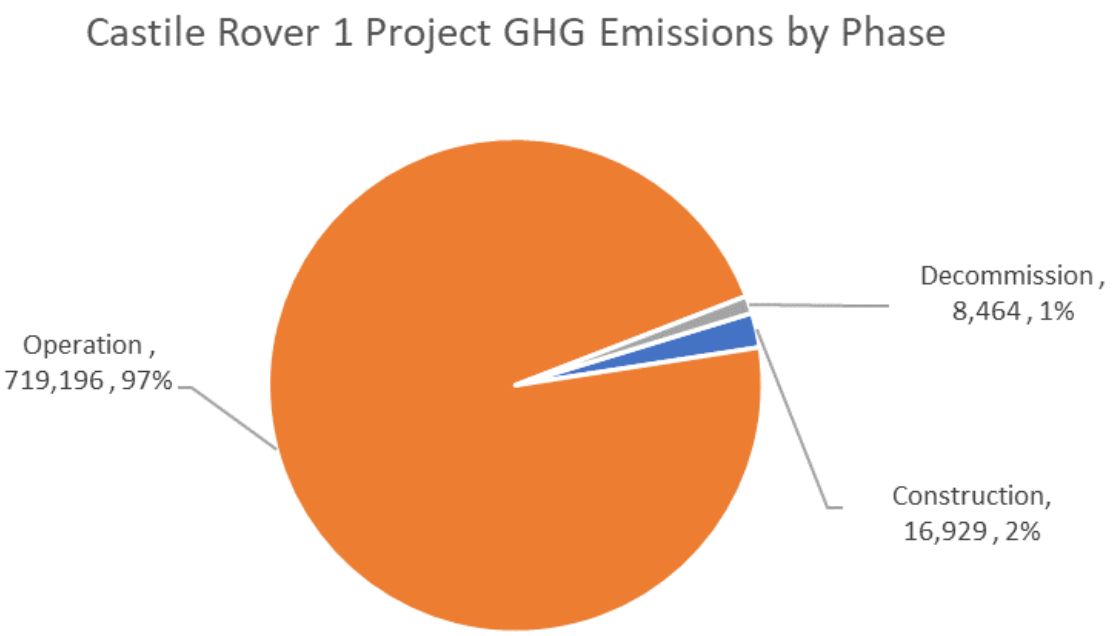

Figure 4-1. Total Rover 1 Project GHG Emissions by Phase (TCO_2e)

Table 4-2. Total Rover 1 Project GHG Emissions by Activity (TCO_2e)

Source	TCO2e	% of Total
Earthworks	2,005	0.3%
Logistics (vehicle and rail)	36,420	4.9%
Construction of box cut	2,789	0.4%
Explosives (ANFO)	8,755	1.2%
POX	281,658	37.8%
Travel (FIFO)	16,994	2.3%
Sewage treatment plant	303	0.04%
Vegetation and soil carbon loss	3,324	0.4%
Power consumption	352,354	47.3%
Decommissioning	8,464	1.1%
Gold production (NG consumption)	1,901	0.3%
Mining Plant Operations	885	0.1%
Road Maintenance	658	0.1%
Site Support Operations	28,079	3.8%

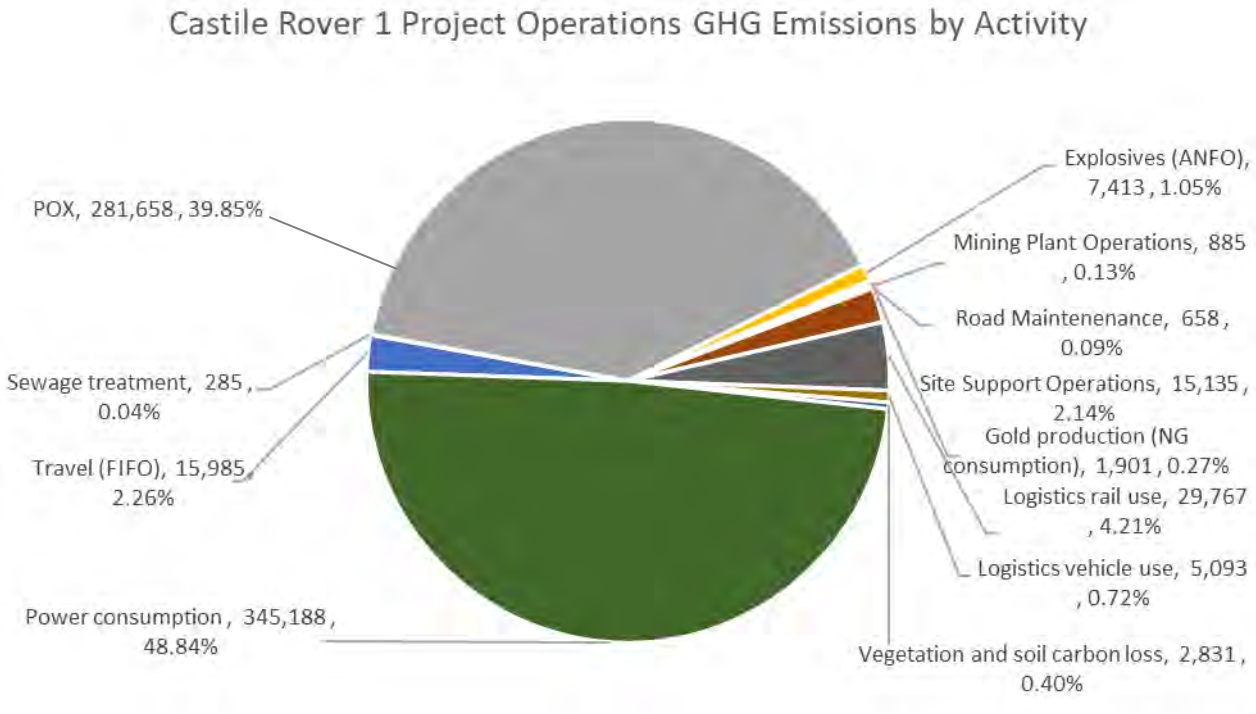

Figure 4-2. Total Rover 1 Project Emissions by Activity (TCO_2e).

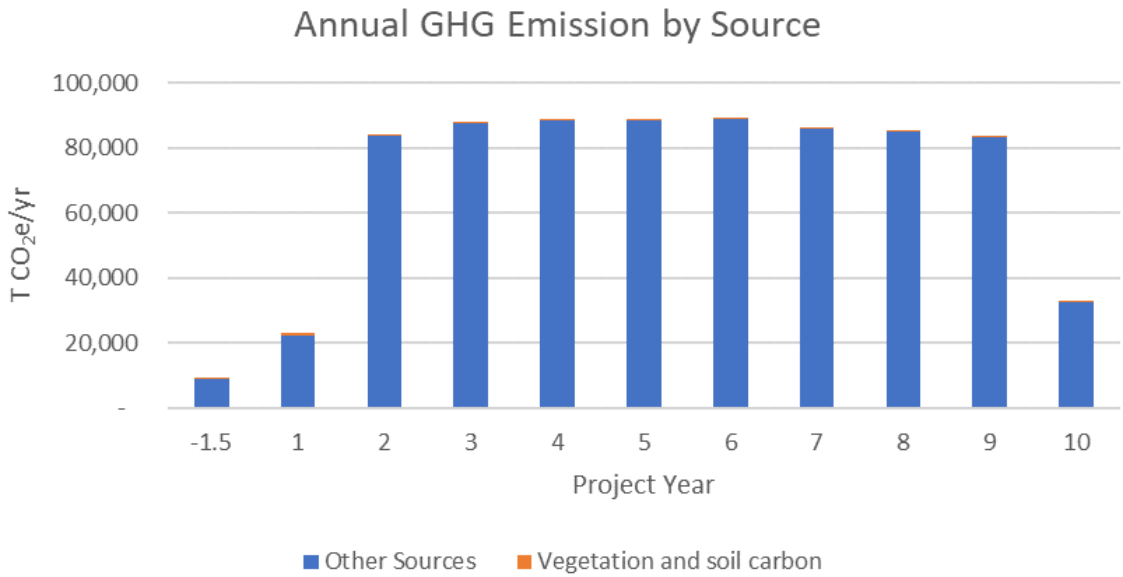

Figure 4-3. Total Rover 1 Project Emissions Including Construction and Operations. Note construction years are negative.

Table 4-3. GHG Emissions by Scope (1 or 2) and Source

Source	TCO2e	% of Total
Power (Scope 2)	352,354	47.9%
Construction and Operations Activities (Scope 1)	380,447	51.8%
Vegetation and land use change (Scope 1)	3,324	0.5%

Emissions from constructions are dominated by power consumption, approximately 7,000 TCO_2e, accounting for 42.3% of total emissions. Box cut mining earth works, approximately 3,000 TCO_2e, and civil earthworks, approximately 2,000 TCO_2e make up a further 28.4% of combined construction emissions Table 4-4. Logistics vehicle use, approximately 1,500 TCO_2e, make up 9.2% of total emissions. Explosives (ANFO) use, approximately 1,300 TCO_2e, make up 7.9% of total emissions. Emissions from all other activities each make up less than 5% of emissions.

Table 4-4 Construction GHG Emissions by Source

Source	TCO2e	% of Total
Earthworks	2,005	11.8%
Logistics vehicle use	1,560	9.2%
Box Cut mining	2,789	16.6%
Explosives (ANFO)	1,342	7.9%
Site Support Operations	546	3.2%
Travel (FIFO)	1,010	6.0%
Sewage treatment plant	19	0.1%
Vegetation and soil carbon loss	493	2.9%
Power consumption	7,166	42.3%

Emissions from operations are dominated by power consumption, approximately 0.35 $MTCO_2e$ and POX processing, approximately 0.28 $MTCO_2e$, combined accounting for 88.7% of emissions during operation Table 4-5. Emissions from all other activities each make up less than 5% of emissions.

Table 4-5 Operations GHG Emissions by Source

Source	TCO2e	% of Total
Travel (FIFO)	15,985	2.3%
Sewage treatment	285	0.04%
POX	281,658	39.9%
Explosives (ANFO)	7,413	1.0%
Gold production (NG consumption)	1,901	0.3%
Mining Plant Operations	885	0.1%
Road Maintenance	658	0.1%
Site Support Operations	15,135	2.1%
Logistics rail use	29,767	4.2%
Logistics vehicle use	5,093	0.7%
Vegetation and soil carbon loss	2,831	0.4%
Power consumption	345,188	48.8%

5 REVIEW AGAINST NT POLICY

The scope of this report is to estimate GHG emissions of the Project and review these emissions against the NT GHG policy and legislation. A review of NT EPA GHG policy and legislation is included in the following sections to give context to the emissions estimate. A summary of recommendations for the project against this policy and legislation are included in Section 6.

5.1 NT Long Term Emissions Target

'Northern Territory Climate Change Response: Towards 2050'

The Northern Territory Government's Climate Change Response: Towards 2050 (the *Response*) provides a policy framework that will enable the Northern Territory to strategically manage climate change risk and opportunities. It is a whole of Government response and partnership with all Territorians. Everyone has a role to play.

This *Response* defines the Territory's target to achieve net zero emissions by 2050. This target recognises the role the NT plays in the world-wide movement towards low-carbon economies in an effort to avoid the worst effects of climate change and keep the increase in global average temperature to well below 2 degrees Celsius.

The *Response* identifies 4 key objectives to inform future actions and guide development of mitigation and adaptation strategies, these are each outlined below:

1. achieve net zero emissions

   Our objective is to progressively reduce net greenhouse gas emissions in the Territory, with the goal of achieving net zero emissions by 2050. This long-term objective sets expectations about future emissions constraints to help our industries and businesses plan and adapt. Aiming to achieve net zero emissions aligns the Territory with all other States and Territories across Australia.

2. build a resilient Territory

   Our objective is to build resilience to climate change in the most vulnerable aspects of the Territory's communities, economy and environment. Building a resilient Territory means understanding the likely future effects of climate change, putting in place measures to minimise negative impacts, and identifying opportunities presented by adaptation measures that may bring an economic advantage for the Territory.

3. unlock opportunities from a low carbon future:

   Our objective is to unlock opportunities for Territorians, industries and businesses in the transition to a low carbon future. The Territory has a natural advantage to be able to capitalise on low carbon opportunities with its abundance of natural assets and resources. By acting early, the Territory will position itself to make the most of the opportunities that are presented as the world transitions to a low carbon future.

4. inform and involve all Territorians

   An effective response to climate change requires action from industry, business, community and individuals. Our objective is that all Territorians will understand the potential impacts from climate change, know what they can do to contribute to the response, and take advantage of any opportunity it provides.

The Territory government has drafted a three-year action plan to implement the *Response*. This action plan *Delivering the Climate Change Response: Towards 2050 A Three-Year Action Plan for the Northern Territory Government* (the *Action Plan*).

It is recommended that the Project review the opportunities to reduce emissions of the project and integrate an emissions reduction scope of work into the design process of the project. It is recommended the project develops a GHG management plan aligning with the NT long term emissions target.

5.2 Roadmap to Renewables Energy

The Northern Territory Government's 50 per cent renewable energy target is defined, in this report, to be 50 per cent of the electricity consumed in 2030 inclusive of behind-the-meter generation, future self-generating enterprises and new large industrial consumers. The roadmap sets out recommendations to achieve its goal.

The roadmap makes 11 recommendations. It recommends that the Northern Territory Government should align its policy objectives, departmental activity and government programs toward the development and purchase of renewable energy-generated electricity. It recommends, in order to kick start the roll out of renewable energy generation, it is proposed that government uses its purchasing power to create initial demand through purchasing electricity from renewable energy suppliers.

It is recommended that the Project incorporate PV solar power generation to maximum extent practicable.

5.3 NT Large Emitters Policy

The NT Government 'Greenhouse Gas Emissions Management for new and Expanding Large Emitters' (the Large Emitters Policy) details the minimum requirements for the management of greenhouse gas emissions from new or expanding industrial and land use development projects. It has been established in recognition of the Territory's target of net zero greenhouse gas emissions by 2050.

Large greenhouse gas emitters are either industrial projects or land use projects that involve the clearing of native vegetation and exceed the below thresholds:

- Industrial project threshold: Estimated scope 1 emissions of 100 000 T CO_2e in any financial year over the life cycle of a project, not counting emissions generated from land clearing directly associated with the Project.
- Land use project threshold: Estimated scope 1 emissions of 500 000 T CO_2e generated from a single land clearing action OR cumulatively from multiple land clearing actions on a 'property' over time.

Projects that exceed one of the thresholds are required to develop a greenhouse gas Abatement Plan detailing the expected emissions from the project and develop a plan that demonstrates how the project will meaningfully contribute to the Territory's net zero emissions target.

The content requirements of a greenhouse gas Abatement Plan required under this policy are noted in Table 5-1, previous requirements for large infrastructure projects under the NT EP Act are also provide in the table.

The content requirements of a greenhouse gas Abatement Plan required under this policy are noted in Table 5-1, previous requirements for large infrastructure projects under the NT EP Act are also provide in the table.

Table 5-1 Expected Northern Territory GHG Requirements under the NT EP Act and Large Emitters Policy

Content Required	Environmental Impact Statement Expected Requirement Under the NT EP Act	Large Emitters Policy Greenhouse Gas Abatement Plan Requirements
Project description	√	√
Scope 1 and 2 emissions	√	√
Scope 3 emissions		√
Comparison with NT & national emissions	√	
Long term project GHG goal and targets (including interim targets)		√
Contribution to NT net zero target	√	
Consideration of renewable energy and contribution to NT renewables target	√	
GHG avoidance, mitigation and management	√	√
GHG mitigation continuous improvement		√
Monitoring and reporting	√	√
Residual impact	√	
Offsets		√
Review	√	√

The Project emissions do not exceed the industrial threshold during construction or operations.

5.4 NT Draft GHG Offset Policy

To support the use of offsets under the EP Act, the Territory Government has established the Northern Territory Offsets Framework under section 125(2) of the *Environment Protection Act 2019*. This includes both the NT Biodiversity Offsets Policy as well as the NT Greenhouse Gas Emissions Offset Policy. This policy and technical guidelines are currently in Draft and undergoing stakeholder consultation.

The Territory Government has an objective to transition the Territory's economy to a low carbon economy.

This objective is reflected in the Territory's target of net zero emissions by 2050 established by the Climate Change response.

The Climate Change Response includes a range of actions designed to support the achievement of this target. One of these actions is the development of a Greenhouse Gas Emissions Offsets Policy under the Northern Territory Offsets Framework. This policy will guide the use of offsets as a tool to support the decarbonisation of industry in the Territory.

Under the NT Offsets Framework, offset requirements can be applied to environmental approvals under the EP Act or statutory approvals under a Prescribed Act. This enables offsets to be used as a tool to compensate for emissions produced by development, such as land clearing, resource exploration and extraction, or the establishment and ongoing operation of a facility.

The NT Government may consider the use of offsets to compensate for emissions in the assessment and approval stages of a development project. The NT Government will only consider the use of offsets as

appropriate where proponents have applied the mitigation hierarchy to the project. This means all reasonable steps have been taken by proponents to first avoid or mitigate emissions, and significant residual emissions will remain.

The overarching target that applies to emissions in the Territory is the NT target of net zero greenhouse gas emissions by 2050.

Emissions offsets must make a material and meaningful contribution towards achieving the Territory's target of net zero emissions by 2050, as well as any additional or interim targets set to achieve this 2050 target.

In general offsets should be applied to a project where significant residual emissions will be produced. Emissions may be produced and identified over periods of time over the life of a project (for example, annually or every five years) or through a more distinct or "one off" emitting event such as land clearing. Residual emissions include any emissions remaining once all reasonable steps have been taken to first avoid or mitigate the production of emissions.

Assessing agencies and decision makers are responsible for determining whether residual emissions are significant. The determination about whether residual emissions are significant and the amount of residual emissions that need to be offset should be made based on the following:

- the estimated emissions produced by the project, either annually or for a single event
- the projected emissions profile over the life of the project
- the target for emissions offsets identified in Section 6 of the policy
- the overall impact on the Territory's emissions profile and trajectory towards the Territory's target of net zero emissions by 2050, based on:
    - the emissions produced by the project
    - the cumulative emissions produced across a proponent's enterprises in the Territory
    - the emissions associated with the relevant industry.
- the capacity of the project, proponent and industry to avoid, mitigate or offset emissions
    - the advice of any assessing agencies for the project (for example, the NT EPA for projects assessed under the EP Act)
    - national and international emissions reduction targets, strategies and obligations.

To meet the Territory's target of net zero emissions by 2050, the project should consider offsets in line with the GHG management plan recommended to be developed in Section 5.1.

5.5 NT EPA Act

The NT EPA has incorporated the Northern Territory Government's net zero greenhouse gas emissions by 2050 target into the environmental objective for the NT EPA's Environmental Factor: Atmospheric Processes. The Policy sets out the Northern Territory Government's expectations for how GHG emissions are to be managed from new, or expanding, industrial and land use development projects as one means of achieving the net zero by 2050 target.

The NT EPA has released a draft Environmental factor guidance: Atmospheric processes, Greenhouse Gas Emissions. This policy and technical guidelines are currently in Draft, it has undergone stakeholder consultation and is in internal review.

The draft guideline states that under the Environmental Factor: Atmospheric Processes a proponent is to refer a proposed action to the NT EPA if its emissions exceed:

- Industrial project threshold: Estimated scope 1 emissions of 100 000 T CO2e in any financial year over the life cycle of a project, not counting emissions generated from land clearing directly associated with the Project.
- Land use project threshold: Estimated scope 1 emissions of 500 000 T CO2e generated from a single land clearing action OR cumulatively from multiple land clearing actions on a ‘property’ over time.

The NT EPA proposes to adopt the thresholds as a guide to when a proposed action requires referral to the NT EPA for consideration under the EP Act. This project does not exceed these triggers, therefore there is no requirement to refer this project under the Environmental Factor: Atmospheric Processes of the NT EP ACT.

6 REVIEW AND RECOMMENDATIONS

This assessment indicates that the Project is unlikely to trigger thresholds for scope 1 or scope 2 GHG emissions noting the above policies, therefore no formal Abatement Plan is required as part of NT EPA Referral submission.

A review of these emissions against each of the identified NT legislation and policies is completed above and a summary of recommendations is provided below.

- It is recommended that the Project develop a GHG Management Plan addressing the following items:
  - Alignment with the NT long term target of Net Zero by 2050.
  - Consider the applicability of offsets for scope 1 emissions.
  - Review the opportunities to reduce emissions of the Project and integrate an emissions reduction scope of work into the design process of the Project
- It is recommended that the Project incorporate PV solar power generation to the maximum extent practicable, to align with the *Roadmap to Renewables Energy* policy.

7 REFERENCES

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APPENDIX A FULLCAM MODEL INPUTS

The following inputs were utilised for the GHG emissions calculations for areas cleared for the project.

FullCAM version 6.20.03.0827

Scenario:

Configuration

- Forest System including minerals
- tree yield formula

Timing

- Simulation timing: Step
- Start simulation 1/1020
- End simulation 1/2500
- Simulation steps: Monthly with recording of output every 12 simulation steps (i.e. annual)

Data Builder

- Lat Long: -20.002153978217095 133.6580972708515E, Apply downloaded data
- State = Northern Territory
- SA2 = Gulf (71055)
- NPI region = No Region
- Growth Region = 1
- Spatial data averaged over 100ha
- Native Species Regeneration>=500mm rainfall

Site

- Water, temperature and Productivity Cycle table data across all time
- t/ha output, max aboveground biomass 7.42015 tdm/ha Trees

Trees & Soil

- Native Species Regeneration>=500mm rainfall
- 13.8144% soil that is clay by weight

Initial conditions

- no product recovery

Events

- 1 Jan 2024 Initial clearing: no product recovery –infrastructure clearing 100% site affected
  - Standard values
  - 100% of material converted to CO_2 via oxidation
- 1 Jan 2130 Plant trees: Native Species Regeneration>-500mm rainfall – site revegetation
  - Standard value

APPENDIX B GHG ESTIMATE RESULTS

Annual Emissions						Construciton		Operation								
year						-2	1	2	3	4	5	6	7	8	9	10
Construction		Uplift included	Emissions Block	Unit	Total CO2e	12 mon	6 mo									
Scope 1																
	Earthworks	Yes 20%	1,336	t CO2e	2,005	1,336	668									
	Logistics vehicle use	Yes 20%	1,560	t CO2e	1,560	1,560										
	Box Cut mining	Yes 20%	2,789	t CO2e	2,789	2,789										
	Explosives (ANFO)	Yes 20%	8,755	t CO2e	1,342	692	650									
	Site Support Operations	Yes 20%		t CO2e	546	546	-									
	Travel (FIFO)	Yes 20%	673	t CO2e/yr	1,010	673	337									
	Sewage treatment plant	Yes 20%	13	t CO2e/yr	19	13	6									
	Vegetation and soil carbon loss	No	493	t CO2e	493	164	329									
	Break Down of Site Support Ops above:															
	Site Support (Cranes, Bobcats, Trucks)	Yes 20%	1,770													
	Site Support (Utes)	Yes 20%	836		326											
	Site Support (Buses)	Yes 20%	466		177											
	Site Support (Forklifts)	Yes 20%	43		43											
Scope 2	Power consumption	No			7,166	1,488	5,677									
Scope 3	Not included in scope of work															

						Construciton		Operation									
						-2	1	2	3	4	5	6	7	8	9	10	
Operations		Uplift included				12 mo	6 mo										
Scope 1																	
	Travel (FIFO)	Yes 20%	1,683	t CO2e/yr	15,985		841	1683	1683	1683	1683	1683	1683	1683	1683	1683	
	Sewage treatment	Yes 20%	30	t CO2e/yr	285		15	30	30	30	30	30	30	30	30	30	
	POX	Yes 20%	32933	t CO2e/yr	281,658		5694	32842	32934	32934	32934	33024	32934	32934	32934	12496	
	Explosives (ANFO)	Yes 20%	8755	t CO2e/yr	7,413		650	1088	1376	1300	1307	1073	184	184	211	42	
	Gold production (NG consumption)	Yes 20%	1901	t CO2e/yr	1,901		38	222	222	222	222	223	222	222	222	84	
	Mining Plant Operations	Yes 20%	100	t CO2e/yr	885		17	100	100	100	100	100	100	100	100	67	
	Road Maintenenance	Yes 20%	69	t CO2e/yr	658		35	69	69	69	69	69	69	69	69	69	
	Site Support Operations	Yes 20%	3114	t CO2e/yr	27,533		1359	3107	3114	3114	3114	3080	3056	3056	3056	1476	
	Logistics rail use	Yes 20%	3527	t CO2e/yr	29,767		600	3315	2857	3386	3386	4514	4797	3809	2222	882	
	Logistics vehicle use	Yes 20%	605	t CO2e/yr	5,093		103	567	489	579	580	772	821	651	379	151	
	Vegetation and soil carbon loss	No	2831	t CO2e	2,831		329	508	416	346	290	247	212	183	160	140	
	Break Down of Site Support Ops above:																
	Site Support (Cranes, Bobcats, Trucks)	Yes 20%	1770	t CO2e/yr	15,135		306	1765	1770	1770	1770	1775	1770	1770	1770	671	
	Site Support (Utes)	Yes 20%	836	t CO2e/yr	7,559		622	834	836	836	836	797	778	778	778	464	
	Site Support (Buses)	Yes 20%	466	t CO2e/yr	4,424		388	466	466	466	466	466	466	466	466	312	
	Site Support (Forklifts)	Yes 20%	43	t CO2e/yr	415		43	43	43	43	43	43	43	43	43	29	
Scope 2	Power consumption	No			345188		5677	40576	41652	42071	41843	41312	39157	39390	39351	14160	
Scope 3	Not included in scope of work																

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