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# Greenhouse Gas Management Plan

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## Environment

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## 1 Summary

Roy Hill Iron Ore Pty Ltd (RHIO) is the proponent for the Roy Hill Iron Ore Mine Revised Proposal (the Revised Proposal), which is to expand the existing operations at the Roy Hill Iron Ore Mine.

In summary, the Revised Proposal includes:

- An increase in the proposal ground disturbance footprint by 5,995 hectares
- Change to the life of mine (LOM) water management strategy, including increased water abstraction and dewatering and managed aquifer reinjection to dispose of excess water
- Revised waste material management strategy including changes to backfilling of pits, in-pit tailings and additional waste rock dump locations as well as development of permanent surface water structures
- An increase in greenhouse gas emissions.

This Greenhouse Gas (GHG) Management Plan was prepared in accordance with the *Instructions on how to prepare Environmental Protection Act 1986 (WA) Part IV Environmental Management Plans* published by the Western Australian Environment Protection Authority (EPA) (EPA 2020a).

The GHG Management Plan details the measures that are required to manage GHG emissions from the Revised Proposal as summarised in Table 1.

Table 1 - Greenhouse Gas Management Plan Summary

Title of proposal	Revised Proposal for the Roy Hill Iron Ore Mine
Proponent name	Roy Hill Iron Ore Pty Ltd
Assessment number	2214
Location	110 km north of Newman
Local Government Area	Shire of East Pilbara
Purpose of the management plan	This GHG Management Plan identifies management and mitigation measures to ensure impacts from GHG emissions associated with the Revised Proposal are not greater than predicted
Key environmental factor and objective	Key Environmental Factor: Greenhouse Gas Emissions EPA Objective: To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change. (EPA 2020)
Key provisions	Management of the contribution to global GHG concentrations from the emissions of Scope 1 and Scope 2 emissions through the implementation of the following key provisions: implementation of reasonable and practicable fuel efficiency measures, including setting interim LOM targets for Scope 1 emissions implementation of reasonable and practicable energy efficiency (electricity use) measures, including setting annual targets for electricity use routine emissions monitoring and reporting in accordance with the National Greenhouse and Energy Reporting Act 2007 comply with the National Safeguard Mechanism to maintain emissions below the allocated baseline carry out regular assessment of GHG emissions reduction technologies

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## 2 Context, Scope and Rationale

### 2.1 Proposal

Roy Hill Iron Ore Pty Ltd (RHIO) operates the Roy Hill Iron Ore Mine (RHIO mine) including mine process plant. Associated infrastructure supporting the RHIO mine includes:

- Heavy haul railway system to the port
- Port facilities at Port Hedland.

The RHIO mine is situated approximately 115 km north of Newman on the flat plains at the eastern end of the Chichester Range, in the Pilbara region of Western Australia. With defined mineralisation of more than 2.4 billion tonnes of +55% Fe iron ore, enough to sustain a mine life of more than 20 years, RHIO mine will produce up to 65 million tonnes per annum (Mtpa) of direct ship ore as Lump and Fines Hematite.

Roy Hill comprises the construction and operation of state of the art facilities including:

- 65 Mtpa mine, processing plant, airport and permanent accommodation village
- 344 km heavy haul railway linking the mine and port
- Port stockyard and two-berth export facility in Port Hedland
- Integrated Corporate Headquarters and Remote Operations Centre based in Perth.

The Original Proposal for the mine was assessed in two stages (Stage 1 and Stage 2), with subsequent post-assessment approvals under section (s) 45C and s46 of the *Environmental Protection Act 1986* (EP Act).

Since the commencement of the Original Proposal, RHIO has developed a better understanding of the orebody, specifically relating to ore quality in various locations within the mining tenements. This increased knowledge has resulted in changes to the life of mine (LOM) plan resulting in flow-on impacts on the management of water, materials and tailings. A Revised Proposal has been developed to outline the Proposed Changes.

The Revised Proposal includes:

- An increase in the proposal ground disturbance footprint by 5,995 hectares;
- Change to the life of mine (LOM) water management strategy, including increased water abstraction and dewatering and managed aquifer reinjection to dispose of excess water;
- Revised waste material management strategy including changes to backfilling of pits, in-pit tailings and additional waste rock dump locations as well as development of permanent surface water structures; and
- An increase to greenhouse gas emissions.

### 2.2 Scope of the GHG Management Plan

This GHG Management Plan applies to Scope 1 and Scope 2 (Clean Energy Regulator, 2018) greenhouse gas emissions from activities undertaken as per the Revised Proposal that are within the operational control of RHIO.

The Revised Proposal is generally for increases and changes to existing operational areas and aspects, rather than the construction of new infrastructure and equipment. Therefore, the use of established infrastructure means that GHG emissions have already been reduced as far as reasonable and practicable through design options and equipment selection decisions taken as part of the Original Proposal. This includes the procurement of electricity from the gas-fired power station in Newman. However, whilst the operation of the power station

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is outside the direct operational control of RHIO, this GHG Management Plan includes actions to manage energy efficiency, and consequently Scope 2 emissions from the power station.

This GHG Management Plan is limited to the RHIO Mine operations and the emissions associated with the proposed changes within the Revised Proposal and does not apply to GHG emissions related to the operations of Roy Hill's port and rail facilities. The rail and port operations were addressed in separate environmental assessments and consequently are regulated under different approvals and management plans.

## 2.2.1 Emissions Calculations

GHG emissions are expressed in CO<sub>2</sub>-e, which is an aggregate of GHG emissions, including carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), sulphur hexafluoride (SF<sub>6</sub>), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and nitrogen trifluoride (NF<sub>3</sub>) calculated as an equivalent CO<sub>2</sub> emission by factoring in the global warming potential (GWP) of each gas. GWP is applied in accordance with National Greenhouse and Energy Reporting (Measurement) Determination 2008.

Emissions calculations are undertaken using the methodologies described by the National Greenhouse and Energy Reporting (Measurement) Technical Guidelines (Commonwealth of Australia 2017) which provide guidance and commentary to assist reporters in estimating GHG emissions for reporting under the NGER Act.

Method 1 of the Technical Guidelines has been used to calculate emissions for the Revised Proposal. This method specifies the use of designated emission factors and is based on the National Greenhouse Accounts (NGA) Factors default method. These emission factors are national average factors determined using the Australian Greenhouse Emissions Information System (AGEIS).

Scope 1 and 2 emissions have been calculated using the above methodology. Scope 3 emissions are not included within the scope of this GHG Management Plan as the Proposed Changes in the Revised Proposal do not seek an increase in the quantity of iron ore shipped for steel production. Additionally, the product ore grade is not expected to change on average for the LOM to result in a significant increase in emissions from steel production.

## 2.2.2 Scope 1 emissions

RHIO commenced reporting Scope 1 emissions under Section 19 of the NGER Act in the 2012-13 financial year. Following changes in legislation, and the subsequent introduction of the Safeguard Mechanism operating under the NGER Act, RHIO applied to the Clean Energy Regulator for a New Facility calculated-emissions baseline to apply to the mine for the three-year period FY2016-17 to FY2018-19. In 2020, RHIO applied for a calculated baseline for the Roy Hill mine. This new baseline was set at 441,353 tCO<sub>2</sub>-e per year for the period between FY2018-2019 to FY2020-2021. Reported emissions under the NGER Act for the mine (Revised Proposal) are provided in Table 2.

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Table 2 - Reported Scope 1 emissions

Financial Year	Reported Scope 1 emissions tCO <sub>2</sub> -e
2012-13	15,181
2013-14	40,339
2014-15	118,741
2015-16	86,369
2016-17	194,180
2017-18	391,919
2018-19	412,588
2019-20	427,952

Scope 1 emissions associated with the Revised Proposal include:

- Combustion of diesel fuel for the operation of mobile equipment and vehicles. The majority of RHIO mine emissions (~99.4%) come from the combustion of diesel in mobile equipment i.e. machinery and vehicles, including the mine haulage fleet and processing equipment. The following mobile equipment is used on the mine site for ore mining, waste management stockpiling, processing and site services:
  - Shovels, trucks, drilling equipment
  - Major ancillary (excavators, dozers, graders, loaders, trucks, integrated tool carrier)
  - Minor ancillary (pit pumps, rock breakers, telescopic handlers, cranes, forklifts, other lifting equipment)
  - Service equipment (light vehicles, lighting towers, generators, compressors, welders, service truck, fuel truck, fire truck, ambulance).
- Combustion of diesel fuel for onsite electricity generation (mobile generators);
- Combustion of diesel fuel for blasting in mining (ANFO);
- Emissions associated with vegetation clearing, due to the staged and progressive clearing over the life of mine. GHG emissions associated with the Revised Proposal are estimated to be 6,200 tCO<sub>2</sub>-e per year. Vegetation clearing contributes to loss in capacity to sequester carbon as well as emissions from vegetation decomposition.
- Emissions associated with the disposal of waste and wastewater (Department of Agriculture, Water and the Environment, 2017) have not changed as a result of the Proposed Changes.

Scope 1 emissions for the projected life of mine are estimated to be up to 466,000 tCO<sub>2</sub>-e per year, with a forecast average of 430,981 tCO<sub>2</sub>-e per year and total emissions of 5.1 MtCO<sub>2</sub>-e. The profile of the Scope 1 emissions is forecast to be consistent across the life of the mine until the mine closure period when emissions significantly reduce, based on current forecast without adopting GHG reduction measures.

A summary of estimated Scope 1 GHG emissions is displayed in Figure 1.

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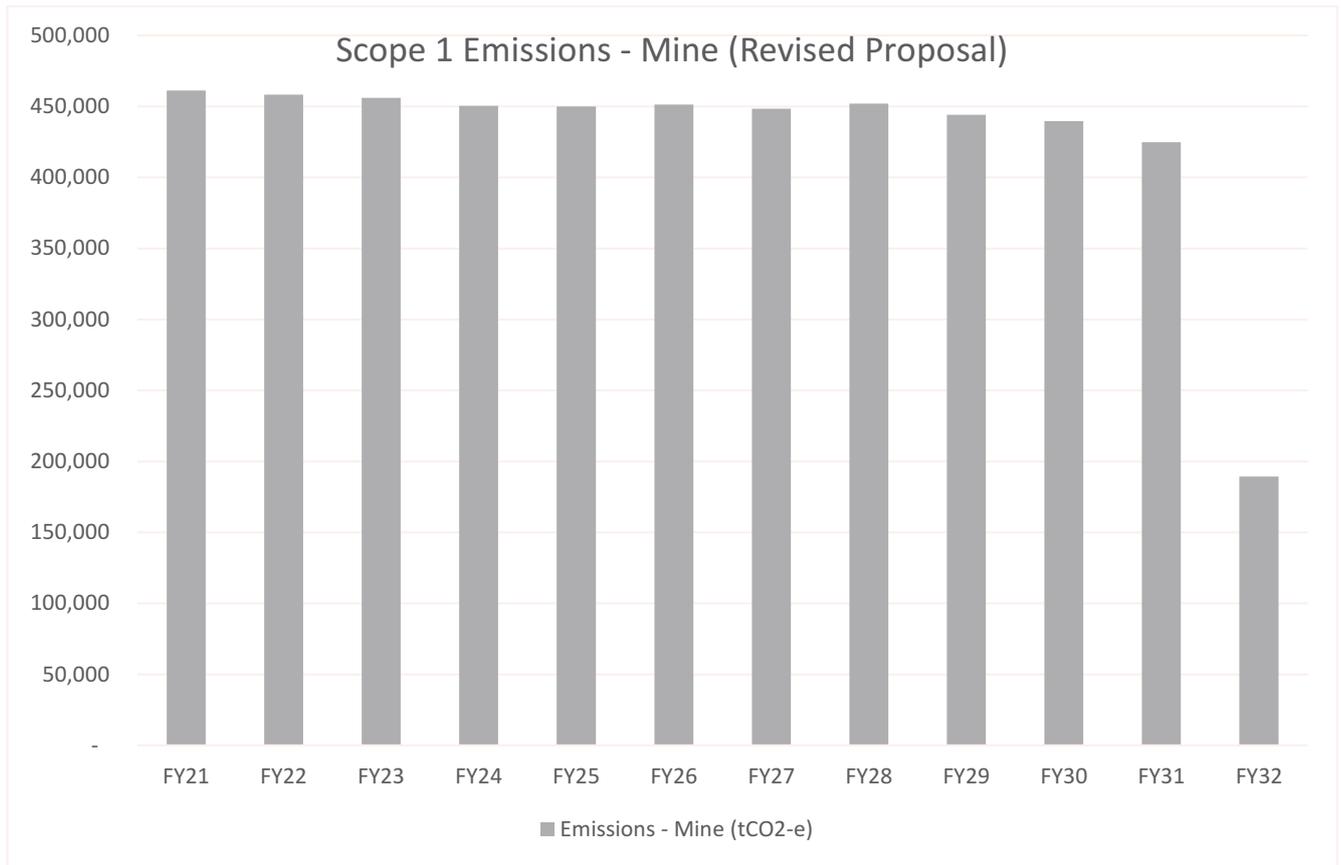


Figure 1 - Estimated total scope 1 emissions

### 2.2.2.1 Emissions intensity and benchmarking against other iron ore mines

Emissions intensity data has been used to benchmark GHG emissions from the Revised Proposal against other iron ore mines, i.e. tonnes of GHG emitted per tonne of iron ore mined. The iron ore mines considered for benchmarking are similar facilities located in the Pilbara region with publicly available information about their Scope 1 emissions.

Emissions intensity is calculated by:

$$Emissions\ intensity = \frac{Scope\ 1\ emissions}{Production\ rate}$$

- Forecast Revised Proposal annual Scope 1 emissions = 450,000 tCO2-e
- Forecast Revised Proposal iron ore production per annum = 59,100,000tpa
- Revised Proposal emissions intensity = 0.0076 tCO2-e/t iron ore.

The calculated emissions intensity of the Revised Proposal compared with other iron ore mines currently operating in the Pilbara region is outlined in Figure 2 and Table 3.

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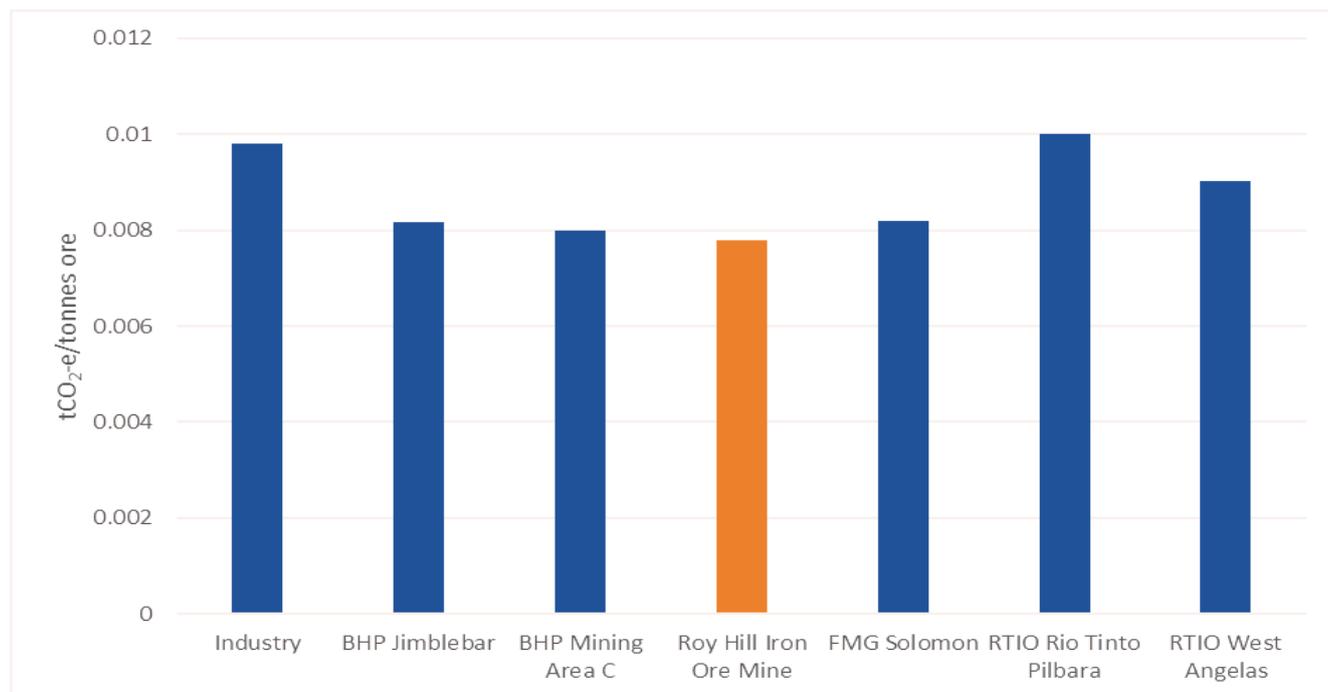


Figure 2 - Emissions intensity benchmarking against other West Australian iron ore projects

Table 3 – GHG benchmarking

Project	Ore production (t) per annum	Total scope 1 emissions (tCO <sub>2</sub> -e) per year	Emissions Intensity (tCO <sub>2</sub> -e/t ore)	Source
Roy Hill Iron Ore Mine (Revised Proposal)	59,100,000	450,000	0.0076	-
BHP Mining Area C	150,000,000	1,200,000	0.0080	Public environmental review document (BHP, 2017)
BHP Jimblebar	50,673,195	414,000	0.0082	Public environmental review document (BHP, 2019)
FMG Solomon	39,650,000	324,651	0.0082	Eliwana Project referral document (Fortescue, 2018)*
Rio Tinto West Angelas	35,000,000	315,825	0.0090	Public environmental review document (Rio Tinto, 2018)
West Australian iron ore industry	-	-	0.0098	Published journal paper (Norgate T. and Haque N., 2010)**
Rio Tinto Pilbara	325,000,000	3,200,000	0.01	Climate change report (Rio Tinto, 2019)

\* Eliwana itself was reviewed but not included in this analysis due to site not being in full production phase; \*\* Intensity calculated by removal of port and rail component from the total.

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## 2.2.3 Scope 2 emissions

Scope 2 emissions associated with the Revised Proposal are from electricity consumed at the mine. The majority of electricity consumed at the mine is supplied by a third-party and generated by a gas-fired power station in Newman. The power requirements for stationary equipment and site services including installed power, peak continuous power, average utilisation and average continuous draw, has been estimated and included the following stationary equipment and services:

- Scope 2: consumption of electricity supplied from the gas-fired power station in Newman for stationary equipment and services:
  - Crushing
  - Wet and dry screening
  - Classification and spirals
  - Waste fines thickening
  - Stockyard
  - Raw, potable and fire water services
  - Diesel services
  - Miscellaneous power and lighting.

Scope 2 emissions for the projected life of mine are estimated to be up to 302,000 tCO<sub>2</sub>-e per year, with a forecast average of 288,000 tCO<sub>2</sub>-e per year and total emissions of 3.4 MtCO<sub>2</sub>-e. Scope 2 emissions are forecast to increase over the next three years. Following this increase, this level of emissions is planned to be sustained for the life of mine until the mine closure period when power demand and emissions are significantly reduced.

An overview of estimated Scope 2 emissions is provided in Figure 3.

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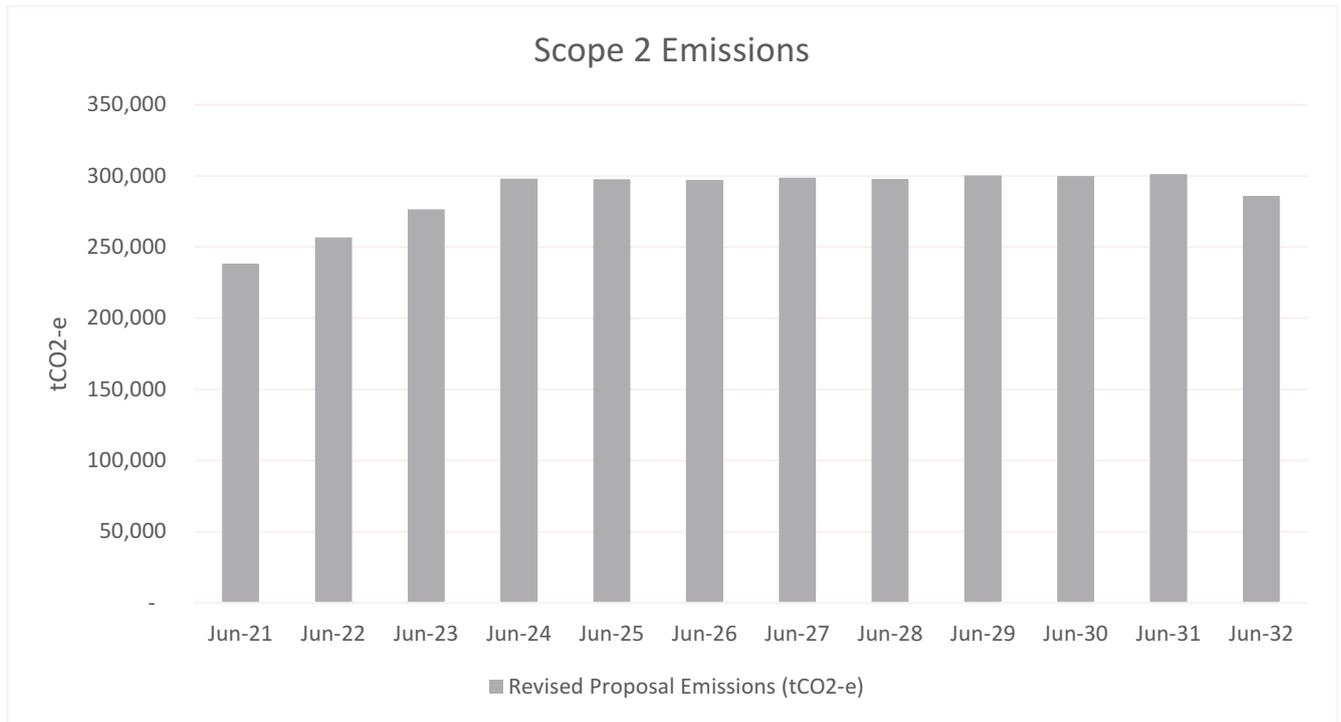


Figure 3 - Revised Proposal Scope 2 Emissions

## 2.3 Key Environmental Factors

This GHG Management Plan has been prepared in relation to the Key Environmental Factor: Greenhouse Gas Emissions. The EPA’s objective for the factor Greenhouse Gas Emissions is *“To reduce greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change”*.

The EPA GHG emissions guideline (EPA, 2020b) requires proponents of major greenhouse emitting projects to show how they can reasonably and practically avoid, reduce and offset emissions. The requirements of this guideline have been considered in the preparation of this plan.

## 2.4 Condition Requirements

The RHIO Mine was originally approved under Ministerial Statements (MS 824 and 829) following submission of a Public Environmental Review (RHIO, 2009) for Stage 1 and an Environmental Referral (ENVIRON Australia Pty Ltd, 2009) for Stage 2. Following these approvals, a number of amendments have been made under s45 and s46 of the EP Act. These approvals, and the subsequent amendments, are herein referred to collectively as the ‘Original Proposal’.

Since the commencement of the Original Proposal, RHIO has developed a significantly better understanding of its orebody, specifically relating to ore quality in various locations within the mining tenements. This increased knowledge has resulted in changes to the life of mine (LOM) plan resulting in flow-on impacts to management of water, materials and tailings. It has been determined that a Revised Proposal is required under s38 of the EP Act.

The Revised Proposal is currently being assessed through an Environmental Review Document under Part IV of the EP Act and the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). This GHG management plan outlines the management approach to GHG associated with the proposed changes within the Revised Proposal.

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## 2.5 Rationale and Approach

The Original Proposal for the mine was assessed in two stages (Stage 1 and Stage 2), with subsequent post-assessment approvals under s45C and s46 of the EP Act. A GHG Management Plan was prepared in 2009 to support Stage 1 of the mine (SMEC 2009).

This plan supersedes the 2009 version and has been developed for the Revised Proposal, which incorporates and expands Stage 1 and Stage 2 of the Original Proposal. Furthermore, the GHG Management Plan demonstrates all reasonable and practicable measures to minimise GHG emissions.

### 2.5.1 Survey and study findings

RHIO has not previously undertaken surveys or studies concerning greenhouse gas emissions. RHIO began reporting GHG emissions and energy data in accordance with the NGER Act in 2012-2013.

### 2.5.2 Key assumptions and uncertainties

This GHG Management Plan has been developed using all relevant and available information at the time of preparation. As the understanding of GHG management improves over time, this GHG Management Plan may require updating.

### 2.5.3 Management approach

The RHIO Environmental Management System (EMS) Framework provides a framework for achieving the key environmental management objectives during the operational phases of the Mine. The framework is illustrated in Figure 4. Implementation of the EMS Framework ensures environmental performance is achieved through environmental management practices that are consistent with RHIO's Environmental Policy and objectives. Management measures and controls are specifically detailed in environmental plans, procedures and work instructions which are implemented during the Operation phase of the Mine. RHIO's key environmental management documents have been developed to address environmental risks posed by mining and associated activities.

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Figure 4 - Environmental Management System Framework

This GHG Management Plan has been developed utilising a risk-based approach and outlines both outcome-based and management-based provisions. Whilst it encompasses broad GHG management techniques, it has also been developed to outline trigger values, monitoring and reporting measures to achieve of adopting a practical approach to minimising greenhouse gas emissions. The provisions are further outlined in Section 3.

## 2.5.4 Commonwealth regulation and policy

The United Nations Framework Convention on Climate Change (UNFCCC) provides the framework for international cooperation to reduce global GHG emissions and limit temperature increases. The UNFCCC Paris Agreement entered into force on 4 November 2016, and Australia is currently committed to reducing GHG emissions by 26 to 28 per cent below 2005 levels by 2030.

A framework of national legislative policies, programs and guidelines has been established to support the commitment to meeting the climate change challenge. The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) establishes a framework for corporations to report GHG emissions and energy consumption and production from 1 July 2008.

Under the NGER Act, entities are required to register and report greenhouse gas emissions, energy production and energy consumption information if specific requirements are met (either at a facility or corporate group level).

The methods and criteria for calculating GHG emissions and energy data under the NGER Act are detailed in the National Greenhouse and Energy Reporting (Measurement) Determination 2008. Roy Hill Holdings Pty Ltd commenced reporting under Section 19 of the NGER Act in 2012-13. The National Greenhouse and Energy

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Reporting (Safeguard Mechanism) Rule 2015 (SGM) seeks to impose limits on large GHG-emitting facilities to ensure that net emissions are kept below a defined baseline. The SGM applies to facilities with Scope 1 emissions of more than 100,000 tonnes of CO<sub>2</sub>-e per year, which includes the RHIO Mine.

The Original Proposal has a calculated baseline of 386,581 tCO<sub>2</sub>-e per year. The SGM was amended in March 2019 and requires RHIO to re-apply to the Clean Energy Regulator for a new baseline before October 2020. The new baseline is anticipated to be approximately 441,353 tCO<sub>2</sub>-e per year.

## 2.5.5 State regulation and policy

The Western Australian Government's Greenhouse Gas Emissions Policy for Major Projects (the State GHG Policy) commits the State Government to work with all sectors of the Western Australian economy to achieve net-zero GHG emissions by 2050 and commits to working with the Commonwealth Government's interim target of emission reductions of 26 to 28 per cent by 2030 (United Nations, 2016).

The State GHG Policy is designed to guide Government decision making for major projects that are assessed by the EPA. In accordance with the policy, the Minister for Environment will consider the particular characteristics of each project and the advice and recommendations of the EPA. The Government may then consider whether it is appropriate to apply a condition that sets out the requirements for a plan detailing the proponent's contribution towards achieving the Government's aspiration of net zero emissions by 2050.

The State GHG Policy supports the development of GHG Management Plans for proposals and provides recommended content. Table 4 details how this GHG Management Plan addresses the contents defined by the State GHG Policy.

Table 4 - State GHG Policy management plan requirements

Content	GHG Management Plan response
<i>The Policy supports the development of Greenhouse Gas Management plans for proponents which:</i>	
<ul style="list-style-type: none"><li>Outline strategies to avoid, reduce, mitigate and offset the project's direct (Scope 1) emissions contributing towards the State's aspiration of net zero by 2050</li></ul>	Strategies to avoid, reduce, and mitigate GHG emissions associated with the Revised Proposal are described in Section 3. Since the Revised Proposal is expected to end in 2032, net zero emissions by 2050 will be achieved.
<ul style="list-style-type: none"><li>Are unique to a proposal's specific circumstances;</li></ul>	The GHG Management Plan is specific to activities associated with the Revised Proposal.
<ul style="list-style-type: none"><li>Allow proponents to take account of opportunities at either facility level or across national operations;</li></ul>	The Revised Proposal is wholly owned and operated by RHIO and is the only iron ore mine in its portfolio. The GHG Management Plan is specific to activities associated with the Revised Proposal at the facility level.
<ul style="list-style-type: none"><li>Allow proponents to propose their own timeframes and interim targets;</li></ul>	Management action timeframes and targets are described in Section 3.
<ul style="list-style-type: none"><li>Include requirements for periodic public reporting against their targets;</li></ul>	Periodic public reporting of progress against the management actions is described in Section 3.
<ul style="list-style-type: none"><li>Account for and align with Commonwealth requirements.</li></ul>	The GHG Management Plan describes how emissions will be managed in accordance with Commonwealth requirements, including responsibilities under the NGER Act.

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## 2.5.6 Rationale for choice of provisions

This GHGMP has been developed based on the assessment of potential impacts from greenhouse gas emissions and requirements from the Environmental Factor Guideline – Greenhouse Gas Emissions.

In line with the mitigation hierarchy, Roy Hill has proposed the management provisions outlined in Section 3.0 based on the following rationale:

- GHG abatement opportunities adopted in this GHGMP have been assessed by Roy Hill to determine whether they are reasonable and practicable against multiple criteria including safety, technical performance, operability, emissions reduction, availability, scale, and economic return. Roy Hill considers that reasonable and practicable GHG abatement measures are considered 'good industry practice'.
- There is potential for substantial changes in technology over the Revised Proposal lifetime, which may influence the reasonableness or practicability of GHG abatement measures. As this GHGMP is dynamic, Roy Hill will complete periodic reviews of policies, markets, technology and infrastructure as part of their adaptive management approach.

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## 3 Environmental Management Plan Provisions

This section outlines outcome-based provisions, management-based provisions and key requirements under this GHG Management Plan. When implemented, it is expected that these provisions will achieve the objective of the greenhouse gas emissions environmental factor and minimise emissions so that environmental values are protected. Outcome-based provisions are performance based and are used where a potential impact on the environment is capable of objective measurement and reporting. The outcome-based provisions are outlined in Table 5.

Table 5 - Outcome-based Provisions

#	Management action	Target	Monitoring	Reporting	Offset
1	Comply with the SGM to maintain GHG emissions within the allocated baseline	Maintain Scope 1 emissions below the SGM baseline.	GHG emissions will be measured in accordance with the requirements of the National Greenhouse and Energy Reporting Measurement Determination	Annual reporting of GHG emissions in accordance with the NGER Act.	Allowable offsets will be purchased and surrendered equivalent to the amount of emissions above the baseline level.  Monitoring of annual volume of offsets required, purchased and surrendered in accordance with the SGM.
2	Establish and achieve an interim emissions target at the Roy Hill mine	Implement emission reduction initiatives for the Revised Proposal that either avoid, reduce or offset emissions to achieve interim targets.	GHG emissions will be measured in accordance with the requirements of the National Greenhouse and Energy Reporting Measurement Determination	Performance against targets will be reported in the annual compliance audit report submitted to EPA.	Allowable offsets will be purchased and surrendered equivalent to the amount of emissions above the emissions reduction target.

Management-based provisions relate to management actions and may be used where part of the environment is not capable of objective measurement and reporting. The management-based provisions are outlined in Table 6.

Table 6 – Management-based provisions

#	Management action	Target	Monitoring	Reporting
1	Set annual target for electricity use	Specific target will be set annually and notified internally. Targets will consider energy efficiency and renewable energy measures available at the time.	Electricity usage will be metered at the supply point and at appropriate points across the mine	Performance against electricity usage targets will be summarised in the annual compliance audit report submitted to EPA.
2	Monitor and report GHG emissions in accordance with the NGER Act	No non-compliances with the monitoring and reporting requirements of the NGER Act.	Annual internal audit	Non-compliances will be reported to the regulator as required and summarised in the annual compliance audit report submitted to EPA.

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#	Management action	Target	Monitoring	Reporting
3	Carry out regular assessment of the reasonable and practicable GHG emission reduction technologies or techniques that have or could be implemented and ensure technologies are implemented if deemed viable	Carry out review at least once a year and ensure viable technologies are implemented.	Annual internal audit	Outcomes of the reviews will be summarised in the annual compliance audit report submitted to EPA.  Updates to the GHG Management Plan as a consequence of the five-yearly reviews will be submitted to the EPA and published on approval.

## 3.1 Comply with the SGM

Under the NGER (Safeguard Mechanism Rule) 2015, the Roy Hill mine has a calculated baseline set at 441,353 tCO<sub>2</sub>-e per year for the period between FY2018-2019 to FY2020-2021. Following this three-year period, Roy Hill is planning to apply for a production adjusted baseline that will allow to increase the current baseline only if there is an increase in production from the Roy Hill mine. Since the establishment of the SGM, Roy Hill has ensured that where there were occurrences of unforeseen excess emissions situations, these were resolved as per the requirements of the SGM. For example, in 2019 Roy Hill surrendered 5,038 Australian Carbon Credit Units (ACCU) to the Clean Energy Regulator to offset excess emissions from the FY2017-2018 period. Whilst Roy Hill will work towards ensuring emissions are below the SGM limit, if the limit is exceeded Roy Hill will surrender ACCUs.

## 3.2 Establish and achieve an interim emissions target

Roy Hill will set emissions reduction targets for the emissions that will arise from the Proposed Changes which are emissions additional to those already approved in the Original Proposal. Regular targets for emissions reduction projects have been established to ensure an incremental reduction in emissions over the life of the project.

Emissions arising from the Proposed Changes and the proposed interim reduction targets are outlined in Figure 5 and Table 7. To meet these targets Roy Hill will implement emission reduction initiatives to either avoid, reduce or offset emissions to achieve the interim targets.

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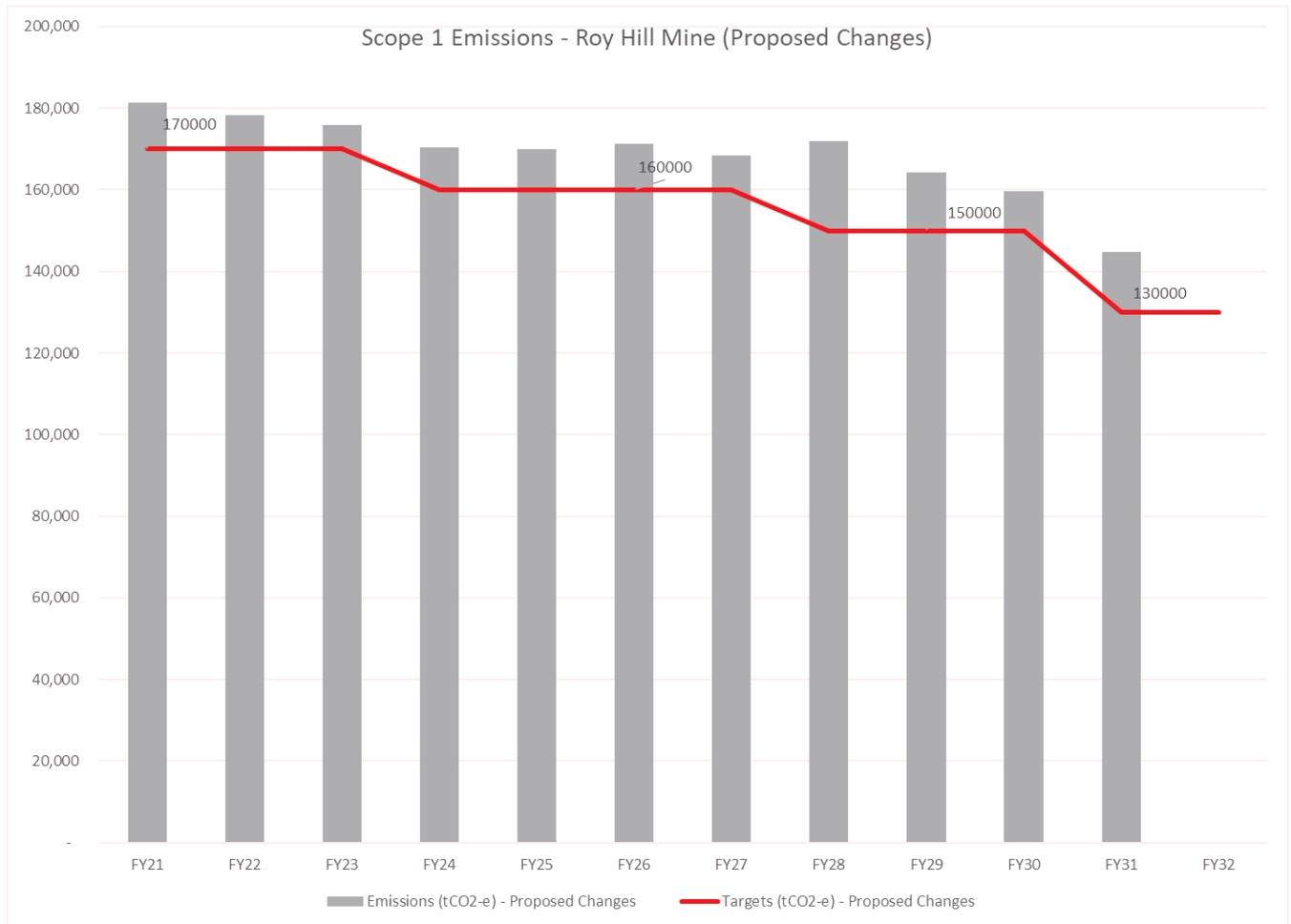


Figure 5 - Interim Emissions Targets - Scope 1 emissions (Proposed Changes)

Table 7 - Interim Emissions Targets - Scope 1 emissions (Proposed Changes)

Year	FY2021 – FY2023	FY2024-2027	FY2028 – FY2030	FY2031 – FY2032
<b>Proposed Changes Target (tCO<sub>2</sub>-e)</b>	170,000	160,000	150,000	130,000

In the event that Roy Hill is not able to meet the proposed targets, Roy Hill will offset the excess emissions by purchasing ACCUs. Roy Hill has engaged an ACCUs supplier to offset excess emissions under the Safeguard Mechanism in the past and can confirm ACCUs are available in the market.

In accordance with the EPA guidance (EPA, 2020b), compliance offsets that may be required under the Safeguard Mechanism would be recognised as a contribution to the proposed interim GHG emissions reduction targets under this GHGMP.

### 3.3 Set annual target for electricity use

Internal targets will be set annually for electricity use at the mine and notified to all departments. This will complement the existing process undertaken by the Finance department where electricity use is tracked against forecasts developed before the beginning of a financial year. Targets will consider energy efficiency and renewable energy measures available at the time.

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Performance against electricity usage targets will be summarised in the annual compliance audit report submitted to EPA.

## 3.4 Monitor and report GHG emissions in accordance with the NGER Act

Monitoring, auditing and reporting of GHG emissions for the Revised Proposal will be used to measure ongoing performance and provide data that aids in the identification of improvement opportunities. Monitoring, and reporting of GHG emissions is carried out in accordance with the requirements of the NGER Act.

The effectiveness of GHG emissions reduction projects will be monitored on an ongoing basis. During monitoring, actions may be identified for improvement.

Auditing of the environmental and GHG emission performance of the Revised Proposal will include:

- internal and external environmental audits (as required) of compliance to its statutory obligations and management plans; and
- internal auditing of GHG emissions data reporting as required under the NGER Act.

## 3.5 Carry out regular assessment of GHG emission reduction technologies

The emissions reduction industry is one that is currently undergoing rapid change facilitated by the global commitment to reaching zero emissions targets. Consequently, there is an enormous number of technology concepts that are being identified and then developed for commercial use. To ensure that Roy Hill remains abreast of these opportunities to reduce our carbon footprint, Roy Hill has established a Strategic Power Group (SPG). The purpose of the SPG is to regularly review and assess GHG emissions reduction technologies and projects that can deliver reductions in Scope 1 and 2 emissions for our operations. The SPG meets on a regular basis throughout the year and Roy Hill commits to ensuring this group review of technologies happens throughout each year during the LOM.

It is acknowledged that the mining fleet is by far (>99%) the largest source of scope 1 emissions at the mine and that there are no economic or technologically viable large-scale vehicles currently available for the mining industry that could be considered to achieve significant reductions.

Despite the technological limitations, several emissions reduction projects are currently under assessment by the SPG with a focus on Scope 1 and 2 emissions of the Proposed Changes.

Key emissions reduction projects that Roy Hill is investigating to reduce GHG emissions at the mine are outlined in Table 8. This table also outlines initiatives that have been assessed and have not been deemed to be viable to date for economic, safety or practicality reasons.

As industry develops new commercial emissions reduction technology, Roy Hill will consider its applicability to its operation.

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Table 8 – GHG Abatement Projects

GHG Abatement Project	Mitigation Hierarchy	Approx. CO2-e mitigated (tonnes per year)	Scope	Status	Indicative Timeframe for Implementation
Connecting the mine network of dewatering gensets to Alinta's grid	Avoid	12,000	1	Not feasible at this stage	N/A
Utilise solar power to create and store hydrogen which could then be transported to fuel cells at dewatering bores to power bore pumps by electrolysis	Avoid	16,000 – 25,000	1	Not feasible at this stage	N/A
Installation of a 30 MW solar farm  In partnership with Alinta, this solar farm would feed the Alinta grid and offset emissions from the Newman Power Station	Avoid	61,574	2	Approved for implementation	FY2024
Hitachi fleet optimisation  Tuning EH5000 engines to reduce fuel consumption. This can result in 4-7% savings across the Hitachi fleet.	Minimise	4,300 – 7,500	1	Approved for implementation	FY2022
Use of diesel fuel additive  Addition of Caltex Active Tec product to all diesel supplied to Roy Hill. This can achieve between 1% - 4% fuel usage reduction across all mine equipment. A trial conducted by Roy Hill suggests that reductions over 1% can be achieved with the use of the additive.	Minimise	4,500 – 18,000	1	Under assessment	FY2023
Use of carbon fibre trays in mining hauling fleet  The use of lighter material has the potential to improve performance and consequently reduce fuel consumption between 10% - 15%	Minimise	19,000 – 29,000	1	Under assessment	N/A
Electrification of the Hitachi haul fleet capability, install overhead canterly, and remap Hitachi fleet.	Minimise	Up to 25,000	1	Not feasible	N/A

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GHG Abatement Project	Mitigation Hierarchy	Approx. CO2-e mitigated (tonnes per year)	Scope	Status	Indicative Timeframe for Implementation
Installation of new reciprocating generators at Alinta PS.	Minimise	64,000	2	Under assessment	N/A

## 4 Adaptive Management and Review of GHG Management Plan

### 4.1 GHG Management Plan Review

This GHG Management Plan will be reviewed, evaluated and updated as required or in response to the following triggers:

- Introduction of a new process or activity that could introduce new or amend existing GHG emissions
- Outcomes of relevant technical studies and investigations into new GHG emission reduction opportunities or new energy efficiency technologies or techniques
- Changes in relevant state or commonwealth legislation
- Comments from the EPA during the environmental assessment process.

An internal audit of the monitoring and reporting procedures will be carried out annually to ensure accuracy and compliance with relevant legislation. The annual audits will include checking that:

- All requirements have been adequately reported
- Inventory boundaries have been set correctly
- Correct calculation methods have been used to quantify GHG emissions
- Correct energy production and consumption reporting factors and methods have been applied
- Energy efficiency opportunities have been reported
- Reporting procedures show relevance, completeness, consistency, transparency, and accuracy
- Timeframes have been met for outputs and deliverables.

Independent verification of the GHG inventory will be conducted as required for quality assurance purposes and to provide feedback on managing data collection and inventory quality.

After a review is triggered, any updates to the GHG Management Plan (other than administrative changes) will be submitted to the EPA.

### 4.2 Review of mitigation measures

In addition to ongoing routine analysis of operations to identify reasonable and practicable efficiency opportunities, RHIO will undertake a five-yearly assessment of potential equipment, technologies and techniques to improve the GHG emissions performance of the Revised Proposal. The review will consider the aspects described in Table 9.

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Table 9 – Potential Mitigation Measures for Regular Review

Aspect	Measure	Aspects for review
Fuel efficiency	Fuel efficiency of mobile equipment	<ul style="list-style-type: none"> <li>Maintenance and renewal of haul fleet.</li> <li>Use of alternative fuels (e.g. biodiesel, hydrogen).</li> <li>Use of electric vehicles and equipment (electrification).</li> <li>Recycling and reuse of waste oil and hydrocarbons.</li> <li>Mine plan development including evolution of plant layout to minimise haul distances.</li> </ul>
Energy efficiency	Energy/fuel efficiency of site electricity generation	<ul style="list-style-type: none"> <li>Maintenance and renewal of key power using equipment.</li> <li>Use of diesel-powered back-up generators and mobile lighting rigs.</li> <li>Mine plan development, including evolution of plant layout to minimise pump/convey distances.</li> </ul>
Reducing fugitive emissions	Fugitive emissions from waste management and treatment	<ul style="list-style-type: none"> <li>Use of waste to energy technology to manage domestic/putrescible waste streams.</li> <li>Use of bio-sequestration in wastewater treatment systems</li> </ul>
Renewable energy	Options for electricity generation for lighting and in accommodation camps and ancillary/support buildings	<ul style="list-style-type: none"> <li>Use of renewable energy, including:                             <ul style="list-style-type: none"> <li>Small to medium wind turbines.</li> <li>Solar thermal and voltaic panel.</li> <li>Geothermal energy for space and water heating.</li> <li>Hybrid systems, utilising more than one technology</li> </ul> </li> </ul>
Research and development	Technological advances regarding management of GHG emissions	<ul style="list-style-type: none"> <li>Technological developments identified through regulator, peak-industry groups, academia or other organisations</li> <li>Participation in research for energy efficiency technologies in iron ore mining.</li> </ul>

## 5 Stakeholder Consultation

This GHG Management Plan is included as an appendix to the Environmental Review Document (ERD) for the Revised Proposal and will be reviewed by the EPA, key Decision-Making Authorities, and the general public as part of the environmental assessment process.

Comments received from the EPA during the initial review will be incorporated into this GHG Management Plan before the publication of the ERD (and associated management plans) for public review and comment. All comments received during the public review period that relate to this GHG Management Plan will be considered, and changes made where required.

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## 6 Abbreviations

Table 10 – Abbreviations

Abbreviation	Definition
ACCU	Australian Carbon Credit Unit
AGEIS	Australian Greenhouse Emissions Information System
EMS	Environmental Management System
EP Act	<i>Environmental Protection Act 1986</i>
EPA	Environmental Protection Authority
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
ERD	Environmental Review Document
GHG	Greenhouse Gas
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
LOM	Life of Mine
NGA	National Greenhouse Accounts
NGER Act	The National Greenhouse and Energy Reporting Act 2007
RHIO	Roy Hill Iron Ore Pty Ltd
SGM	National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015
SPG	Roy Hill's Strategic Power Group
UNFCC	United Nations Framework Convention on Climate Change

## 7 References

Table 11 – References

Document number	Title
Clean Energy Register 2018	Scope 1, 2 and 3 emissions defined in <i>Greenhouse gases and energy</i> (Clean Energy Regulator 2018).
EPA 2020a	Environmental Protection Authority (EPA) 2020a. Instructions on how to prepare Environmental Protection Act 1986 (WA) (EP Act) Part IV Environmental Management Plans. Environmental Protection Authority, Perth WA.
EPA 2020b	Environmental Protection Authority (EPA) 2020b. Environmental Factor Guideline: Greenhouse Gas Emissions. Environmental Protection Authority, Perth WA.
Government of Western Australia, 2017	Greenhouse Gas Emissions Policy for Major Projects
SMEC 2009	SMEC 2009. Roy Hill Iron Ore: Greenhouse Gas Management Plan. Report prepared for Roy Hill Iron Ore, June 2009
United Nations 2016	The Paris Agreement, United Nations Framework Convention on Climate Change, 2016.

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