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Technical note

Project	Southdown Magnetite Project		
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Subject:	Southdown Joint Venture Magnetite Transhipping Project - Greenhouse Gas Assessment		

1 Introduction

The Port of Albany (hereafter, 'the Port') is on the southern coast of Western Australia with infrastructure in Princess Royal Harbour (PRH) and King George Sound (KGS). It is an industrial port operated by Southern Port Authority (SPA) under the *Port Authority Act 1999*, exporting bulk products such as grain, woodchips and silica sand, and importing fertiliser, fuel and timber products.

Grange Resources Limited (Grange) on behalf of the Southdown Joint Venture (SDJV) is developing the Southdown Magnetite Project. The Port has undergone growth in the past decades to meet the potential shipping needs of the Southdown Magnetite Project run by SDJV. SDJV proposes to construct and operate an open pit magnetite mine at the Southdown Magnetite deposit located ~90 km north-east of Albany, Western Australia.

SPA propose to expand current anchorages in KGS to accommodate for transhipping operations, involving:

- construction of a new jetty at berth 5
- loading of a transhipment vessel (TSV) at berth
- first and second stage loading at inner and outer anchorages from TSV to ocean-going vessel (OGV)

The proposal involves the construction of a new berth (Berth 5) adjacent to Lot 60/61 and the export of magnetite utilising a transhipment vessel at the proposed Berth 5 (Figure 1.1). The proposed transhipment will occur at two locations (an inner and outer anchorage area). The fully laden OGV requires greater than -20 m CD depth of water. The only proposed anchorage area which supports the full draft of the OGV is Anchorage Y (Outer anchorage). However, Anchorage Y is more exposed to the predominant swell wave penetrating KGS which can potentially cause downtime for transhipment due to excessive movement of vessels. Therefore, two stages loading of OGV (as described below) are considered to minimise the downtime due to the energetic wave conditions.

1. First stage of OGV loading: OGV is short loaded by TSV (i.e. multiple TSV trips) at one of the proposed inner anchorages (Anchorage W, D or Z, most likely Anchorage W) up to a level (e.g. 50 to 80% of the OGV capacity, depending on the vessel hull configuration) that allows for the safe Under Keel Clearance (UKC) of the vessel to pass safely over the 15mCD seabed contour between the inner anchorages and Anchorage Y.

2. Transit of OGV between the preferred inner anchorage (most likely Anchorage W) to Anchorage Y (one time per OGV) to access deeper water.

3. Second stage of OGV loading: Continuing loading at the deeper water outer anchorage (Anchorage Y) to be topped up to full draft of the OGV (i.e. fully laden).

4. OGV Departure: Fully laden OGV will departure from Anchorage Y and starts the transit to receiving ports.

The Preliminary Feasibility Studies (PFS) demonstrated that a wide range of TSV sizes (6kt to 40kt) will be able to achieve the proposed target of 5.45 mtpa (5 mtpa dry plus 9% moisture content).

SDJV preliminary review of the freight options indicated that the project is feasible (from financial point of view) by adopting the most cost-effective option for OGV chartering which is chartering the upper size of the Capesize vessel range (150-220 kt). At the end of the PFS a Base Case scenario was selected to represent the likely operation for the ongoing assessment prior the final tendering process and finalising the TSV vessel. The base case scenario comprises of a 20 kt TSV and 200 kt OGV (can be varied depending on the available OGV at the time of chartering).

In the Base Case scenario, 20,000 tonnes of magnetite concentrate (including 9% moisture content) will be loaded on TSV at each loading cycle. A total amount of approximately 200,000 tonnes is required to load the Capesize OGV. The TSV will therefore undertake 10 return shipments of magnetite concentrate from Berth 5 to the nominated anchorage areas within King George Sound.

SPA is referring the Proposal under Part IV, Section 38 of the Western Australian *Environmental Protection Act 1986* (EP Act) and the Commonwealth *Environment Protection and Biodiversity Act 1999* (EPBC Act).

If the project is likely to exceed 100,000t of Scope 1 emissions each year under the EP Act, mitigation measures to reduce emissions are required.

Figure 1.1 Proposed transhipment anchorages in King George Sound and proposed new Berth 5

2 Methods

The Environmental Factor Guideline (Greenhouse Gas Emissions, EPA 2020) provides guidance on what information is to be provided as part of an assessment. This includes:

- Estimates of Scope 1, 2 and 3 GHG emissions over the life of a proposal
- A breakdown of GHG emissions by source inclusive of, but not limited to stationary energy, fugitives, transport and emissions associated with changes to land use
- Projected emissions intensity (emissions per unit of production) for the proposal and benchmarking against other comparable projects
- A Greenhouse Gas Management Plan, including:
  - Intended reductions in Scope 1 emissions over the life of the proposal
  - Regular interim and long-term targets that reflect an incremental reduction in Scope 1 emissions over the life of the proposal.
  - Strategies which demonstrate that all reasonable and practicable measures have been applied to avoid, reduce and offset a proposal's Scope 1 emissions over the life of the proposal.

As part of landside approvals, a Greenhouse Gas Management Plan is being prepared for ongoing site management.

The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (WRI 2004) is the internationally recognised and accepted standard for companies to use in quantifying and reporting their GHG emissions). This Guideline has been used when considering the scope of a future greenhouse gas management plan.

The strategy requires companies or projects to consider the following principles when undertaking GHG calculations:

- **Relevance**: ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users – both internal and external to the company

- **Completeness**: Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusion

- **Consistency**: Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data. Inventory boundary, methods, or any other relevant factors.

- **Transparency**: Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.

- **Accuracy**: Ensure that the quantification of GHG emissions is systematically neither over or under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.

The Protocol stipulates that Scope 1 and 2 emissions only should be accounted for, as Scope 3 emissions are generally the responsibility of another entity.

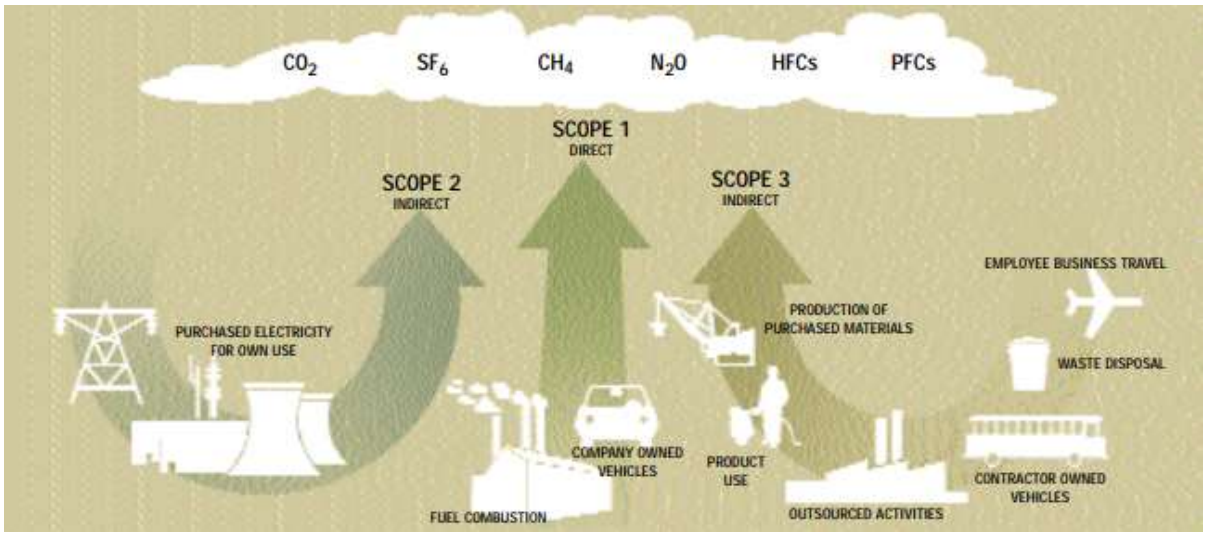

Figure 2.1 Scope 1, 2 and 3 emissions (WRI 2004)

2.2 Organisational and operational boundary

An organisational boundary is usually drawn around operations that a company or project has full control over i.e. makes operational and financial decisions over. It also should consider both on-site and off-site activities and all geographical locations. It could also be drawn around any GHG emissions that it has responsibility for managing, so that the entity is able to identify its risks or exposures.

In this instance, because approval has been sought for the construction activity described in Section 1, the operational boundary has been drawn to include the construction of the new berth 5 (pile driving), and the transhipment operation (transportation of product by TSV between port and OGV, including loading). Construction may also include seawall remediation works which will involve some land based work using long reach excavators. Though this is yet to be determine at this stage of the Project.

The organisational boundary is to include activity directly within the construction footprint. Any offsite activity by sub-contractors, such as steaming of vessel to site or delivery of goods and services is not to be included, as these emissions are the responsibility of the third party.

2.3 Completeness

The Corporate GHG Standard (WRI 2004) encourages a corporation to account for all relevant emissions sources. It does allow for emissions sources to be excluded where there is a lack of data, uncertainty in calculation methodology or where the source is small (i.e. not material).

Table 2.2 provides a summary of all potential emissions sources within the operational boundary described above.

Table 2.1 Transhipment details and potential emissions sources

Emission Source	Within Operational Boundary	Data Availability	Size of emission source
Scope 1			
Fuel use associated with pile driving for construction of new Berth 5	Yes	Yes – from Hera Hammers (2017)	Relatively Insignificant (Only construction period. e.g., period of 10 days using a 8 tonne hammer)
Fuel combustion by TSV (at berth, transit to inner anchorage, transit to outer anchorage, including loading the TSV)	Yes	Fuel estimates are based on 'typical' vessels but may vary from vessel to vessel.	Major emissions source for this project.
Fuel combustion for OGV (transit from inner anchorage to outer anchorage)	Yes	Fuel estimates are based on 'typical' vessels but may vary from vessel to vessel.	Relatively Insignificant (25 OGV per year which translate to transit once every 2 weeks, less than 10km transit)
Fuel combustion for long reach excavator (seawall remediation)	Yes		Relatively Insignificant (Only during construction period, no more than 10 days)
Scope 2			
Shiploader	Yes - The shiploader will be powered by shorepower and is included in separate landside GHG estimates and approvals.		

2.4 Consistency

GHG information should be gathered in a consistent manner over time to identify data trends and allow comparison over time. BMT have used the following methodological approaches when quantifying emissions:

- National Greenhouse Accounts (NGA) Factors for the relevant year (Department of Industry, Science, Energy and Resources, various) have been used to determine emission calculation and factors for fuel and energy in Australia.
- Where emission factors are not available within the Australian NGA Factors, the UK Government GHG Conversion Factors for Company Reporting (Department of Business, Energy and Industry Strategy, 2020) - this methodology is commonly used internationally in the absence of country-specific guidance.

2.5 Transparency

The GHG Protocol requires that all processes, procedures, assumptions and limitations are clear, to the extent that a third party should be able to derive the same results if using the same source data. BMT have documented all data sources, inclusions/exclusions, emission factor and methodology sources in Section 3.

3 Total Greenhouse Gas Emissions

The quantity surveyor for the project, has estimated the following fuel use for the project.

Table 3.1 Total estimated fuel use for transhipment operation

Activity	Equipment	Duration (hours)	Est. fuel usage (Kl)
Berth construction	Pile drive hammer (8 t)	11.5L/hr ~12 hours per day 10 days max	1.3KL
Sea wall remediation[1]	Long-reach excavator	Conservatively 60L/hr ~12 hours per day 10 days max	7.2kL
Fuel combustion by TSV (at berth, transit to inner anchorage, transit to outer anchorage, including loading the TSV)	TSV	Less than 200 days per year, app.12 hour operation per day at the berth	5,310kL
Fuel combustion by OGV (transit from inner to outer anchorage)	OGV	Whilst it varies greatly per vessel, average sailing fuel use is 2.3KL/hr for cape-size vessel at full-steam, 27 times per year, with sailing time of approx.. 1 hr between anchorages	251 KL
TOTAL			**5,569 KL/year**

Using the GHG calculation methodology and emission factor from the National Greenhouse Accounts Factors Workbook (DBEIS 2020), the total GHG emissions has been calculated using the following formulas for transportation fuel:

$$E_{ij} = \frac{Q_i \times EC_i \times EF_{ijoxec}}{1\,000}$$

Where:

i. E_{ij} is the emissions of gas type (j), carbon dioxide, methane or nitrous oxide, from fuel type (i) (CO_2-e tonnes).

[1] Seawall remediation works are not confirmed and may not be necessary during construction of the new berth. It has been included to provide a conservative estimate of GHG emissions.

ii. Q_i is the quantity of fuel type (i) (kilolitres or gigajoules) combusted for transport energy purposes

iii. EC_i is the energy content factor of fuel type (i) (gigajoules per kilolitre or per cubic metre) used for transport energy purposes

iv. EF_{ijoxec} is the emission factor for each gas type (j) (which includes the effect of an oxidation factor) for fuel type (i) (kilograms CO2-e per gigajoule) used for transport energy purposes

Table 3.2 Emission estimates for transhipment operations (all Scope 1 emissions)

Activity	Est. Fuel use (KL)	Energy Content Factor (GJ/KI)	GHG Emission Factor (2021)	Total GHG Emissions (tCO2-e)
Construction (including new berth and seawall remediation works	8.5	38.6	70.4	22.9
Fuel combustion by TSV (at berth, transit to inner anchorage, transit to outer anchorage, including loading the TSV)	5,310	38.6	70.4	14,327
Fuel combustion by OGV (transit from inner to outer anchorage)	251,000	38.6	70.4	677.23
TOTAL				**15,027/year**

This total of 15,027 tCO2-e Scope 1 emissions falls well below the EP Act threshold for undertaking mitigation action of 100,000 t of CO2-e being generated by a project on an annual basis. Over the lifetime of a project (assuming a 30 year lifespan), the total would still be far less (approximately 450 KT CO2-e in total).

The basis of this assessment is the assumption that heavy fuel oil will continue to be used by shipping companies – many are rapidly transitioning to lower emission fuels or even zero emission vessels (green hydrogen or electric). Over the lifespan of the project, it is likely that emissions from vessels and transportation will reduce significantly. Further options are being considered as part of a Greenhouse Gas Management Plan, which has been addressed separately by Grange as part of the wider Southdown Magnetite Project.

4 References

Department of Business, Energy and Industry Strategy (DBEIS) (2020) Greenhouse gas reporting: conversion factors 2020. Available at <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020> [Accessed 27 June 2022]

EPA (2020) Environmental Factor Guideline – Greenhouse Gas Emissions. Environmental Protection Authority, Perth, Western Australia, April 2020

Hera Hammers (2017) Operating Instructions Diesel Hammers: D6 through D280. Hera Hammers, Ijmuiden, the Netherlands. Available at <https://www.hera-hammers.com/wp-content/uploads/2017/11/Dieselhammer_instructions.pdf> [Accessed 21 July 2022]

World Resources Institute (WRI) (2004) A Corporate Accounting and Reporting Standard. Prepared by the World Resources Institute and the World Business Council for Sustainable Development, Washington DC, USA, March 2004