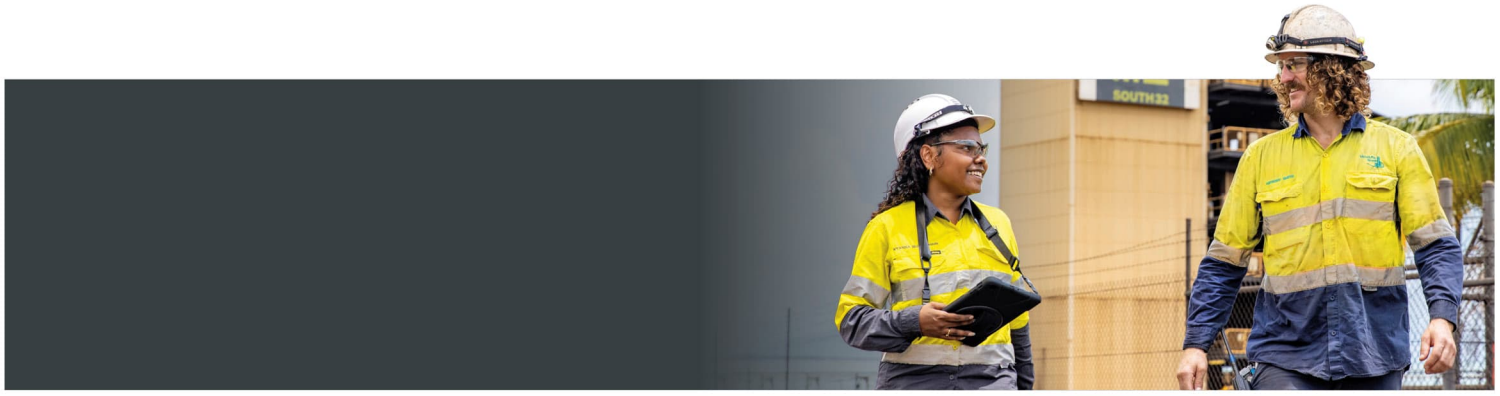
GROOTE EYLANDT MINING COMPANY (GEMCO)

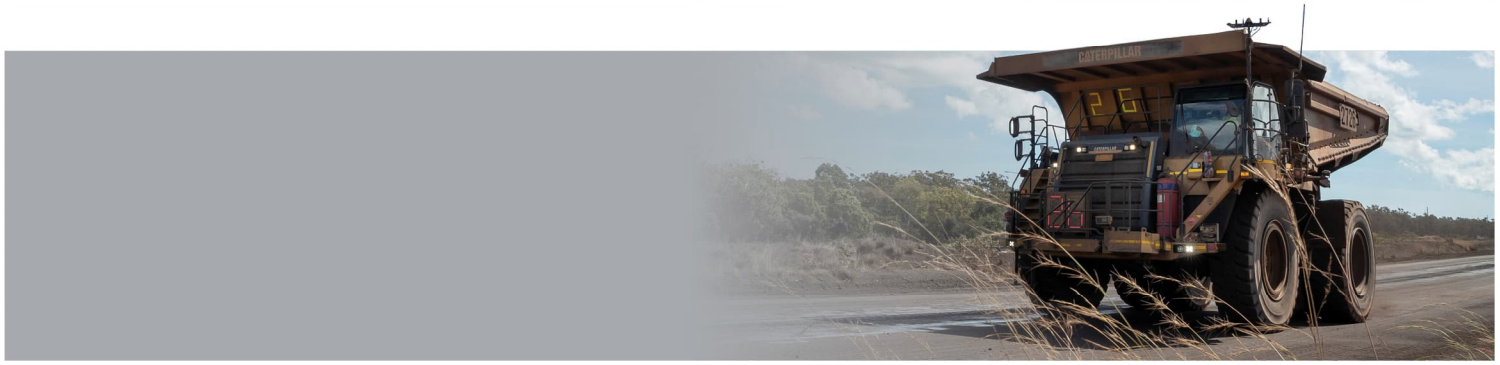
SOUTH32

SOUTHERN LEASE MINING PROJECT

NT Environment Protection Act Referral - Supporting Information

April 2023





HANSEN ENVIRONMENTAL CONSULTING

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

The following abbreviations are commonly used throughout this document.

Abbreviation / Acronym	Definition
3D	Three-dimensional
4WD	Four-wheel drive
AA	Access Authority
AAPA	Aboriginal Areas Protection Authority
AHD	Australian Height Datum
ALC	Anindilyakwa Land Council
ALRA	*Aboriginal Land Rights (Northern Territory) Act 1976* (Cth)
Cth	Commonwealth
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEPWS	Department of Environment, Parks and Water Security
DITT	Department of Industry, Tourism and Trade
DNREAS	Department of Natural Resources, Environment, the Arts and Sport (former department)
EARC	East Arnhem Regional Council
EIS	Environmental Impact Statement
EL	Exploration Licence
EP Act	*Environment Protection Act 2019* (NT)
EP Regulations	*Environment Protection Regulations 2020* (NT)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
FIFO	Fly-In Fly-Out
GEMCO	Groote Eylandt Mining Company Pty Ltd
GHG	Greenhouse Gas
IPA	Indigenous Protected Area
ha	Hectare
MNES	Matter of National Environmental Significance
Mt	Million tonnes
Mtpa	Million tonnes per annum
NAFI	North Australian Fire Information
NGER Act	*National Greenhouse and Energy Reporting Act 2007* (Cth)

Abbreviation / Acronym	Definition
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
ROM	Run of Mine
RWA	Restricted Work Area
Sacred Sites Act	*Northern Territory Aboriginal Sacred Sites Act 1989* (NT)
SIA	Social Impact Assessment
SOR	Statement of Reasons
TPWC Act	*Territory Parks and Wildlife Conservation Act 1976* (NT)
TOR	Terms of Reference

EXECUTIVE SUMMARY

The Groote Eylandt Mining Company Pty Ltd (GEMCO) (the "proponent") is proposing to develop the Southern Lease Mining Project (the "project"). The project involves developing a mining project in Exploration Licence (EL) 2455 (known as the Southern Lease) on Groote Eylandt. Groote Eylandt is a largely undeveloped island in the Gulf of Carpentaria, approximately 650 km south-east of Darwin and 50 km off the coast of Arnhem Land. The Southern Lease is adjacent and to the south of the existing GEMCO Mine (the Western Leases). The project area is located in the north-western part of the Southern Lease. Angurugu is the nearest township and is located approximately 10 km by direct line from the northern boundary of the project area. Groote Eylandt, including the Southern Lease, is Aboriginal land under the *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth). The Anindilyakwa Land Council (ALC) is the land council responsible for this land.

The project will use the same open cut mining methods used at the proponent's existing operations. Approximately 15 million tonnes of run of mine (ROM)[1] ore is proposed to be mined over approximately three years. Manganese ore from the project will be transported via haul road to the existing GEMCO Mine, washed at the concentrator and blended with ore from the proponent's other operations.

Activities to be undertaken in the Southern Lease include:

- The construction of minor facilities, such as a crib hut, heavy vehicle park up area, water management infrastructure including dams and pipelines, a water treatment plant for supplying potable water, a remote truck refuelling station, and a modular sewage biocycle treatment plant.
- The development of open cut mining quarries and haul roads.
- Mining of ore and hauling it to the existing GEMCO Mine using haul trucks.
- Progressive rehabilitation of areas that have been disturbed.

The area proposed to be cleared for the project is approximately 1,620 ha.

A small workforce would be required during the construction phase, whereas the workforce for the operations phase would be drawn from the proponent's existing workforce.

The proponent has located and designed the project to avoid and mitigate impacts, where possible. The process that was adopted to plan the project to avoid and mitigate impacts included:

- Gathering baseline data on environmental and cultural values to identify the most sensitive features in the Southern Lease.
- Undertaking an iterative project planning process, in consultation with the ALC, Traditional Owners and key regulators, to:
    - Locate the project in a broad area that avoids the most sensitive environmental and cultural features in the Southern Lease (e.g. sacred sites, significant wetlands, large perennial watercourses); and
    - Design the project disturbance footprint to avoid and minimise impacts on key features, such as riparian corridors and wetlands.

[1] *ROM is the volume of ore that is mined prior to any processing.*

The proponent is proposing to prepare an Environmental Impact Statement (EIS) for the project. A "proponent initiated EIS referral" under the *Environment Protection Act 2019* (NT) (EP Act) is being lodged with the Northern Territory Environment Protection Authority (NT EPA) to initiate the regulatory process. This document provides supporting information for the EP Act Referral. It is accompanied by an EP Act Referral Form and a Statement of Reasons explaining why an EIS is an appropriate level of assessment for the project.

A referral under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) has been made to the Department of Climate Change, Energy, the Environment and Water (DCCEEW). The proponent has nominated the project as requiring approval under the EPBC Act, given potential impacts on threatened and migratory species that are listed under the EPBC Act. It is the proponent's intent that a single EIS process be used to satisfy the assessment requirements under both the Commonwealth EPBC Act and the Northern Territory EP Act.

This document provides supporting information for the EP Act Referral and describes:

- Regulatory approvals required for the project, including the steps involved in the EIS process;
- The project setting, including the regional setting, natural features in the project area, land ownership and land use, and tenure;
- The stakeholder engagement that has been undertaken and is proposed to be undertaken; and
- The project description.

Under Northern Territory legislation and guidelines, information about the environment is categorised into environmental factors and objectives in order to provide a standard and systematic approach to environmental impact assessment and reporting. Environmental factors are aspects of the environment that may be impacted by a proposed action. The proponent has undertaken an assessment of environmental factors for the project and determined that the following environmental factors are potentially relevant:

- Terrestrial environmental quality;
- Terrestrial ecosystems;
- Hydrological processes;
- Inland water environmental quality;
- Aquatic ecosystems;
- Air quality;
- Atmospheric processes;
- Community and economy;
- Culture and heritage; and
- Human health.

This document provides an overview of the environmental values for each environmental factor (i.e. the baseline environment and environmental sensitivities). It also describes the project's potential impacts on each factor, the studies to be conducted as part of the EIS to assess the impacts, and the avoidance and mitigation measures to be adopted to ensure that the NT EPA's environmental objectives are met.

1 INTRODUCTION

1.1 PURPOSE

The Groote Eylandt Mining Company Pty Ltd (GEMCO) (the "proponent") is proposing to develop the Southern Lease Mining Project (the "project"). An Environmental Impact Statement (EIS) is proposed to be prepared for the project and a referral under the *Environment Protection Act 2019* (NT) (EP Act) is being made to initiate the regulatory process. The EP Act Referral is being submitted to the NT EPA as a "proponent initiated EIS referral". The EP Act Referral has been prepared to meet the requirements of relevant guidelines prepared by the NT EPA, including *Referring a proposal to the NT EPA* (NT EPA, 2021a) and *Preparing a proponent initiated EIS referral* (NT EPA, 2020).

This document provides supporting information for the EP Act Referral and should be read in conjunction with:

- The referral form;
- The Draft Terms of Reference (TOR) for the EIS; and
- A Statement of Reasons (SOR), which explains that the project is located in a sensitive setting and hence a comprehensive environmental assessment process, in the form of an EIS, is appropriate.

A referral under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) was made on 23 January 2023 and is currently being processed by the Department of Climate Change, Energy, the Environment and Water (DCCEEW). It is the proponent's intent that a single EIS process be used to satisfy the assessment requirements under both the EPBC Act and the EP Act.

1.2 PROJECT OVERVIEW

GEMCO has been operating on Groote Eylandt in the Northern Territory (NT) for nearly 60 years. The proponent's existing operations comprise:

- The existing manganese mine and associated infrastructure on the western side of Groote Eylandt (termed the "Western Leases" or the "existing GEMCO Mine") (Figure 1).
- A new mining area that is approved and currently under construction (the Eastern Leases) (Figure 1).

Manganese is mined from quarries by open cut mining methods and then the ore is washed in a concentrator, located in the Western Leases. The manganese product is transported from the Western Leases by road train to GEMCO's port facility at Milner Bay (Figure 1) and shipped to customers around the world. Manganese is a critical mineral, i.e. a mineral that is strategically important to Australia's economy and essential in emerging technologies such as electric vehicles and low emission power sources.

Exploration Licence (EL) 2455, known as the Southern Lease, was granted to the proponent in 2016. The Southern Lease adjoins the Western and Eastern Leases (Figure 1). The proponent has undertaken several exploration programs in the Southern Lease to assess potential future resources and is now proposing to develop a mining project in a project area in the north-western part of the Southern Lease (Figure 1).

The project will use the same open cut mining methods used at the proponent's existing operations. Mining in the project area will be undertaken for approximately three years. Manganese ore from the project will be transported via haul road to the Western Leases and washed at the concentrator. Project ore will be blended with ore from the Western Leases and Eastern Leases and sold as a single product. The project will be operated as part of the proponent's existing operations and will not be an independent mine.

Based on current life of operations planning, project mining operations will take place concurrently with mining in the Western and Eastern Leases. However, these other mining areas are forecast to scale back production by the time that project operations commence, and consequently the project will not increase GEMCO's current production rate of 10 Million tonnes per annum (Mtpa) of Run of Mine (ROM)[2] manganese ore.

1.3 THE PROPONENT

The proponent, GEMCO, has two shareholders, South32 Limited (60%) and Anglo Operations (Australia) Pty Ltd (40%). GEMCO is operated by South32.

South32 is a globally diversified metals and mining company. South32 mines and produces bauxite, alumina, aluminium, metallurgical coal, manganese, copper, nickel, silver, lead and zinc in Australia, Southern Africa and South America. Manganese product from the existing GEMCO Mine is shipped to customers around the world.

Anglo Operations (Australia) Pty Ltd is a wholly owned subsidiary of Anglo American Plc, a mining group based in the United Kingdom that is listed on the London Stock Exchange. Anglo American Plc is one of the world's largest mining companies and has a diverse portfolio of interests in iron ore, manganese, base metals, precious metals, minerals, and steelmaking coal.

Key contact details for the proponent and Hansen Environmental Consulting, its environmental consultant for this EP Act Referral, are provided in Table 1.

TABLE 1 CONTACT DETAILS

	Proponent	Environmental Consultant
Company Name	Groote Eylandt Mining Company Pty Ltd (GEMCO)	Hansen Environmental Consulting
Postal Address	GEMCO, Rowell Highway, Alyangula NT 0885	Level 15, 215 Adelaide Street, Brisbane QLD 4000
Phone	(08) 8987 4435	(07) 3180 1234
Contact Person: Name	Mike Chapman	Laura Knowles
Contact Person: Title	Project Study & Approvals Manager	Principal Environmental Scientist
Contact Person: Email	mike.chapman@south32.net	lknowles@hansenec.com.au

[2] *ROM is the volume of ore that is mined prior to any processing.*

1.4 REPORT STRUCTURE

This report is structured as follows:

- Section 2 provides an overview of the key regulatory approvals for the project;
- Section 3 describes the project setting, including land ownership, tenure, land use and natural features;
- Section 4 describes the stakeholder engagement undertaken for the project, and proposed to be undertaken as part of the EIS process;
- Section 5 provides a project description, including an account of the way in which the project has been designed to avoid and minimise impacts; and
- Section 6 describes the environmental factors and objectives relevant to the project. For each relevant factor, a brief description of the environmental values, potential impacts, EIS studies to be undertaken and avoidance and mitigation measures is provided. Given that the EIS and associated specialist studies are still to be undertaken, the information in this section is preliminary.

1.5 PUBLICATION STATEMENT

The following personnel from Hansen Environmental Consulting were involved in the preparation of this EP Act Referral:

- Peter Hansen (Director) - BE(Hons);
- Laura Knowles (Principal Environmental Scientist) - BSc(Hons), HDipEd, MPhil(EnvSc);
- Ross Edwards (Senior Environmental Scientist) - BSc(Hons), MSc; and
- Jesse Scherer (Environmental Scientist) - BSc, MEnv.

2 REGULATORY APPROVALS

2.1 OVERVIEW

Table 2 lists the key approvals required for the project.

TABLE 2 KEY REGULATORY APPROVALS

Approval	Legislation	Agency	Status
Northern Territory Approvals			
Environmental Approval	EP Act	NT EPA	The EP Act and *Environment Protection Regulations 2020* (NT) (EP Regulations) establish a framework for assessing potential environmental impacts of development projects (termed "actions"). The assessment should focus on environmental factors that may be potentially impacted, as outlined in the *NT EPA Environmental factors and objectives* (NT EPA, 2022) guideline. Under the EP Act, if a project has the potential to have a significant impact on the environment, a referral must be made to the NT EPA to confirm if an approval is required and, if required, the appropriate approval pathway. Although the project has been designed to avoid impacts as far as possible, there is still the potential for it to give rise to impacts on environmental values. The proponent is therefore proposing to prepare an EIS for the project to provide a full assessment of impacts, and inform the development of mitigation measures. As noted in Section 1.1, a proponent initiated EIS referral is being made for the project and this document provides supporting information for the referral. Key steps in the EP Act assessment process are described in Section 2.2.
Tenement	*Mineral Titles Act 2010* (NT)	Department of Industry, Tourism and Trade (DITT)	The project area is located within EL2455, an exploration licence granted in 2016. Prior to project commencement, it will be necessary to obtain a mineral lease for the project.
Mining Authorisation	*Mining Management Act 2001* (NT)	DITT	It will be necessary to obtain Authorisation for the project under the *Mining Management Act 2001* (NT). This Authorisation can only be granted once the EP Act assessment process has been completed and once a mineral lease has been granted.

Approval	Legislation	Agency	Status
Australian Government Approvals			
Environmental Approval	EPBC Act	DCCEEW	The EPBC Act prescribes the Australian Government's role in environmental assessment, biodiversity conservation and the management of protected Matters of National Environmental Significance (MNES). The EPBC Act requires approval to be obtained for activities that are likely to have a significant impact on MNES. The proponent has lodged an EPBC Act Referral for the project and nominated the project as a controlled action (i.e. requiring approval under the EPBC Act), given potential impacts on the following two MNES: • Listed Threatened Species and Ecological Communities; and • Listed Migratory Species. DCCEEW is currently processing the EPBC Act Referral. It is the proponent's intent that a single accredited EIS process be used to satisfy the assessment requirements under both the EPBC Act and the EP Act.
Landowner Consent	*Aboriginal Land Rights (Northern Territory) Act 1976* (Cth) (ALRA)	Prime Minister and Cabinet	ALRA is Commonwealth legislation which provides Aboriginal landowners with legal title to traditional lands. Freehold land granted under ALRA is referred to as Aboriginal land. Groote Eylandt is Aboriginal land under ALRA and the Anindilyakwa Land Council (ALC) is the land council responsible for this land. On 17 May 2016, the proponent and the ALC signed an Exploration Agreement under ALRA for the Southern Lease. It will be necessary to obtain a Mining Agreement under ALRA prior to the project commencing. The Mining Agreement is a confidential agreement, which will prescribe the conditions under which mining may take place. These may include conditions, specified by the Traditional Owners, to protect environmental and cultural values of significance to them.

2.2 ENVIRONMENTAL ASSESSMENT PROCESS

The key steps in the EP Act assessment process, and the subsequent process to obtain Authorisation under the *Mining Management Act 2001* (NT), are listed below. These steps are based on the understanding that an EIS will be prepared for the project. Figure 2 shows these steps and the relationship between the EP Act assessment process and the EPBC Act assessment process. It also shows the statutory timeframes for steps in the process.

- A project planning process was undertaken, which included gathering baseline data, engaging with key stakeholders such as the ALC, and designing the project to avoid and minimise impacts where possible. The process is described further in Section 5.2.11.
- An EPBC Act Referral was made for the project, based on the project description developed in the project planning stage.
- The EP Act assessment process is being initiated with the submission of this EP Act Referral.
- The NT EPA will conduct a preliminary review to determine whether the EP Act Referral contains the information required under legislation and relevant guidelines. The NT EPA will then determine whether to accept or refuse the EP Act Referral.
- Assuming the NT EPA accepts the EP Act Referral, it will be placed on public exhibition. The documents that will be placed on public exhibition include the referral form, the supporting information (this document), draft TOR and SOR. Stakeholders, including government agencies and the public, can make submissions on the EP Act Referral during this period.
- The NT EPA will consider submissions, including those from government agencies and the public, and make a decision as to whether environmental impact assessment is required and the level of assessment. The NT EPA will also review the comments received on the draft TOR and decide whether to approve the TOR, or modify and approve the TOR.
- The proponent will prepare and submit a draft EIS that addresses the requirements outlined in the TOR. Section 6 describes the key studies that will be undertaken as part of the EIS. The draft EIS will focus on the environmental factors and objectives most relevant to the kinds of activities proposed to be undertaken and the impacts likely to occur.
- Once the draft EIS has been lodged, it will be placed on public exhibition.
- Once the public exhibition period has concluded, the NT EPA will publish any submissions on its webpage and provide them to the proponent. It may direct the proponent to prepare a supplement to the draft EIS ("the EIS supplement") to address submissions.
- Once submitted to the NT EPA, the EIS supplement will be placed on public exhibition.
- The NT EPA will assess the EIS (i.e. the draft EIS, the EIS supplement and any further information) and produce an EIS Assessment Report that is provided to the Minister. The EIS Assessment Report will describe the key issues associated with the project and provide recommendations with respect to environmental management.
- The Minister will review the EIS Assessment Report and decide to either grant, or refuse to grant, an environmental approval under the EP Act for the project. The environmental approval will set out conditions that are designed to manage the potentially significant environmental impacts of the project.

Both the EIS Assessment Report and finalised environmental approval will be published on the NT EPA's website.

- The NT EPA will also provide the EIS Assessment Report to DCCEEW for its consideration of issues related to MNES. Assuming that the project is approved, DCCEEW will issue an approval that contains conditions designed to manage and mitigate the impacts of the project on MNES. Approval under the EPBC Act, following the completion of the EIS Assessment Report, is independent to the environmental approval granted under the EP Act.
- Once the EIS Assessment Report has been issued, and a mineral lease has been granted, the proponent can lodge an application to DITT for Authorisation under the *Mining Management Act 2001* (NT). The application comprises a form, accompanied by a Mining Management Plan for the project.
- After the grant of environmental approvals under the EP Act and EPBC Act, it may be necessary to prepare additional pre-construction approvals (e.g. management plans that require approval from a government agency). Any requirement for these approvals will depend on the project impacts identified, the management/monitoring commitments made in the EIS and the requirements of the regulators.

As detailed in Table 2, the project also requires a Mining Agreement under ALRA and a mineral lease under the *Mineral Titles Act 2010* (NT). There may also be secondary environmental approvals required. For example, if places/objects of heritage significance are proposed to be disturbed, it will be necessary to obtain approval under the *Heritage Act 2011* (NT). Any requirement for these kinds of secondary approvals will depend on the nature of impacts predicted and further information will be provided in the EIS.

3 PROJECT SETTING

3.1 LOCATION

The project area is located in the Southern Lease, on Groote Eylandt (Figure 1). Groote Eylandt is a largely undeveloped island in the Gulf of Carpentaria, approximately 650 km south-east of Darwin and 50 km off the coast of Arnhem Land (Figure 1).

The Southern Lease is located in the south-western part of Groote Eylandt. It is adjacent and to the south of the Western Leases and is also located immediately adjacent to the southern boundary of the Eastern Leases (ML21220) (Figure 1 and Figure 3). The Southern Lease is remote and is accessed via Yenbakwa Road, an unsealed public road. The project area is located in the north-western part of the Southern Lease (Figure 1). Angurugu is the nearest township and is located approximately 10 km by direct line from the northern boundary of the project area.

3.2 REGIONAL SETTING

Groote Eylandt is Australia's third largest island, with a land area of approximately 2,285 km^2. Groote Eylandt is part of an archipelago of islands, which also includes Bickerton Island and several small, neighbouring islands. The Traditional Owners of the Groote Eylandt Archipelago are an amalgamation of two cultures, the Warnindilyakwa, and the Nunggubuyu (ALC, 2021). The Traditional Owners are made up of 14 clan groups, divided into two moieties, united by a common culture of kinship, ceremony and language. Both cultures speak Anindilyakwa as their first language, and the land, people and culture are also referred to by this term. The remote location of the Groote Eylandt Archipelago has fostered a strong attachment to traditional culture among the Anindilyakwa people. Ceremony and spirituality play a central role in Anindilyakwa life and traditional practices, and cultural norms are still prominent on the Archipelago. Anindilyakwa people are proud and protective of their culture.

Groote Eylandt is largely undeveloped, and much of the island is still used for traditional practices. The existing GEMCO Mine is the main development on the island and has been operating for nearly 60 years. There are three townships on Groote Eylandt, namely Alyangula, Angurugu and Umbakumba (Figure 1). They have a combined population of approximately 2,050 people (Australian Bureau of Statistics, 2021). There are also several small, rural Aboriginal settlements (termed "outstations") on Groote Eylandt. Outstations typically have varying levels of use, from permanent occupation to occasional visitation.

Groote Eylandt, and the surrounding marine area, has significant ecological value. Groote Eylandt and its smaller surrounding islands have been identified by the NT Government as one of 67 sites that are of "Conservation Importance in the NT" (Department of Natural Resources, Environment, the Arts and Sport (DNREAS), 2009). The area has been designated a significance ranking of "International Significance". One of the reasons for this significance ranking is that the threatened terrestrial fauna species present on the island are relatively protected from key threatening processes that exist on the mainland (e.g. Cane Toads (*Rhinella marina*)) (DNREAS, 2009).

The Groote Eylandt Archipelago has been declared an Indigenous Protected Area (IPA). An IPA is an area of Indigenous-owned land or sea where Traditional Owners have entered into an agreement with the Australian Government to promote biodiversity and cultural resource conservation (Department of Climate Change,

Energy, the Environment and Water, 2022). IPAs form part of the National Reserve System, established by the Australian Government to conserve unique landscapes, plants and animals. The Groote Eylandt Archipelago was declared the Anindilyakwa IPA in 2006 and is administered by the ALC. The ALC Land and Sea Rangers are funded by the Australian Government through the IPA. A key focus of the ALC Land and Sea Rangers is to ensure that the unique culture and environment of the Groote Eylandt Archipelago is conserved for future generations.

There are no declared National Parks on Groote Eylandt.

3.3 NATURAL FEATURES IN THE PROJECT AREA

Elevations within the project area range from approximately 1 m to 103 m Australian Height Datum (AHD). Outcrops of the geological basement form rocky outcrops and are referred to as “white rock”. Some white rock areas have cultural significance to the Anindilyakwa people.

The project area is traversed by the Arnduwamurrumanja Creek, Salt Creek and Second Creek (Figure 3). These creeks are intermittent, flowing for several months during and after wet season rainfall events, although waterholes may persist into the dry season or all year round in some locations. Flows from Salt Creek and Second Creek converge into a coastal plain, downstream of the project area. The project area is also traversed by the Yenbakwa River which flows to the south (Figure 3). The Amagula River flows to the east of the project area and is a significant watercourse, maintaining flows year-round (Figure 3).

The land within and surrounding the project area comprises natural bushland that is mainly eucalypt dominated open forest and woodland. The most common eucalypts are Darwin Stringybarks (*Eucalyptus tetrodonta*) and Darwin Woollybutt (*Eucalyptus miniata*), but a wide variety of other native plants and vegetation communities occur. *Melaleuca*-dominated vegetation also occurs within riparian zones and wetlands.

The land within the project area is subject to periodic burning. Based on the North Australian Fire Information (NAFI, 2022) database, which contains data on fires from 2000 to 2021, the project area has been consistently burnt. Between 2000 and 2021, over half the area has been burnt in 8 or more years (NAFI, 2022).

Groote Eylandt has a tropical climate that is dominated by annual wet and dry seasons, with the wet season typically occurring from November to April (inclusive).

3.4 LAND OWNERSHIP

Groote Eylandt is Aboriginal land under ALRA, and the ALC is responsible for managing this Aboriginal land. The proponent’s exploration activities in the Southern Lease are undertaken in accordance with an Exploration Agreement under ALRA. As described in Section 2, it will be necessary to obtain a Mining Agreement under ALRA prior to the project commencing.

3.5 ADMINISTRATIVE BOUNDARIES AND LAND ZONING

Groote Eylandt, including the project area, is located within the East Arnhem Local Government Area, administered by the East Arnhem Regional Council (EARC).

The project area is located on Aboriginal freehold land, and the area is not zoned under *the Northern Territory Planning Scheme 2020* (NT). The closest zoned land to the project area is in Angurugu, approximately 10 km north.

3.6 LAND USE

3.6.1 SOUTHERN LEASE

The Southern Lease is remote, containing only a few 4WD access tracks and one outstation (Wurrumenbumanja, also known as Leske Pools outstation) (Figure 3). There are several borrow pits in the Southern Lease, associated with the EARC's recent maintenance work on Yenbakwa Road.

Accessible portions of the Southern Lease are periodically used by the Traditional Owners for fishing, hunting, camping, swimming and collecting resources including bush tucker, such as sugarbag (honey from native bees). There are also sacred sites within the project area, which are important for ceremonial purposes. The location of sacred sites cannot be disclosed within this EP Act Referral given that reporting on sacred sites is still being finalised by the ALC (refer Section 6.10) and there are confidentiality considerations.

Being Aboriginal land under ALRA, the majority of the Southern Lease is not open to the general public. However, the ALC has nominated a number of recreation areas that can be accessed by the general public, subject to a permitting system. Figure 3 shows the location of the recreation areas within or in proximity to the Southern Lease.

Wurrumenbumanja Outstation is the only outstation within the Southern Lease (Figure 3). There are two additional outstations located beyond, but in close proximity to, the Southern Lease, namely the Yedikba Outstation and Yenbakwa Outstation (Figure 3). Yedikba Outstation is permanently occupied and consists of two houses, water tanks and a small solar farm. Although Yenbakwa and Wurrumenbumanja outstations are occasionally used by the Traditional Owners, they have not been permanently occupied for more than ten years.

The proponent has undertaken exploration in the Southern Lease since 2016, with exploration activities including clearing to facilitate the development of drill pads and access tracks. Areas disturbed by exploration are progressively rehabilitated.

No grazing, cropping, forestry, or industrial activities are undertaken in the Southern Lease.

3.6.2 PROJECT AREA

As described for the broader Southern Lease in Section 3.6.1, the project area is used periodically by the Traditional Owners for traditional purposes. The EIS Social Impact Assessment (SIA) will describe the way in which the Traditional Owners use the project area.

There is no built infrastructure in the project area, other than Yenbakwa Road, an unsealed public road, and other 4WD access tracks/roads. There are no outstations in the project area. The nearest outstations are Yedikba Outstation, which is located approximately 400 m west of the project area and the nearest proposed disturbance, and Wurrumenbumanja Outstation, which is located approximately 100 m east of the project area (and 1 km east of the nearest proposed disturbance).

There are no recreation areas in the project area. The nearest recreational area to the project area is South Point Area located approximately 80 m to the west of the project area. The Amagula Pools (Leske Pools) recreation area is located approximately 2.2 km to the east of the project area.

The proponent has undertaken exploration in the project area since 2016. In February 2023 the proponent lodged an EP Act Referral for a further exploration program in the project area.

3.7 TENURE

The proponent holds an Exploration Licence (EL2455) over the Southern Lease (Figure 4). Figure 4 also shows the mineral titles that have been granted in the vicinity of the Southern Lease. These include the mineral leases for the Western and Eastern Leases.

Access Authority (AA32517) traverses the Southern Lease. This Access Authority connects mining areas within the Western Leases that are to the north and south of the Emerald River (Figure 4). A haul road, termed the "J Quarry Haul Road", is being constructed in the Access Authority. A mineral lease will ultimately be sought for the project and will encompass a portion of AA32517 (i.e. this portion of the Access Authority will lapse and be incorporated into the future project mineral lease).

4 STAKEHOLDER ENGAGEMENT

4.1 ENGAGEMENT TO DATE

As noted in Section 2, in 2016 the proponent and the ALC signed an Exploration Agreement under ALRA for the Southern Lease. The Exploration Agreement is designed to ensure that the proponent's activities in the Southern Lease (e.g. exploration, field surveys) are undertaken in a manner that is respectful of the Traditional Owners' preferences, and that areas considered by the Traditional Owners to be environmentally or culturally significant are protected. The signing of an Exploration Agreement was preceded by several years of discussions between the proponent, the ALC and Traditional Owners. These discussions ensured the timely provision of relevant and easily understood information to the ALC and Traditional Owners, allowed key project concerns to be addressed, key project related decisions to be influenced, and positive relationships to be developed.

Since the signing of the Exploration Agreement, the proponent and the ALC have had ongoing discussions about proposed exploration activities, field surveys and a potential future mining project in the Southern Lease. There have also been formal, quarterly meetings between the proponent and the ALC (termed "Mining Liaison Committee Meetings"). In these meetings, the proponent provides an update on activities undertaken in the Southern Lease and activities planned to be undertaken. These meetings are also used to identify opportunities for Traditional Owners to undertake site visits and assist with fieldwork.

In late 2022, the proponent undertook a series of pre-lodgement meetings with the ALC and key regulators in relation to the project and proposed EIS process. These included:

- A series of meetings with the ALC, held over two days in November 2022. Details of the project were provided, along with a discussion of potential impacts, avoidance and mitigation measures and EIS studies to be undertaken. The ALC was supportive of the project planning that has been undertaken (described in Section 5.2.11) and the work undertaken to avoid impacts, where possible. The ALC raised several technical issues that will be addressed in the EIS. These issues included (but were not limited to) final land use and legacy infrastructure, the relocation of community tracks/roads, and the assessment of impacts on terrestrial ecology, surface water and groundwater. The ALC has also provided advice on the stakeholder engagement program to be undertaken as part of the EIS.
- In November 2022, a pre-lodgement meeting was held with Lisa Bradley (Director, Environmental Assessment, Department of Environment, Parks and Water Security (DEPWS))[3] and Kylie Fitzpatrick (Manager, Environmental Assessment, DEPWS). These regulators were supportive of the project planning process that had been undertaken, as well as the proponent's intent to backfill all quarries and design a water management system involving the reuse of mine water from the Southern Lease in the concentrator in the Western Leases. Issues that were discussed at the pre-lodgement meeting included those related to mine rehabilitation, water management, terrestrial ecology, stakeholder engagement and the environmental assessment process.

[3] *The NT EPA is an independent authority, comprising a small number of board members. The Environmental Assessment Division of DEPWS provide services to the NT EPA.*

- In December 2022, a pre-lodgement meeting was held with Dr Josh Bray (Assistant Director, Environmental Approvals Division, Environment Assessments West Branch, DCCEEW), Gisella Marquez Donayre (Senior Environmental Assessment Officer, DCCEEW) and Alex Santiago (Environmental Assessment Officer, DCCEEW). The meeting focussed on the project overview and approval process and DCCEEW did not raise any significant issues, although it recommended that the proponent consider offsets early in the approval process.

4.2 PROPOSED ENGAGEMENT

A comprehensive stakeholder engagement program will be undertaken as part of the EIS process, in accordance with the requirements of *Stakeholder Engagement and Consultation* (NT EPA, 2021b). The findings from the program will be integrated with EIS preparation and project planning. The objectives of the stakeholder consultation program are to:

- Seek feedback from stakeholders, and to listen to and understand the priorities, values and perspectives of all stakeholder groups;
- Identify potential issues or concerns that will contribute to better project outcomes, avoid mistakes and mitigate negative impacts;
- Provide the proponent and regulators with confidence that the communities' attitudes, beliefs, values and concerns are well understood and can be managed through all phases of the project; and
- Support delivery of a project that is environmentally, economically, culturally and socially acceptable to the community and key stakeholders.

The initial phase of the stakeholder consultation program involves identifying stakeholder issues. Stakeholders will be provided with key information about the project, the EIS and approval process, and the consultation program. It is anticipated that a range of consultation materials may be used, including individual meetings, group presentations, and the provision of project information sheets. Culturally appropriate consultation will be undertaken with Traditional Owners, including the use of maps, photos and, where feasible, videos in language.

A second phase of consultation will be undertaken to respond to the key issues and concerns raised in the initial round of consultation.

A final phase of consultation will occur in parallel with the public exhibition of the EIS. The primary objective of this phase of consultation is to assist stakeholders in understanding the findings of the EIS.

In parallel to the EIS consultation described above, the proponent (via the ALC) will engage with the affected clan groups in relation to a Mining Agreement for the project under ALRA. The Mining Agreement will describe the conditions under which project activities may be undertaken. This includes environmental conditions such as ensuring culturally and environmentally sensitive areas are avoided. The Mining Agreement will also detail the compensation to be provided to Traditional Owners for the activities, and describe the process for engaging with Traditional Owners. The project cannot proceed until a Mining Agreement has been reached.

5 PROJECT DESCRIPTION

5.1 PURPOSE OF THE PROJECT

The primary objective of the project is to optimise the development of manganese resources in the Southern Lease in a socially and environmentally sustainable manner. The project will:

- Extend GEMCO's operational life, which will extend the period during which economic benefits are generated. These include employment opportunities, royalty payments to the Traditional Owners, and government royalties and tax payments. Section 5.2.12 provides further detail on the anticipated social and economic benefits of the project.
- Provide a source of manganese ore to the rapidly developing battery manufacturing facilities in Asia, supporting the transition to a lower carbon economy.

5.2 PROJECT DESCRIPTION

5.2.1 PROJECT LAYOUT

Mine planning is currently being undertaken to develop a mine plan that ensures optimum, environmentally responsible utilisation of the manganese resource. However, a conceptual project layout is available (Figure 5) that shows:

- The life of mine disturbance footprint, which is the area proposed to be physically cleared due to the project.
- Mining/infrastructure areas, including mining quarries, stockpiles, overburden emplacements and infrastructure that is required in order to support mining activities (e.g. laydown areas, mine water dams).
- Haul road corridors, including haul roads proposed to be developed and associated drainage works, stockpiling areas and borrow pits.
- Infrastructure areas, including water storage dams.

Further detail on the project layout will be provided in the EIS, and the project design (including project layout and production rate) will also be subject to further refinement during the detailed design phase.

5.2.2 PROPOSED MINING ACTIVITIES

Approximately 15 million Mt of ROM ore is proposed to be mined from the project area.

Ore will be extracted from open cut mining quarries, with the following sequence of activities undertaken, as per operations at the Western Leases:

- Clearing vegetation using bulldozers.
- Stripping and recovering topsoil. Topsoil will be stripped and pushed into windrows, before being picked up by loaders or excavators and placed into trucks. The topsoil will then be placed directly on areas ready for rehabilitation or stockpiled for later use.

- Pre-stripping overburden. Overburden will be excavated, using excavators, trucks and dozers, in order to gain access to the ore. This material will either be temporarily stockpiled or placed directly within previously mined quarries.
- Drilling and blasting the ore. The ore will be drilled and blasted to break up the material so it can be easily handled.
- Mining ore. The ore will be mined using a fleet of excavators and trucks, and the ore will be hauled to the Western Leases Concentrator using haul trucks. The ore may be stored temporarily in ROM stockpiles, near the active quarries, prior to being hauled the Western Leases.
- Backfilling quarries following ore removal. Dozers will be used to backfill quarries with overburden, and a stable and free draining landform will be created. Due to the swell factor in mined overburden, some backfilled quarry areas in the final landform will extend slightly (0.25 m to 2 m) above the natural ground level.
- Topsoil replacement. Topsoil will be spread over backfilled areas and the topsoil will then be lightly scarified.
- Revegetation. The proponent plans to establish native vegetation in mine rehabilitation consistent with its existing practices.

During the life of the mine, and after approvals for the mining project have been granted, ongoing exploration and geotechnical investigations will continue to be undertaken within the disturbance footprint. This exploration/geotechnical work will provide information that assists with detailed resource definition and mine planning. It is distinct from ongoing exploration/geotechnical investigative work that the proponent will undertake, in accordance with the exploration licence, up until the time that all necessary approvals for mining have been granted.

5.2.3 PROCESSING AND TRANSPORTATION

Mined ore will hauled by truck from project quarries to the Western Leases. As part of its Western Leases operations, the proponent has approval for a haul road (J Quarry Haul Road) within an Access Authority that traverses the project area (Figure 6). This haul road is currently under construction and will be operational in late 2023. As part of the project, a series of haul roads will be constructed to connect project quarries to the J Quarry Haul Road. Ore from the project area will be hauled to the concentrator via this combination of new haul roads and the J Quarry Haul Road.

Project ore will be stockpiled and blended with ore from the proponent's existing operations and will then be crushed and processed in the concentrator. Manganese product will be hauled by road train from the concentrator to the existing Milner Bay Port Facility (Figure 1) for shipping to customers. The washing of manganese ore gives rise to waste materials, including tailings (sands and slimes) and middlings (a coarse waste fraction). These will be disposed in designated tailings storage facilities in the Western Leases and the proponent has confirmed that these facilities have sufficient capacity for waste materials from the project. Middlings will be used as road base material.

The project does not involve any upgrade to existing, approved facilities (e.g. concentrator, port) and the use of these facilities does not form part of the activity being considered in this referral. The project is limited to activities proposed to be undertaken within the project area, which is wholly within the Southern Lease.

5.2.4 EQUIPMENT AND INFRASTRUCTURE

The project will primarily use the proponent's existing mobile equipment fleet, although some additional equipment may be required (e.g. additional haul trucks).

Given that the project will be operated as part of the proponent's existing operations, very limited infrastructure is required to be developed as part of the project. Proposed infrastructure includes minor facilities in the Southern Lease such as:

- Workforce facilities (e.g. a crib hut, equipment park up areas).
- Water management infrastructure (e.g. pipelines and pumps, dams and water fill points).
- A modular water treatment plant for supplying potable water.
- A remote haul truck refuelling station and fuel storage facility compliant with AS1940.
- A modular sewage biocycle treatment facility. Sewage sludge will be transported to the Western Leases and disposed in the existing facilities.
- During the construction phase, there will be a temporary mobile maintenance workshop. During operations, any servicing and maintenance of heavy vehicles and equipment will be undertaken at the existing maintenance facilities in the Western Leases.

The project area is traversed by several 4WD tracks/roads that provide access to outstations, culturally sensitive sacred sites and recreational areas. It will be necessary to realign some sections of these tracks to ensure continued access to these areas. The activity being considered in this EP Act Referral includes the realignment of these tracks/roads, and these realignments are within the disturbance footprint.

5.2.5 PROJECT UTILITIES

Project utilities will be as follows:

- Power for the project (e.g. for operating pumps) will be produced using diesel generators, which will be located within the project area. No powerlines are required to be constructed.
- A groundwater bore will be developed in the project area to provide potable water and a water treatment plant will treat the water to a suitable standard.
- A communications tower/s will be required.
- A sewage treatment plant will be constructed.

5.2.6 MINE WATER MANAGEMENT

Water, comprising groundwater inflows to the quarries and rainfall runoff, will accumulate in quarries during the life of the mine. This water ("mine water") will be pumped to storage dams and then used for dust suppression. Any surplus will be pumped to the Western Leases for use as water supply in the concentrator, avoiding the need to discharge it to the environment. The water pipeline connecting the project's water management system to the concentrator will be located in an existing cleared haul road corridor in the Western Leases to avoid any environmental impacts.

Erosion and sediment control measures will be included as part of the project design.

5.2.7 GENERAL WASTE

The typical sources of general waste that will be generated by the project include:

- Waste from the crib hut, such as food scraps, packaging and personal protective equipment.
- Waste generated during the construction phase, including scrap metal, wooden pallets and the waste from mobile maintenance facilities (e.g. engine air filters, waste oil, oily water, miscellaneous hydrocarbon wastes – coolants, tyres, and spent batteries).

The waste will be stored in sealed, labelled containers, before being transported off-site for reuse, recycling or disposal, in accordance with the proponent's waste management system.

5.2.8 WORKFORCE

A small construction workforce will be required for the construction phase. The proponent will draw from its existing workforce during operations and there will consequently be no net increase in the size of the proponent's workforce. The proponent's existing (i.e. in 2023) workforce includes:

- A permanent workforce of approximately 1,100 people, including employees and full time contractors; and
- Additional temporary contractors employed for short term work activities.

The current workforce comprises a combination of workers who reside on Groote Eylandt in accommodation provided by the proponent and fly in fly out (FIFO) workers (from Darwin and Cairns). This arrangement will continue for the project.

No additional workforce accommodation will be required to be constructed as part of the project.

5.2.9 TIMING

Subject to the necessary approvals being in place, project construction is scheduled to commence in financial year 2027, with construction taking approximately two years. Following construction, mining will occur over an approximate three year period. Once mining has been completed, the project will transition into a rehabilitation and closure phase where any final rehabilitation will be undertaken, and infrastructure will be decommissioned. This phase will take approximately two to three years to complete.

5.2.10 SUMMARY STATISTICS

Referring a proposal to the NT EPA (NT EPA, 2021a) requires the inclusion of tables listing the size/capacity of various project components (e.g. the size of quarries or capacity of mine water dams). Project design is still being finalised and so this information cannot yet be provided with confidence. This information will be provided in the EIS, which is still to be prepared. The infrastructure required for the project is described in preceding sections. The total mine disturbance footprint is approximately 1,620 ha.

5.2.11 MITIGATION HIERARCHY

INTRODUCTION

South 32's Environment Standard emphasises the importance of the mitigation hierarchy being followed (i.e. designing activities to avoid impacts where possible, applying mitigation measures to further reduce impacts and only relying on offsets for impacts that remain after avoidance and mitigation measures have

been applied). This is consistent with the environmental decision-making hierarchy in the EP Act which requires that decision makers, proponents and approval holders follow a hierarchy of approaches (in order of priority). This involves ensuring that actions are designed to avoid adverse impacts on the environment, applying management measures to mitigate these impacts to the greatest extent, and providing environmental offsets where these impacts cannot be avoided or mitigated.

AVOIDANCE

OVERVIEW

Groote Eylandt, including the Southern Lease, has significant environmental, social and cultural values. The proponent has therefore located and designed the project to avoid and mitigate impacts where possible. This has been achieved through:

- Gathering baseline data on environmental and cultural values to ensure that the most sensitive features in the Southern Lease are identified.
- Undertaking an iterative project planning process, in consultation with the ALC, Traditional Owners and key regulators, to:
    - Locate the project in a broad area that avoids the most sensitive environmental and cultural features in the Southern Lease; and
    - Design the disturbance footprint to avoid and minimise impacts on key features, such as riparian corridors and wetlands.
- Ensuring that the project is designed and operated in a manner that avoids and mitigates impacts where possible.

Further detail on these elements is provided below.

BASELINE DATA

In 2016, following the signing of the Exploration Agreement and grant of the exploration licence, the proponent commenced exploration drilling to gain a better understanding of the manganese resource. Figure 7 shows the potential mineralised area in the Southern Lease (i.e. the area in which manganese may potentially occur). This is the area in which exploration (and potentially mining) would be undertaken if there were no environmental or cultural considerations.

The proponent also commenced baseline environmental studies in 2016. Baseline environmental work was undertaken with the permission of the ALC. The Traditional Owners were provided with an opportunity to participate in fieldwork and most field surveys included Traditional Owner participation. Baseline environmental work has included:

- Terrestrial ecology work, including:
    - A baseline terrestrial ecology assessment of the western part of the Southern Lease in 2016. This assessment included vegetation mapping, threatened flora searches, fauna trapping (including motion-sensor camera trapping), active searches, bird census, spotlighting, and habitat assessments.
    - A large-scale research project (termed the “Southern Lease Small Mammal Research Project”) (Cumberland Ecology, 2019) undertaken between 2017-2019 in consultation with the NT Government.

The research project comprised detailed camera surveys at 152 locations within and adjacent to the Southern Lease.

  - A camera monitoring program undertaken in 2021 (Cumberland Ecology, 2023), targeting Feral Cats (*Felis catus*) and the Northern Quoll (*Dasyurus hallucatus*) within a survey grid in the western part of the Southern Lease. The program included the deployment of 75 baited motion-sensor cameras, and built upon similar research undertaken by the NT Government in 2016.
  - Reviewing NT Government vegetation mapping and refining this mapping through undertaking fieldwork in areas of sensitive or significant vegetation types (e.g. riparian and wetland areas) as defined in the *Land Clearing Guidelines – Northern Territory Planning Scheme* (DEPWS, 2021) (Land Clearing Guidelines).
- Undertaking an aquatic ecology field survey in 2019 to determine the baseline condition of aquatic ecosystems associated with each of the watercourses in the Southern Lease. Surveys included assessment of macroinvertebrate, fish and flora communities, and water and sediment quality.
- Mapping the alignment of waterways, including watercourses (i.e. the more significant waterways, generally with riparian vegetation and aquatic ecology values) and drainage features. This was done by:
  - Reviewing government data and any other available waterway mapping;
  - Using LiDAR, aerial imagery, and drone imagery to correct the mapped alignment of waterways and identify additional potential waterways; and
  - Undertaking field inspections of the potential waterways to confirm the geomorphology, geology and presence or absence of riparian vegetation.
- Mapping of catchment areas.
- Engaging the ALC to undertake a study to define the location of sacred sites and delineate the required buffer zones around these sites (termed restricted work areas). Refer to Section 6.10 for more detail on this study.

PROJECT PLANNING PROCESS

In 2019 the proponent undertook an internal planning process, guided by baseline environmental work, to delineate the most environmentally sensitive areas of the Southern Lease (an area of approximately 26,000 ha). The kinds of features that were identified and considered were large, perennial rivers and their floodplains, estuarine areas, significant wetlands, and monsoon vine thicket (this vegetation type is generally considered to be culturally and environmentally sensitive). The proponent then delineated an area for future exploration (and potentially future mining) that avoids the identified sensitive areas. This area was referred to as the potential exploration area and it is shown in Figure 7. It comprises 9,521 ha, which is approximately 57% of the potential mineralised area (16,830 ha). All the proponent's recent exploration in the Southern Lease has been limited to the potential exploration area, which has minimised the impacts of exploration.

In 2021, the proponent began planning a potential future mining project (i.e. the project described in this referral). By this time, the ALC had mapped the location of sacred sites. The boundaries of riparian and wetland vegetation had also been confirmed through fieldwork by this time, and accurate flood modelling had been undertaken. This information, together with the proponent's knowledge of the manganese resource, was used to locate the proposed mining project in the north-western part of the Southern Lease (Figure 7).

The project disturbance footprint comprises approximately 1,620 ha, which is approximately:

- 10% of the potential mineralised area;
- 17% of the potential exploration area; and
- 6% of the Southern Lease.

The mining project has been limited to this area because of the proponent's objective of avoiding and minimising impacts on the most sensitive environmental and cultural values. The environmental planning process described above has enabled environmental and cultural issues to be considered, and sensitive features to be avoided, in the early stages of project design.

The project planning process was undertaken in consultation with the ALC, the NT EPA, DEPWS and DITT, all of whom were supportive of the process.

PROJECT DESIGN PROCESS

In addition to locating the project to avoid the most sensitive parts of the Southern Lease, the project will incorporate the following design measures to further avoid and mitigate impacts:

- Quarries will be backfilled to ensure that there will be no final voids in the post-mining landform. The post-mining landform will be shaped to be free-draining.
- Water that accumulates in mining quarries during the life of the mine will be used for dust suppression and in the concentrator at the Western Leases, avoiding the need to discharge it to the environment.
- The life of mine disturbance footprint does not encroach on sacred sites or their restricted work areas.
- All quarries will be located beyond the 1% Annual Exceedance Probability (1 in 100 year) flood extents. This will allow mining to take place in a manner that avoids disturbance of the main channels of the watercourses and limits any interference with surface water flows. With the exception of a watercourse road crossing in the upper reaches of Salt Creek, all project activities will be set back least 100 m from watercourses. No watercourse diversions are proposed.
- Project activities have been located and designed to avoid disturbance of wetlands and riparian vegetation, where possible.
- Rehabilitation will be undertaken progressively over the mine life.

MITIGATION

The proponent is proposing to prepare an EIS for the project, which will describe environmental values and potential impacts. As described in Section 6, a range of specialist studies will be undertaken as part of the EIS, and these will identify mitigation measures required to minimise impacts on environmental values. The EIS will describe mitigation measures, as well as identify monitoring programs. Section 6 provides an indication of the kinds of measures that will be adopted for each environmental factor, but the details of these measures will be informed by the EIS process, which is still to be undertaken.

5.2.12 CONSIDERATION OF ALTERNATIVES

Section 5.2.11 describes the environmental planning and design process that was adopted for the project. It explains that only a small portion of the potential mineralised area is proposed to be mined

(approximately 10%). The mining project has been restricted to this small area because of the proponent's objective of avoiding and minimising impacts on sensitive environmental and cultural values. There are numerous alternatives to the project that would have involved mining a much larger area. These alternatives would give rise to greater impacts on sensitive environmental and cultural values and these alternatives are not being pursued in order to protect these values.

The only feasible alternative to the project would be the 'do nothing' case. Not proceeding with the project would mean that substantial socio-economic benefits are foregone. The existing GEMCO Mine has been operating for almost 60 years and provides significant socio-economic benefits to the Traditional Owners and the local community, as well as the regional economy of the NT. Development of the project will extend GEMCO's mine life and will therefore allow for the continuation of socio-economic benefits including:

- Government royalties and taxes, and business opportunities which significantly contribute to both the local economy and the regional economy of the NT.
- Economic benefits related to employment opportunities, including the provision of approximately 1,100 permanent jobs at the existing mine. This includes approximately 60 jobs for Aboriginal and Torres Strait Islander people. Jobs are also provided for temporary contractors employed for short term work activities.
- Benefits for the Traditional Owners and other residents of Groote Eylandt, including:
    - Royalties for distribution to the ALC and Traditional Owner groups. The ALC has an infrastructure development plan, which is reliant on funding by royalties from GEMCO, including royalties from a future mining project in the Southern Lease;
    - Education, training and apprenticeship opportunities for local residents, including Traditional Owners;
    - Procurement opportunities for businesses on Groote Eylandt and, in particular, Indigenous enterprises;
    - Provision of social infrastructure and services, specifically health services, to the communities on Groote Eylandt;
    - Developing strategic partnerships with, and providing financial and in-kind support to, community organisations operating on Groote Eylandt; and
    - Coordination of community events by the proponent.

5.2.13 RELATIONSHIP WITH OTHER MINES AND PROJECTS

WESTERN AND EASTERN LEASES

The project area is adjacent to the Western Leases (i.e. the existing GEMCO Mine) and manganese ore from the project will be transported via haul road to the Western Leases and washed at the concentrator. Project ore will be blended with ore from the proponent's other operations and sold as a single product. The project does not involve any upgrade to existing, approved facilities (e.g. concentrator, port) and the use of these facilities does not form part of the activity being considered in this referral. The project is limited to activities proposed to be undertaken within the project area, which is wholly within the Southern Lease.

The project area also adjoins the Eastern Leases (i.e. a new mining area that is approved and currently under construction). The Eastern Leases Project is a separate and unrelated project to the proposed Southern Lease Mining Project.

EXPLORATION

The proponent has undertaken several exploration programs in the Southern Lease (including in the project area) and proposes to continue undertaking exploration/geotechnical investigative work in accordance with the exploration licence. Exploration/geotechnical investigative work is undertaken in accordance with authorisations under the *Mining Management Act 2001* (NT). In addition, any exploration/geotechnical work with the potential for a significant impact on environmental values is referred to the NT EPA under the EP Act. In February 2023, the proponent lodged a referral under the EP Act for the Southern Lease Exploration Program (2023-2025) in the project area. This exploration program includes exploration drilling, geotechnical investigations and the development of tracks to access drill pads and test pits. The NT EPA is currently processing the EP Act Referral for the exploration program. The exploration program is scheduled to commence in calendar year 2023 and be completed by 2025. Drilling may extend beyond this if there are delays in the program (e.g. due to weather). Construction of the Southern Lease Mining Project is scheduled to commence in financial year 2027.

6 ENVIRONMENTAL FACTORS AND OBJECTIVES

6.1 INTRODUCTION

The *NT EPA Environmental Factors and Objectives* guideline (NT EPA, 2022) categorises information about the environment into environmental factors and objectives in order to provide a standard and systematic approach to environmental impact assessment and reporting. Environmental factors are aspects of the environment that may be impacted by a proposed action. The guideline identifies a total of 14 environmental factors, characterised under five themes, namely Land, Water, Sea, Air, and People (NT EPA, 2022). Objectives have been developed for each environmental factor and potential impacts must be considered relative to these objectives.

The *Referring a proposal to the NT EPA* (NT EPA, 2021a) guideline requires proponents to consider potential project impacts (including all impact sources and pathways) relative to each environmental factor to determine whether the project may significantly impact the environment. The EP Act Referral should focus on the environmental factors that will potentially be impacted.

An assessment of environmental factors (i.e. a pre-referral screening, as per *Referring a proposal to the NT EPA* (NT EPA, 2021a)) has been undertaken for the project. It has been determined that the following environmental factors are potentially relevant to the project:

- Terrestrial environmental quality;
- Terrestrial ecosystems;
- Hydrological processes;
- Inland water environmental quality;
- Aquatic ecosystems;
- Air quality;
- Atmospheric processes;
- Community and economy;
- Culture and heritage; and
- Human health.

Pre-referral screening undertaken by the proponent and its environmental consultants has confirmed that the following environmental factors are not relevant to the project:

- Landforms. Although some of the white rock outcrops in the Southern Lease are distinctive physical landforms, the project has been designed to ensure that the disturbance footprint is located beyond these areas. There are no other distinctive geological or anthropogenic features in the project area, nor are there monuments or tourism related to landforms. The project is consequently not predicted to impact this environmental factor.

- Environmental factors related to the Sea theme, including coastal processes, marine environmental quality and marine ecosystems. No activities within the coastal or marine environment are proposed and there will be no direct impacts on these environmental values. Indirect impacts on the marine environment will also not occur given that the project has been designed to avoid and minimise impacts on the watercourses that traverse the project area (e.g. no discharges of mine water, the disturbance footprint being set back from watercourses). Section 6.4.2 and Section 6.5.2 describe these measures further.

The following sections describe the environmental factors relevant to the project. These sections provide an overview of the receiving environment and environmental values, potential impacts, EIS studies proposed to be undertaken (including the guidelines relevant to the assessment) and avoidance and mitigation measures. They are based on the information available at the time of preparing the EP Act Referral, noting that an EIS is still to be prepared. A significant body of technical work is planned to be undertaken as part of the EIS, including multi-season field surveys, collection of ongoing monitoring data and impact assessment, including numerical modelling of impacts where relevant (e.g. groundwater modelling). This technical work will provide further information on the receiving environment and impacts, and this will guide the design of avoidance and mitigation measures. In some instances, the nature of the impacts (e.g. for community and economy) cannot be determined until the consultation program described in Section 4 has been completed. The information in the following sections is therefore high level given that the project is in the early stages of the impact assessment.

Some sections on environmental factors are more detailed than others and this reflects the status of the technical work undertaken to date (e.g. the sacred sites assessment described in Section 6.10 has been completed, whereas the SIA described in Section 6.9 is still being scoped). The EIS, once prepared, will contain a full account of all studies.

6.2 TERRESTRIAL ENVIRONMENTAL QUALITY

The environmental objective for terrestrial environmental quality is to protect the quality and integrity of land and soils so that environmental values are supported and maintained (NT EPA, 2021a).

6.2.1 ENVIRONMENTAL VALUES AND SENSITIVITIES

The project area comprises a range of soil types and landforms. The dominant soil types are expected to include rudosols, chromosols, kandosols, tenosols, arenosols and hydrosols variously associated with low hills, plains and waterways.

The soils present within the project area are generally expected to be suitable for reuse in rehabilitation activities. Government mapping shows that the disturbance footprint is not located within an area of potential acid sulfate soils. There are no agricultural activities (e.g. grazing or cropping) currently being undertaken within the project area.

The key environmental values to be protected are the soil qualities that support life. The relevant soil qualities are soil chemistry and soil bio-physical properties. Protecting these soil qualities will protect a range of soil-dependent biological processes.

6.2.2 POTENTIAL IMPACTS

Potential impacts to be assessed in the EIS include:

- Localised disturbance of soil due to the construction of mine infrastructure and open cut mining activities;
- Increased erosion and sediment mobilisation because of soil disturbance; and
- Soil contamination due to spills.

6.2.3 EIS STUDIES

A soils study is proposed to be undertaken as part of the EIS to characterise the soil qualities within the project area, identify and quantify available soil resources for rehabilitation and to identify any specific soil handling or management measures that may be necessary. It will also make general recommendations in relation to erosion and sediment control.

The soils study will involve the following key components:

- A desktop study that will include a review of relevant soil reports and documentation, analysis of remote sensing data and consultation with government stakeholders.
- A field survey to identify and describe soils within the project area. The field survey will be undertaken at a survey density that supports detailed soil mapping. It will involve the use of appropriate survey techniques including surface inspections, detailed soil profiles and soil sampling and analysis, and will be undertaken at a suitable survey density. The field survey will be undertaken in consultation with government stakeholders and in accordance with all relevant guidelines, including:
  - *Guidelines for Surveying Soil and Land Resources, Australian Soil* (McKenzie, N.J., Grundy, M.J., Webster, R. and Ringrose-Voase, A.J.,2008).
  - *Australian Soil and Land Survey Handbook: Guidelines for Conducting Surveys* (Gunn, R.H., Beattie, J.A., Reid, R.E. and van de Graaff, R.H.M.,1988).
  - *Australian Soil and Land Survey: Field Handbook* (National Committee on Soil and Terrain, 2009).
  - *Queensland Soil and Land Resource Survey Information Guideline* (Department of Resources, 2021).
  - *Soil Physical Measurement and Interpretation for Land Evaluation* (McKenzie, N., Coughlan, K and Cresswell, H.,2002).
  - *Soil Chemical Methods – Australasia* (Rayment G.E. and Lyons D.J., 2011).
- Classification of soil types and mapping soil type distribution at a suitably detailed mapping scale. This will be undertaken in accordance with all relevant guidelines, including *The Australian Soil Classification* (Isbell and National Committee on Soil and Terrain, 2021) and the *Technical Specifications for Land Unit Core Attributes, Mapping Scales 1:25,000, 1:50,000 and 1:100,000* (Hill and Napier, 2018) and in consideration of feedback received during consultation with government stakeholders.

- An assessment of the suitability of each soil type for reuse in mine rehabilitation activities. This assessment will identify the depths of useable topsoil and subsoil associated with each soil type within the project area. This assessment will inform mine planning, including the scheduling of soil stripping and rehabilitation activities.
- Identification of any management or ameliorative measures associated with handling of topsoil and any useable subsoil.

The EIS will also describe proposed rehabilitation methods for the project (which will be similar to those used at the existing GEMCO Mine) and will discuss mine closure and post-mining land use. The post-mining land use will be guided by stakeholder consultation, experience at the existing GEMCO Mine, and the results of relevant studies (e.g. the soils study).

6.2.4 AVOIDANCE AND MITIGATION

GEMCO operates detailed soil management procedures to ensure best practice control and management of available soil resources. These procedures have been developed over the operating life of the existing GEMCO Mine and have proven to be effective in maintaining good soil conditions that enable successful mine rehabilitation. These procedures, together with the findings of the EIS soils study, will inform the soil management procedures for the project.

Soil management strategies for erosion and sediment control will be adopted where necessary to manage erosion impacts and sediment mobilisation.

6.3 TERRESTRIAL ECOSYSTEMS

The environmental objective for terrestrial ecosystems is to protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning (NT EPA, 2021a).

6.3.1 ENVIRONMENTAL VALUES AND SENSITIVITIES

OVERVIEW

The land within and surrounding the project area comprises natural bushland that is mainly eucalypt dominated open forest and woodland. The most common eucalypts are Darwin Stringybarks and Darwin Woollybutt, but a wide variety of other native plants and vegetation communities occur. Melaleuca-dominated vegetation (such as *Melaleuca viridiflora* (Broad-leaved Paperbark) and/or *Melaleuca cajuputi* (Swamp Tea Tree) occurs within the riparian zones and wetlands of the project area. The project area contains vegetation communities which potentially provide a range of habitat types and features for fauna species, including potential foraging, shelter and breeding opportunities.

Figure 8 shows the habitat types in the project area. The project area is dominated by laterite woodland and forest, with smaller areas of sandstone woodland and forest and riparian/wetland vegetation.

Vegetation that can be defined as sensitive and/or significant under the NT *Land Clearing Guidelines* (DEPWS, 2021) occurs in the project area in the form of riparian vegetation, wetlands and vegetation containing large trees with hollows suitable for fauna.

THREATENED AND MIGRATORY SPECIES

Based on fieldwork and ecological assessments undertaken to date (including review of database searches), no threatened flora species or Threatened Ecological Communities listed under the EPBC Act have been recorded within the project area. However, one threatened flora species listed under the *Territory Parks and Wildlife Conservation Act 1976* (NT) has been recorded within database searches, namely *Utricularia singeriana*. *Utricularia singeriana* is listed as Vulnerable under the TPWC Act and is known to occur within wetland areas and near watercourses and requires seasonally inundated grassland/low open woodland.

Several terrestrial fauna species listed as threatened or migratory under the EPBC Act or TPWC Act have been recorded within the Southern Lease and are expected to occur within the project area. These species are listed in Table 3. In addition to these species, there may be additional species which are known from Groote Eylandt and have the potential to occur in the project area.

TABLE 3 LISTED THREATENED OR MIGRATORY SPECIES RECORDED WITHIN THE SOUTHERN LEASE

Species	EPBC Act Status	TPWC Act Status
Masked Owl (northern) (*Tyto novaehollandiae Kimberli*)	Vulnerable	Vulnerable
Northern Quoll (*Dasyurus hallucatus*)	Endangered	Critically Endangered
Ghost Bat (*Macroderma gigas*)	Vulnerable	Not Listed
Mertens' Water Monitor (*Varanus mertens*)	Not Listed	Vulnerable
Salt-water Crocodile (*Crocodylus porosus*)	Migratory	Not Listed
Eastern Osprey (*Pandion cristatus*)	Migratory	Not Listed

The Brush-tailed Rabbit-rat (*Conilurus penicillatus*) (Vulnerable – EPBC Act; Endangered – TPWC Act) and Northern Hopping-mouse (*Notomys aquilo*) (Endangered – EPBC Act; Vulnerable – TPWC Act) have discrete distributions on Groote Eylandt and are not likely to occur in the project area. The Small Mammal Research Project was undertaken between 2017 and 2018 to determine whether these species occurred in the Southern Lease and surrounds (including within the project area), and if so, their distributions. This research project was commissioned and managed by the proponent and designed by threatened species experts in DEPWS. The Small Mammal Research Project included a substantial body of fieldwork which comprised more than 27,000 trap nights using infrared cameras. No records of the species were obtained, and it was concluded that this was due to the absence of the species in the areas surveyed. The Small Mammal Research Project included survey sites within the disturbance footprint and, based on the findings of this research project, neither the Brush-tailed Rabbit-rat or Northern Hopping-mouse are likely to be present in the project area.

The Bare-rumped Sheathtail bat (*Saccolaimus saccolaimus*) (Vulnerable – EPBC Act; Not Listed – TPWC Act) has not been recorded from Groote Eylandt. However, given that there have not been many previous surveys for this species, Cumberland Ecology in conjunction with Specialised Zoological, recently undertook fieldwork in the project area using methods suitable to detect the Bare-rumped Sheathtail bat. No records of the species were obtained and it is unlikely to be present in the project area. This fieldwork is ongoing and will be described in the Terrestrial Ecology Report to be included as part of the EIS.

Although there are some records of the Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*) from Groote Eylandt, the extensive infrared camera survey work undertaken in the Southern Lease has not detected

this species. Given that the species is readily detected using infrared cameras, the Northern Brushtail Possum has been assessed as unlikely to be present in the project area. This fieldwork will be described in the Terrestrial Ecology Report to be included as part of the EIS.

The EIS that will be prepared for the project will describe listed threatened and migratory species that are present or have potential to occur in the project area. The EIS will contain the results of multi-season field surveys.

EXOTIC/FERAL SPECIES

The Southern Lease contains feral/exotic species such as the Domestic Dog (*Canis familiaris*), Feral Cat (*Felis catus*), and House Gecko (*Hemidactylus frenatus*). A number of weed species have also been recorded in the Southern Lease, generally associated with disturbed areas (including public roads and access tracks, and in the vicinity of outstations and watercourses). Three weed species detected in the Southern Lease are "declared" weeds under the *Weeds Management Act 2001* (NT), namely *Hyptis suaveolens* (Hyptis), *Sida cordifolia* (Flannel Weed), and *Stachytarpheta cayennensis* (Snakeweed).

6.3.2 POTENTIAL IMPACTS

The EIS will include a detailed assessment of impacts, guided by multi-season surveys and published conservation advice. Potential direct and indirect impacts to be assessed include:

- Loss of habitat for threatened fauna and flora species due to the clearing of vegetation;
- Direct removal of sensitive and/or significant vegetation;
- Fragmentation of vegetation communities and habitat;
- Spread of weed and pest species;
- Potential for changes to the fire regime, with resultant impacts on threatened fauna;
- Indirect impacts on fauna due to dust, noise, blasting, vibration and lighting;
- Vehicle and equipment movements resulting in potential impacts on fauna; and
- Cumulative impacts with other activities on Groote Eylandt, including the proponent's other mining activities.

6.3.3 EIS STUDIES

As indicated in Section 5.2.11, the proponent has undertaken numerous ecological surveys within the Southern Lease and surrounds, including general terrestrial ecology surveys, as well as the Small Mammal Research Project (a camera monitoring program in the Southern Lease) and ground-truthing of map units for vegetation types that are sensitive and/or significant under the *NT Land Clearing Guidelines* (DEPWS, 2021). This work informed the project planning process that was undertaken for the project, and the EIS Terrestrial Ecology Report will provide a full description of the methodologies adopted and the results of the surveys.

A review of the survey work undertaken to date has indicated that, despite the large number of surveys undertaken (which include over 50,000 trap nights of infrared camera data), some threatened species that occur in the project area or have potential to occur have not yet been well surveyed. These include the Ghost Bat, Masked Owl and Mertens' Water Monitor. Targeted surveys will be undertaken for these species as part of the EIS. In addition, a targeted threatened flora survey for *Utricularia singeriana* (i.e. the only

threatened flora species known or with potential to occur within or in proximity to the project area) will be undertaken. The proponent met with representatives of DEPWS several times in 2022 to discuss EIS fieldwork and DEPWS has also reviewed field survey plans for several elements of the proposed EIS fieldwork. The proponent will continue to consult with DEPWS in relation to EIS field surveys and results.

This survey work will be described in the Terrestrial Ecology Report to be included as part of the EIS. The report will include a description of the baseline terrestrial environment, an assessment of project impacts (including cumulative impacts), and an outline of the avoidance and mitigation measures required for the project. The EIS will also determine whether there are likely to be any residual impacts.

The EIS will draw on any relevant guidelines, including:

- *Guidelines for Assessment of Impacts on Terrestrial Biodiversity* (NT EPA, 2013).
- *Land Clearing Guidelines – Northern Territory Planning Scheme* (DEPWS, 2021).
- *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (Department of the Environment, 2013). This is relevant to the assessment of impacts for any species that are MNES.

6.3.4 AVOIDANCE AND MITIGATION

As discussed in Section 5.2.11, the project has been designed to avoid the most sensitive parts of the Southern Lease, including the majority of sensitive and/or significant vegetation, and watercourses.

The EIS will identify any measures that are necessary to minimise impacts, as well as identify monitoring programs. These are expected to include measures such as:

- A Permit to Clear process, including pre-clearance surveys;
- Weed management measures;
- Feral animal control;
- Fire management; and
- Erosion and sediment controls.

The details of these measures will be informed by the EIS process, which is still to be undertaken.

If the assessment determines that significant residual impacts on listed threatened species are likely, even after the application of avoidance and mitigation measures, an offsets proposal will be developed in accordance with relevant guidelines, e.g. *Biodiversity Offsets Policy* (DEPWS, 2022) and *Environment Protection and Biodiversity Conservation Act 1999 (Cth) Environmental Offsets Policy* (Department of Sustainability, Environment, Water, Population and Communities, 2012).

6.4 HYDROLOGICAL PROCESSES

The environmental value for hydrological processes is to protect the hydrological regimes of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained (NT EPA, 2021a).

6.4.1 GROUNDWATER

ENVIRONMENTAL VALUES AND SENSITIVITIES

GROUNDWATER SETTING

Groote Eylandt is formed on a basement of Proterozoic age sedimentary rocks. The Proterozoic basement was subsequently deformed and metamorphosed, forming quartzite. The quartzite basement surface has been extensively eroded.

A subsequent increase in global sea levels during the Cretaceous period inundated low lying areas of the quartzite basement surface and deposited marine sediments over the quartzite basement surface. The marine sediments lithified over time and, in the project area, formed two distinct formations, namely an older marine sandstone formation and a younger marine claystone formation. Locally, the older part of the marine sandstone has been eroded and redeposited (i.e. reworked).

Manganese mineralisation occurs in the upper profile of the marine claystone.

During the Tertiary period, the marine claystone was extensively modified by a long period of tropical weathering (or laterisation). The weathering process resulted in the development of a deep weathered profile (or laterite).

The local stratigraphy is illustrated in Figure 9.

The key elements of the groundwater regime are as follows:

- A shallow lateritic aquifer that is typically dry and unsaturated, but is seasonally recharged by rainfall during the wet season.
- A thick, low permeability claystone aquitard that confines the groundwater table and acts to hydraulically separate the overlying laterite from the underlying sandstone aquifer.
- A deeper sandstone aquifer that is relatively transmissive. The distribution of the sandstone aquifer is highly variable across the project area and its surrounds. In general, the sandstone aquifer is thin or absent in the northern parts of the project area and in the vicinity of basement outcrops, and is thicker in the southern part of the project area.
- A dry, crystalline quartzite aquitard.

The groundwater regime is typically recharged by rainfall that occurs during the wet season.

The shallow groundwater regime (associated with the laterite aquifer) is characterised by significant seasonal variations in groundwater table depth. Groundwater pressure in the deeper groundwater regime (associated with the confined sandstone aquifer) is relatively consistent throughout the year.

Groundwater typically discharges to coastal waters and local waterways, and via evapotranspiration.

Groundwater in the project area is typically neutral to slightly acidic and non-saline, with low concentrations of metals, metalloids, and other solutes.

GROUNDWATER-DEPENDENT VALUES AND SENSITIVITIES

The project EIS will describe the groundwater values and sensitivities that are present or have the potential to occur in the project area. Based on fieldwork and stakeholder consultation undertaken to date, the groundwater environmental values that are likely to be relevant include:

- Aquatic ecosystems that are dependent on interactions with groundwater (i.e. groundwater dependent ecosystems);
- Groundwater resources (i.e. productive aquifers);
- Groundwater supply bores (e.g. for drinking water supply);
- Watercourses and drainage features that are dependent on interactions with groundwater;
- Wetlands and other surface water features that are dependent on interactions with groundwater; and
- Cultural and spiritual values.

The EIS will consider these values in determining the groundwater management strategies for the project.

POTENTIAL IMPACTS

The EIS will include a detailed assessment of the potential effects of the project on hydrogeological processes during mine operations and post-closure. Potential effects to be assessed include:

- A temporary reduction in groundwater level/pressure (i.e. drawdown) in and around areas where mining extends below the groundwater table.
- Changes to groundwater level/pressure (i.e. drawdown or mounding) arising from the final landform.
- Changes to ground permeability and water storage properties in backfilled quarry voids (and any resulting change in the rate of groundwater recharge).

The EIS will include an assessment of potential impacts of these hydrogeological effects on relevant environmental values and sensitivities, including:

- Impacts on groundwater dependent ecosystems;
- Impacts on groundwater resources (i.e. productive aquifers);
- Impacts on groundwater supply bores and users;
- Impacts on groundwater-surface water interactions with watercourses, drainage features, wetlands and other relevant surface water features; and
- Impacts on cultural and spiritual values.

The EIS will assess potential cumulative impacts on groundwater with other activities on Groote Eylandt (including the proponent's other mining activities).

The EIS will assess the effects of climate change on the groundwater impacts of the project.

EIS STUDIES

The EIS will include a groundwater study that involves:

- A desktop study of the groundwater regime of the project site and its surrounds;
- A groundwater site investigation that includes:
  - Installing a dedicated groundwater monitoring network in the project area and its surrounds;
  - Monitoring groundwater levels and groundwater quality;
  - Aquifer permeability testing;
  - A census of groundwater use and supply bores;
  - A site inspection to confirm baseline groundwater-surface water interactions, watercourse characteristics and the distribution of watercourse alluvium;
- Compiling and analysing the information collected from the desktop study and the groundwater site investigation to develop a conceptual model of the groundwater regime;
- Developing a 3D numerical groundwater flow model for the project to simulate the existing groundwater regime and predict the potential effects of the proposed mining activities;
- Assessing the groundwater impacts on relevant environmental values and sensitivities (listed in the previous section) during mine operations and post-closure; and
- Developing feasible mitigation and management strategies in the event of potential adverse impacts being identified.

AVOIDANCE AND MITIGATION

As discussed in Section 5.2.11 quarries will be backfilled to ensure that there will be no final voids in the post-mining landform. This will avoid the creation of long-term evaporative groundwater sinks or associated groundwater drawdown.

In addition, the project has been designed with the following measures that will avoid or mitigate effects on hydrogeological processes and associated impacts on values and sensitivities:

- The post-mining landform will be shaped to be free-draining. This will avoid the creation of areas where surface water could collect and enhance groundwater recharge.
- The EIS will identify any feasible monitoring and management strategies in the event of potential adverse impacts being identified. These are expected to include:
  - A compliance groundwater monitoring program to be implemented throughout the life of the project to confirm the actual extent of groundwater impacts and validate the groundwater modelling predictions presented in the EIS. The groundwater monitoring network will be suitable for identifying and monitoring the effects of the project on the groundwater regime. It is expected that the groundwater monitoring program will incorporate groundwater monitoring bores located outside the maximum predicted zone of hydrogeology effects that can be used for monitoring background conditions. It will also include bores located within the predicted maximum zone of drawdown to validate the groundwater level predictions.

- Investigation of any unexpected monitoring results and implementation of any corrective actions identified by the investigation. This process will ensure the early identification of any unexpected groundwater level effects and allows the targeted application of corrective measures to minimise the potential for environmental harm to the groundwater regime.
- Periodic reviews of the groundwater monitoring program and supporting data. The scope of these reviews may include reviewing and updating the groundwater monitoring program, reviewing the accuracy of the groundwater model and reviewing the suitability of the groundwater triggers.

6.4.2 SURFACE WATER

ENVIRONMENTAL VALUES AND SENSITIVITIES

SURFACE WATER SETTING

The project area is located on a gently undulating coastal plain that is punctuated by occasional rocky outcrops. A prominent rock outcrop is located along the eastern boundary of the project area and forms low rises and ridgelines that extend west across the central part of the project area and south along the eastern boundary of the project area. These ridgelines form local catchment boundaries between the Emerald River, Salt Creek, Yenbakwa River and Amagula River catchments (Figure 10).

The project area is traversed by Arnduwamurrumanja Creek, Salt Creek, Second Creek and the Yenbakwa River (Figure 10).

Arnduwamurrumanja Creek commences to the east of the project area and flows in a north-westerly direction. This creek traverses the project area, before joining with the Emerald River, approximately 1.2 km downstream of the project area. The lower reach of the Emerald River is a tidal watercourse that flows to the coastline a further 1.3 km downstream to the west.

Salt Creek and Second Creek both commence within the western part of the project area and flow in a westerly direction. These creeks join at a tidal estuary approximately 1.6 km downstream of the project area along the Salt Creek channel, and approximately 2.7 km downstream of the project area along the Second Creek channel. The tidal estuary flows to the coastline, a further 860 m to the north-west.

The Yenbakwa River commences within the south-eastern part of the project area and generally flows in a south-westerly direction to the coastline, approximately 6.1 km downstream of the project area.

These watercourses typically have an incised channel that is set within broad valleys and open coastal plains. The watercourse channels occasionally lose and regain definition in areas of flat topography. These watercourses transition to wide, tidal estuaries as they approach the coastline.

Surface water flow in these watercourses is intermittent, and typically lasts for several months during and after rainfall events. Waterholes in these watercourses may persist into the dry season or all year round in some locations. Flows in the lower reaches and estuaries of these watercourses are influenced by the tides.

The Amagula River is a significant perennial watercourse located to the east of the project area (Figure 10).

SURFACE WATER-DEPENDENT VALUES AND SENSITIVITIES

The EIS that will be prepared for the project will describe the surface water values and sensitivities that are present or have potential to occur in the project area. Based on fieldwork and stakeholder consultation undertaken to date, the surface water environmental values that are likely to be relevant to surface water in the project area include:

- Aquatic ecosystems;
- Recreational use, including swimming and aesthetic values;
- Human consumption of aquatic foods;
- Opportunistic drinking water supply;
- Aesthetic values; and
- Cultural and spiritual values.

These EIS will consider these values in determining the surface water management strategies for the project.

POTENTIAL IMPACTS

The EIS will include an assessment of potential project effects on hydrological processes during mining operations and post-closure. Potential effects to be assessed include:

- Changes to catchment yield arising from the mine site drainage design and associated surface water flows;
- Changes to the flood regime, including the timing and frequency of flood events, flood extents and depths, and flood flows;
- Haul road encroachment on watercourses (specifically related to the proposed haul road crossing of Salt Creek) and associated changes in downstream flows, geomorphology and flood inundation areas; and
- Changes in downstream flow and geomorphology due to erosion and sedimentation.

The project layout has been designed to avoid encroachment of open cut mining on watercourses and any associated potential for changes in downstream flows, geomorphology and flood inundation areas. The project has been designed to avoid the need for mine water discharges into watercourses or water supply abstraction from watercourses, and hence the downstream flow effects of these activities (which are commonly associated with mining projects) are not relevant to this project.

Surface water hydrology effects have the potential to impact relevant environmental values and sensitivities. Potential impacts to be assessed include:

- Impacts on surface water supplies and other uses;
- Impacts on watercourses and drainage features;
- Impacts on wetlands and surface water features;
- Impacts on cultural and spiritual values dependent on surface water flows.

The EIS will assess potential cumulative impacts on surface water with other activities on Groote Eylandt (including the proponent's other mining activities).

The EIS will assess the effects of climate change on the surface water hydrology impacts of the project.

EIS STUDIES

The EIS will include a surface water study that involves:

- Undertaking a baseline surface water monitoring program within the project area and downstream surface waters. Surface water monitoring data will be collected on a monthly basis from all relevant surface water features. Water samples will be analysed for a range of parameters including (but not limited to) metals, major ions, turbidity, salinity, nutrients and hydrocarbons.
- Undertaking a baseline surface water assessment based on all available baseline surface water information. The baseline surface water assessment will establish the baseline surface water setting for the project in sufficient detail to enable the incremental and cumulative effects of the project on the surface water setting to be identified, described and assessed quantitatively. It will include:
    - A flood study, including robust hydrologic and hydraulic modelling of a range of flood events.
    - Describing and mapping the regional catchment setting.
    - Describing and mapping the local catchments and drainage characteristics including surface water flows, standing water, surface water quality and landscape/geomorphological characteristics based on analysis of available information.
    - Describing the known environmental values.
- Describing the project operations and post closure arrangements and including an assessment of the potential for each aspect of the project to give rise to surface water effects and impacts.
- Identifying the type and quality of waters that the project is expected to generate and developing water management objectives and strategies for these waters.
- Designing a staged conceptual site drainage arrangement that minimises the potential for surface water effects and impacts.
- Designing a water management system for project operations that ensures the full capture and containment (i.e. 'nil discharge') of any mine water generated by the project. The design will be informed by probabilistic modelling and will include sizing of any dams and pumps necessary as part of the water management system. The EIS will provide a conceptual description of the proposed water management system, including the project's water supplies, storages, transfers and demands.
- Describing and quantifying the incremental residual effects (if any) of the project on the baseline surface water setting (including receiving water flows and quality), and their contribution to cumulative surface water impacts.
- Addressing the effects and impacts of climate change on all aspects of the surface water study.

AVOIDANCE AND MITIGATION

As discussed in Section 5.2.11, the project will be designed with the following measures that will avoid or mitigate potential downstream hydrological effects and associated impacts on values and sensitivities:

- Locating all quarries beyond the 1% (1 in 100) Annual Exceedance Probability flood level of watercourses. This will limit the potential for ingress of flood water into quarries and avoids the interference with flood flows.
- Minimising effects of the project haul road on surface water hydrology by designing the main haul road with a single watercourse crossing that will be located in the upstream reach of Salt Creek.
- Avoiding catchment yield effects during mining operations by minimising the quarry catchment areas and the collection and containment of runoff from undisturbed and rehabilitated areas.
- Avoiding post closure catchment yield effects by shaping the post-mining landform to be free-draining.
- Avoiding erosion and sedimentation effects on hydrology by ensuring that any stormwater runoff from the project disturbance area is managed in accordance with baseline conditions in receiving surface waters.

The EIS will identify any feasible monitoring and management strategies in the event of potential adverse impacts being identified. These are expected to include:

- A surface water monitoring program for the project. The monitoring program will be designed to confirm the relevant baseline conditions and verify the predicted project effects on surface waters. The program will also be designed to identify any unexpected environmental risks. It is expected that this will be a multi-faceted monitoring program that includes surface water flow and quality monitoring, mine site water monitoring, water management infrastructure inspections, waterway condition inspections and any other relevant monitoring measures.
- Environmental management plans relevant to the management of surface water impacts from the project.

6.5 INLAND WATER ENVIRONMENTAL QUALITY

The environmental value for inland water environmental quality is to protect the quality of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained (NT EPA, 2021a).

6.5.1 GROUNDWATER

ENVIRONMENTAL VALUES AND SENSITIVITIES

Section 6.4.1 describes the local groundwater regime and the groundwater values and sensitivities that are present or have potential to occur in the project area.

POTENTIAL IMPACTS

The EIS will include a detailed assessment of potential sources of groundwater contamination during mine operations and post-closure. Potential sources to be assessed include:

- Seepage of pit water from the open cut quarries;
- Seepage from overburden emplacements;
- Seepage from temporary ROM stockpiles;
- Seepage from the middlings reused on haul roads; and
- Spillage of hydrocarbons and chemicals.

The EIS will include an assessment of the potential groundwater quality effects of these sources, and the associated impacts on relevant environmental values and sensitivities (as listed in Section 6.4.1).

EIS STUDIES

Section 6.4.1 describes the EIS groundwater study that will be undertaken for the project.

A geochemistry study will be undertaken to inform the groundwater study. The geochemistry study will involve characterising the potential quality of seepage from the open cut quarries, overburden emplacements, ore and coarse rejects under representative environmental conditions. The study will include identification of specific management measures required for handling and storage of materials.

AVOIDANCE AND MITIGATION

As discussed in Section 5.2.11, the project has been designed with the following measures that will avoid or mitigate effects on groundwater quality and associated impacts on values and sensitivities:

- During mining operations, water will be pumped from mining quarries and used for dust suppression or in the concentrator at the Western Leases. Quarry dewatering will create a temporary hydraulic gradient towards the mining quarries. This will minimise the potential for quarry water and any associated contaminants to migrate away from the quarries to the surrounding groundwater regime during the life of the mine.
- Quarries will be backfilled and a free-draining final landform will be established which will avoid the creation of final void lakes and any associated potential groundwater quality effects.
- Hydrocarbon and chemical storage will be managed using a range of measures including adequate bunding or storage areas, and immediate clean-up of any spills. These measures are standard practice at the existing GEMCO Mine and are designed to prevent the contamination of groundwater. Given the limited hydrocarbon and chemical storage activities proposed, and the controls that will be adopted, the project is not expected to give rise to groundwater contamination as a result of hydrocarbon and chemical contamination.

The EIS will identify any feasible monitoring and management strategies in the event of potential adverse impacts being identified. These are listed in Section 6.4.1.

6.5.2 SURFACE WATER

ENVIRONMENTAL VALUES AND SENSITIVITIES

Section 6.4.2 describes the local surface water setting and the surface water values and sensitivities that are present or have potential to occur in the project area.

POTENTIAL IMPACTS

The EIS will include a detailed assessment of potential impacts on inland surface water quality. Given that the project has been designed to avoid the need to discharge mine water, the assessment will focus on stormwater runoff from mining disturbance areas. The EIS will include an assessment of potential impacts on relevant environmental values and sensitivities (as listed in Section 6.4.2).

EIS STUDIES

Section 6.4.2 describes the EIS surface water study that will be undertaken for the project. In addition, and as noted in Section 6.5.1, a geochemistry study will be undertaken. The geochemistry study will inform the assessment of impacts on surface water quality and will include identification of specific management measures required for handling and storage of materials.

AVOIDANCE AND MITIGATION

As discussed in Section 5.2.11, the project will be designed with the following measures that will avoid or mitigate potential surface water quality effects and associated impacts on values and sensitivities:

- Avoiding discharges of mine water by:
  - Minimising quarry catchment areas at all stages of the mine life.
  - Capturing and containing any mine water generated by the project.
  - Minimising the collection and containment of clean runoff from undisturbed and rehabilitated areas at all stages of the mine life.
  - Ensuring that the water management system for the project operates as a 'nil discharge' system by sizing storages and pumps to ensure nil discharge of mine water based on a range of operating scenarios and climate conditions.
- Avoiding the release of sediment-laden runoff from mine disturbance areas by:
  - Ensuring that runoff from all disturbed areas is either captured in the mine water management system or directed to erosion and sediment control structures.
  - Adopting erosion and sediment control measures that are based on sound engineering principles and are environmentally-acceptable for the project setting.
  - Ensuring that any stormwater runoff from the mine disturbance area does not increase turbidity or suspended sediment levels in receiving surface waters above baseline conditions (as determined by the baseline surface water assessment).

The EIS will identify any feasible monitoring and management strategies in the event of potential adverse impacts being identified. These are listed in Section 6.4.2.

6.6 AQUATIC ECOSYSTEMS

The environmental objective for aquatic ecosystems is to protect aquatic habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning (NT EPA, 2021a).

6.6.1 ENVIRONMENTAL VALUES AND SENSITIVITIES

Section 6.4 and Section 6.5 describe the surface water and groundwater setting for the project, and explain that the project area is traversed by Arnduwamurrumanja Creek, Salt Creek, Second Creek and the Yenbakwa River (Figure 10). These watercourses provide aquatic ecology values including habitat for aquatic biota. These watercourses flow during rainfall and for short periods (<2 months) after substantial rainfall events. The wetlands within the project area are ephemeral palustrine wetlands. There are no Ramsar wetlands within the project area or on Groote Eylandt.

An aquatic ecology assessment, including multi-season field surveys, will be included in the EIS. It will provide a full description of environmental values and an assessment, supported by fieldwork, of the potential for threatened and migratory species to occur in the project area. Based on survey work undertaken to date, no threatened species are expected to occur in the watercourses in the project area and one aquatic migratory species occurs (i.e. the Saltwater Crocodile (*Crocodylus porosus*), listed as migratory under the EPBC Act). Although the Largetooth Sawfish (*Pristis pristis*) (listed as Vulnerable under both the EPBC Act and TPWC Act) may occur within the larger rivers in the Southern Lease, it is unlikely to occur in the watercourses in the project area given their small size, intermittent flows and lack of permanent off-channel wetlands.

6.6.2 POTENTIAL IMPACTS

Section 6.4 and Section 6.5 describe potential effects on hydrological processes and water quality, respectively. The EIS will assess the impact of these effects on aquatic ecology values, including migratory species, threatened species (if present) and other ecological values, including wetlands.

6.6.3 EIS STUDIES

An aquatic ecology assessment will be undertaken, drawing on the results of the groundwater and surface water assessments described in Section 6.4 and Section 6.5. It will include:

- A desktop assessment, including database searches and a literature review.
- Multi-season field surveys including characterisation of aquatic habitat, the collection of water, sediment and macroinvertebrate samples, surveys for fish and turtles, and characterisation of aquatic flora.
- An assessment of impacts, with impacts on species listed under the EPBC Act being undertaken in accordance with *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (Department of the Environment, 2013).
- A description of avoidance and mitigation measures relevant to aquatic ecology values.

6.6.4 AVOIDANCE AND MITIGATION

The measures described in Section 6.4 and Section 6.5 to avoid and mitigate impacts on hydrological processes and inland water quality will also be effective in avoiding and mitigating impacts on aquatic ecosystems. The EIS Aquatic Ecology Assessment will describe any additional avoidance and mitigation measures that may be required.

6.7 AIR QUALITY

The objective in relation to air quality is to protect air quality and minimise emissions and their impact so that environmental values are maintained (NT EPA, 2021a).

6.7.1 ENVIRONMENTAL VALUES AND SENSITIVITIES

The project area comprises natural bushland, with existing development limited to 4WD tracks/roads. Particulate matter (i.e. dust) is the most relevant air quality parameter in this setting. Existing sources of dust are likely to comprise natural dust including pollens, grass seeds, windblown dust from unvegetated areas, smoke and ash particles from bushfires, and dust from other mining operations, including the existing GEMCO Mine and the Eastern Leases. The proponent maintains an air quality monitoring network as part of its existing operations and the EIS will report on results from this network, as relevant to the project area.

Environmental values to be protected include human health and amenity, with the nearest township to the project area being Angurugu, which is located 10 km to the north of the project area. The nearest outstations are Yedikba Outstation and Wurrumenbumanja Outstation, which are located approximately 400 m and 1 km from the disturbance footprint, respectively.

6.7.2 POTENTIAL IMPACTS

The key air emissions generated by open cut mining activities in the project area will be particulate matter (i.e. dust), which can be categorised by size and/or by chemical composition. Minor emissions of other substances, such as volatile organic compounds, trace metals or oxides of nitrogen, carbon or sulphur could be generated by the project, mainly due to mine vehicle exhausts and use of generators. However, the project is not likely to emit these pollutants in sufficient levels to result in any measurable adverse air quality impacts at sensitive receptors.

As the project is a continuation of mining, rather than an increase or expansion in production, the project will not give rise to any changes in activities at the proponent's existing operations (i.e. Western or Eastern Leases) and therefore will not change air emissions from the existing operations.

6.7.3 EIS STUDIES

A comprehensive air quality assessment will be undertaken covering the construction and operations phases of the project. Air emissions generated by the project will be characterised, assessed against background levels and evaluated based on the potential to cause environmental or health related impacts.

The air quality assessment will combine dispersion modelling, detailed information on mining activities, local and regional meteorology and existing air quality data to estimate the potential effect of project activities on

ambient dust levels. Estimated dust levels will be compared with the applicable air quality objectives to confirm whether any potential adverse impacts on health or amenity may occur.

The NT has not published guidelines on air quality modelling and so the air quality assessment will be undertaken in accordance with *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (New South Wales Environment Protection Authority, 2022).

As discussed in Section 6.3.2, impacts from dust on terrestrial ecosystems will be considered as part of the EIS terrestrial ecology assessment.

6.7.4 AVOIDANCE AND MITIGATION

The proponent will continue to operate its existing air quality monitoring network. The requirement for additional air quality management and mitigation measures will be determined by the air quality assessment. The kinds of measures that will be considered include:

- Watering of haul roads to minimise emissions;
- Maintaining roads to minimise the potential for build-up of total suspended particulates;
- Scheduling blasting activities when meteorological conditions are suitable;
- Limiting dust generating activities such as topsoil stripping, overburden removal during adverse prevailing wind conditions; and
- Progressive rehabilitation of available disturbed areas.

The EIS will describe the avoidance, mitigation and monitoring measures relevant to air quality.

6.8 ATMOSPHERIC PROCESSES

The objective in relation to atmospheric processes is to minimise greenhouse gas emissions so as to contribute to the NT Government's goal of achieving net zero greenhouse gas emissions by 2050 (NT EPA, 2021a).

6.8.1 POTENTIAL IMPACTS

Sources of greenhouse gas (GHG) emissions from the project are anticipated to be diesel used (from mining equipment and generators) and land clearing.

6.8.2 EIS STUDIES

The air quality assessment will include a GHG assessment, which will reference the *National Greenhouse and Energy Reporting Act 2007* (Cth) (NGER Act) and its supporting legislation and regulations, and the Safeguard Mechanism (if applicable).

GHG emissions for the project will be estimated on an annual basis for the life of the project. Emissions will be estimated based on a methodology that is consistent with the following standards and guidance documents, in order of preference:

- *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (Cth) under NGER Act;
- *Australian National Greenhouse Accounts Factors* (DCCEEW, 2023); and
- Greenhouse Gas Protocol.

The contribution of GHG emissions from the project to the NT and national emissions inventory will be established. The study will describe mitigation measures to be adopted, including reporting frameworks.

Other EIS studies will also consider the impacts of a changing climate, where necessary (e.g. in relation to the design of the water management system).

6.8.3 AVOIDANCE AND MITIGATION

The proponent operates in accordance with South32's Global Environment Standard, which requires all operations and projects to consider energy use and emissions within the business planning process, and identify and implement energy efficiency and emission reduction initiatives. The Environment Standard also requires that all operations maintain a GHG emissions forecast for the life of the mining operation.

The EIS will describe the measures to be adopted to avoid and minimise GHG emissions, and the reporting framework to be adopted.

6.9 COMMUNITY AND ECONOMY

The environmental value for community and economy is to enhance communities and the economy for the welfare, amenity and benefit of current and future generations of Territorians (NT EPA, 2021a).

6.9.1 ENVIRONMENTAL VALUES AND SENSITIVITIES

Section 3.2 provides an overview of the regional setting for the project. It explains that the Traditional Owners of Groote Eylandt have a strong attachment to traditional culture, with ceremony and spirituality playing a central role in Anindilyakwa life. Groote Eylandt is largely undeveloped, and much of the island is still used for traditional practices. The existing GEMCO Mine is the main development on the island. There are three townships on Groote Eylandt, namely Alyangula, Angurugu and Umbakumba (Figure 1), as well as several outstations.

The proponent is the largest employer on Groote Eylandt and generates substantial revenue not only for the Groote Eylandt community, including the Traditional Owners, but also for the NT economy.

6.9.2 POTENTIAL IMPACTS

The SIA, which is still to be undertaken for the project, will identify and assess the potential impacts of the project on the community and economy. It will consider all potential impact pathways, and will be guided by the outcomes of stakeholder engagement. Although the SIA will consider potential impacts related to the project workforce, these are not expected to be a key focus, given the proponent will draw from its existing workforce during operations. The SIA is more likely to focus on issues such as potential impacts on access to

areas for recreation, collection of resources (e.g. bush tucker) and cultural purposes. In addition to describing potential impacts, the SIA will discuss potential opportunities associated with the project, such as enabling the socio-economic benefits associated with the existing GEMCO Mine to be extended (Section 5.2.12).

Other issues relevant to the community and economy environmental factor include:

- In this setting, because of the strong attachment to traditional culture, impacts on culture and heritage may also present as impacts on values related to the community and economy environmental factor. Section 6.10.2 discusses potential impacts on culture and heritage.
- Potential impacts related to air quality (Section 6.7.2).
- Potential impacts of noise on residential amenity.
- Potential impacts of the project on visual amenity.

6.9.3 EIS STUDIES

SOCIAL IMPACT ASSESSMENT

An SIA, informed by a stakeholder engagement program, will be undertaken for the project. It will describe the existing socio-economic profile of the area of influence, identify impacts and opportunities, and include measures to mitigate impacts and enhance opportunities. Guidelines relevant to the SIA include *Guidelines for the Preparation of an Economic and Social Impact Assessment* (NT EPA, 2013).

NOISE ASSESSMENT

A comprehensive noise and vibration assessment will be undertaken for the project. Noise levels and sources of noise emissions associated with the project will be assessed, relative to background noise levels. The assessment will include consideration of blasting activities, mobile equipment and mining activities during all phases of the project, including project construction and operations. Noise modelling will then be undertaken to inform the noise and vibration impact assessment.

VISUAL ASSESSMENT

A visual assessment will be undertaken to confirm the project's impact on visual amenity. This assessment will address the impacts of the project using line-of-sight assessment and site-specific visualisation tools, where necessary.

AIR QUALITY ASSESSMENT

Refer Section 6.7.3.

CULTURAL HERITAGE ASSESSMENT

Refer Section 6.10.3.

6.9.4 AVOIDANCE AND MITIGATION

SOCIAL AND ECONOMIC IMPACTS AND OPPORTUNITIES

The SIA will describe measures to avoid and minimise impacts, and enhance opportunities. The nature of these measures will be guided by the findings of the SIA. However, the project design already incorporates numerous measures, developed in consultation with the ALC and Traditional Owners, designed to avoid impacts. Section 5.2.11 discusses the project planning process that was adopted to ensure that the project is sited in an area that avoids the parts of the Southern Lease that are most sensitive from a social, cultural and environmental perspective. The project design has also accounted for the presence of 4WD tracks/roads that traverse the project area, providing access to outstations, recreation areas and sacred sites. These tracks/roads will be realigned during the life of the project to ensure that the project does not restrict access to these areas. Avoidance measures related to culture and heritage areas are discussed in Section 6.10.4.

NOISE

The control of noise and vibration will be a key consideration in the design of the project, and the noise and vibration assessment will identify any potential requirement for additional avoidance and mitigation measures (e.g. enclosing generators). Noise mitigation measures required for the project will be described in the EIS.

The proponent's existing complaints handling procedure will be extended to address any noise complaints related to the project. Key aspects to the procedure are the investigation of any complaint, and adoption of any noise control measures identified as necessary during the investigation.

VISUAL AMENITY

A range of design and management measures are available to minimise visual impacts. Potential measures that may be considered include minimising the clearance of vegetation, use of visual screening, progressive rehabilitation of disturbed areas, designing infrastructure to blend with the surrounding environment and designing exterior lighting to minimise impacts. The EIS will describe measures to be adopted to avoid and minimise visual impacts.

AIR QUALITY ASSESSMENT

Refer Section 6.7.4.

CULTURAL HERITAGE ASSESSMENT

Refer Section 6.10.4.

6.10 CULTURE AND HERITAGE

The objective for culture and heritage is to protect sacred sites, culture and heritage (NT EPA, 2021a).

6.10.1 ENVIRONMENTAL VALUES AND SENSITIVITIES

As discussed in Section 2, Groote Eylandt (including the project area) is Aboriginal land under ALRA. Section 3.2 provides an overview of the cultural setting of the project.

The Southern Lease contains several sacred sites. Sacred sites are places in the landscape that have a special significance under Aboriginal tradition. They often have Dreaming association (i.e. a connection with the creation process), and may include features in the landscape such as rivers, trees or rocky outcrops. Sacred sites are protected under the *Northern Territory Aboriginal Sacred Sites Act 1989* (NT) (Sacred Sites Act).

There are also sites of potential archaeological significance in the Southern Lease. A number of archaeological studies have been conducted in the Southern Lease on behalf of the ALC, and these studies have recorded archaeological sites such as rock art sites, stone arrangements, stone artefact scatters, shell midden sites, and culturally modified trees. These studies have not recorded archaeological sites in the disturbance footprint, but further survey work will be undertaken as part of the EIS to determine if there are archaeological sites within the disturbance footprint and the broader project area.

6.10.2 POTENTIAL IMPACTS

SACRED SITES

The ALC has an anthropology department and employs a fulltime anthropologist. In 2019, the proponent engaged the ALC to work with the Traditional Owners to undertake a sacred sites assessment for the Southern Lease to document sacred sites and define suitable restricted work areas (RWAs) (i.e. buffers) to ensure their protection. Undertaking this sacred sites assessment was also a requirement of the Exploration Agreement that was signed between the ALC and the proponent under ALRA.

The study area for the sacred sites assessment included a large area of the Southern Lease, including the project life of mine disturbance footprint. Sacred sites were documented by two anthropologists (assisted by the ALC anthropologist and a Cultural Liaison Officer). Fieldwork undertaken with Traditional Owners was a fundamental component of the work. The testimony and evidence of 106 Warnindilyakwa Traditional Owners regarding the nature and location of sacred sites was captured via the following culturally appropriate methods:

- Large general meetings/focus groups;
- On-site meetings;
- Small group meetings;
- Vehicular (including helicopter) and pedestrian surveys;
- Participatory digital mapping meetings; and
- Ad hoc meetings.

The proponent engaged a surveyor to work with the ALC to accurately delineate the boundaries of sacred sites that are defined by physical features such as rock outcrops.

The fieldwork and consultation have been completed and reporting is underway. The ALC has provided data to the proponent confirming the location of sacred sites and RWAs. This information has guided project planning, as discussed in Section 5.2.11. The project has been designed to ensure that all activities are beyond sacred sites and their RWAs, and that sacred sites will not be impacted by the project. The location of sacred sites and RWAs cannot be provided in this document.

No impacts on sacred sites are predicted.

ARCHAEOLOGICAL SITES

An archaeological assessment will be included in the EIS, which will assess the potential for direct disturbance to archaeological sites, as well as indirect impacts (e.g. impacts from dust or vibration).

6.10.3 EIS STUDIES

SACRED SITES

As discussed in Section 6.10.2, the proponent has engaged the ALC to undertake a sacred sites assessment. An Instructions Report, documenting the results of the assessment, is currently being finalised. Once the Instructions Report is available, the proponent intends to provide it to the Aboriginal Areas Protection Authority (AAPA) in support of an application for an Authority Certificate. An Authority Certificate provides conditions for any works undertaken on or near sacred sites. Although it is not a requirement to be in possession of an Authority Certificate, having an Authority Certificate (and undertaking the work in accordance with the requirements of the certificate) indemnifies the holder against prosecution under the Sacred Sites Act for damage to sacred sites in the area of the Authority Certificate. The Authority Certificate process is separate to the EIS process, although the two processes will run in parallel. The EIS will describe the status of the Authority Certificate process.

ARCHAEOLOGY

An archaeological assessment will be undertaken and will encompass the full extent of the life of mine project disturbance footprint, as well as surrounding areas that may experience indirect impacts from the project. It will include the following tasks, which will be undertaken in consultation with the Traditional Owners:

- Searches of relevant heritage registers and a literature review;
- Field survey work;
- An assessment of the significance of archaeological sites;
- An assessment of potential impacts; and
- A description of avoidance and mitigation measures.

6.10.4 AVOIDANCE AND MITIGATION

The project has been deliberately located to avoid impacts on sacred sites. The proponent intends to obtain an Authority Certificate and will undertake its activities in accordance with the requirements of the Authority Certificate.

The EIS will identify avoidance and mitigation measures for archaeological sites. The details of these measures will be informed by the archaeological assessment, which is still to be undertaken.

Standard measures that are likely to be adopted, as per the proponent's existing operations on Groote Eylandt, include:

- Areas of cultural heritage will be recorded in the proponent's mine planning systems to ensure that mine plans comply with regulatory requirements.

- A Permit to Clear process will be adopted to ensure that clearing complies with all regulatory requirements, including the Authority Certificate.
- A module on cultural heritage and cultural awareness training will be provided as part of the workforce induction process; and
- In the event that the proponent's employees or contractors suspect that they have uncovered an unexpected archaeological find, a set procedure would be followed to cease disturbance and assess the significance of the find, in consultation with the ALC.

6.11 HUMAN HEALTH

The objective for human health is to protect the health of the Northern Territory population (NT EPA, 2021a).

6.11.1 ENVIRONMENTAL VALUES AND SENSITIVITIES

Interactions between project activities and human health include potential impacts on:

- Drinking water and recreational water (discussed in Section 6.4).
- Air quality (discussed in Section 6.7).
- Impacts on bush tucker. Traditional Owners supplement their diets with bush tucker (e.g. sugarbag), including bush tucker from the Southern Lease. The SIA (discussed in Section 6.9) will describe the Traditional Owners' use of resources in the project area (including bush tucker), potential impacts of the project on resource use, and measures to avoid and minimise impacts.

Biting insects (e.g. mosquitoes) are another issue relevant to human health and are discussed in the following sections.

6.11.2 POTENTIAL IMPACTS

Mine sites (e.g. standing water in dams) can create breeding sites for mosquitoes. These insects can be vectors for disease. Mine sites also have the potential to introduce mosquitoes that are exotic to the NT or which have been previously eliminated (Department of Health and Families, 2005).

6.11.3 EIS STUDIES

As part of its existing operations, the proponent works collaboratively with the NT Department of Health (NT Health) on mosquito monitoring and management. GEMCO currently assists NT Health during its annual visit to Groote Eylandt. GEMCO provides assistance by escorting NT Health personnel to key areas across GEMCO's tenements to allow them to obtain mosquito samples for analysis. The EIS will describe this existing program, its relevance to the project and any amendments to the program that may be required to accommodate the requirements of the project. Any proposed amendments to the existing program will be developed in consultation with NT Health. The guideline relevant to this work is *Guidelines for Preventing Mosquito Breeding Sites Associated with Mining Sites* (Department of Health and Families, 2005).

6.11.4 AVOIDANCE AND MITIGATION

The EIS will describe avoidance and mitigation measures to ensure that the project does not give rise to impacts on human health, related to mosquitoes. In developing mitigation measures, the EIS will draw on the guidance contained in Department of Health and Families (2005). The project does not involve the construction of residential facilities (e.g. workforce facilities) and so the focus will be describing measures to minimise the creation of mosquito breeding habitat within the project area, and any amendments to the current monitoring program to accommodate the project.

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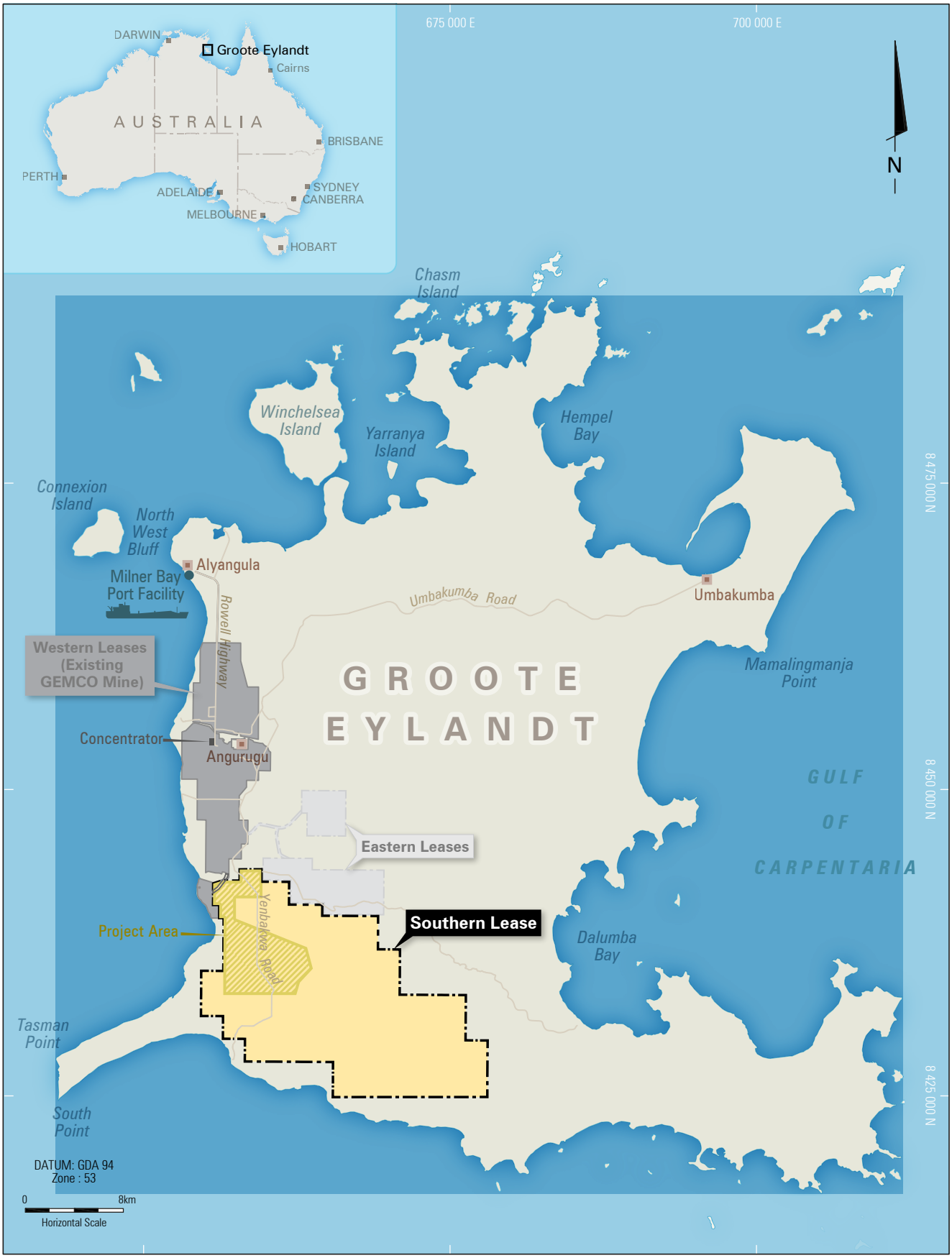
FIGURES

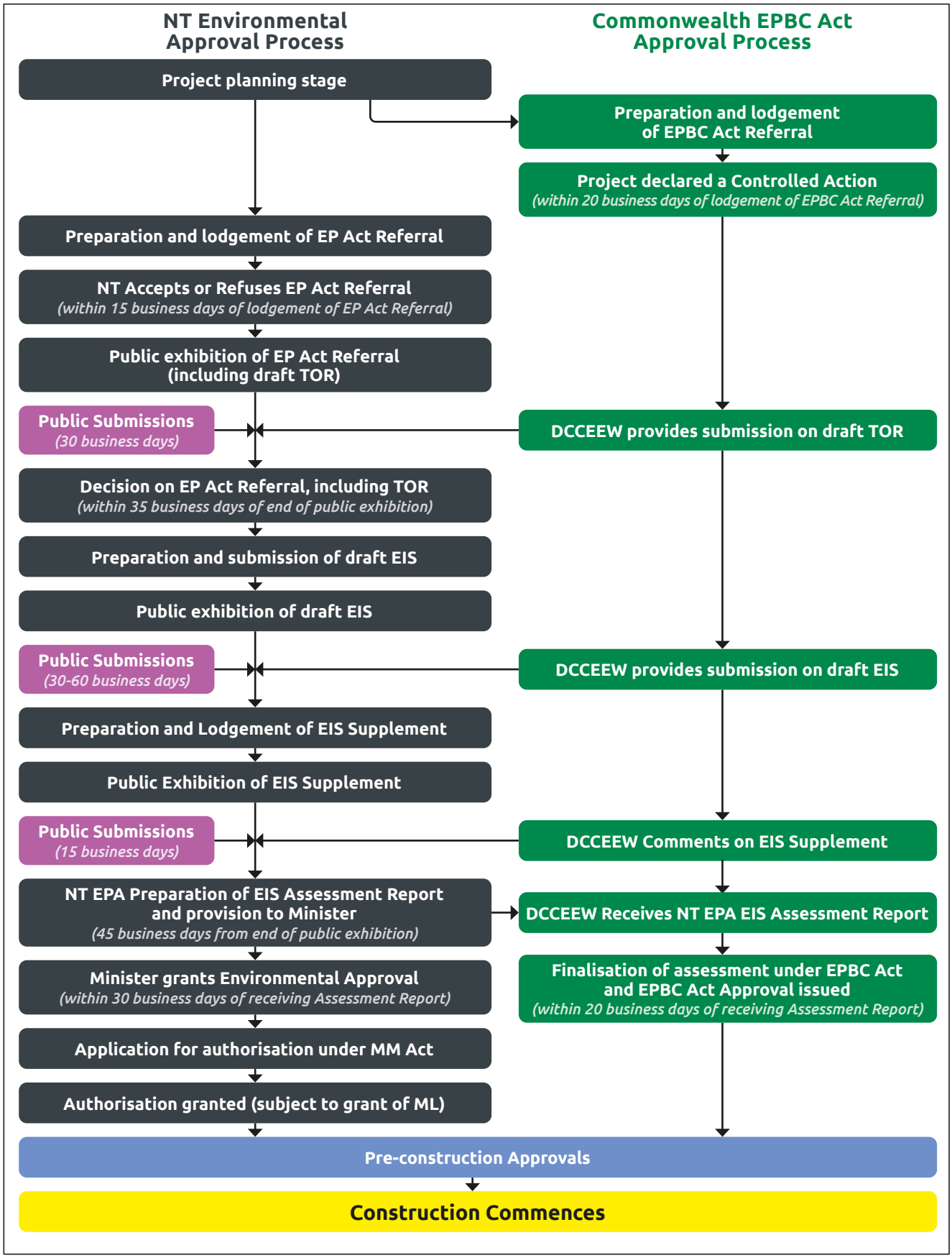
HANSEN
ENVIRONMENTAL
CONSULTING



SOUTHERN LEASE MINING PROJECT

Location Plan

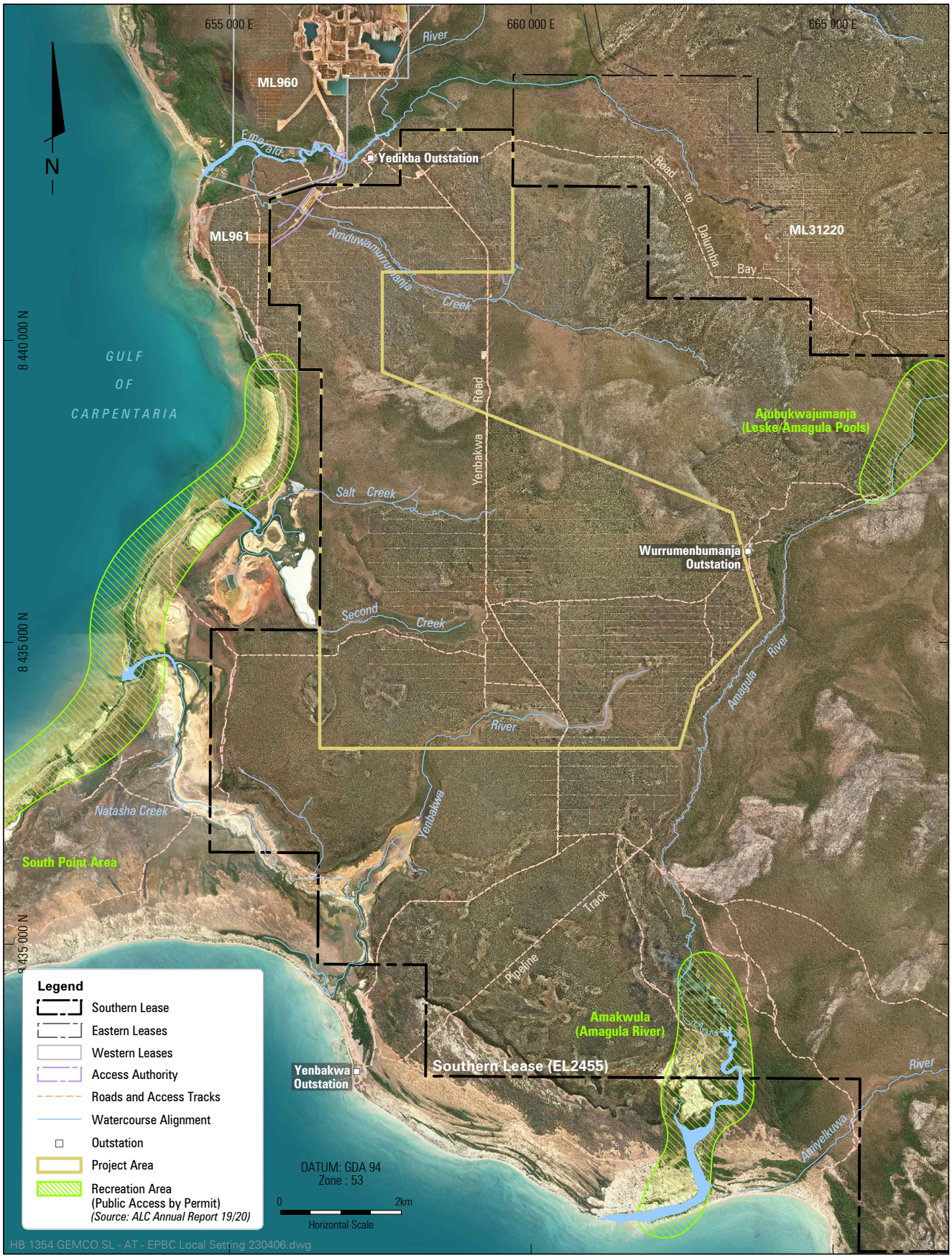
FIGURE 1



SOUTHERN LEASE MINING PROJECT

Environmental Approval Process

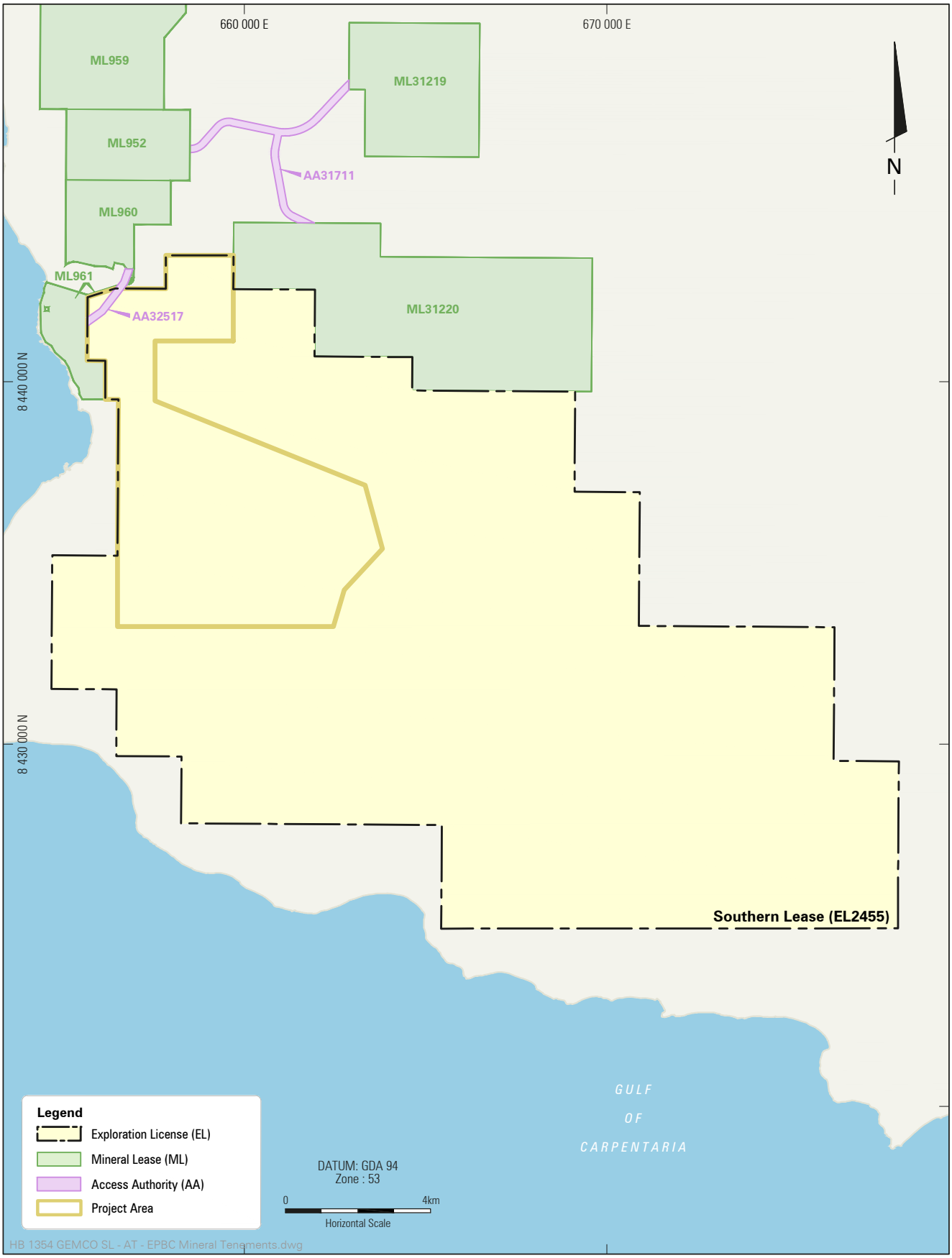
FIGURE 2



SOUTHERN LEASE MINING PROJECT

Local Setting

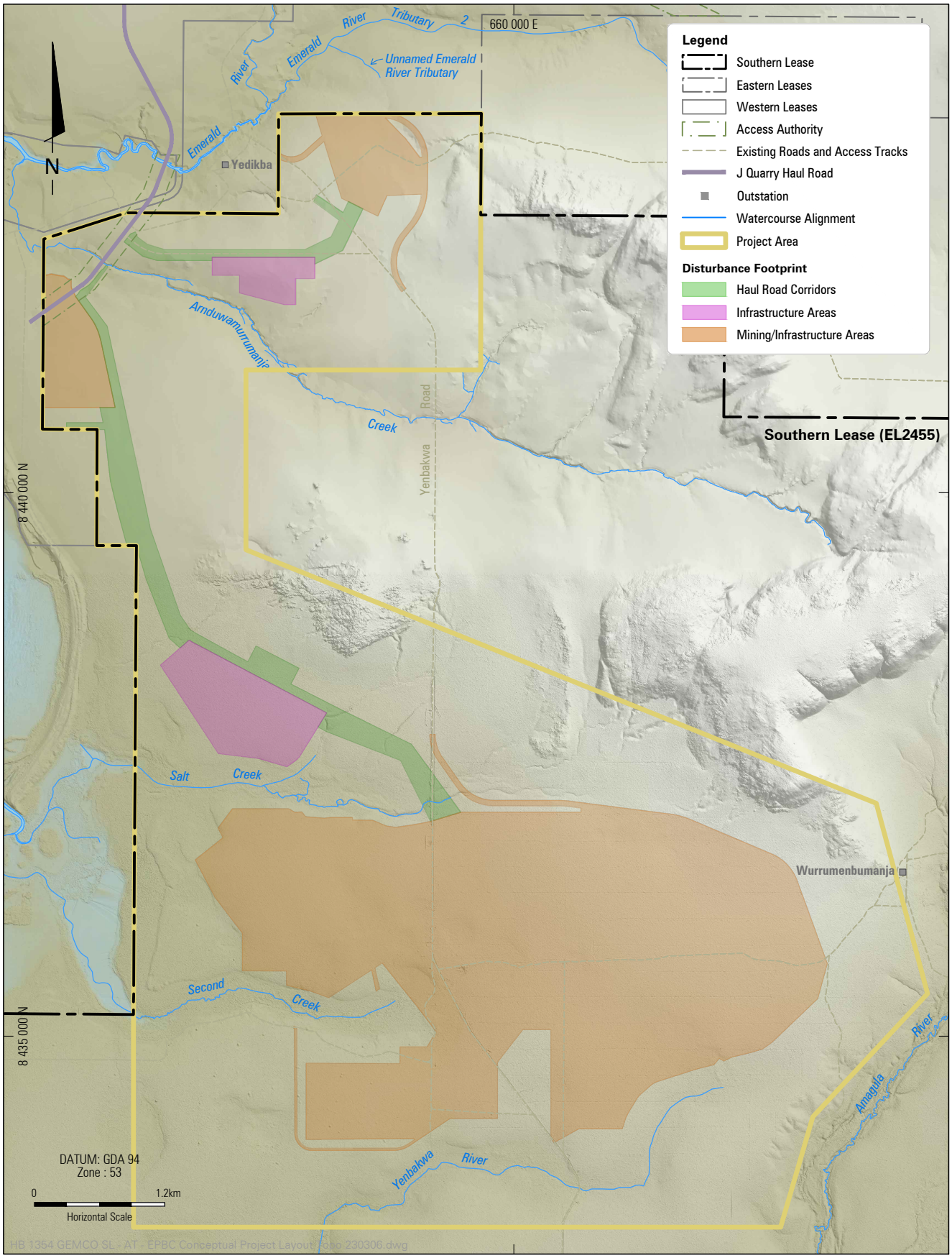
FIGURE 3



SOUTHERN LEASE MINING PROJECT

Mineral Tenements

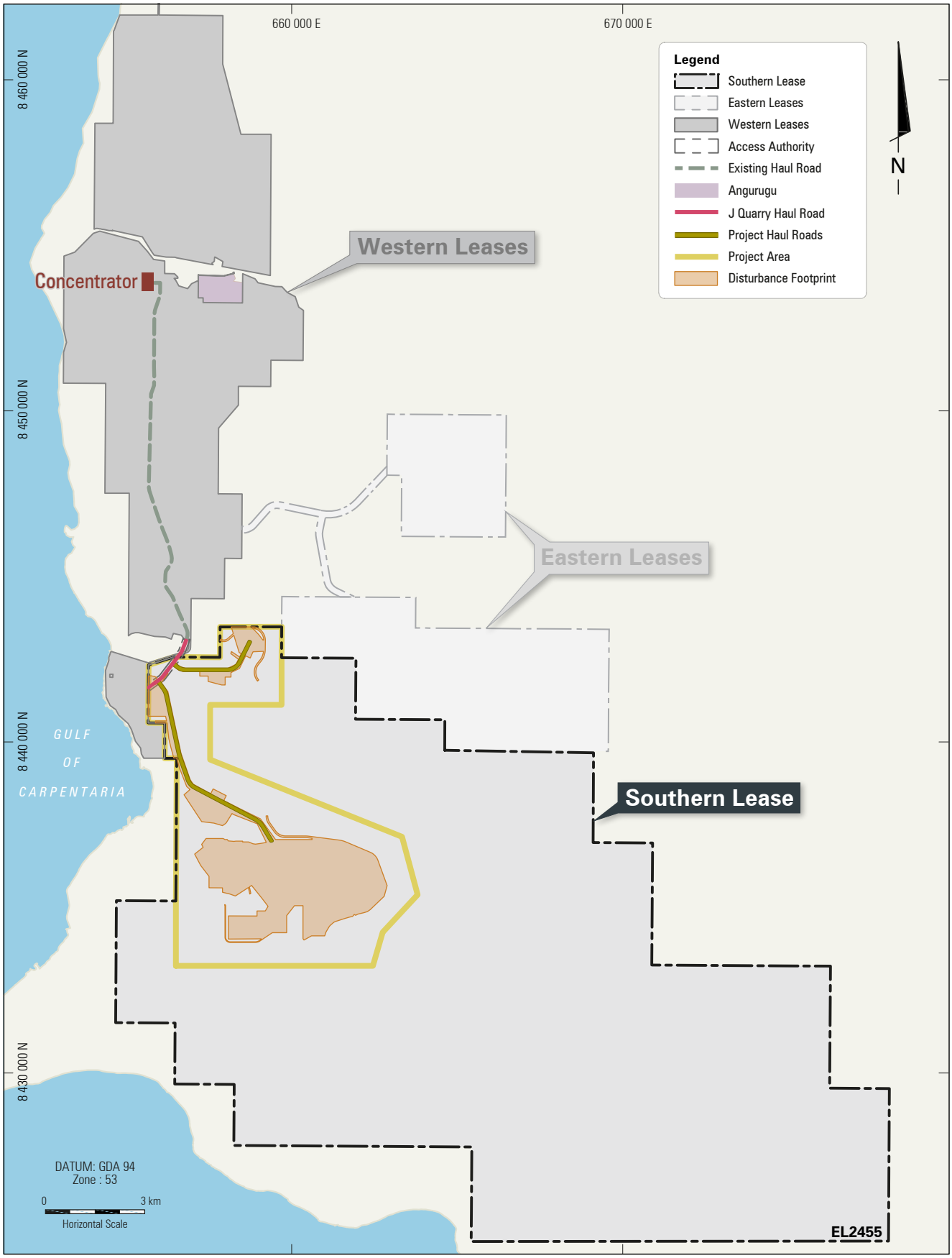
FIGURE 4



SOUTHERN LEASE MINING PROJECT

Conceptual Project Layout

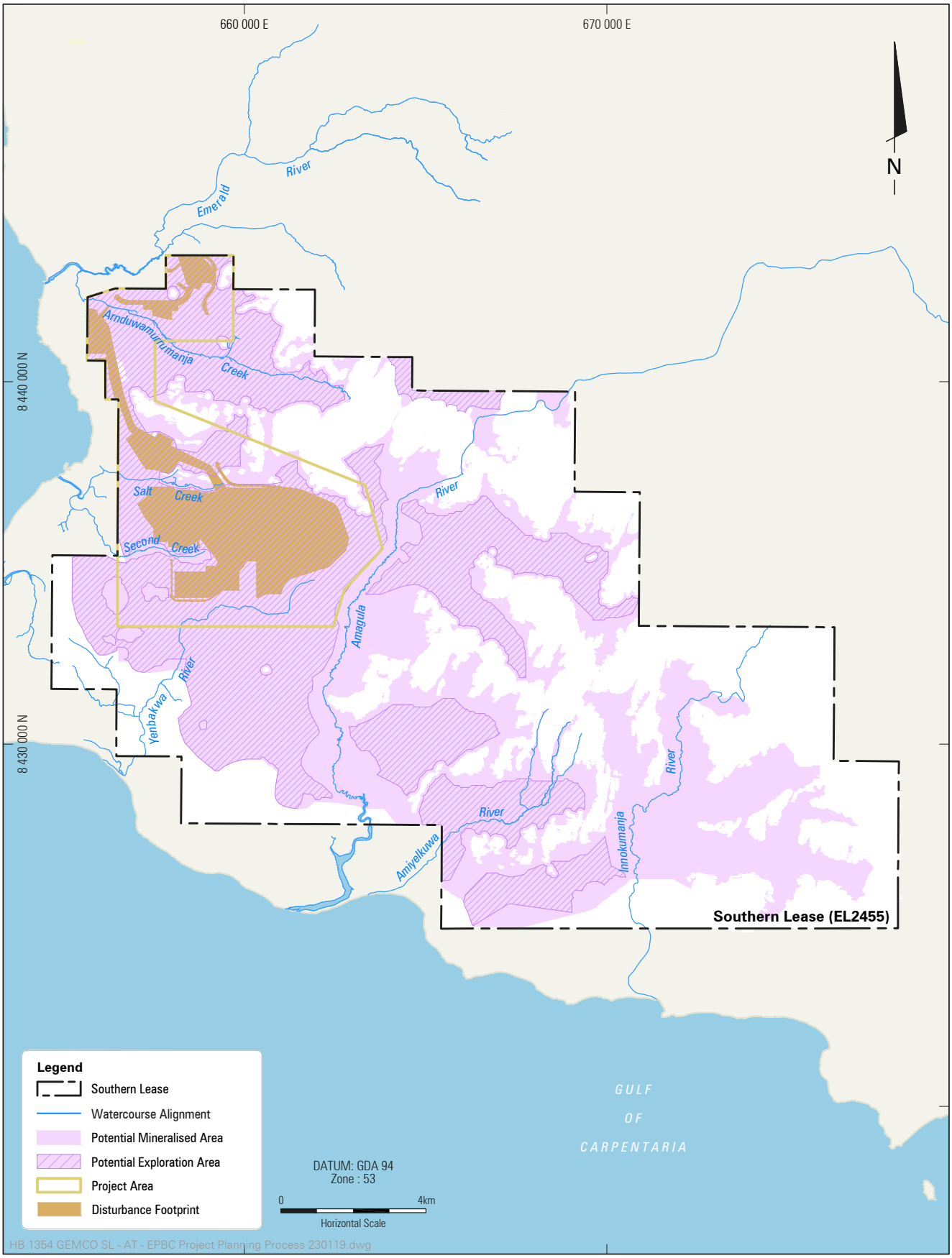
FIGURE 5



SOUTHERN LEASE MINING PROJECT

Project Setting

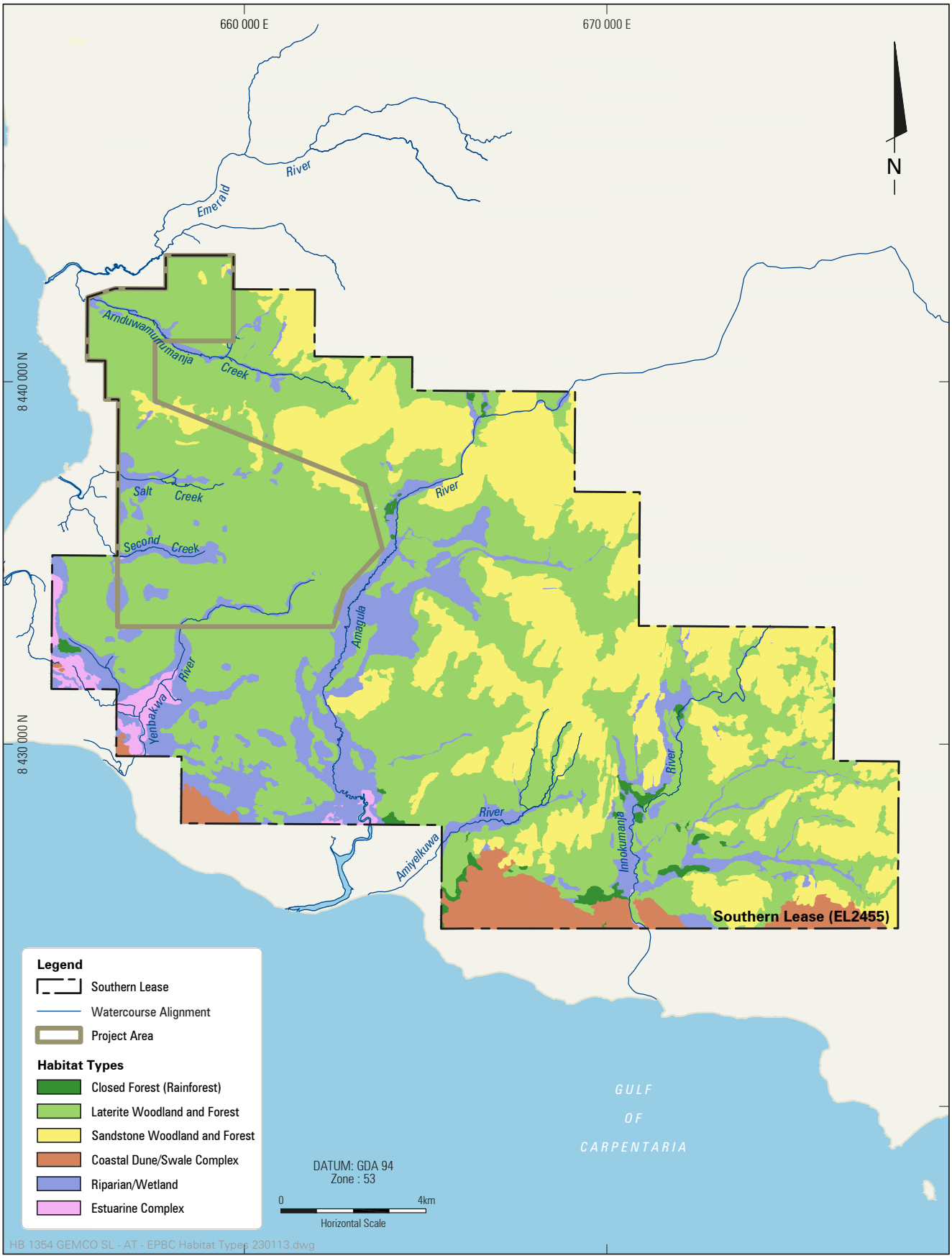
FIGURE 6



SOUTHERN LEASE MINING PROJECT

Project Planning Process

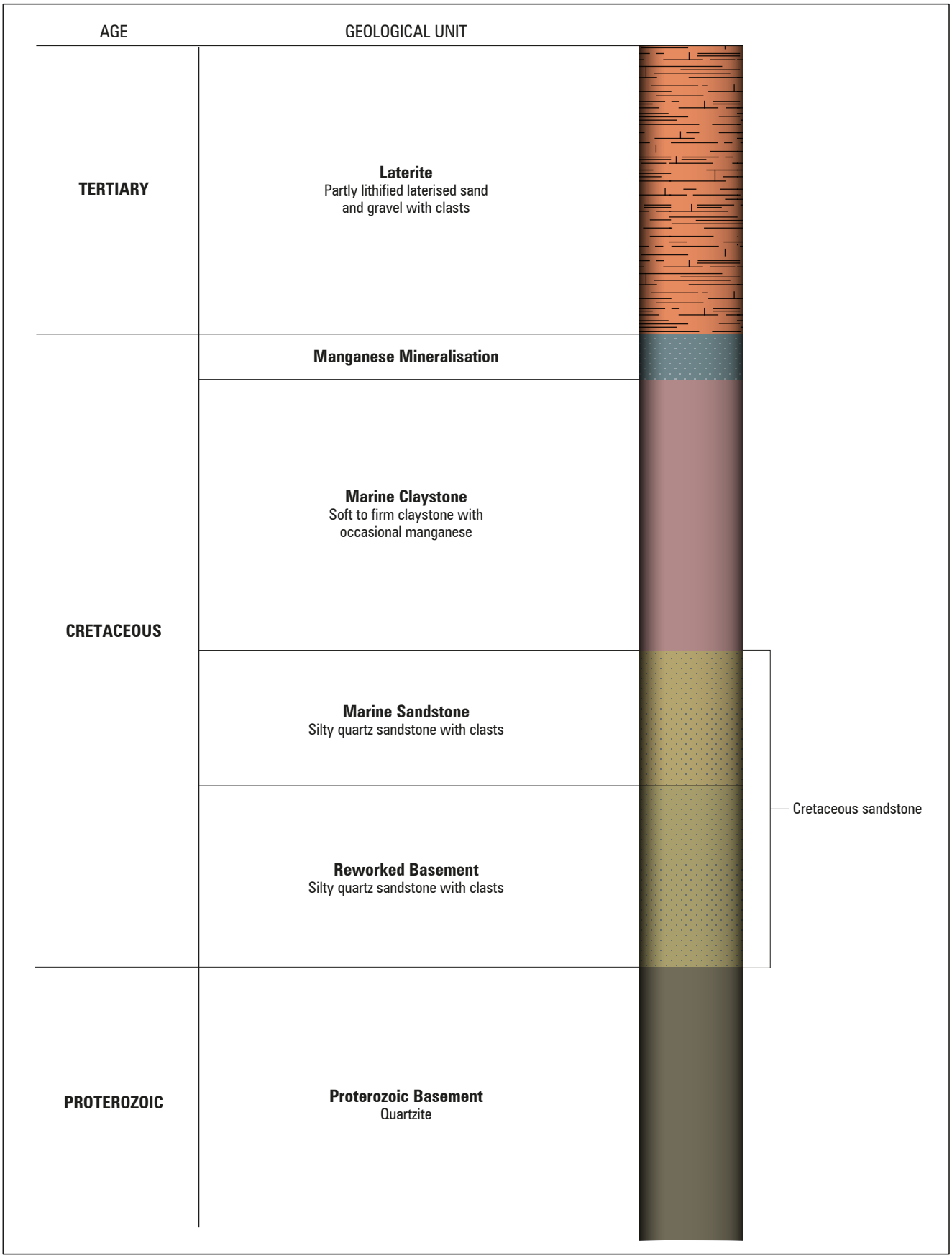
FIGURE 7



SOUTHERN LEASE MINING PROJECT

Habitat Types

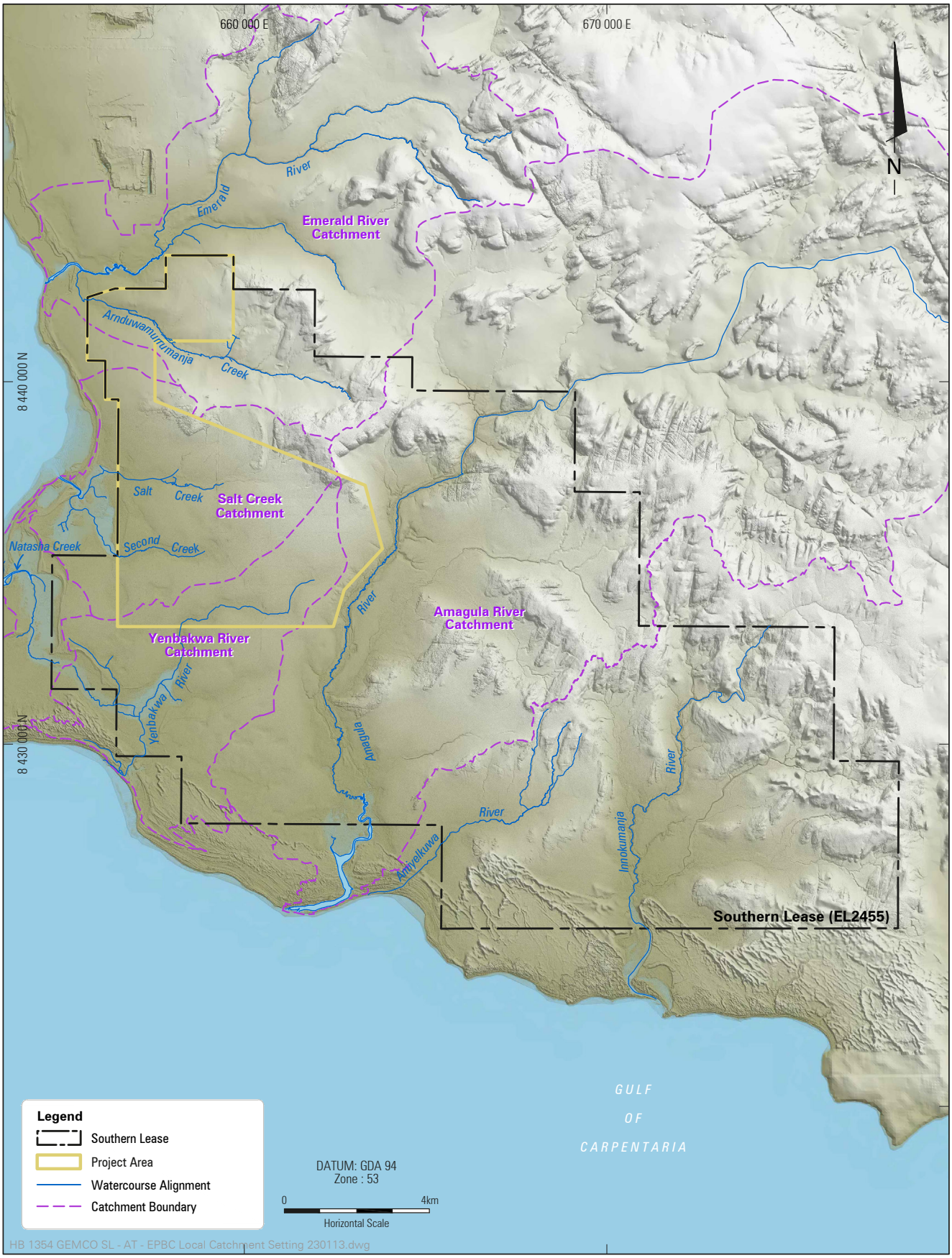
FIGURE 8



SOUTHERN LEASE MINING PROJECT

Indicative Stratigraphy of the Southern Lease

FIGURE 9



SOUTHERN LEASE MINING PROJECT

Local Catchment Setting

FIGURE 10