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GEMCO Eastern Leases Project

Notice of Intent

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LIST OF ABBREVIATIONS AND ACRONYMS

AAPA	Aboriginal Areas Protection Authority
Aboriginal Sacred Sites Act	<i>Aboriginal Sacred Sites Act 1999 (NT)</i>
ALC	Anindilyakwa Land Council
ALRA	<i>Aboriginal Land Rights Act (Northern Territory) 1976 (Cth)</i>
ASS	Acid Sulfate Soils
BoM	Bureau of Meteorology
DME	Department of Mines and Energy (Northern Territory)
DotE	Department of the Environment (Federal)
EA Act	<i>Environmental Assessment Act 1982 (NT)</i>
EAA Procedures	<i>Environmental Assessment Administrative Procedures 1984</i>
EIS	Environmental Impact Statement
ELR	Exploration Licence in Retention
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
FIFO	Fly In Fly Out
GEMCO	Groote Eylandt Mining Company Pty Ltd
Heritage Act	<i>Heritage Act 2011 (NT)</i>
MIA	Mine Industrial Area
ML	Mineral Lease
MM Act	<i>Mining Management Act 2001 (NT)</i>
MNES	Matters of National Environmental Significance
Mtpa	Million tonnes per annum
NOI	Notice of Intent
NT EPA	Northern Territory Environment Protection Authority
ROM	Run of Mine
RPA	Regional Partnership Agreement
SIA	Social Impact Assessment
TPWC Act	<i>Parks and Wildlife Conservation Act 2000 (NT)</i>

1 INTRODUCTION

1.1 Purpose

This Notice of Intent (NOI) has been prepared in order to initiate the Northern Territory environmental assessment and approval process for the proposed Groote Eylandt Mining Company Pty Ltd (GEMCO) Eastern Leases Project (the project). The NOI has been prepared to meet the requirements of the Northern Territory *Environmental Assessment Act 1982* (EA Act) and the *Environmental Assessment Administrative Procedures 1984* (EAA Procedures). It provides a high level overview of the project and its environmental setting, and describes potential environmental issues and the way in which issues are proposed to be assessed and managed. The NOI provides information to allow regulators to determine the level of environmental assessment required for the project and the issues to be addressed as part of the environmental assessment.

A referral under the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) will be lodged for the project at around the same time that the NOI is submitted. The EPBC Act referral will initiate the assessment and approval process under the EPBC Act. It is the proponent's intent that a single environmental assessment process is used to satisfy the requirements under the Federal EPBC Act and the Northern Territory EA Act.

1.2 Project Overview

The project involves the development of a number of additional mining areas to the east of the existing GEMCO mine on Groote Eylandt in the Gulf of Carpentaria, approximately 650 km south-east of Darwin (Figure 1). The existing GEMCO mine is a manganese mine that has been operating for approximately 50 years.

Operations at the existing GEMCO mine involve mining manganese ore by open cut mining methods, and then processing the ore in a concentrator to produce a concentrate. The concentrate is transported by road train via the Rowell Highway from the mine to GEMCO's port facility at Milner Bay (Figure 2). Concentrate is stockpiled at the port before being loaded onto ships for transport to market. GEMCO currently sells approximately 6 Million tonnes per annum (Mtpa) of manganese ore to domestic and export markets.

The Eastern Leases area comprises two Exploration Licences in Retention (ELR28161 and ELR28162) located approximately 2 km east of the existing GEMCO mine at their closest point (Figure 2). GEMCO proposes to mine manganese ore from the Eastern Leases by open cut mining methods. Ore from the Eastern Leases would be transported by trucks to the existing GEMCO operations via a new haul road. Ore would be processed at the

concentrator at the existing GEMCO mine and the concentrate would be transported to market via the existing port.

The project is a continuation of existing operations, rather than an expansion. It will be integrated with the existing GEMCO operations and will make use of the existing GEMCO mine processing and shipping facilities. No changes or upgrades to these facilities are required as part of the project. Manganese ore from the project is proposed to be blended with manganese ore from the existing GEMCO mine in order to maintain the quality of the product. The project will not increase the production rate of the existing GEMCO mine, it will only increase the life of mine.

1.3 The Proponent

The project proponent is the Groote Eylandt Mining Company Pty Ltd which has two shareholders, BHP Billiton Manganese Australia Pty Ltd (60%) and Anglo Operations (Australia) Pty Ltd (40%).

Billiton Manganese Australia Pty Ltd is a wholly owned subsidiary which forms part of BHP Billiton Plc, the ultimate parent entity which is listed on the London Stock Exchange. BHP Billiton has extensive manganese ore mining interests in Australia and South Africa including the high grade, open cut manganese ore mine on Groote Eylandt. GEMCO accounts for more than 15% of the world's high grade ore production, with approximately 70% of its production exported to global markets.

Anglo Operations (Australia) Pty Ltd is a wholly owned subsidiary which forms part of Anglo American Plc, a UK-based mining group that is listed on the London Stock Exchange. Anglo American Plc is one of the world's largest mining companies which has a diverse portfolio of interests in coal, iron ore, manganese, base metals and minerals and precious metals and minerals. Together, BHP Billiton and Anglo American are the world's largest producer of seaborne manganese ore through their operations in Australia and South Africa.

This NOI has been prepared by Hansen Bailey environmental consultants on behalf of GEMCO, with input from the Manganese Australia capital projects team, and GEMCO's HSEC specialists and site personnel.

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1.4 Report Structure

The structure of the report is as follows:

Section 2	The Federal and Territory regulatory framework governing the project
Section 3	Details of stakeholder consultation
Section 4	A description of the project
Section 5	Details of the baseline environment, potential impacts and EIS approach
Section 6	References

2 REGULATORY FRAMEWORK

2.1 Environmental Assessment and Approval Process

Table 1 summarises the key legislation relating to the environmental assessment and approvals that are required for the project.

Table 1
Key Environmental Approvals

Approval	Legislation	Administering Authority
Environmental Assessment Report	Northern Territory EA Act and EAA Procedures	Northern Territory Environment Protection Authority (NT EPA)
EPBC Act Approval	Commonwealth EPBC Act	Commonwealth Department of the Environment (DotE)
Authorisation under the <i>Mining Management Act 2001</i> (MM Act)	Northern Territory MM Act	Northern Territory Department of Mines and Energy (DME)

2.1.1 Environmental Assessment Act and Administrative Procedures

The Northern Territory's environmental assessment process is administered under the EA Act and Administrative Procedures. The EA Act establishes a framework for assessing potential environmental impacts of development projects. It allows for varying levels of environmental assessment, depending on the scale and complexity of the project and the potential environmental impacts. The most comprehensive assessment is an Environmental Impact Statement (EIS).

The NT EPA is the administering authority for the environmental assessment process under the EA Act. The NT EPA's 2013 guideline *Guide to the Environmental Impact Assessment Process in the Northern Territory* describes the environmental assessment process. As per the guideline, the environmental assessment process is initiated by the proponent submitting the NOI (this document). The NT EPA then makes a decision on the level of assessment required and issues draft EIS Guidelines (if an EIS is required). The EIS is required to be prepared in accordance with these guidelines. This NOI describes technical work that is proposed to be undertaken as part of the EIS, but the final scope for the EIS will only be determined once the EIS Guidelines have been issued.

The draft EIS is submitted to the NT EPA and then placed on public exhibition. The environmental assessment process concludes with an Environmental Assessment Report

being issued for a project. The Environmental Assessment Report contains recommendations for the management of environmental issues.

2.1.2 Mining Management Act

The MM Act is administered by the Northern Territory DME and was established to ensure the development of the Northern Territory's mineral resources in accordance with environmental standards consistent with best practice in the mining industry. The MM Act aims to protect the environment through establishing a system whereby mining activities that will result in a substantial disturbance of the ground require an Authorisation under the MM Act. An application for Authorisation under the MM Act can only be made once the environmental assessment process under the EA Act has concluded (i.e. after the Environmental Assessment Report described in Section 2.1.1 has been issued).

The MM Act also establishes a system whereby operators of mines are required to implement and maintain a management system for the site (as described in a Mining Management Plan). The Mining Management Plan describes the environmental management structure, environmental commitments, monitoring programs, rehabilitation and closure planning. GEMCO currently completes the necessary Mining Management Plans for the existing GEMCO mining operation and will incorporate a similar plan for this project.

2.1.3 EPBC Act

The EPBC Act prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and management of protected Matters of National Environmental Significance (MNES). DoE is the administering authority for the EPBC Act. MNES include but are not limited to:

- Listed threatened species, communities and migratory species;
- Protected areas (e.g. world heritage properties, wetlands of international importance [Ramsar wetlands], conservation zones); and
- Commonwealth Indigenous heritage.

Actions that are likely to have a significant impact on MNES are subject to an assessment and approvals process. Similar to the Northern Territory EA Act, the level of assessment required under the EPBC Act is determined by the nature and scale of the potential impacts and the complexity of the project. An EIS is the most comprehensive assessment required under the EPBC Act.

Arrangements can be made with DotE and the NT EPA to accredit the EIS prepared under the Northern Territory EA Act to be used for the purpose of DotE's assessment under the EPBC Act.

An EPBC referral will be lodged for the project at around the same time that the NOI is submitted to the NT EPA. As indicated in Section 5.6.1, a number of threatened species listed under the EPBC Act have been recorded from the project site or have been assessed as having a high or moderate potential of being present. The EPBC referral will provide further detail in relation to these species, and the potential project impacts on these species. The proponent will seek to prepare a single EIS for use under the EPBC Act and the Northern Territory EA Act.

2.2 Other Legislation

In addition to the key environmental approvals discussed in Section 2.1, there are a number of other approvals that may be required. These are discussed in the following sections.

2.2.1 Commonwealth Legislation

Aboriginal Land Rights Act (Northern Territory)

The *Aboriginal Land Rights Act (Northern Territory) 1976* (ALRA) is Commonwealth legislation which provides a comprehensive scheme for the claiming and granting of freehold title to traditional Aboriginal land in the Northern Territory. It provides Aboriginal landowners with legal title to traditional lands. The ALRA also outlines a process for obtaining consent from the Traditional Owners for exploration and mining on Aboriginal land. Consent is obtained in the form of an Exploration Agreement or Mining Agreement with the relevant Land Council. The ALRA is administered by the Federal Minister for Indigenous Affairs.

The land within the project site is Aboriginal land under ALRA. The Land Council responsible for Groote Eylandt is the Anindilyakwa Land Council (ALC). GEMCO has a Mining Agreement under ALRA for the existing GEMCO mine and a Special Purposes Lease for Alyangula township and the Milner Bay port facility. GEMCO also has an Exploration Agreement with the ALC for the Eastern Leases ELRs and it will be necessary to obtain a Mining Agreement with the ALC for the Eastern Leases prior to the grant of a mineral lease/s. It will also be necessary to obtain access to the land for the proposed haul road via an agreement under Section 19 of ALRA.

2.2.2 Northern Territory Legislation

Aboriginal Sacred Sites Act

The *Aboriginal Sacred Sites Act 1999* (Aboriginal Sacred Sites Act) is Northern Territory legislation designed to protect sacred Aboriginal sites (which are places in the landscape that have a special significance under Aboriginal tradition). The Aboriginal Areas Protection Authority (AAPA) is an independent statutory organisation established under the Aboriginal Sacred Sites Act, responsible for overseeing the protection of Aboriginal sacred sites. AAPA is responsible for issuing Authority Certificates under the Aboriginal Sacred Sites Act. AAPA is also responsible for taking action against those who damage sacred sites or otherwise breach laws relating to sacred sites.

An Authority Certificate provides conditions for any works undertaken on or near sacred sites. Undertaking the work in accordance with the requirements of an Authority Certificate indemnifies the holder against prosecution under the Act for damage to sacred sites in the area of the Authority Certificate.

Heritage Act

There is a requirement for a works approval to be obtained under the *Heritage Act 2011* (Heritage Act) for any disturbance of places/objects of heritage significance. Heritage places/objects may be of Indigenous or non-indigenous significance. The Heritage Act is administered by the Northern Territory Department of Lands, Planning and the Environment, which considers recommendations from the Heritage Council.

Water Act

The *Water Act 1992* (Water Act), administered by the Northern Territory Department of Land Resource Management, establishes a system of water licences for discharges to watercourses. However, in some circumstances, discharges of water may be regulated through the Mining Management Plan, rather than through a water licence under the Water Act.

3 STAKEHOLDER CONSULTATION

3.1 Overview

A comprehensive stakeholder consultation program will be undertaken for the project. The program will be conducted throughout the EIS preparation phase and will be integrated with environmental impact assessment and project planning. The program will include consultation with stakeholders who are likely to have an interest in the project. A provisional list of stakeholders is provided in Section 3.2. Additional stakeholders may be identified during the consultation program.

The objectives of the stakeholder consultation program will be to:

- Establish open communication with all stakeholders;
- Facilitate stakeholder understanding of the project;
- Identify stakeholder issues and concerns with the project;
- Respond to stakeholder issues through environmental impact assessment, project planning or communication; and
- Provide feedback to stakeholders on the findings of the EIS and the management measures that are proposed to be implemented.

The initial phase of the stakeholder consultation program will involve the identification of stakeholder issues. This phase will involve face-to-face consultation with key stakeholders and the provision of key project information including an introductory project overview, a description of the EIS and project approval process, and an overview of the EIS consultation program.

It is anticipated that a range of consultation methods may be used, including individual meetings, group presentations, and the provision of project information sheets.

This proactive approach will ensure that stakeholder's issues are identified and understood early in the EIS process and will enable issues to be responded to as part of the EIS process and as part of further forms of consultation.

3.2 Project Stakeholders

A list of persons and groups identified as being potentially interested in the project is provided in Table 2. This list is dynamic and will be updated as new stakeholders are identified.

Table 2
Provisional Stakeholder List

Stakeholder Group	Stakeholder
Federal Government	Department of the Environment
	Groote Eylandt and Bickerton Island Regional Partnership Agreement Committee
NT Government and Statutory Authorities	Environment Protection Authority
	Aboriginal Areas Protection Authority
	Department of Arts and Museums
	Department of Business
	Department of Health
	Department of Land Resource Management
	Department of Lands, Planning and the Environment
	Department of Mines and Energy
	Department of Police, Fire and Emergency Services
	Department of Primary Industry and Fisheries
	Department of Transport
	Parks and Wildlife Commission NT
Non-Government Organisations	Environment Centre Northern Territory
	Amateur Fishermen's Association of the Northern Territory
Local Government	East Arnhem Shire Council
Land Council	Anindilyakwa Land Council
Traditional Owners	Wurramaminyamanja Maminyamanja Clan
	Warnungangkurrakba Wurramara Clan
	Warnindilyakwa Mamarika Clan
	Warnungawerrikba Wurrawilya Clan
	Warnungwamakwula Amagula Clan
	Warnungawerrikba Lalara Clan (Ceremonial People)
Businesses, service and facility providers	Business owners and operators, service and facility providers in Alyangula
	Business owners and operators, service and facility providers in Angurugu
	Business owners and operators, service and facility providers Umbakumba
Communities	Alyangula residents
	Angurugu residents
	Umbakumba residents
Interest Groups	Anindilyakwa Land & Sea Rangers
GEMCO	Employees and contractors

4 PROJECT DESCRIPTION

This section describes the Eastern Leases Project, including the project setting and proposed mining activities. An overview of the existing GEMCO mine is also provided, and this section describes the way in which the project will be integrated with the existing GEMCO mining operations.

4.1 Existing GEMCO Mine

4.1.1 Overview

The existing GEMCO mine is an open cut manganese mining operation. It commenced operations in 1964 and has an anticipated remaining mine life of approximately 14 years. As shown in Figure 3, the existing GEMCO mine comprises a number of mineral leases (MLs), covering a total area of approximately 8,500 ha.

The township of Angurugu (population of approximately 800) is located directly adjacent to the existing mining operation. The township of Alyangula and the Milner Bay port facility are located approximately 13.5 km to the north of the mine's concentrator and main infrastructure area (Figure 2).

4.1.2 Mining and Rehabilitation Method

Open cut mining is undertaken in a number of operating quarry areas. Figure 4 shows the quarries that comprise the existing GEMCO mine. The existing quarries are typically mined in strips approximately 1 km long and 40 m wide. Typical quarry depth is approximately 10-25 m. Plate 1 shows an open cut quarry at the existing GEMCO mine with shallow overburden being removed using excavators so as to uncover the manganese ore body.



Plate 1
View of Mining Activities (D Quarry) at the Existing GEMCO Mine (photo taken March 2014)

The GEMCO mining operations involve the following sequence of activities:

- Clearing of vegetation using bulldozers;
- Stripping and stockpiling of topsoil using a combination of dozers, front-end loaders and trucks;
- Removing shallow (typically weathered) overburden using a combination of trucks and excavators. Overburden is emplaced in mined quarry areas, or may be temporarily emplaced in out-of-pit emplacement areas until quarry areas are available for backfilling and rehabilitation;
- Drilling and blasting the exposed manganese ore;
- Mining the ore using a truck and shovel fleet;
- Progressive backfilling of mined quarry areas with excavated overburden. Dozers operate in parallel with the truck and excavator fleet pushing overburden back into previously mined quarries; and
- Progressive rehabilitation of backfilled quarry and overburden emplacement areas. Topsoil is placed, spread and seeded in order to promote successful revegetation of mine disturbance areas.

Backfilled quarries and areas disturbed by mining activities are progressively rehabilitated to restore mined land to self-sustaining open woodland ecosystems, similar to pre-mining ecosystems and the surrounding undisturbed land. GEMCO operates a comprehensive, long-term monitoring program designed to evaluate the success of mine rehabilitation. Rehabilitation is currently monitored and assessed at over 100 separate sites across the operation. Rehabilitation performance against success criteria is regularly audited by internal and external specialists to ensure the ongoing improvement and long-term sustainability of mine rehabilitation. Examples of rehabilitation at the existing GEMCO mine are shown in Plates 2 and 3.



Plate 2

2 Year Old Mine Rehabilitation at the GEMCO Mine - D Quarry Rehabilitation 2011 (photo taken November 2013)



Plate 3
25 Year Old Mine Rehabilitation at the GEMCO Mine - D Quarry Rehabilitation 1989 (photo taken November 2013)

4.1.3 Transport and Processing

A fleet of 777 haul trucks and excavators is used to extract the ore and transport it to the Run of Mine (ROM) stockpile, via a network of dedicated haul roads. Ore from various quarries is blended at the ROM stockpile before being crushed, screened and washed at the concentrator (Figure 5 and Plate 4). The current capacity of the concentrator is 4.8 Mtpa of washed ore.



Plate 4
View of Concentrator at the Existing GEMCO Mine

Washed manganese is stored in the existing GEMCO product storage bins or at the concentrate product stockpile (CPS) prior to being loaded onto road trains. The washed manganese ore is then transported approximately 13.5 km by road train along the Rowell Highway to the Milner Bay port facility (Figure 4 and Plate 5). In some instances, due to the nature and quality of the manganese ore type being mined, it is not necessary to wash the ore and this material is able to bypass the concentrator and be trucked directly to Milner Bay port facility. Manganese is unloaded and stockpiled at the existing Milner Bay port facility. Depending on customer requirements, stockpiled manganese may be blended prior to being reclaimed and conveyed to the ship loading facility. Manganese is shipped from Milner Bay and the majority of ore is exported to international customers. GEMCO currently sells approximately 6 Mtpa of manganese (which includes washed manganese from the concentrator, and ore that has bypassed the concentrator).



Plate 5
View of Wharf at Milner Bay Port Facility

The processing of manganese ore also generates sand tailings, slimes tailings and middlings (coarse fraction). Sand tailings and slimes tailings are pumped from the concentrator to dedicated storage facilities located adjacent to the main infrastructure area (Figure 4). Middlings, which are used as road base construction material or as stemming in blasting, are stored at a designated storage area located opposite the ROM stockpiles.

Other key infrastructure associated with the existing GEMCO mine includes administration buildings, warehousing, maintenance workshop facilities, fuel storage, equipment storage areas and mine water storages (Figure 5).

The integration of the project with the existing GEMCO mine is discussed in Section 4.2.

4.1.4 Workforce

The existing mining operation has a workforce of approximately 1,000 people. The workforce comprises both direct employees and contractors. Much of the workforce operates on a fly in fly out (FIFO) arrangement, whereby workers live in accommodation villages in and around Alyangula during their rostered shifts, and then return to a home base on the mainland during their rostered time off. Key home bases are Darwin and Cairns, and there are direct flights from Groote Eylandt to these cities. Non-FIFO workers reside permanently on Groote Eylandt, mainly in GEMCO-owned housing in Alyangula.

4.2 Eastern Leases Project

The project involves:

- developing a number of quarries within the Eastern Leases ELRs;
- mining manganese ore by the same open cut mining methods used at the existing GEMCO mine; and
- transporting the ore by truck on a new designated haul road to the existing GEMCO mine infrastructure area.

Ore from the project would be processed at the existing GEMCO mine facilities and exported via the existing Milner Bay port, with no changes or upgrades of these facilities required as a result of the project. The project will not change the production rate at the existing GEMCO mine and is viewed as a continuation of the existing operation. The project will, however, increase the overall life of mine.

The project site comprises the Eastern Leases ELRs and the proposed haul road connecting the Eastern Leases with the existing GEMCO mining operation (Figure 6).

4.2.1 Description of Project Site

Location

The project site is located on the western side of Groote Eylandt. The Eastern Leases ELRs are located approximately 2 km east of the existing GEMCO mine area known as D Quarry (Figure 6).

The township of Angurugu is the closest residential community to the project site and is located approximately 6 km to the north-west of the Eastern Leases. The township of Alyangula is located approximately 20 km north-west of the project site (Figure 4).

There are several Aboriginal outstations located on Groote Eylandt. The nearest outstations to the project site are Yedikba and Wurrumenbumanja (Figure 6). Yedikba is located approximately 2.4 km to the west of the southern ELR and Wurrumenbumanja is located approximately 3.4 km to the south of the southern ELR.

Tenements

The project mining tenements comprise ELR28161 (the northern ELR) and ELR28162 (the southern ELR) (Figure 6). GEMCO will apply to convert these ELRs to MLs.

Other tenements in the vicinity of the project site include the MLs associated with the existing GEMCO mine, and Exploration Licence (Applications) EL2457 and EL2455, both

held by GEMCO (Figure 3). There is also an application for a Petroleum Tenement (EP245) held by Paltar Petroleum Ltd over much of Groote Eylandt.

Appendix A provides further detail on the tenements, including the tenement number, the grant date and expiry date, and the name of the tenement holder.

Land Ownership

The project site is located on Aboriginal land, scheduled under ALRA, on property owned by the Anindilyakwa Land Trust. The Traditional Owners are represented by the ALC. GEMCO has a Mining Agreement under ALRA for the existing GEMCO mine and will require a similar agreement for the project.

The northern and southern ELRs are located on NT Portions 1653 and 1654, respectively, and the proposed haul road is located on part of NT Portion 1632.

Topography, Natural Features and Land Use

The topography within the project site is generally flat, with outcropping of quartzitic rock occurring across the area. The project site is located in the upper catchments of the Emerald, Amagula and Angurugu Rivers (Figure 7).

The Emerald River and its tributaries drain the majority of the northern ELR and the western area of the southern ELR. The Amagula River drains the eastern area of the southern ELR via two main tributaries. Angurugu River partially drains the north-eastern area of the northern ELR.

The land within and surrounding the project site comprises natural bushland. No farming or agriculture activities are undertaken in the vicinity of the project site. Exploration activities have been undertaken across the Eastern Leases by GEMCO since 2006 as a part of its exploration licence obligations. This program of drilling activities has progressively intensified in recent years in an effort to prove up the volume and quality of measured, indicated and inferred mineral resources.

There are a number of recreation areas on Groote Eylandt. These are areas that the public can access, provided that they are in receipt of a recreational permit issued by the ALC under ALRA. The nearest recreation area to the project site is Leske Pool, which is located directly to the south of the southern ELR (Figure 2). The Leske Pool recreation area includes a swimming hole on the Amagula River, which is used by locals.

4.2.2 Proposed Mining Activities

Figure 6 shows the location of the manganese ore body within the Eastern Leases. The ore is relatively shallow (typically less than 10 m deep) and is consequently proposed to be

mined by open cut mining methods, as per the existing GEMCO mine. There is a resource of around 38 Mt, although exploration work is currently being undertaken to confirm the size of the resource and some of this resource is currently unclassified. Mine planning is currently underway to develop a suitable mine plan that ensures optimum, environmentally responsible utilisation of the resource. The mine plan will not necessarily include mining the full extent of the ore body, given that there are a number of environmental factors (e.g. cultural heritage and waterways) which may constrain the location of proposed mining activities. A suitable mine plan will be developed as part of the EIS process, taking environmental factors into consideration, along with the outcomes of stakeholder consultation (Section 3). Details of any necessary flood protection measures will be determined as part of mine planning.

Project establishment and development activities will include:

- Construction of a haul road connecting the Eastern Leases to the existing GEMCO mine (Figure 6). The haul road is proposed to be unsealed and would have a total length of approximately 8.5 km. This distance is taken from the edge of the existing GEMCO mineral lease boundary to the edge of the northern ELR and includes a connector haul road which joins to the edge of the southern ELR. The haul road would provide access for personnel, materials and equipment, and enable haulage of ore to the concentrator;
- Construction of any necessary flood protection measures;
- Construction of a mine related infrastructure facilities which include but are not limited to dewatering dams, water fill points, sedimentation dams, crib hut and truck park-up areas;
- Construction of temporary laydown storage areas for equipment and consumables necessary for the development of the haul road and dewatering dams; and
- Development of quarries and overburden emplacement areas.

These activities will be located entirely within the project site, and no construction or development activities are required within the existing GEMCO mine as a result of the project.

The mining method will be the same as the methods employed at the existing GEMCO mine, as described in Section 4.1.2. The project will make use of the equipment fleet (front-end loaders, dozers, graders, 777 haul trucks, excavators and watercarts) from the existing GEMCO mine. Some additional equipment, such as a watercart and grader, may be required for the project.

Additional mine facilities and minor infrastructure will be established on the project site. The mine facilities will comprise parking areas and employee welfare facilities (e.g. demountable

kitchen and ablution units). Establishment of these facilities may involve minor preparatory works using standard techniques and equipment. Water management infrastructure is likely to include water storages and surface water drainage. The exact location of the additional mine facilities and infrastructure will be determined as part of the mine planning process.

There are no declared roads within or in close proximity to the project site. The nearest declared road is the Angurugu – Umbakumba Road located approximately 8 km to the north-west of the project site. There is, however, a public access track traversing the southern ELR (Figure 2). The proponent will undertake consultation with relevant stakeholders and seek necessary approvals prior to any realignment or use of this track for project activities.

Rehabilitation methods will be as per the methods used at the existing GEMCO mine, with the project site being progressively rehabilitated to native open woodland vegetation. Although there may be temporary out of pit overburden emplacement areas during the life of the operation, it is anticipated that the final decommissioned landform will not include out-of-pit overburden emplacement areas, with all overburden ultimately being emplaced in quarry areas and rehabilitated.

4.2.3 Processing and Transport

Figure 8 is a conceptual process flow sheet showing the mining, transport and processing of ore from the project.

Mined ore will be trucked from the project quarries to the existing ROM ore stockpiles located at the existing GEMCO mine industrial area (Figure 5). Ore will be transported via the project haul road, which will connect the Eastern Leases to the existing GEMCO mine. The existing GEMCO haul truck fleet will be used.

Stockpiled ore from the Eastern Leases will typically be blended with ore from the existing GEMCO mine at the ROM stockpile. This will allow a consistent product quality to be achieved in order to meet customer requirements. Blended ore will be loaded into the existing GEMCO concentrator for processing. The operation of the concentrator is described in Section 4.1.3. No upgrades to the existing GEMCO concentrator are proposed as part of the project.

Manganese concentrate will be transported via road train to the existing Milner Bay port facility (Figure 4) for shipping to export and domestic markets. The concentrate may be temporarily stockpiled at the CPS before being transported. No changes to the road transport or port facilities are required as a result of the project. These facilities are described further in Section 4.1.3.

The processing of manganese ore from the Eastern Leases will generate tailings (sands and slimes) and middlings. GEMCO has established tailings and middlings handling and storage methods that are described in the existing GEMCO Mining Management Plan and these methods have been operating since the commencement of operations. This system involves emplacing the tailings in completed quarries, and stockpiling the middlings for reuse as construction material or for ongoing road maintenance. The current system for managing tailings and middlings will be extended to include tailings and middlings from the project.

4.2.4 Project Utilities

All power for project operations will be produced using diesel generators. Diesel will be stored at the existing fuel storage facilities located at the GEMCO mine (Figure 5) and trucked to the Eastern Leases to meet project demands. No upgrades to the diesel storage facilities at the GEMCO mine are required as a result of the project.

Potable water will be trucked to the Eastern Leases from the existing GEMCO water treatment plant. The existing plant has sufficient capacity to meet the requirements for the project.

A communications tower may be required to be constructed within the Eastern Leases in order to allow communications with the existing GEMCO mine.

4.2.5 Mine Water Management

The project will generate pit water comprising groundwater inflows to the pits and rainfall runoff to the entire pit catchment. Groundwater inflows are expected to show some spatial variability and seasonality, with peak rainfall runoff occurring during the wet season. Pit water and water collected from the mine disturbed catchment areas will be primarily used at the project site for dust suppression and other ancillary purposes.

The mine water balance, and strategy for the management of any excess mine water, will be developed as part of the EIS. The strategy will be guided by groundwater modelling results, baseline water quality data, water balance modelling and consultation with key stakeholders and regulators.

Sediment and erosion control measures will be included as part of the project design.

4.2.6 Schedule

Project timing is subject to the receipt of environmental approvals, MLs and other necessary approvals (including a Mining Agreement under ALRA). According to current planning, construction in the northern ELR would commence in early 2017 and the construction phase

would last approximately 18 months. This construction phase would include the development of the northern limb of the haul road. Mining activities in the northern ELR would commence in mid-2018. Construction in the southern ELR is scheduled to commence approximately 4 years later in 2022 and mining would then take place in both ELRs until approximately 2031. Landform restoration and mine decommissioning would then be undertaken in both ELRs.

Although project mining operations will be undertaken over a period of 14 years, from 2018 to 2031, the project mining activities will be undertaken concurrently with the operation of the existing GEMCO mine. The project will consequently only extend the overall life of the existing mine by approximately three to four years. The project will, however, enable GEMCO to maintain the quality of its product over the 14 year life of the project through the blending of project ore with ore from the existing GEMCO mine.

4.2.7 Workforce and Accommodation

The workforce at the existing GEMCO mine is approximately 1,000 people. Although the project's operational workforce is still being determined, the project is not anticipated to give rise to a significant additional workforce (over and above the existing GEMCO mine workforce). This is because the project is a continuation of activities at the GEMCO mine, rather than an expansion, and so a proportion of the existing GEMCO mine workforce would service the project. The project will, however, require a peak construction workforce of approximately 90 persons. Workforce accommodation arrangements for this peak construction workforce are still being determined and will be described in the EIS.

5 BASELINE ENVIRONMENT, POTENTIAL IMPACTS AND EIS APPROACH

5.1 Geology

The geology and mineralogy of Groote Eylandt and the project site are well documented and well understood.

Groote Eylandt was formed on a stable basement of Proterozoic quartzite and Lower Cretaceous quartz sandstone derived from the older Proterozoic quartzite. These basement materials outcrop over the majority of the island.

A blanket of Cretaceous sediments has been deposited over the quartzitic basement in the west of the island. The distribution of Cretaceous sediments is generally consistent over the basement materials on the western plains of the island.

The Cretaceous sediments comprise a sequence of glauconitic marine clays, sands and siltstones. The upper sequence contains the manganese deposits.

The manganese ore is a sedimentary layer, consisting of manganese strata occurring between clay and sand beds. The ore body is essentially stratabound and strataform in character and it represents a continuous horizon up to 11 m thick. The ore body consists of pisolitic and oolitic manganese oxides.

Much of the Cretaceous sediment profile (including some of the manganese deposits) has been extensively modified by a long period of tropical weathering (or laterisation) during the Tertiary period. This has resulted in the development of thick laterite profiles up to 25 m thick. A thin veneer of Quaternary soils are typically present over the laterite horizons. Soils are discussed in Section 5.3.

The geological setting of the project provides the basis for the study of potential impacts of the project on groundwater. The groundwater regime is discussed in Section 5.4.

5.2 Climate

Groote Eylandt has a tropical climate that is dominated by annual wet and dry seasons, typically November to April and May to October, respectively.

Climatic data for Groote Eylandt has been collected since 1970 from the Bureau of Meteorology (BoM) weather stations located in Alyangula township (Station No. 014507) and

at the Groote Eylandt Airport (Station No. 014518) (Figure 2). The station located at the Groote Eylandt Airport is the closest long-term BoM meteorological station to the project site.

The long-term average monthly rainfall recorded at Groote Eylandt Airport from 1999 to 2014 ranges from 1 mm to 345 mm, with an annual average rainfall of 1,367 mm. The average monthly rainfall is typically the highest in March and lowest in August.

The annual average maximum daily temperature recorded from 1999 to 2013 at Groote Eylandt Airport is 32.1°C. The highest monthly average temperature was 34.4°C while the lowest was 15.1°C. These relatively stable temperatures are typical of the tropical Groote Eylandt climate.

An understanding of the meteorology of the project site is relevant to the air quality, noise and water studies that will be undertaken as part of the EIS.

5.3 Soils, Rehabilitation and Closure Planning

5.3.1 Baseline Environment

Groote Eylandt soils have been investigated extensively by GEMCO as part of the existing mining operations. These investigations have confirmed that the monsoonal climate and high degree of weathering have influenced the soils across the island. Previous studies have described the soils as acid red earths comprising hard setting loams and hard setting dark brown sands showing earthy consistency. These soils exhibit low fertility as a result of weathering and leaching processes.

A review of regional mapping shows that the project site comprises up to five land systems (Figure 9). Elevated areas are characterised by rock outcrops and rudosols. Low lying areas are shown to be dominated by tenosols and to a lesser extent kandosols. A small area of hydrosols is shown to be associated with the key drainage features in the west of the project site.

An initial assessment of Acid Sulfate Soils (ASS) has been undertaken based upon the CSIRO Atlas of Australian Acid Sulfate Soils (2013). This ASS mapping is classified against a nationally recognised system that provides a rating for the probability of ASS presence over the mapped area. The ASS mapping classifies the project site as having an 'extremely low probability' of ASS presence. ASS issues are considered unlikely to be relevant to the project. This assessment is supported by extensive mining experience on Groote Eylandt which demonstrates that ASS are not a significant risk.

5.3.2 Potential Impacts

The project will result in localised soil disturbance due to the construction of mine infrastructure and undertaking open cut mining activities. The impacts of soil disturbance can potentially include loss of agricultural land suitability, increased erosion and sediment mobilisation. However, there are no agricultural activities (e.g. grazing or cropping) undertaken on the project site and there would be no loss of agricultural land as a result of the project. The EIS will describe the erosion and sediment control measures required for the project.

5.3.3 Proposed EIS Studies

A soils study is proposed to be undertaken as part of the EIS to 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 address the following key areas:

- An extensive field survey and soil type distribution mapping of the project site undertaken at a 1:50,000 mapping scale, in accordance with relevant guidance (e.g. McKenzie *et al.* (2008) *Guidelines for Surveying Soil and Land Resources* [the Blue Book] [after Rossiter, 2000 and Gunn *et al.*, 1988]);
- A suite of laboratory analysis designed to characterise soil suitability for reuse in rehabilitation activities and provide baseline metal concentrations in the surface soils;
- 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 site. This assessment will inform mine planning, including the scheduling of soil stripping and rehabilitation activities; and
- 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 landform and land use will be guided by stakeholder consultation, experience at the existing GEMCO mine, technical mine planning issues and environmental factors such as the soil properties.

5.3.4 Potential Management Measures

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 been proven effective in maintaining good soil conditions to enable successful mine rehabilitation. The project will adopt these proven GEMCO soil management procedures, and improve upon them where possible.

Erosion and sediment control measures will be adopted where necessary to manage erosion impacts and sediment mobilisation.

5.4 Groundwater Resources

5.4.1 Baseline Environment

The Groote Eylandt groundwater regime has been the subject of extensive investigation and assessment. GEMCO maintains a groundwater monitoring network that comprises numerous monitoring bores and production wells. The groundwater conditions across the existing GEMCO mine and surrounding area have been documented and assessed in numerous groundwater studies, which include a 3D numerical groundwater model.

At the project site, shallow, laterally discontinuous groundwater has been identified within superficial geological deposits. This groundwater may be perched within low permeability laterite deposits. Deeper groundwater is typically present within Cretaceous sediments underlying the ore body, but the distribution of groundwater in these sediments is not uniform.

5.4.2 Potential Impacts

Open cut mining activities that typically have the potential to impact the groundwater regime include the excavation of overburden materials and underlying ore body and the release of polluting substances.

Where groundwater is present, the mining of ore and associated or overlying sediments could potentially result in localised drawdown or depressurisation of groundwater. Groundwater drawdown could potentially impact private groundwater bores, surface waters or groundwater dependent ecosystems in the affected area.

Potential sources of groundwater contamination typically associated with mining activities include seepage from mine water dams and the storage of hydrocarbons. Hydrocarbons will, however, be stored at the existing GEMCO mine in existing facilities, rather than at the

project site. Hydrocarbon storage is therefore not anticipated to be a significant risk for groundwater in the project site. The EIS will assess potential impacts from seepage of mine water dams.

5.4.3 Proposed EIS Studies

A detailed groundwater monitoring program has been established at the project site. Geological and groundwater data from the project site monitoring program will be combined with long-term water level and quality monitoring data collected from the existing GEMCO operations. This information will be used to define the existing groundwater regime within the project site and surrounding areas.

A numerical groundwater model will be developed to simulate the existing conditions of the groundwater regime and provide predictions of the potential impacts of future mining activities. The predictive modelling for the project will identify the scale and extent of mining impacts upon water levels and groundwater users at various stages during mine operations and post closure. The impacts associated with any predicted change in groundwater levels, groundwater quality and mine inflow will be assessed.

5.4.4 Potential Management Measures

An ongoing groundwater monitoring program will be established to monitor the effects of the project on groundwater levels over the life of the project. The monitoring program will be likely to include measurement of groundwater levels and groundwater quality sampling to determine any potential requirement for additional management measures.

5.5 Surface Water Resources

5.5.1 Baseline Environment

The project is located in the upper catchments of the Emerald River, Amagula River and Angurugu River (Figure 7). Rainfall runoff from these areas is carried by overland sheet flow to defined river and drainage channels. The Emerald River and its tributaries drain the majority of the northern ELR and the western area of the southern ELR. The Amagula River drains the eastern area of the southern ELR via two tributary drainages (east and west). A small area of the northern ELR drains north to the Angurugu River. Figure 7 shows the existing drainage features.

5.5.2 Potential Impacts

The key potential impacts of the project that could arise from open cut mining and associated activities include:

- Changes to flood behaviour including flow paths, flood inundation to surrounding areas and flow velocities;
- Geomorphic impacts on watercourses and drainage lines including impacts on channel bed and bank stability;
- Floodplain drainage impacts including ponding of runoff in the post mining landform; and
- Surface water quality impacts arising from:
 - sediment mobilisation and entrainment in rainfall runoff from disturbed areas;
 - pit water; and
 - rainfall runoff from mining areas.

5.5.3 Proposed EIS Studies

A flood impact assessment of the Eastern Leases and the proposed haul road alignment will be undertaken to characterise the existing conditions and identify any construction, operational and post mining surface water impacts. This flood impact assessment will include robust hydrologic and hydraulic modelling of a range of flood events to determine the potential geomorphic and surface water impacts of the project.

A mine water management assessment will be undertaken to assess the performance of the proposed mine water management system. This assessment will include development of strategies to manage mine-affected water, sediment-affected water and natural overland drainage.

Water supplies and demands will be described for the project and a water balance derived. A water balance model will be developed to simulate the performance of the mine water management system over the life of the project and ensure that mine water storages are adequately sized to maximise the re-use of pit water between both the dry and wet seasons, whilst minimising the need for discharge of mine-affected water.

The existing GEMCO surface water quality monitoring program has been extended to capture baseline information on the water quality at the project site and surrounding area. Surface water quality data are being collected on a monthly basis from all relevant watercourses associated with the project including the Emerald, Angurugu and Amagula Rivers.

Water samples are analysed for a broad range of parameters including (but not limited to) metals, major ions, turbidity, salinity, nutrients and hydrocarbons. These data will be compared to relevant water quality criteria to identify potential surface water quality impacts.

5.5.4 Potential Management Measures

Flood modelling will be used to inform mine planning for the project. Mine planning will aim to minimise the project activities undertaken in the immediate vicinity of key drainage features and any associated riparian vegetation.

The outcomes of the surface water assessment and flood modelling will be used to determine the potential for flooding and geomorphic impacts, and any necessary mitigation measures. Mitigation measures may include preventative works and engineered structures to ensure stability of watercourse beds and banks that may be impacted by the project.

The water balance model will provide input to the design and layout of mine water management infrastructure associated with the project. These design measures will ensure that the potential for impacts to surface water quality are minimised.

5.6 Biodiversity

5.6.1 Baseline Environment

A large number of detailed flora and fauna assessments have been undertaken on Groote Eylandt since 1992, and several of these assessments have covered parts of the project site.

Figure 10 shows vegetation communities of Groote Eylandt, with Eucalypt Woodlands being the dominant community across the island. Limited patches of Melaleuca and rainforest vine thickets are also present, with Casuarina forests fringing parts of the southern and eastern extent of the island.

An array of fauna species inhabit the island, notably a large variety of small marsupials, reptiles and migratory birds. Groote Eylandt is of particular conservation significance because of a lack of introduced predator species, such as the Cane Toad.

The upper reaches of two watercourses traverse the project site, namely the Emerald River and the Amagula River, as well as several tributaries and minor drainage lines (Figure 6). The upper reaches of each river are considered to be in good condition. The rivers, drainage lines, and accompanying riparian vegetation are expected to provide important habitat for fauna species.

A number of threatened species, listed under the Commonwealth EPBC Act and/or the Northern Territory *Territory Parks and Wildlife Conservation Act 2000* (TPWC Act), have been recorded from Groote Eylandt. Species that have been recorded from the project site, or are assessed as having a high or moderate potential of occurring, are listed in Table 3.

Table 3
Listed Threatened Species Present within the Project Site,
or with a High or Moderate Potential to Occur

Common Name	Scientific Name	EPBC Act Status	TPWC Act Status
CONFIRMED PRESENT			
Masked Owl (Northern)	<i>Tyto novaehollandiae kimberli</i>	Vulnerable	Vulnerable
Brush-tailed Rabbit-rat	<i>Conilurus penicillatus</i>	Vulnerable	Endangered
Northern Quoll	<i>Dasyurus hallucatus</i>	Endangered	Critically Endangered
Northern Hopping Mouse	<i>Notomys aquilo</i>	Vulnerable	Vulnerable
HIGH			
Yellow-spotted Monitor	<i>Varanus panoptes</i>	-	Vulnerable
Mertens' Water Monitor	<i>Varanus mertensi</i>	-	Vulnerable
MODERATE			
Pale Field Rat	<i>Rattus tunneyi</i>	-	Vulnerable

5.6.2 Potential Impacts

Project activities, such as mining activities or the clearing of vegetation for construction purposes, may cause impacts to terrestrial and aquatic flora and fauna. Impacts due to project activities may include:

- Loss of habitat for threatened species due to the clearing of vegetation;
- Fragmentation of vegetation communities and habitat;
- Spread of weed and pest species;
- Potential for changes to the fire regime, with resultant impacts on flora and fauna;
- Disturbance to aquatic habitat or fish passage;
- Indirect impacts on fauna due to dust, noise, blasting, vibration and lighting; and
- Ground compaction, soil contamination or changes in water flows resulting in potential disturbance to vegetation communities.

5.6.3 Proposed EIS Studies

A comprehensive, two-season flora and fauna survey will be undertaken as part of the EIS. It will assess terrestrial and aquatic flora and fauna, and include targeted searches for threatened fauna species. The survey will aim to:

- Identify and determine the distribution of vegetation within the project site;
- Confirm the presence of threatened flora and fauna species within the project site;
- Determine areas of high value habitat for threatened species found on the project site, and those with a high to moderate likelihood of occurring on the project site; and
- Record the presence of any pest animal or weed species on the project site.

5.6.4 Potential Management Measures

GEMCO has a variety of flora and fauna management and mitigation measures already in place for the existing GEMCO mine and these will be extended to the project. The specific management measures required for the project will be determined based on the results of the EIS flora and fauna assessment. GEMCO's existing management measures relevant to flora and fauna include:

- Management Plans, such as:
 - Threatened Species Management Plan;
 - Pest Animal and Weed Management Plan, including specific management plans for the Cane Toad, quarantine inspection procedures, weed hygiene, and a weed management manual; and
 - Land and Biodiversity Management Plan.
- Clearing procedures to minimise the loss of vegetation and habitat, such as:
 - Controlled felling and clearing techniques; and
 - Conducting pre-clearance surveys for threatened species.
- Rehabilitation Planning Manuals and procedures.

The need for biodiversity offsets will also be considered, depending on the impacts identified during the EIS flora and fauna assessment.

5.7 Air Quality

5.7.1 Baseline Environment

GEMCO currently operates an extensive background air quality monitoring network under the framework of an Air Emissions Management Plan. The monitoring network provides baseline air quality data for several locations in the vicinity of the project site. The measured background dust levels include natural sources of dust, dust emissions from existing anthropogenic sources in the area, including the existing GEMCO mine and bushfires.

Angurugu is the closest township to the project site and is located approximately 6 km to the north-west of the Eastern Leases, at the closest point (Figure 6). Angurugu is located adjacent to the existing GEMCO mine, approximately 1.7 km to the east of the concentrator.

Sensitive receptors that have been identified in the vicinity of the project site include Angurugu township and the Aboriginal outstations of Yedikba and Wurrumenbumanja (Figure 6). Yedikba is located approximately 2.4 km to the west of the southern ELR and Wurrumenbumanja is located approximately 3.4 km to the south of the southern ELR. Yedikba is located adjacent to the southern part of the existing GEMCO mine. There is no history of dust complaints from Yedikba, despite its close proximity to the existing mining operation.

5.7.2 Potential Impacts

The key air emissions generated by open cut mining activities on the project site will be particulate matter (i.e. dust). Particulate matter can be categorised by size and/or by chemical composition. The potential for harmful effects depends on both. A proportion of the particulate matter generated by the project may have an elevated manganese content.

Minor emissions of other substances, such as volatile organic compounds, trace metals (other than manganese) or oxides of nitrogen, carbon or sulphur could be generated by the project, mainly due to mine vehicle exhausts and use of generators. 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, no changes to the existing GEMCO mine are proposed as a result of the project. The project is therefore not expected to change or increase air emissions from the existing GEMCO mine.

The project will give rise to greenhouse gas emissions as a result of electricity and fuel consumption.

5.7.3 Proposed EIS Studies

A comprehensive air quality assessment will be undertaken covering the construction and operational phases of the project. Air emissions generated as a result of 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 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.

Human health and amenity are the most sensitive environmental values and compliance with standards for health and amenity will confirm that no impacts on other less sensitive environmental values (e.g. native flora and fauna) will occur.

An assessment of greenhouse gas emissions will be undertaken in accordance with the *National Greenhouse and Energy Reporting Act 2007*.

5.7.4 Potential Management Measures

The existing GEMCO Air Emissions Management Plan and air quality monitoring network will continue to operate on an ongoing basis to measure the impact of project operations at sensitive receptors.

The requirement for additional air quality management and mitigation measures will be determined by the air quality impact assessment. Potential measures that could be effective in controlling air emissions and avoiding adverse impacts will be considered. Such measures include:

- Watering of ore stockpiles and haul roads to minimise emissions;
- Maintaining roads to minimise the potential for build-up of total suspended particulates;
- Applying and managing speed limits on roads used by mine traffic;
- Scheduling blasting activities when meteorological conditions are suitable;
- Limiting dust generating activities such as topsoil stripping, overburden removal during adverse prevailing wind conditions Progressive rehabilitation of inactive disturbed areas (e.g. the overburden emplacement areas); and
- Application of dust suppressants to dust sources.

GEMCO will comply with all legislative requirements related to greenhouse gas emissions and energy efficiency. In addition, GEMCO has internal energy efficiency targets outlined under various corporate policies. In order to gain internal corporate approval, the project will have to demonstrate an ability to achieve these targets. The project will evaluate all relevant energy efficiency measures to ensure legislative and corporate compliance.

5.8 Noise and Vibration

5.8.1 Baseline Environment

There are no significant anthropogenic sources of noise within the project site. The existing acoustic environment is likely to be dominated by natural sounds from birds and insects. Potentially sensitive noise receptors correspond to the receptors discussed in Section 5.7.1. There is no history of noise complaints associated with the existing GEMCO mining operation.

5.8.2 Potential Impacts

Potential noise sources from the project include mining equipment operating within the proposed quarry areas, equipment operating in the mine industrial area (e.g. generators and light vehicles), and the transport of ore to the GEMCO mine ROM stockpile (i.e. haul truck movements). Potential vibration impacts include blasting activities undertaken as part of the proposed mining operations.

Similar to air quality, as no changes to the existing GEMCO mine site or operations are proposed as a result of the project, a change or increase noise emissions from the existing GEMCO mine is not expected.

5.8.3 Proposed EIS Studies

A comprehensive noise and blasting impact assessment will be undertaken for the project.

Baseline noise monitoring, including attended and unattended noise surveys, will be conducted to determine applicable noise criteria at sensitive receptors.

Noise and vibration levels and sources of noise emissions associated with the project will be assessed, including consideration of traffic movements, 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.

5.8.4 Potential Management Measures

Similar to air quality, control of noise and vibration will be a key consideration in the design of the project, and noise generating activities will be placed away from sensitive residential receptors where possible. The noise and blasting impact assessment will identify any potential requirement for additional mitigation and management measures (e.g. noise attenuation of equipment – mufflers). Routine servicing of all plant, machinery and equipment will continue in order to ensure compliance with relevant noise criteria.

The existing GEMCO complaints handling procedure will be extended to address any noise related 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.

5.9 Visual Amenity

5.9.1 Baseline Environment

The local visual landscape is dominated by natural vegetation and rock outcrops. No significant night-time light sources are currently present on the project site.

5.9.2 Potential Impacts

The potential impacts on visual amenity arising from the project include visual and lighting effects arising from quarries and project infrastructure, including the proposed haul road. The project will not result in any changes to the existing GEMCO mine site that would result in visual amenity impacts.

5.9.3 Proposed EIS Studies

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

5.9.4 Potential Management Measures

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 on the project site, use of visual screening, progressive rehabilitation of disturbed areas, designing infrastructure to blend with the surrounding environment and designing exterior lighting to minimise impacts.

5.10 Traffic and Transport

5.10.1 Baseline Environment

The project site and existing GEMCO mine are considered remote from mainland Australia. The island is accessed daily by air, using chartered or scheduled flights typically from Darwin or Cairns. Bulk materials are delivered weekly to the island by barge from Darwin.

The key public road on the island is the Rowell Highway. The Rowell Highway is a declared secondary road which extends approximately 15 km from Alyangula to the GEMCO mine site. The Rowell Highway comprises a sealed, two lane road. Sections of this road traverse the existing GEMCO mine site (Figure 6). Several minor public roads intersect the Rowell Highway.

At the project site, the southern ELR is traversed by an unsealed public access track (Figure 6). This is a light vehicle 4WD access track used by the Traditional Owners.

Ore from the Eastern Leases will be transported to the existing GEMCO mine via haul trucks using a new, dedicated, private haul road. The proposed haul road crosses Emerald River Road and arrangements for this intersection will be described in the EIS. This haul road does not intersect any other public roads (Figure 6). There are no rail lines on Groote Eylandt.

5.10.2 Potential Impacts

The potential impacts of the project include the effects of project-related traffic movements on transport safety and infrastructure.

As the project is a continuation of mining, rather than an increase or expansion in production, no changes to the existing GEMCO mine are proposed as a result of the project. The project operations are therefore not expected to change or increase operational traffic and transport movements at the GEMCO mine.

The project will result in a temporary incremental increase in baseline traffic and transport movements during the construction phase due to construction materials and workforce movements.

5.10.3 Proposed EIS Studies

A comprehensive traffic impact assessment will be undertaken for the project. In the absence of specific guidelines in the Northern Territory, this assessment is proposed to be

conducted in accordance with the Queensland Department of Transport and Main Road's (2006) *Guidelines for Assessment of Road Impacts of Development*, and any other relevant guidance.

5.10.4 Potential Management Measures

Traffic and transportation management measures will be developed to ensure the safety of local transport users and the public. Potential measures may include:

- Transport of dangerous goods in accordance with the *Australian Dangerous Goods Code* (7th Edition);
- Obtaining all relevant permits regarding scheduling of over dimensional loads;
- Ensuring traffic loads are within the safe working capacity of the Rowell Highway;
- Consultation with the local council and the community regarding changes to traffic and road use as a result of the project;
- Road intersection and lighting configurations; and
- The development of suitable traffic and transport management plans.

5.11 Waste Management

5.11.1 Baseline Environment

GEMCO maintains a Waste Management Plan for the existing GEMCO mining operation. A range of waste management facilities are operated under the GEMCO Waste Management Plan, including:

- An Integrated Waste Management Facility comprising wet, dry and green tip/landfill areas for disposal of non-hazardous municipal waste;
- A northern scrap yard (or laydown yard);
- Waste tyre disposal areas;
- A bioremediation facility; and
- Minor waste storage areas.

These facilities have sufficient capacity to manage additional wastes generated by the project.

5.11.2 Potential Impacts

Wastes from the existing GEMCO mine will continue to be managed in accordance with the requirements of the GEMCO Waste Management Plan.

Waste types generated by the project will be consistent with the current GEMCO waste streams. As the project is a continuation of mining, rather than an increase or expansion in production, no increase in annual waste volumes are expected as a result of the project.

5.11.3 Proposed EIS Studies

An inventory of waste types and quantities generated by the project will be compiled and management strategies for waste materials will be proposed.

5.11.4 Potential Management Measures

Waste management measures outlined in the existing GEMCO Waste Management Plan will be adopted for the project during construction and operations. These measures address the key objectives of waste avoidance and minimisation, waste reuse and recycling, and waste recovery and treatment. Waste disposal will continue to be considered the least preferred option for waste management.

5.12 Hazard and Risk

5.12.1 Baseline Environment

A range of potentially hazardous facilities and activities form part of the existing GEMCO mine, including blasting events in quarries, explosives storage facilities and the transport, handling and storage of dangerous goods and hazardous substances (including wastes). The existing GEMCO mine also interacts with potential external hazards including extreme weather events, bushfires and wildlife.

These facilities and activities are managed under a suite of legislative requirements and corporate guidelines to ensure that community and workforce safety are protected.

5.12.2 Potential Impacts

The development of a number of quarries in the Eastern Leases carries potential hazards and risks that require careful planning and management to prevent significant impacts on community safety and quality of life, occupational health and safety of the workforce, and the environment.

Hazards and risks associated with the project site are expected to be consistent with the current GEMCO mine. Hazards and risks associated with the existing GEMCO mine will continue to be managed in accordance with the requirements of the GEMCO safety management plans and guidelines.

5.12.3 Proposed EIS Studies

A preliminary hazard analysis will be undertaken for the project and management strategies for significant risks will be proposed.

5.12.4 Potential Management Measures

Hazard and risk management measures outlined in the existing GEMCO safety management plans and guidelines will be adopted for the project. These measures are designed to ensure that the project will not result in significant impacts to community safety and quality of life, occupational health and safety of the workforce, and the environment.

5.13 Cultural Heritage

5.13.1 Overview

Cultural heritage is considered in terms of:

- Places/objects of heritage significance under the Heritage Act. Heritage places/objects may be of Indigenous or non-Indigenous significance.
- Sacred sites under the Aboriginal Sacred Sites Act. Sacred sites are places in the landscape that have a special significance under Aboriginal tradition. Sacred sites may or may not include signs of human modification.

Further detail on this legislation relevant to cultural heritage is provided in Section 2.2.

5.13.2 Heritage Act

There have been no previous archaeological surveys of the project site and consequently the location of any heritage places/objects is not known at this time. An archaeological survey of the project site will be undertaken as part of the EIS, and this will endeavour to locate and describe any heritage places/objects found within the project site. The Traditional Owners of the project site will be provided with the opportunity to participate in the survey.

The archaeological study will also identify any necessary mitigation measures in relation to places/objects of heritage significance. Required mitigation will depend on the nature of any

heritage places/objects that are found, but may include salvage or further recording of the sites. If these works are required, they would be undertaken prior to the sites being disturbed and in accordance with a works approval under the Heritage Act.

5.13.3 Aboriginal Sacred Sites Act

A number of anthropological surveys have been undertaken for the Eastern Leases, and these have included consultation with Traditional Owners in relation to sacred sites. GEMCO is currently undertaking a process with the ALC and Traditional Owners to consolidate the available information and determine any additional work required to fully document the sacred sites within the project site. GEMCO ultimately intends obtaining an Authority Certificate under the Aboriginal Sacred Sites Act for the project.

5.14 Socio-Economics

5.14.1 Baseline Environment

Groote Eylandt is home to a significant Indigenous population and a small non-Indigenous population. The total population of Groote Eylandt in 2011 was approximately 2,545^[1] of which approximately 67% are Aboriginal (ABS 2011).

The Traditional Owners of Groote Eylandt are an amalgamation of two cultures, the *Warnindilyakwa*, and the *Nunggubuyu* (ALC 2014). Both cultures also speak, as their first language, Anindilyakwa. The Groote Eylandt Aboriginal Traditional Owners are referred to as the Anindilyakwa. The ALC is the principal voice of the Aboriginal community on Groote Eylandt.

There are three main urban centres on Groote Eylandt, namely the mining township of Alyangula, and the two Aboriginal settlements of Angurugu and Umbakumba (Figure 1). There is also a scattering of Outstations (small rural Aboriginal settlements) across Groote Eylandt.

GEMCO has a special purposes lease for the operation of the Alyangula township. Only GEMCO employees and their families, and service providers such as police and teachers, reside in the town. GEMCO has responsibility for the provision of services and facilities to the Alyangula community. The provision of services and infrastructure to other communities and settlements on Groote Eylandt (i.e. beyond GEMCO's special purpose lease) is the responsibility of the relevant government authority or the East Arnhem Shire Council. This

^[1] It should be noted that ABS data may underestimate the population of remote Indigenous communities.

includes the provision of services to the Aboriginal communities of Angurugu and Umbakumba.

GEMCO is the largest employer on Groote Eylandt, and generates substantial revenue not only for the township of Alyangula and the Traditional Owners on Groote Eylandt, but also for the Northern Territory economy.

In 2008, the Groote Eylandt and Bickerton Island Regional Partnership Agreement (RPA) (DSS 2013) was signed by the ALC, the Australian Government and the NT Government. The RPA was designed to address locally identified priorities and improve conditions for Indigenous people living in the Anindilyakwa region. In 2009 GEMCO and the East Arnhem Shire Council also became signatories to the RPA. The RPA remains the primary vehicle for GEMCO's community development and investment commitments on Groote Eylandt.

5.14.2 Potential Impacts

The project will extend the life of the existing GEMCO mining operation by a number of years and will also provide GEMCO with the flexibility to provide a product quality that meets the requirements of its customers. The following socio-economic benefits arise from the existing GEMCO mining operation and the project has the potential to expand/extend these socio-economic benefits:

- Provision of direct employment opportunities to the local community including Traditional Owners;
- Royalties for distribution to the ALC and Traditional Owner groups;
- Royalties, government taxes and business opportunities which will significantly contribute to the regional economy of the Northern Territory;
- Education, training and apprenticeship opportunities for local residents, including Traditional Owners;
- Provision of social infrastructure and services, specifically health services, to the communities of Groote Eylandt by GEMCO;
- Procurement opportunities for businesses on Groote Eylandt and in particular Indigenous enterprises; and
- Coordination of community events by GEMCO.

5.14.3 Proposed EIS Studies

A Social Impact Assessment (SIA) will be undertaken for the project and an Economic and Social Impact Management Plan will be prepared. The SIA will provide a detailed description of the social baseline of Groote Eylandt and any key or emerging issues of interest and/or concern. Potential social impacts will be identified and suitable management measures

proposed. Management commitments will be documented in the Economic and Social Impact Management Plan. The SIA will also include an assessment of the potential economic impacts of the project.

5.14.4 Potential Management Measures

The SIA will identify any mitigation and management measures necessary to address any adverse socio-economic impacts, and measures to maximise the distribution of positive benefits. A range of potential measures will be considered to minimise/manage potential adverse impacts. Measures may include:

- Design and implementation of targeted communication and consultation strategies;
- Community investment in social infrastructure and services; and
- Training and education campaigns.

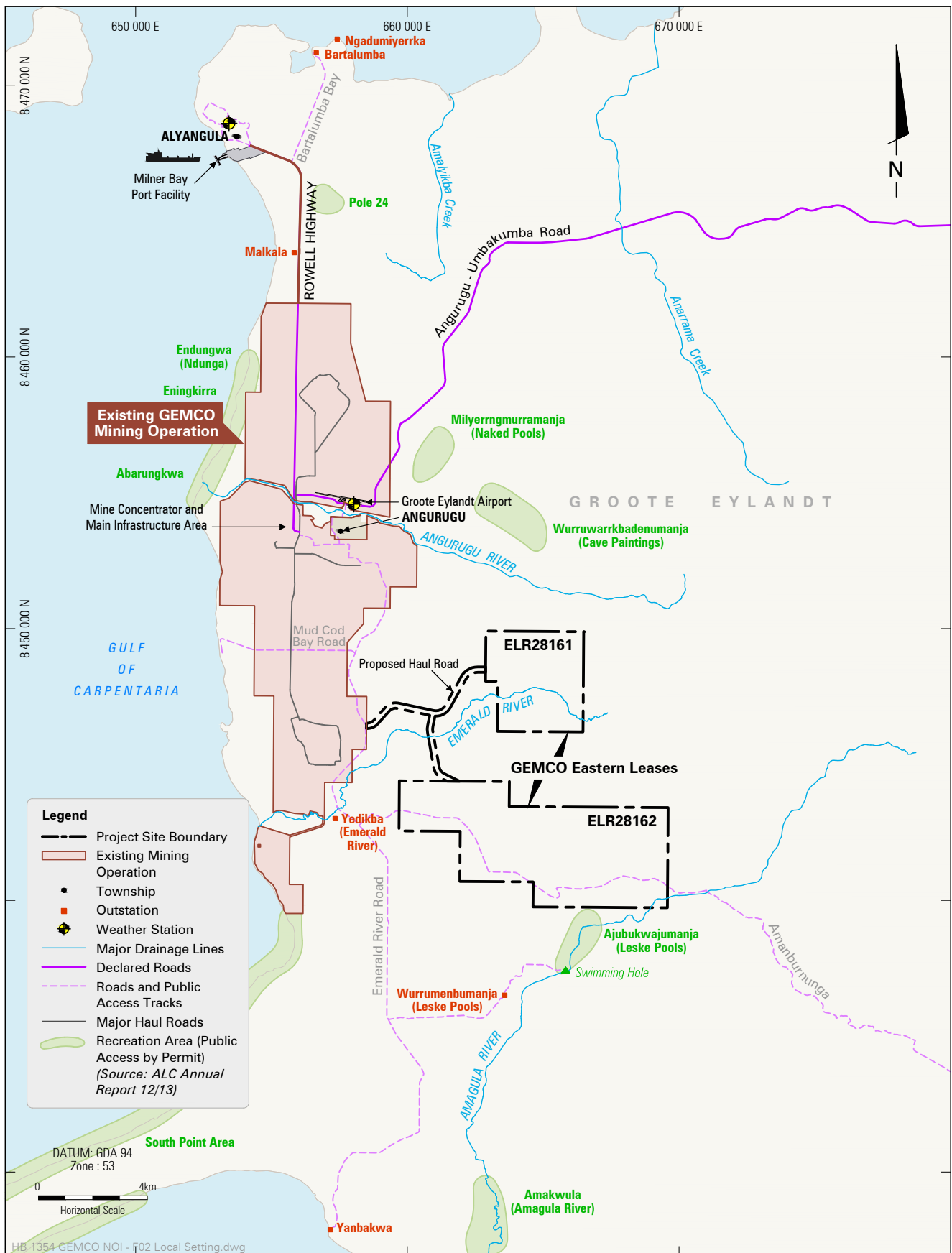
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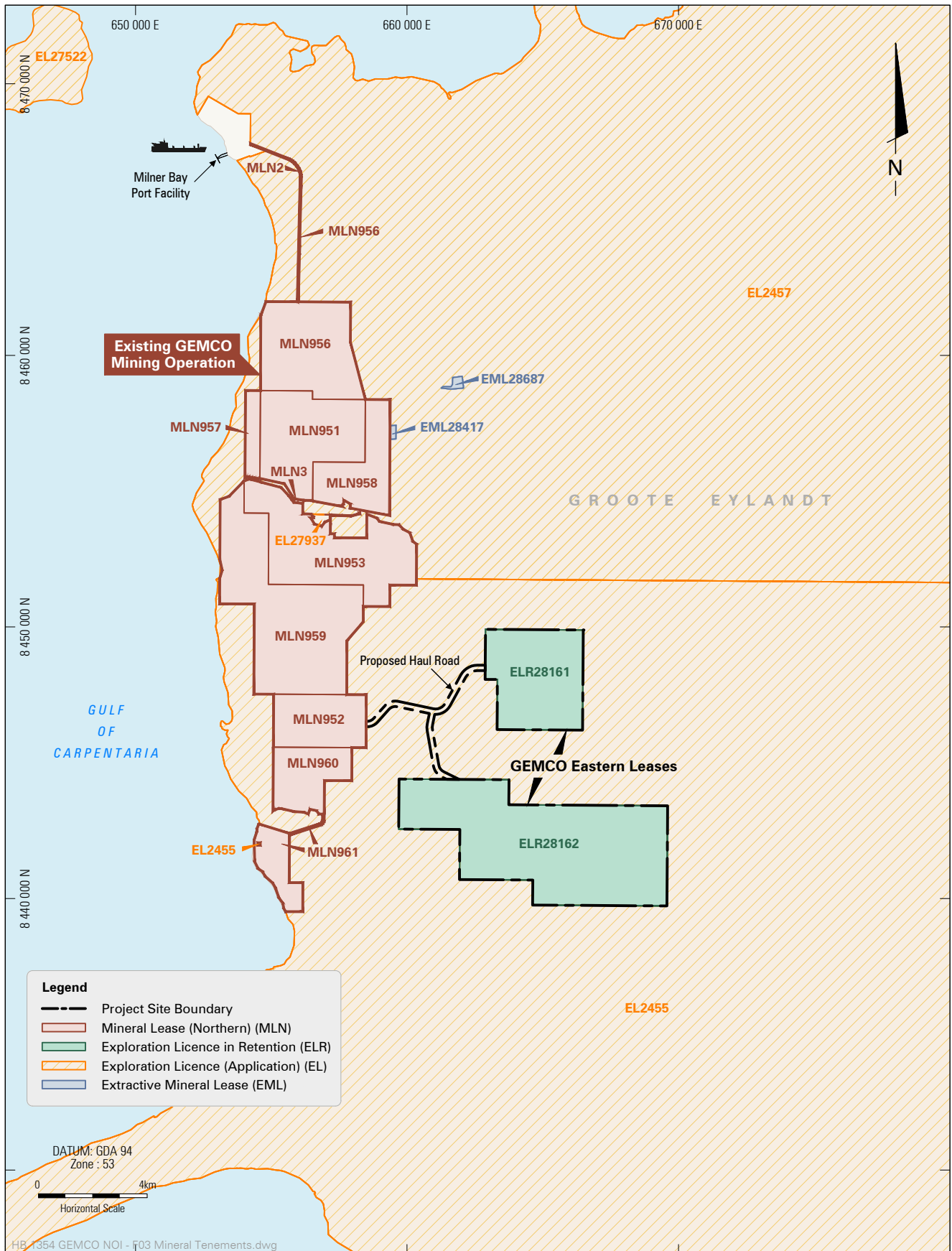
FIGURES



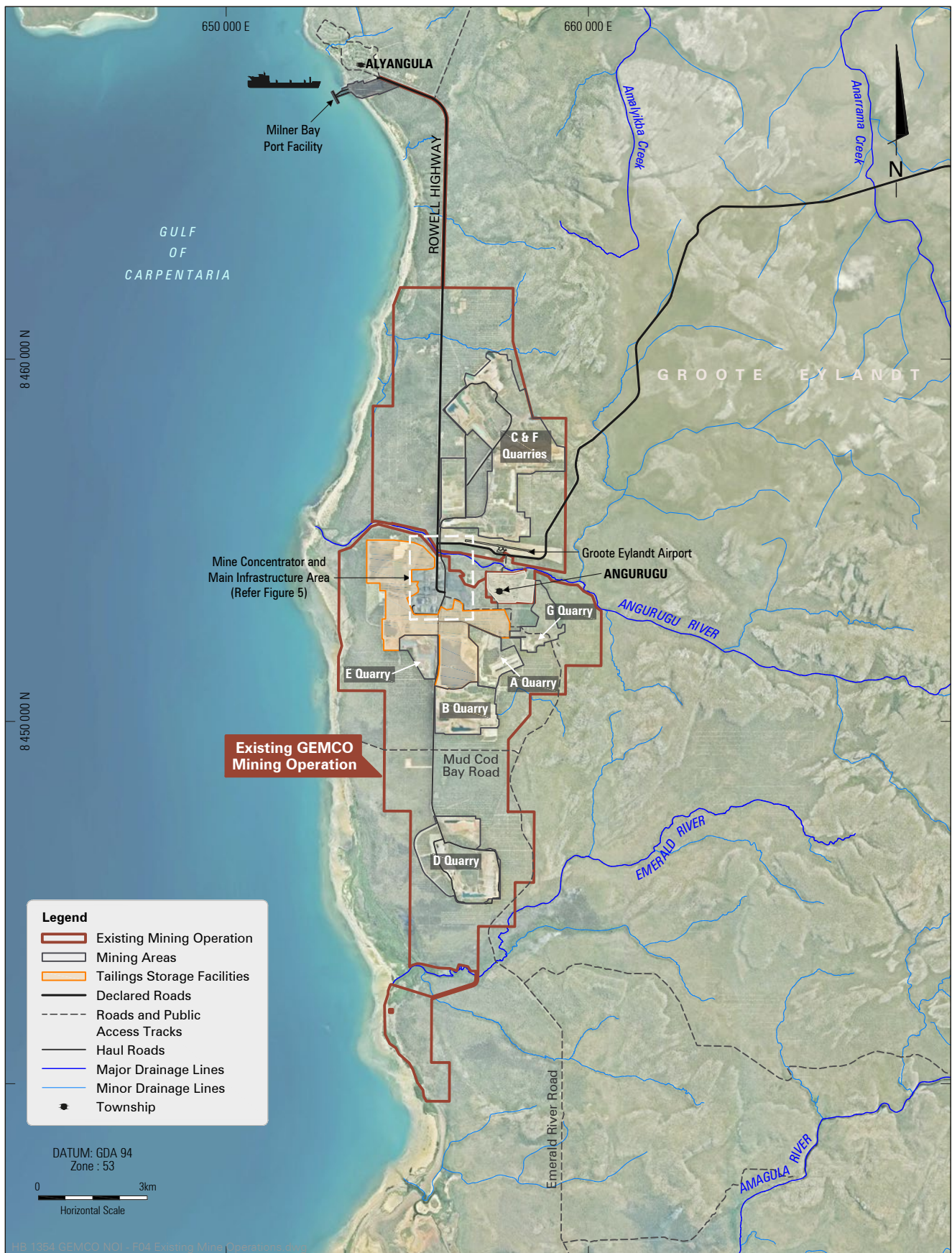
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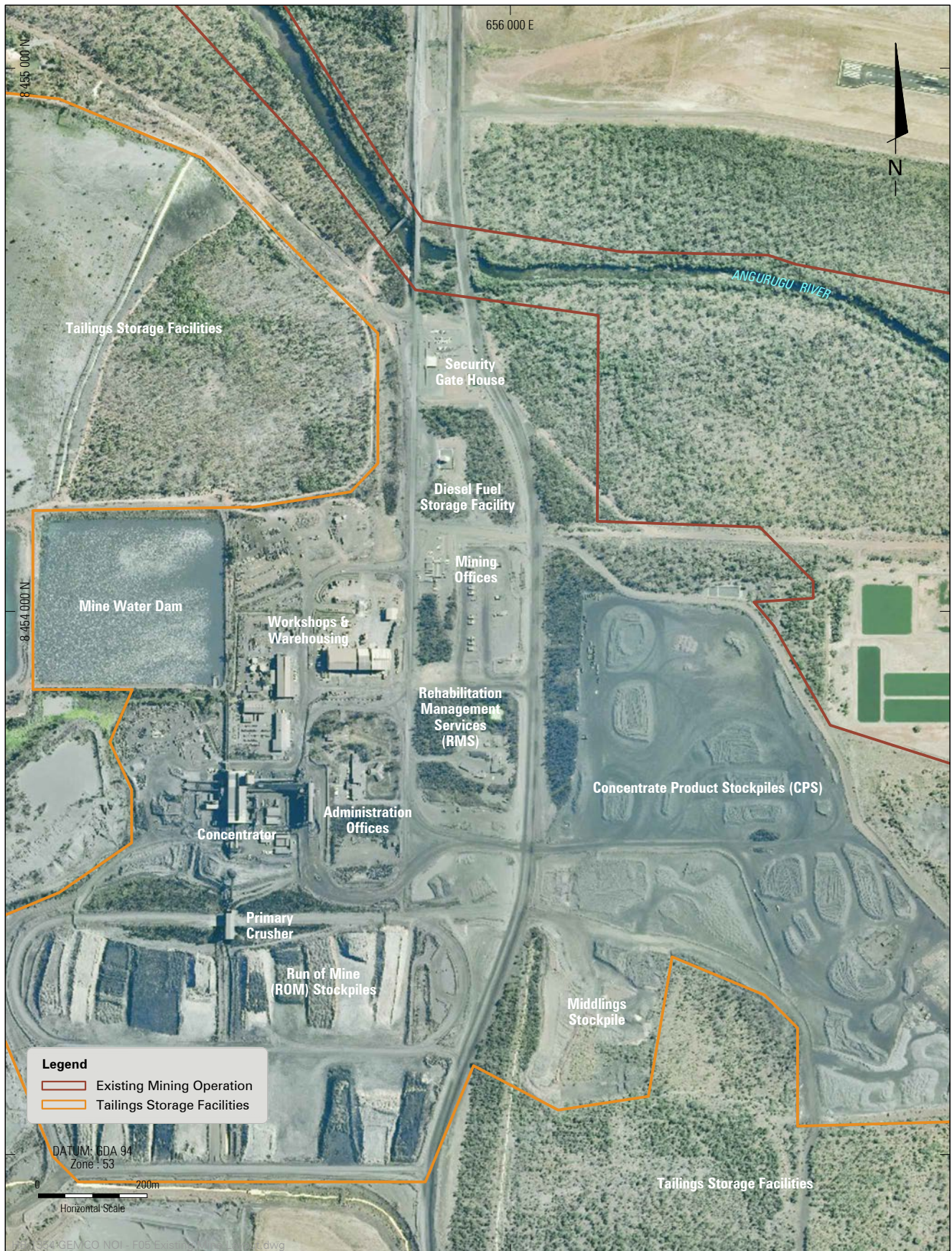
GEMCO EASTERN LEASES PROJECT



GEMCO EASTERN LEASES PROJECT



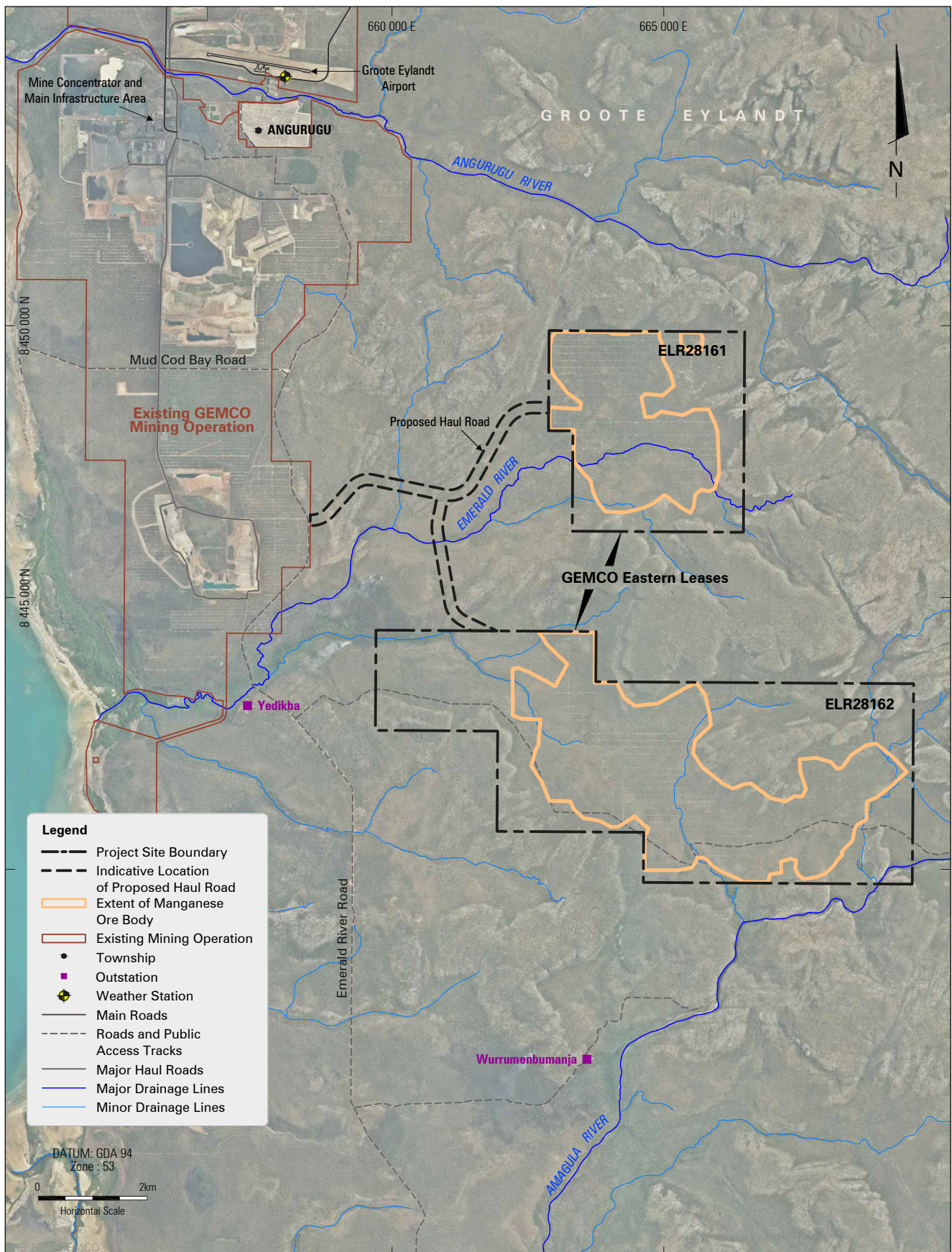
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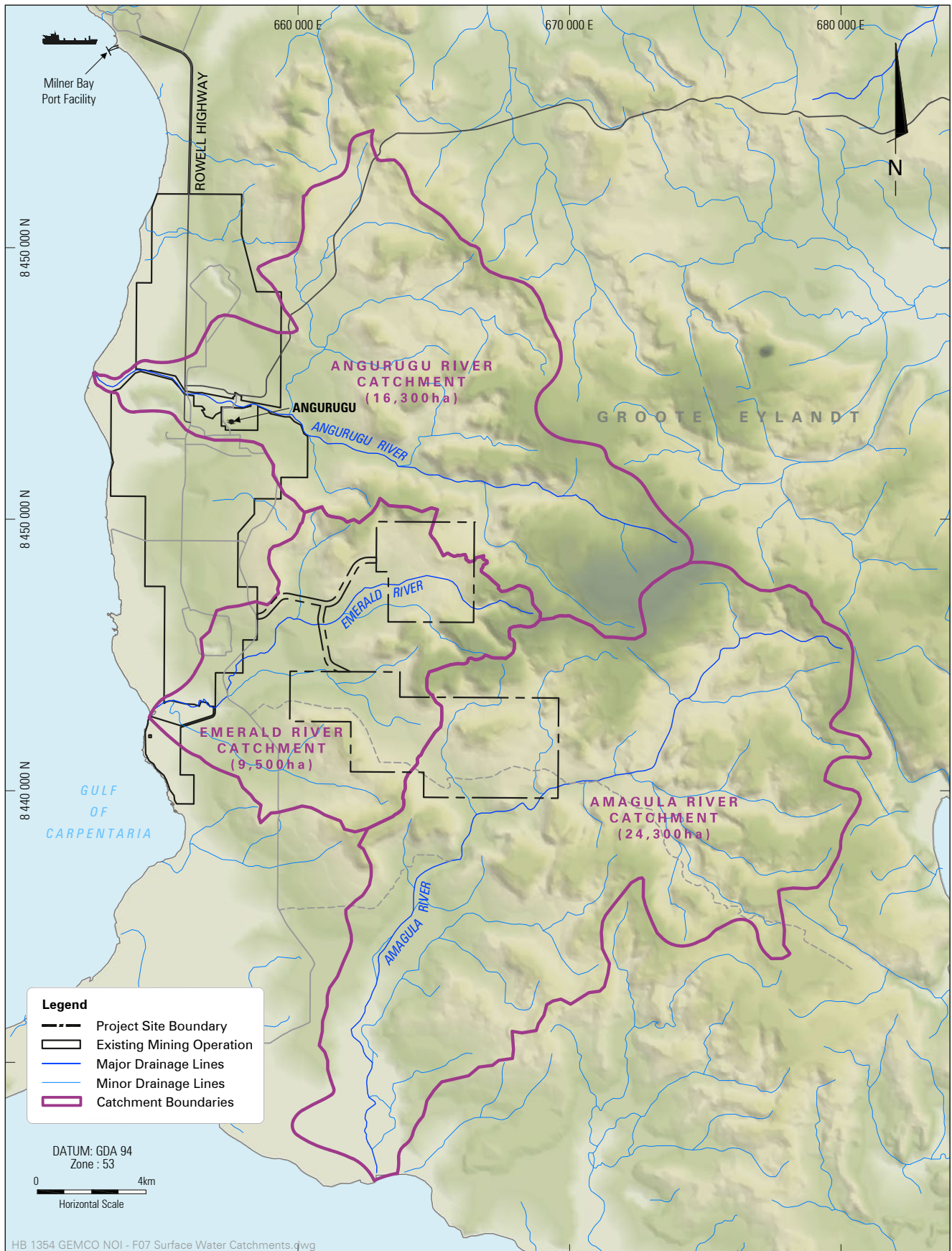
GEMCO EASTERN LEASES PROJECT

Existing GEMCO Mine Concentrator
and Main Infrastructure Area

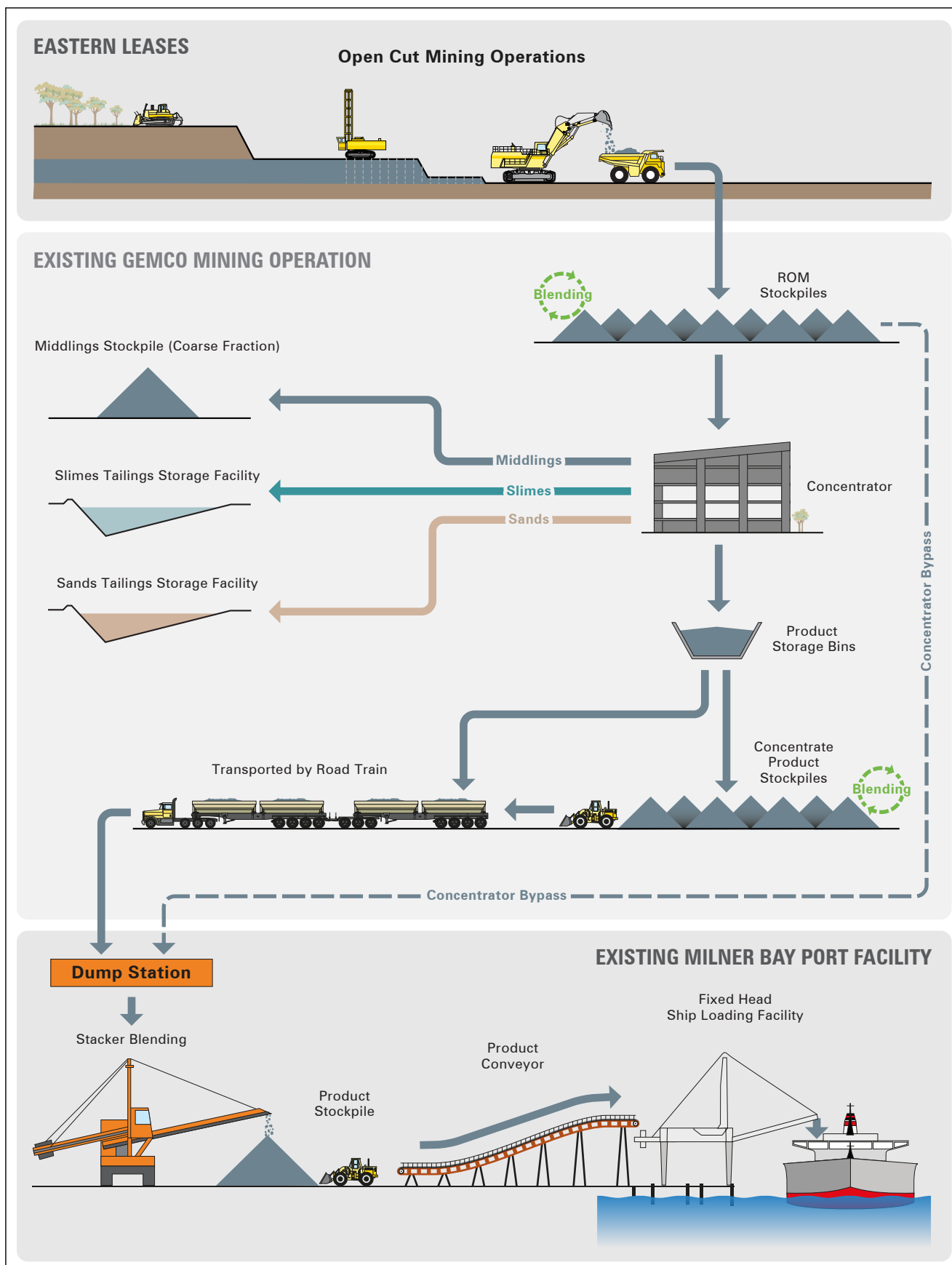
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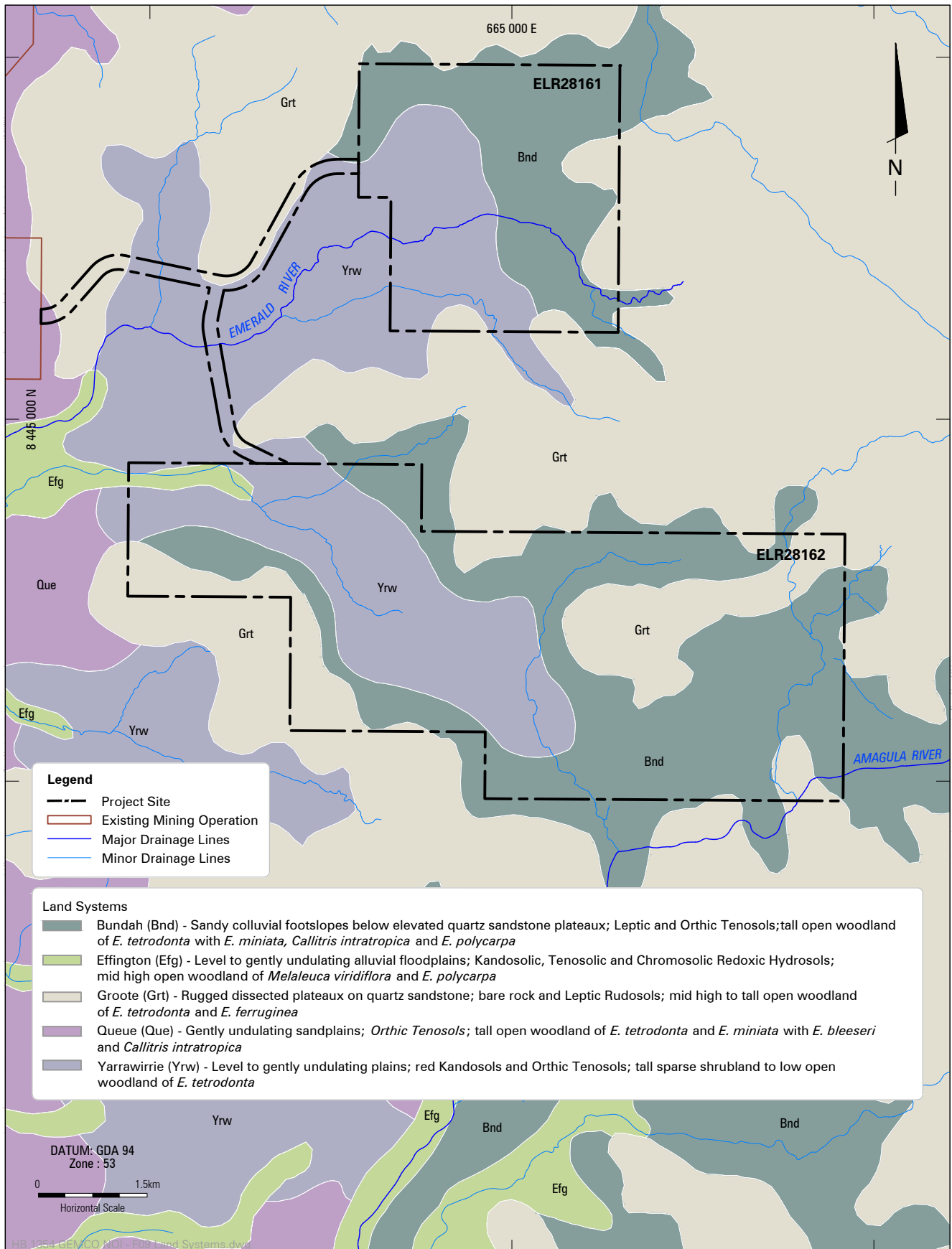
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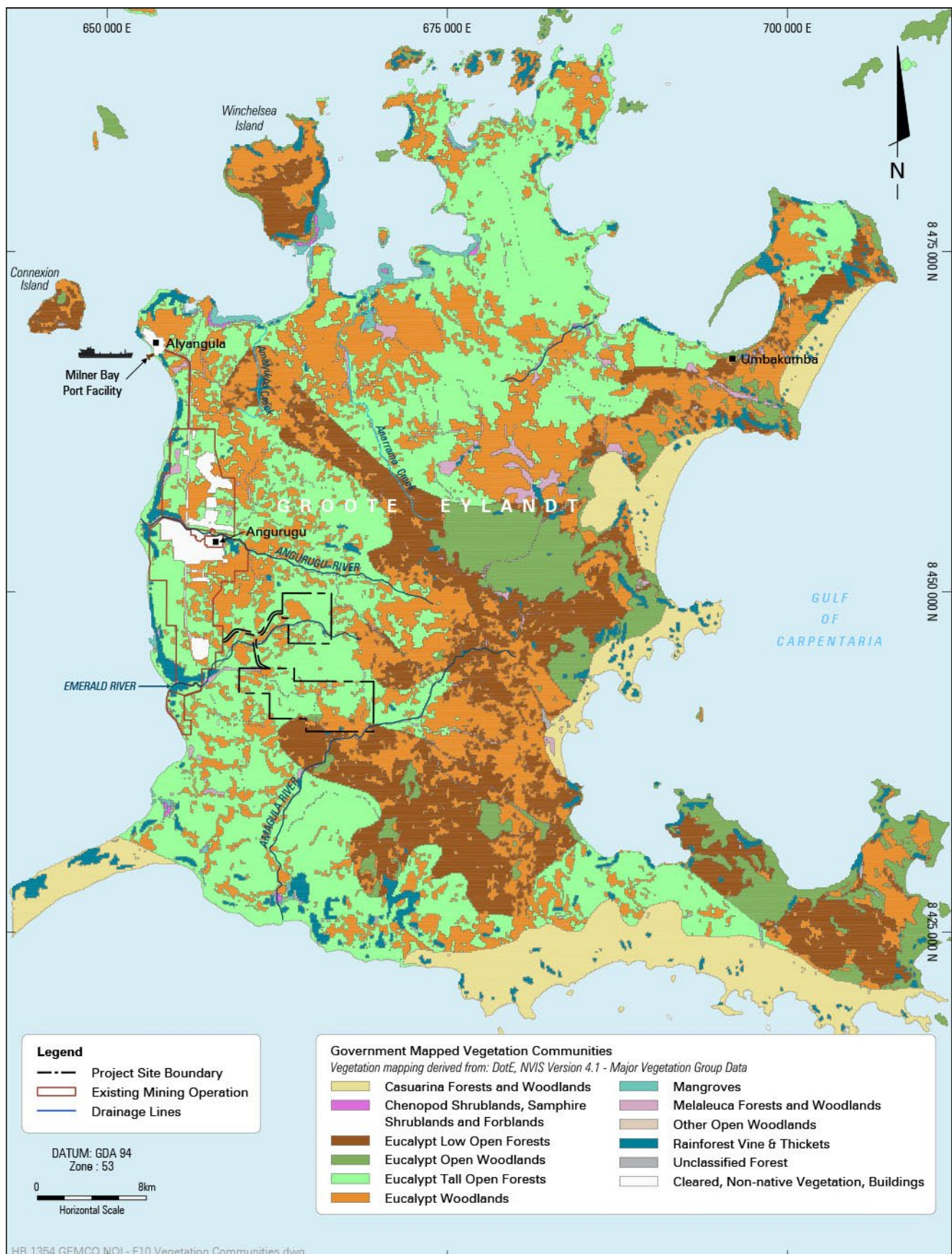
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GEMCO EASTERN LEASES PROJECT



GEMCO EASTERN LEASES PROJECT



GEMCO EASTERN LEASES PROJECT
Government Mapped
Vegetation Communities of Groote Eylandt

FIGURE 10

APPENDIX A

Tenements

Table A: Tenements

Tenement Number	Status	Application Date	Grant Date	Expiry Date	Holder
EL2455	Application	1/02/1980	-	-	Groote Eylandt Mining Company Proprietary Limited
EL2457	Application	1/02/1980	-	-	
ELR28161	Granted	8/06/2010	17/11/2010	16/11/2015	
ELR28162	Granted	8/06/2010	25/11/2010	24/11/2015	
MLN2	Granted	13/09/1982	30/09/1985	29/09/2031	
MLN3	Granted	13/09/1982	20/12/1984	24/07/2027	
MLN951	Granted	31/10/1963	21/05/1965	20/07/2031	
MLN952	Granted	31/10/1963	21/05/1965	20/07/2031	
MLN953	Granted	31/10/1963	21/05/1965	20/07/2031	
MLN956	Granted	29/08/1969	8/04/1974	29/09/2031	
MLN957	Granted	29/08/1969	8/04/1974	29/09/2031	
MLN958	Granted	29/08/1969	8/04/1974	29/09/2031	
MLN959	Granted	29/08/1969	8/04/1974	29/09/2031	
MLN960	Granted	29/08/1969	8/04/1974	29/09/2031	
MLN961	Granted	29/08/1969	8/04/1974	29/09/2031	
EL27937	Application	10/02/2010	-	-	Reflective Minerals Pty Ltd (subsidiary of Northern Manganese Pty Ltd)
EL27522	Application	31/07/2009	-	-	
EML28687	Granted	-	16/11/2011	15/11/2021	Gebie Civil and Construction Pty Ltd
EML28417	Granted	-	4/09/2012	3/09/2022	