QPM ENERGY PROJECT

Environmental Authority Application – Environmental Assessment Report

Prepared for Queensland Pacific Metals Energy

October 2022

QUEENSLAND PACIFIC METALS

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QPM Energy Project

Environmental Authority Application

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Queensland Pacific Metals

E210671 RP1

October 2022

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1	20 September 2022	Susan Lodge	James Wearne	Final Draft for QPM review
2	11 October 2022	Susan Lodge	Anna McRae	Final

Approved by

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11 October 2022

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Abbreviations

Table 1 Abbreviations

Abbreviation	Term
AHD	Australian Height Datum
AS	Australian Standard
ASS	Acid Sulfate Soil
ASRIS	Australian Soil Resource Information System
ATP	Authority to Prospect
BOM	Bureau of Meteorology
CEMP	Construction Environment Management Plan
CHMP	Cultural Heritage Management Plan
CLR	Contaminated Land Register
CSM	Conceptual Site Model
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DES	Department of Environment and Science (Queensland)
DIDO	drive in / drive out
DoR	Department of Resources (Queensland)
EA	Environmental Authority
EAR	Environmental Assessment Report
EMM	EMM Consulting Limited
EMR	Environmental Management Register
EO Act	*Environmental Offsets Act 2014* (Queensland)
EP Act	*Environmental Protection Act 1994* (Queensland)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPC	Exploration Permit - Coal
EPP	Environmental Protection Policy
EPP (Air)	Environmental Protection (Air) Policy 2019
EPP (Noise)	Environmental Protection (Noise) Policy 2019
EP Reg	Environmental Protection Regulation 2019
ERA	Environmentally Relevant Activity
FEED	Front End Engineering and Design
FIFO	fly in/fly out
GCF	Gas compression facility

Table 1 Abbreviations

Abbreviation	Term
GHG	Greenhouse gas
ha	hectare
HAZOP	Hazard and Operability Study
HDD	Horizontal directional drilling
Heritage Act	*Queensland Heritage Act 1992*
ILUA	Indigenous Land Use Agreement
kPag	Kilopascals gauge
km	kilometres
LGA	Local Government Area
m	metres
mm	millimetres
MDL	Mineral Development Licence
ML	Mining Lease
MNES	Matters of National Environmental Significance
MPa	megapascals
MSES	Matters of State Environmental Significance
NC Act	*Nature Conservation Act 1992* (Queensland)
NO_2	Nitrogen Dioxide
NQGP	North Queensland Gas Pipeline
P&G Act	*Petroleum and Gas (Production and Safety) Act 2004*
PCA	Potential Commercial Area
PFL	Petroleum Facility Licence
PJ/a	Petajoule per annum
PL	Petroleum Lease
PLC	Programmable Logic Controller
Planning Reg	Planning Regulation 2017 (Queensland)
$PM_{2.5}$	Particulate Matter 2.5
PM_{10}	Particulate Matter 10
ppm	parts per million
PPL	Petroleum Pipeline Licence
Psig	Pounds per square inch gauge

Table 1 Abbreviations

Abbreviation	Term
QEOP	Queensland Environmental Offsets Policy
QPM Energy	Queensland Pacific Metals Energy Pty Ltd
RE	Regional Ecosystem
RNTBC	Registered Native Title Bodies Corporate
ROW	Right of Way
SCADA	Supervisory Control and Data Acquisition
SDA	State Development Area
SDPWO Act	*State Development and Public Works Organisation Act 1971* (Queensland)
SMC	Streamlined model conditions
SMS	Safety Management Study
SO_2	Sulfur Dioxide
SRI	Significant Residual Impact
S-P-R	source-pathway-receptor
TECH Project	Townsville Energy Chemical Hub Project
TEG	Tri-Ethylene Glycol
TJ/d	Terajoule per day
the Project	QPM Energy Project
TO	Traditional Owner
TSP	Total suspended particles
UXO	Unexploded Ordnance
VM Act	*Vegetation Management Act 1999*
VOC	Volatile Organic Compounds

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1 Introduction

1.1 Purpose

This Environmental Assessment Report (EAR) has been prepared by EMM Consulting Limited (EMM) on behalf of Queensland Pacific Metals (QPM) Energy in support for an application for a new *Environmental Authority* (EA) for a resource activity, as part of the proposed QPM Energy Project (the Project).

The purpose of this document is to provide sufficient detail to support an application for a site-specific EA.

1.2 Document structure

This EAR is the primary reporting within the combined application package, which includes the following technical reports:

- Appendix A – Air Quality;
- Appendix B – Noise;
- Appendix C – Matters of State Environmental Significance (MSES);
- Appendix D – Surface Water;
- Appendix E – Groundwater;
- Appendix F – Soils;
- Appendix G – Contamination and Waste;
- Appendix H – Traffic; and
- Appendix I – Hazard and Risk.

1.3 The Project

The Project involves the design, construction, and operation of a gas compression facility (GCF) and a high-pressure pipeline that links the proposed GCF to the nearby existing and operational North Queensland Gas Pipeline (NQGP).

The Project is proposed 43 kilometres (km) north of Moranbah (refer Figure 1.1).

The Project proposes to collect waste coal mine gas at the proposed GCF via waste gathering lines from existing adjacent mines. At the GCF, waste coal mine gas will be dehydrated and filtered, with the remaining clean gas then compressed and transported via high-pressure pipeline to the existing and operational NQGP. The NQGP will then transport the compressed gas north to Townsville, where it will be depressurised and distributed, by a third party, to industrial users, including QPM's Townsville Energy Chemicals Hub (TECH) Project.

Access to the GCF will be provided via the construction of a 2.8 km all-weather access road from Red Hill Road.

Ancillary activities will also occur within the defined Project footprint.

The geographic boundary of the Project (Project footprint) is described in Section 3.1 and illustrated in Figure 3.2. Any activities beyond these defined boundaries do not form part of this application.

1.4 Approvals approach

QPM Energy is seeking approval for a new EA for a resource activity to support the delivery of the QPM Energy Project. The application is for a site-specific EA. Compliance with Section 125 of the *Environmental Protection Act 1994* (EP Act) is provided in Section 4.1.1.

The related Petroleum Facility Licence (PFL) and Petroleum Pipeline Licence (PPL) applications under EP Act have been submitted to the Department of Resources (DoR). The acceptance and assessment of these applications is pending.

A referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) has been made to the Minister for the Department of Climate Change, Energy, the Environment and Water (DCCEEW)) for consideration on 10 August 2022. The assessment of the referral is pending.

Existing and proposed upstream, mid-stream and downstream infrastructure operated by third parties do not form part of this application.

This application relates only to the proposed high-pressure pipeline, GCF and incidental infrastructure.

QPM's TECH Project is being assessed separately by a Material Change of Use application.

1.5 The applicant

Queensland Pacific Metals (QPM) is an Australian company listed on the Australian Securities Exchange (ASX:QPM). The head office is in Brisbane, Queensland and the company also has an office in Townsville, North Queensland.

QPM shareholders include global battery manufacturing leader LG Energy Solution and major Korean conglomerate POSCO. QPM has secured binding offtake agreements for the sale of nickel and cobalt with LG Energy Solutions and POSCO.

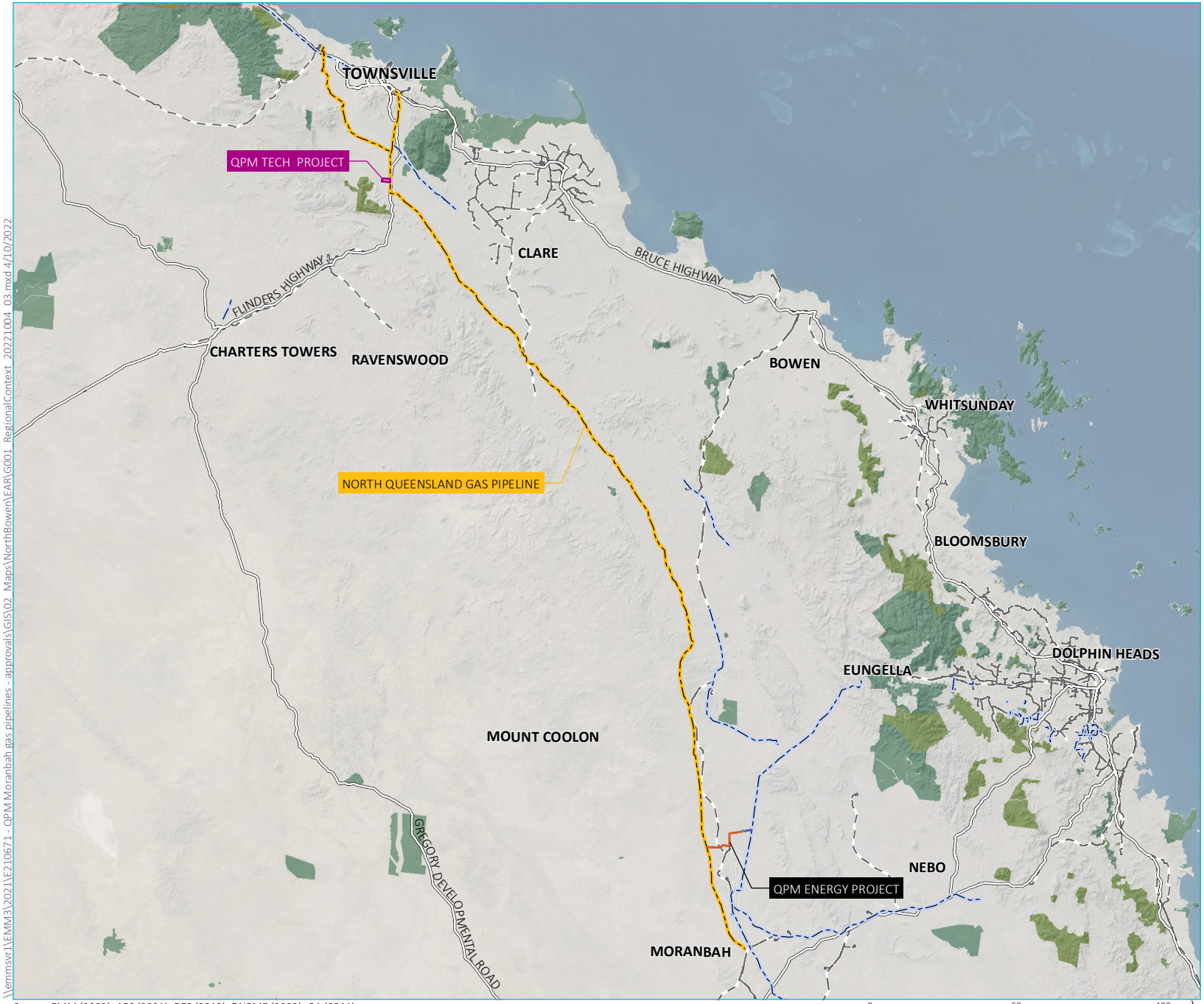
QPM is presently delivering approvals for the TECH Project which is intended to become the leading supplier of high-grade, ethically derived advanced battery materials. Once operational, the TECH Project will be a carbon negative, sustainable, clean and green production facility that will ultimately position QPM as an attractive supplier of key chemicals to the electric vehicle and energy storage industries.

QPM's Energy Project will support projects such as the TECH Project by utilising waste coal mine gas from the Bowen Basin which would be either flared or directly emitted to the atmosphere as a fugitive emission of methane which has a Global Warming Potential factor of 28 times that of carbon dioxide over a 100 year lifetime and 84 times over the first 20 years[1]. Dual benefits of capturing and consuming gas that would otherwise contribute significantly to Global Warming and manufacturing battery grade minerals to support the ongoing electrification of the automobile industry.

In developing the Project and gas supply business, QPM Energy has been established as a wholly owned but stand alone and independently managed entity.

QPM Energy is the applicant and registered operator for the purposes of the application. QPM Energy's suitable operator reference number is 100294011.

[1] Table 8.7 *from the Working Group I's contribution to the IPCC's Fifth Assessment Report (2013)*



KEY

- Gas compression facility
- Pipeline
- Access road
- QPM TECH Project
- North Queensland Gas Pipeline
- Water pipeline
- Rail line
- Major road
- National park/nature reserve
- State forest

Source: EMM (2022); ABS (2021); DES (2019); DNRME (2022); GA (2011)

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Regional context

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Figure 1.1

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2 Site and local setting

2.1 Regional context

The Project is proposed 43 km north of Moranbah (refer Figure 1.1), a coal mining town and locality within the Isaac Regional Council local government area (LGA).

The region is heavily disturbed with extensive mining (both open cut and underground) and grazing activities throughout.

2.2 Local context

The following provides a description of the locality surrounding the Project:

- rural land used for cattle grazing;
- established mining and heavy rail precinct, with Goonyella Riverside Mine (BMA) and North Goonyella Mine (Peabody) and other mines nearby mining high grade metallurgical coal for export markets. The mining region is noted for high gas content coal seams which require pre-mine gas drainage to permit safe operations;
- predominantly flat terrain with undulations, some cracking clays leading to gilgai (ie mounds and depressions formed on shrink-swell cracking clay soils);
- located at the top of two sub-catchments – Isaac River (East) into the Fitzroy Catchment and Suttor River (West) into the Burdekin Catchment;
- substantial areas cleared with some remnant vegetation and regrowth identified. Native grass pastures have been supplemented with significant Buffel Grass intrusion; and
- location of one homestead located approximately 7 km to the west of the GCF and represents the closest inhabited location.

2.3 Climate

The climate of the Project footprint is sub-tropical with generally hot, moist summers and warm, dry winters.

A review of the Bureau of Meteorology (BoM) climate database was undertaken, and information was sourced from two representative weather stations proximal to the site, Moranbah Airport (BoM: 0434035) and Moranbah Water Treatment Plant (BoM: 034038), both of which are located approximately 45 km south of the Project footprint.

Mean monthly maximum temperatures (BoM 034038) range from 24°C in June and July to 34°C in December, and mean monthly minimum temperatures range from 10°C in July to 22°C in January.

Rainfall is seasonally distributed with a distinct wet season occurring during the summer months of December through February and an extended dry season occurring during the months of April through September. Monthly and annual rainfall data sourced from BoM 0434035 indicates that the region receives a range in annual rainfall totals of between 280 and 833 millimetres (mm) per year.

2.4 Tenure interests intersected by the Project

Table 2.1 lists the property interests intersected by the Project. The land extent of property interests proposed to be impacted is illustrated in Figure 2.1.

Table 2.1 Property interests intersected by the Project

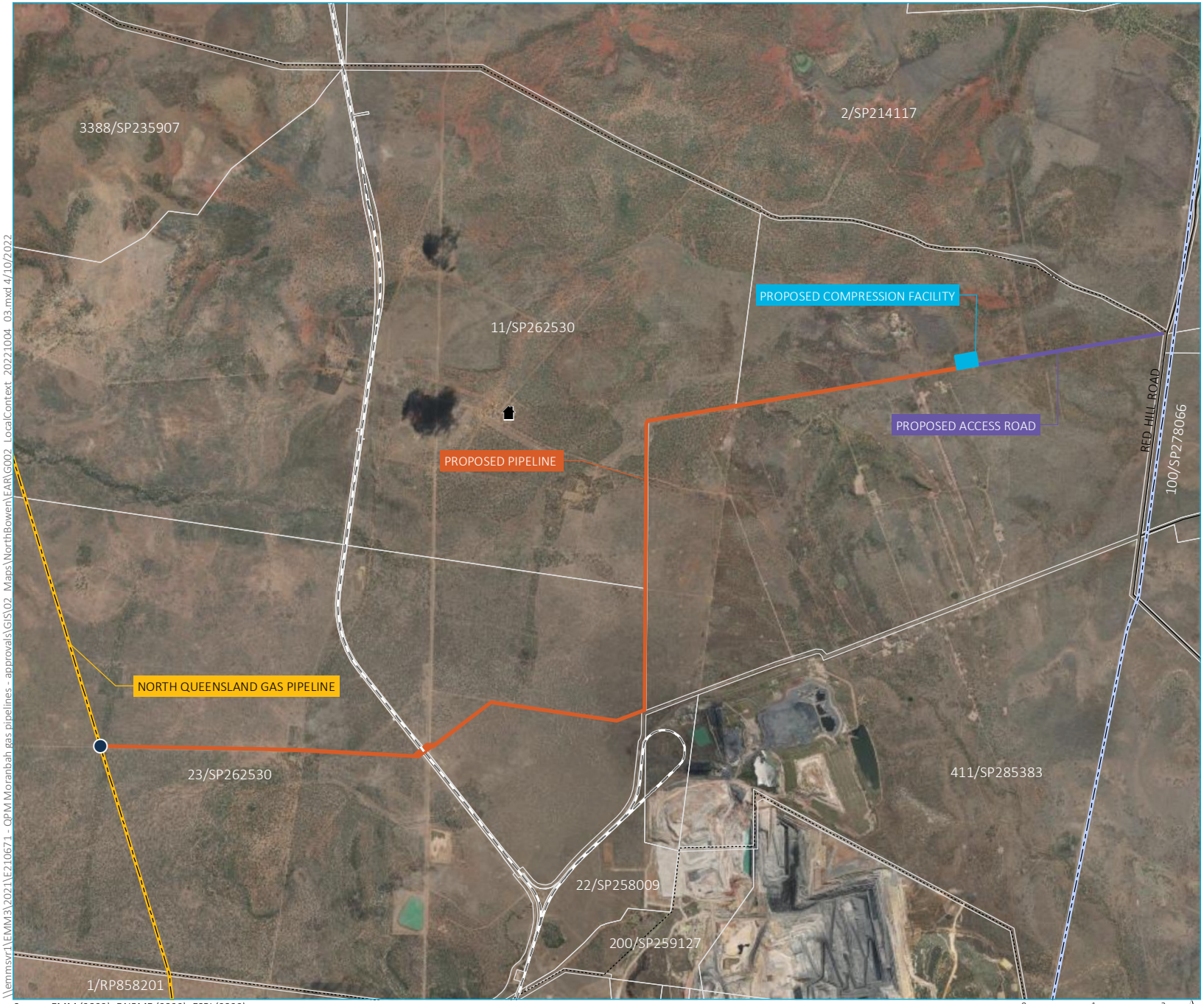
Tenure interest	Description	Project component
Red Hill Road	Road	Access Road
Lot 2 on SP214117	Land Lease	Access Road, GCF, pipeline
CGV44	Easement burdening Lot 2 on SP214117	Access Road
Lot 11 on SP262530	Freehold	Pipeline
Lot 23 on SP262530	Freehold	Pipeline
JSP102362	Easement burdening Lot 23 SP262530 (Eungella water pipeline)	Pipeline
CSP195380	Easement burdening Lot 23 SP262530 (Burdekin Moranbah Pipeline)	Pipeline
Lot 100 on SP235905	Leasehold (rail line)	Pipeline
ESP175262	Easement burdening Lot 11 SP262530	Pipeline

2.5 Resource interests intersected by the Project

Table 2.2 lists the resource interests intersected by the Project. The land extent of the resource interests impacted is illustrated in Figure 2.2.

Table 2.2 Resource interests intersected by the Project

Tenure interest	Description	Interest holder	Project component
EPC 27723	Exploration Permit – Coal	Winfield Group Investments Pty Ltd	Pipeline
MDL 3010	Mineral Development Licence – Coal	Peabody West Burton Pty Ltd	Access Road
MDL 3048	Mineral Development Licence – Coal	Stanmore SMC Pty Ltd	Pipeline
PCA 258	Potential Commercial Area – Petroleum	CH4 Pty Ltd	Access Road, CGF, pipeline
ATP 1103	Authority to Prospect	CH4 Pty Ltd	Access Road, CGF, pipeline
ML 70495	Mining Lease – Coal	Stanmore SMC Pty Ltd	Access Road, CGF, pipeline
ML 1790	Mining Lease – Coal	Stanmore SMC Pty Ltd	Pipeline
PL 486	Petroleum Lease – Petrol	Arrow CSG (ATP 364) Pty Ltd	Access Road
PPL 89	Pipeline Licence – Point to Point – Gas	North Queensland Pipeline No 1 Pty Ltd	Pipeline



KEY

- Gas compression facility
- Pipeline
- Access road
- Homesteads
- Hot tap
- North Queensland Gas Pipeline
- Water pipeline
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

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Source: EMM (2022); DNRME (2022); ESRI (2022)

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Property interests

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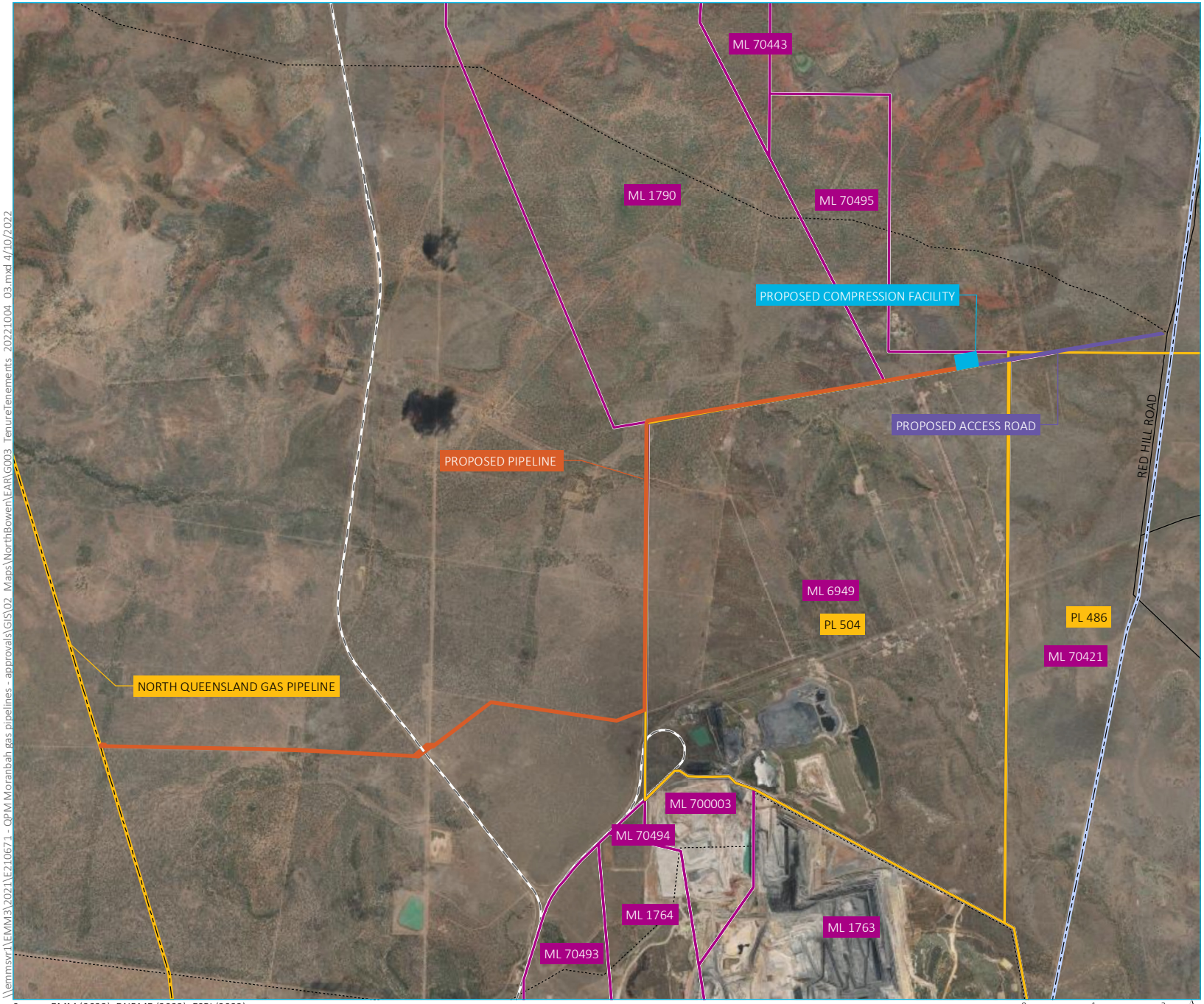

KEY

- Gas compression facility
- Pipeline
- Access road
- Mining lease
- Petroleum lease
- North Queensland Gas Pipeline
- Water pipeline
- Rail line
- Minor road
- Vehicular track

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Source: EMM (2022); DNRME (2022); ESRI (2022)

0 1 2 km

GDA 1994 MGA Zone 55

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Resource interests

QPM Energy Project
Environmental Assessment Report
Figure 2.2

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3 Project description

The Project involves the design, construction, and operation of a GCF and a high-pressure pipeline that links the proposed GCF to the nearby existing and operational NQGP.

The Project proposes to collect waste coal mine gas at the proposed GCF via waste gas gathering lines located at adjacent coal mines. At the GCF, waste coal mine gas will be dehydrated and filtered, with the remaining clean gas then compressed and transported via high-pressure pipeline to the existing and operational NQGP (refer Figure 3.1). The NQGP will then transport the compressed gas north to Townsville, where it will be depressurised and distributed, by a third party, to industrial users, including QPM's TECH Project.

Access to the GCF will be provided via the construction of a 2.8 km all-weather access road from Red Hill Road.

Ancillary activities will also occur within the defined Project footprint.

The Project is proposed 43 km north of Moranbah.

It should be noted that the Project involves capturing and converting methane in waste coal mine gas (a greenhouse gas) into carbon dioxide that would otherwise be released into the atmosphere by the relevant coal mining operator. The Project proposes to capture and convert waste coal mine gas through a process of filtration to remove water slugs and fine coal dust, compression, dehydration to remove water vapour, and flaring, in the event of a shutdown (refer Section 3.3.1 and Figure 3.1). It does not involve refining natural gas or coal seam methane gas.

3.1 Project footprint and battery limits

Table 3.1 describes the key components within the Project footprint.

Table 3.1 Project footprint

Component	Description
Gas Compression Facility	• Captures and converts waste coal mine gas to clean gas which is then compressed to 15.3 megapascal for transport within the high pressure gas pipeline. • Proposed to be located at Dabin Station on the southern boundary of Lot 2 SP214117 and 2.8 km west of the Red Hill Road reserve. • Sited on a 200 metres (m) by 300 m area. • 6 hectare (ha) disturbance footprint.
High-pressure pipeline	• High-pressure pipeline to transport clean gas from the GCF to the NQGP. • 16.8 km in length, running along cleared areas, fence lines and fire breaks along property boundaries. • During construction, a 30 metre (m) wide construction right of way (ROW) (disturbance area of 51 hectares (ha)). • During operations, a 15 m wide operating easement (disturbance area of 25 ha) from 3.2 km.
Access road	• Road to provide all-weather access to the GCF from Red Hill Road reserve. • 2.8 km long and 30 m wide. • 8 ha disturbance footprint.

The Project is defined by limits which include:

- road connection to Red Hill Road;
- GCF inlet flange/s to the facility from gas gathering systems on adjacent mining tenures;
- connection to the NQGP (via hot tap);
- GCF clean water pipeline flange returning water to the relevant existing mine water management systems;
- rainfall run-off from an on-site settling basin; and
- high-pressure pipeline easements (30 m wide ROW) during construction and reduced to 15 m ROW during operations from 3.2 km from the GCF boundary).

The Project footprint, including battery limits, is illustrated in Figure 3.2.

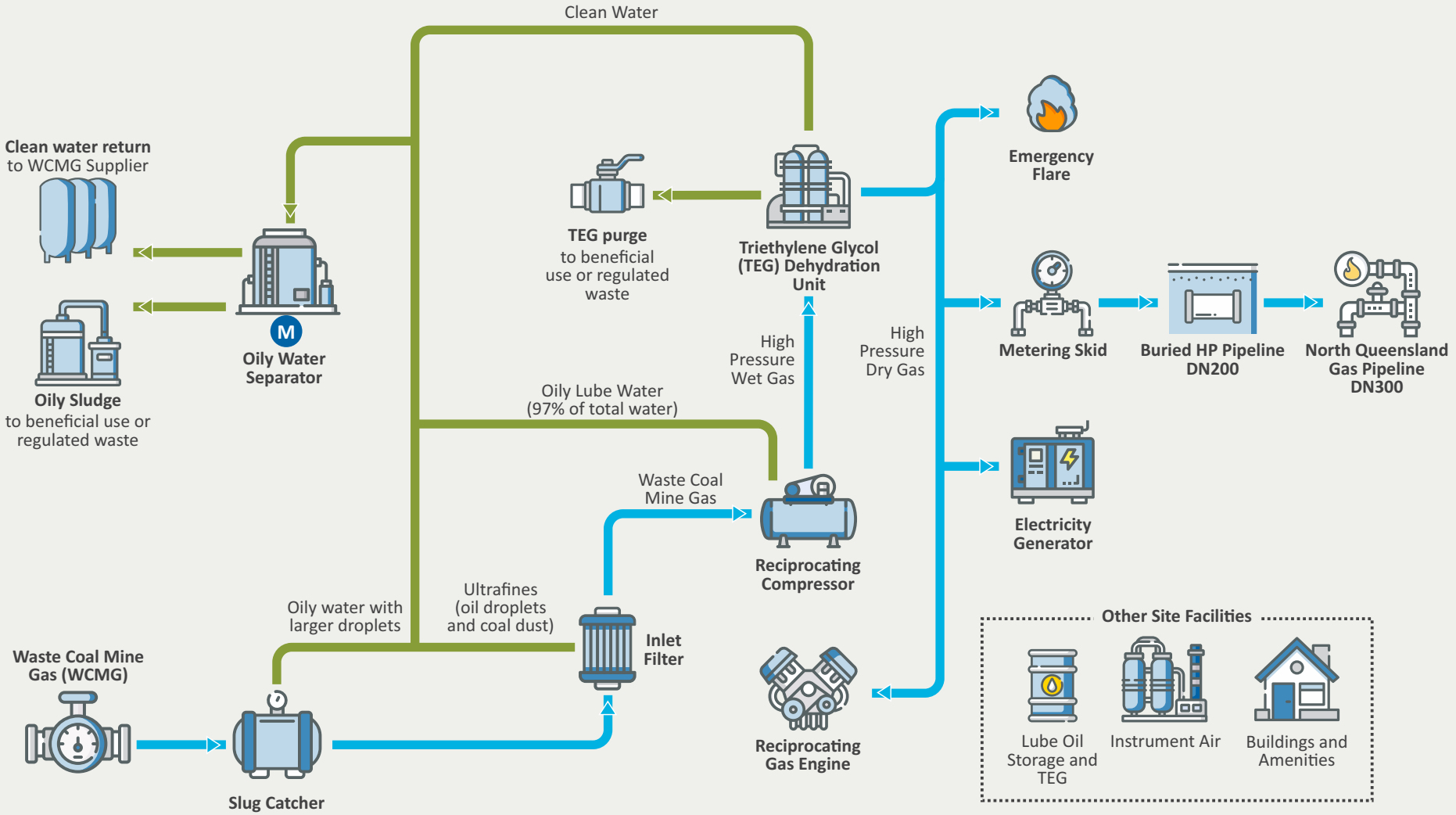
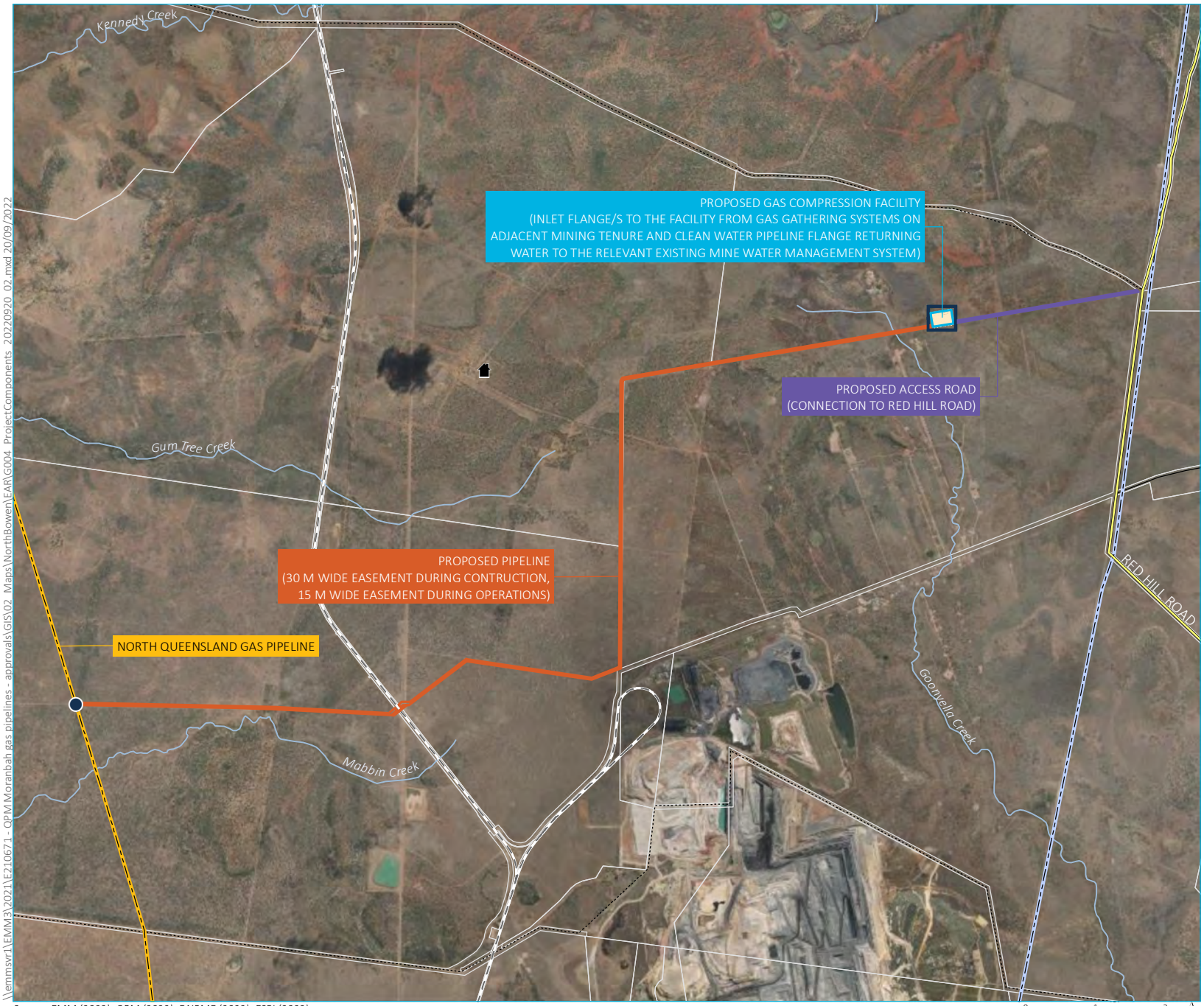
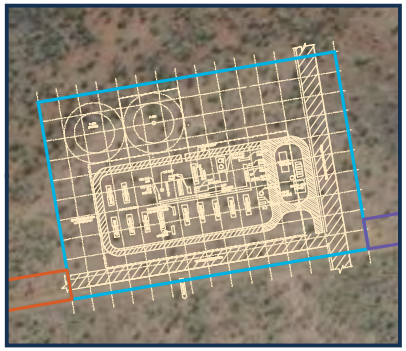


Figure 3.1 **System processes**





KEY

Proposed project components
- Hot tap
- Gas compression facility layout
- Gas compression facility
- Pipeline
- Access road

Existing environment
- Homestead
- North Queensland Gas Pipeline
- Water pipeline
- Rail line
- Red Hill Road
- Minor road
- Vehicular track
- Named watercourse
- Cadastral boundary

Source: EMM (2022); QPM (2022); DNRME (2022); ESRI (2022)

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Project components

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Figure 3.2

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3.2 Project definition and refinement

In defining the Project footprint, a desktop route selection process was undertaken that considered the highly constrained nature of the landscape and the performance needs of the infrastructure. Option 2 was determined to be the preferred option.

In addition to the development that has been undertaken with regards to the surrounding mines and major infrastructure, further structures such as fences, domesticated animal shelters, feed lots and farm tracks have been identified with the assistance of the land lessee. The Project has taken these items into consideration for the alignment of the high-pressure pipeline and GCF. Where these structures are impacted, agreements with the land/asset owner will be sought prior to construction.

Table 3.2 describes the options considered and summarises the findings of the desktop assessment process.

Table 3.2 Desktop route selection process

Option	Constraints	Advantages	Disadvantages	Preference
1	Strategic cropping identified in two sections of the route, including where the existing hot tap (Wards well) is located. Crossing of first order stream, waterway barrier works approvals apply. Horizontal directional drilling (HDD) on the existing rail. Contaminated land soil sampling within the rail corridor as it will be listed on the Environmental Management Register (EMR).	Existing hot tap (Wards Well) available therefore does not require approximately $200k spend to install one a new hot tap. Potentially runs alongside a farmer's track.	Longest pipeline route at approximately 18 km. Farmers track not a gazetted road. Lengthy process with approvals within strategic cropping land. Mapped waterway crossing 2 x HDD under boring required for the existing rail.	3
2	HDD (under boring) on the existing rail. Contaminated land soil sampling within the rail corridor as it will be listed on the EMR. QPM will not be permitted onto the rail corridor – sub-soil will be 3 metres below the lowest level.	Only one HDD under boring required at the existing rail. Pipeline avoids ecological mapping constraints and groundwater dependant ecosystems (~100 m buffer) Better utilisation of fence lines and firebreaks to minimise disruption. Access to an existing Sunwater pipeline offtake valve previously used to build the Newlands rail line. Only one creek crossing (Goonyella Creek) via open trenching.	New hot tap to be installed at a cost of approximately $200k.	1

Table 3.2 Desktop route selection process

Option	Constraints	Advantages	Disadvantages	Preference
3	HDD (under boring) on the existing rail. Proposed route runs alongside an existing easement adjacent to a railway corridor with potential wayleave applications. Contaminated land soil sampling within or adjacent to the rail corridor as it will be listed on the EMR.	Existing 60 m wide easement exists running adjacent the rail corridor and towards to NQGP A possible non gazetted road (Mabbin Road) existing on the last 3km of the proposed route. Potentially no requirement to obtain landholder approval as it appears to be within an easement for the full length.	New hot tap to be installed at a cost of approx. $200 k. Pipeline route is approximately 14.5 km. Intersects *remnant of concern* vegetation and runs adjacent to *remnant – endangered* vegetation. 2 x HDD under boring required for the existing rail and water pipeline. Approval to work within road/rail reserve and construct pipeline potentially requires a two staged process which may be time consuming – approval to construct, then approval for the logistics. Potential for more contaminated land soil sampling for the entire easement as it may be listed on the EMR considering it is adjacent to the rail corridor.	2

The alignment will continue to be optimised within the defined Project footprint, maximising design opportunities and minimising impacts (so far as is reasonably practicable) to sensitive receptors and environmental constraints. For the purposes of this assessment, the worst-case, maximum likely disturbance area has been assessed, with the expectation that any future design optimisations will further reduce potential impacts.

3.3 Gas Compression Facility

3.3.1 Design

The GCF, located on Dabin Station, adjacent to North Goonyella Mine, will receive gas at a normal pressure of 138 kilopascals gauge (kPag) from the upstream field system, and deliver at a maximum delivery pressure of 15,300 kPag. Waste coal mine gas will be dehydrated using a Tri-Ethylene Glycol (TEG) dehydration unit to remove water vapour in the incoming gas and filtered to remove particulates.

The clean dry gas will be compressed using small 5.5 terajoule per day (TJ/d) compressor units powered by gas-fired turbocharged engines using clean gas.

The GCF will receive waste coal mine gas in accordance with Table 3.3.

Table 3.3 Specification of waste coal mine gas received

Component	Unit	Typical
Methane	mol%	97
Ethane	mol%	0.0234
Nitrogen	mol%	1.6625
Oxygen	mol%	0.151
Carbon Dioxide	mol%	1.1408
Helium	mol%	0.0037
Hydrogen	mol%	0.0004
Argon	mol%	0.0181
Water	ml/Sm^3	133
Molecular Weight	Kg/kmol	16.59
Heating Value	MJ/Sm^3	36.66
Wobbe Index	MJ/Sm^3	48.4

The GCF is proposed to include:

- gas filtration;
- gas compression;
- gas dehydration;
- custody transfer metering;
- gas flare;
- oily water separation;
- clean water transfer to adjacent mines; and
- utilities.

The GCF will be powered by two gas engines, with a backup diesel generator for emergencies.

Each compressor will be powered by a reciprocating gas engine, operating under the rates described in Table 3.6.

Table 3.4 Reciprocating gas engine – fuel burning rate

Item	Units	Estimate
Molar density	kmol/m3	0.0447 (based on gas composition)
Molar Mass	kg/kmol	16.5923 (based on gas composition)
Density	kg/m3	0.7420 (at 0 degrees C)
Fuel rate	Nm3/hr	354 (peak rate (100%))
Fuel rate - mass flow	kg/hr	262.67

3.3.2 Construction

Construction of the GCF will include the following activities:

- mobilisation of construction equipment;
- establishment of the 2.8 km access road from Red Hill Road to the Project footprint;
- establishment of access to water supply, via the high-pressure pipeline corridor;
- site bulk earthworks including cut and fill and compaction to design levels;
- installation of steel piles and concrete pads;
- installation of all equipment items, skids and buildings;
- installation of associated steel structures, prefabricated piping, electrical equipment, instrumentation and controls;
- supply and install communication and controls infrastructure;
- demobilisation of construction equipment;
- rehabilitation of temporary disturbance areas; and
- pre-commissioning and commissioning of GCF.

3.3.3 Operations

i General

Typical operations will involve minor maintenance, calibrations, inspections, equipment performance checks, or equipment repair if needed. Operational activities will be typically carried out during daylight hours, unless an emergency requires urgent works at night. The operator will carry out inspections ranging from daily inspections to more rigorous inspections that may vary from one month to four years apart, dependent on the works and in conformance with detailed maintenance and operational integrity plans.

Callout for unplanned activities or responding to process upset may occur throughout the operational life of the facility. The response time for operators to arrive on site for intervention is expected to be one hour. Key operating data and equipment operating status will be viewable from site Supervisory Control and Data Acquisition (SCADA) system. The control system setpoints and functions can be remotely changed or tuned from site SCADA. In general, site SCADA is the local control room which works the same as the remote Main Control Room.

This facility is designed to fail in a safe position. Some process equipment can be remotely started or stopped from site SCADA. During operation gas flow and pressure would be monitored from the GCF and at the gas delivery points.

ii Water and filtered waste

Oily water from the operation of the compressors will be collected in a closed drain system which is predominantly supplied from the blowdown from the GCF's compressor units. Other sources of water include slug catcher water from incoming low-pressure gas and oily water from the pig cleaning operation returned to site.

The closed drain system will collect and de-gas the liquids discharged from the process equipment.

A set of oily water transfer pumps are provided that will manage the liquid level in the closed drain drum. Oily water is transferred to the Oily Water Feed Tank for further processing.

An oily water separation unit will screen the oil content of the water down to an acceptable level (<10 parts per million (ppm)) so that the treated (clean) water can be returned to the coal mine operator.

The oily water separation unit will be operated as on/off by the level control in the main tank. A pair of produced (clean) water transfer pumps discharge the clean water from the Water Loadout Tank to the 350 KPa field header at the site fence. The gas supplier connects their field pipes to the header at the site boundary to accept and return the water to their handling system.

Clean water is also extracted from the waste coal mine gas at the GCF by vapour absorption using TEG. High boiling point TEG is recovered by distillation in the TEG unit. Recovered heat and TEG are reused in GCF processes. Clean water with a low boiling point relative to TEG is recovered (separated) by condensing water vapour from the top of the TEG recovery distillation column. The water is pumped back to the coal mine's pre-mine drainage facility via the Water Loadout Tank to meet their responsibility for water produced on the mine site.

Incoming solid particles are coal dust. The particles are separated in the oily water separator into the oily sludge.

The inlet filer coalescer will filter the incoming gas received from the slug catcher by removing any entrained water in aerosol mist form as well as solids to meet the compressor received gas specification. The coalescer will be designed for a solid removal efficiency of 99.98% > 0.3 µm, and a liquid droplet removal efficiency of 99.7%> 0.3 µm.

The coalescer is equipped with an automatic drain system to discharge the water from the vessel's lower liquid knock-out section and the upper coalescing section to the closed drain system.

The vessel will be fitted with a pressure safety valve to meet code requirements. The vessel will utilise a davit arm and chain block to remove the filter access flange and filter element cage to allow for efficient filter replacement and inspection.

A coalescer bypass line is provided for short-time bypass when undertaking filter element change-out. The maximum acceptable pressure drop across the coalescing filter will be determined by the minimum station inlet pressure and the minimum compressor suction pressure.

3.4 High-pressure Pipeline

3.4.1 Design

The high-pressure pipeline will traverse from the outlet of the GCF, moving generally west for 4.5 km before turning south for 4.5 km and then heading west for 8 km, finishing at the Hot Tap connection to the NQGP.

The high-pressure pipeline, constructed in accordance with AS2885 – 1997, will be sized for the full 24 Petajoule per annum (PJ/a) which is intended to be the plant capacity at full operation. It will cross Goonyella Creek, Denham Park access track, two water pipelines (Sunwater Burdekin and Eungella pipelines) and the Newlands to Goonyella Rail System before connecting with the NQGP.

The design for the high-pressure pipeline is DN200, ASME Class 900 with the line pipe material proposed to be in accordance with API 5L with X52 PSL2 HFW material specification. The design including pipe diameter and class will be refined in detailed design studies.

Corrosion protection for this line will be a 3-layer polyethylene coating system and cathodic protection system. A split hot tap tee will be specified to meet the mechanical requirements for the material and pressure rating of the NQGP at the connection location. The fitting will be welded to the high-pressure pipeline and the hot tap will be carried out under strict operating conditions.

The minimum depth of cover through this area will range between 750 to 900 mm. Crossings will be deeper, between 2,000 and 3,000 mm. The rail crossing will require a depth of cover of 3,000 mm below the lowest points which could be optical fibre within the rail corridor.

There are four crossing points proposed:

- Goonyella Creek at 460 m – will be crossed using conventional dry season open cut and remediation operations in accordance with waterway crossing regulations.
- Farm access road at 5,320 m – will be crossed using conventional trenching methods.
- Sunwater pipelines (side by side) at 12,008 and 12,012 m – the allowable crossing method permits the pipelines to be exposed via excavation and the high-pressure pipeline to be located under the pipelines at a 90-degree alignment to the Sunwater pipelines.
- Newlands to Goonyella Rail System at 12,080 m – access to the 70 m rail easement is typically not permitted, consequently thrust boring is required below the entire easement width. This would take place from the western side. Above rail access for vehicles is nominated via a conveniently located existing crossing 50 m south of the rail crossing. The potential crossing depth must be 3 m below the lowest point in the crossing. This will require potentially a 3 to 4 m deep working platform for equipment to carry out the boring operation. Based on a 4 to 1 batter, access to the trench may be 16 m. Consequently, the working width in the vicinity of the rail has been increased to 50 m.

3.4.2 Construction

The 16.8 km high-pressure pipeline would be constructed in accordance with AS2885-1997 Part 1 Pipelines Gas and Liquid Petroleum. A conventional ROW width of 30m has been identified to facilitate construction operations. Additional width is required in the vicinity of the Newlands to Goonyella Rail System.

The high-pressure pipeline would comprise lengths of coated steel pipe to be welded together and buried with a depth of cover of at least 750 mm to 900 mm.

Construction activities for the high-pressure pipeline would involve:

- clearing of vegetation and stockpiling of topsoil containing the seed bank on the furthest edge of the ROW;
- grading of the ROW and stockpiling adjacent to the Seed Bank. This will establish a safe construction working area;
- separation and stockpiling of topsoil and subsoil;
- creation of a trench in which to lay the high-pressure pipeline. This would be undertaken by a trenching machine, rock saws, or excavator and may involve rock hammers or blasting in hard rock terrain. Spoil will be placed to the other side of the trench to retain passing lanes and operating areas to string pipe for welding and burying;
- welding of pipe sections together to form 'a string' approximately 1 km in length;
- placing the high-pressure pipeline string into the trench and placing padding (eg screened trench sub-soil) around the pipe to protect the coating from external damage;
- returning the subsoil and topsoil to their original horizons;
- testing the integrity of the high-pressure pipeline (hydrotesting) by filling it with water and pressurising it to above the operating level; and
- clearing up and restoring the construction ROW and all temporary facilities.

Restoration would be undertaken in such a way as to ensure that:

- topsoil cover containing the original seed bank is re-established and all land and waterways disturbed by Project activities are returned to a stable condition as soon as possible after construction;
- land is returned as close as possible to its previous productivity;
- stable landforms are re-established to original topographic contours;
- natural drainage patterns are reinstated;
- erosion control measures (eg contour banks, filter strips) are installed in erosion prone areas; and
- the pre-construction environment is reinstated, and disturbed habitats recreated with the exception of a 15 m easement in which the high-pressure pipeline is located where deep-rooted tree growth is discouraged. Typically for a large part of the high-pressure pipeline easement, this corresponds to existing cleared land, cleared fenceline and firebreaks located across existing cleared land.

A Pipeline Restoration Management Plan will be prepared by QPM Energy prior to construction commencing.

3.4.3 Operations

Inspection of the high-pressure pipeline easement for issues such as erosion, weeds, subsidence, and lack of revegetation or third-party activity would be carried out on a regular basis using ground access via the easement. This would also include periodic inspection of the corrosion protection (cathodic) system.

The high-pressure pipeline would be operated with a maximum allowable operating pressure of 15.3 megapascals (MPa).

An allowance for a conventional 30 m construction right of way has been made. Post-construction, the easement will shrink to a 15 m operating width after 3.2 km from the GCF.

Given that the high-pressure pipeline would be underground, land users would be able to resume previous land use activities on top of the high-pressure pipeline provided that they did not include excavation activities. Whilst deep rooted vegetation cannot be re-established directly across the high-pressure pipeline, due to the potential for damage to the high-pressure pipeline, grasslands can be re-established.

Hydrostatic testing procedures, including water sourcing and disposal, will be determined during the detailed design and construction phase.

Disposal of hydrostatic testing water will depend on the initial water quality, nature of any additives, the rate of application, the site of application and the robustness of the receiving ecosystem. The preferred method of use is to recycle water for hydrotesting down the high-pressure pipeline as it is constructed.

The disposal of the water will occur via the Council regulated water treatment facility.

3.5 Other ancillary activities and project components

Other ancillary activities and project components are listed in Table 3.5.

Table 3.5 Other ancillary activities and project components

Component	Description
Access road	• Road to provide all-weather access to the GCF from Red Hill Road. • 2.8 km long and 30 m wide. • 8 ha disturbance footprint. • Red Hill Road is a key connection between Suttor Development Road, 16 km to the North, and Goonyella Road, 36 km to the South. Both join the Peak Downs Highway providing access to East Coast. The shortest route is via Suttor Development Road, being 45 km shorter in travelling to Mackay. • The proposed access road follows the existing fence line between Dabin Station and Burton Downs and will upgrade existing formed farm tracks. • The access road will be constructed initially to support heavy traffic during construction which has the major traffic load. It will be maintained thereafter for operational traffic loads. A trafficable width of 15 m will be formed, with a cleared width of 30 m to support wide load vehicles.
Fencing	• The GCF will be contained within a securely fenced compound. • 2.0 m high chain wire type, with gates of a similar design.
Pipeline scraper facility	• Used to accept a cleaning unit (“pig") inserted into the high-pressure pipeline to remove pipe wall build-up and contaminants as it moves down the high-pressure pipeline under pressure from compressed gas behind it.
Pipeline pig receival facility	• A Pig Receival station is installed adjacent to the NQGP connection which is used to accept a cleaning unit inserted into the high-pressure pipeline to remove pipe wall build-up and contaminants as it moves down the high-pressure pipeline under pressure from compressed gas behind it. The ‘pigging’ activities will occur intermittently throughout the operation of the high-pressure pipeline and will be subject to the noise assessment. • The facility is approximately 15 m x 20 m.
Water/sewer	• Rainwater captured from building roofs and collected in rainwater tanks for general use. • Run-off from site process areas will be directed to a low velocity settling area prior to discharge to overland flows. • Four temporary ablution blocks.

Table 3.5 Other ancillary activities and project components

Component	Description
Switch room	• A switch room will be provided for the station control, communications equipment, and power distribution system. The switch room will be elevated with access stairs and platform to provide ease of access. Smoke detection will be provided in the switch room.
Control room	• The control room/office will contain office space with desks and a SCADA station to monitor the facility operation and status.
Utility Air System	• Utility air will be provided by 2 x 100% air compressors with desiccant dryers installed to remove any liquids, and receivers sized for the engine starter, and instrument air consumption requirements.
Compressor and Engine Lubricating Oil Storage	• Oil storage with pumps will be provided for both the gas compressors and engines. • Day tanks will be manually filled as required. • Bunded.
Fire Safety	• Fire and gas detection will be provided for the compressor packages within the facility. There will be safety showers with a water tank provided in the facility. Gas and flame detectors are provided around major equipment such as the compressor packages and TEG reboiler. • Major equipment such as compressor and TEG dehydration packages will be supplied with skid bunds incorporated into the base frame. The lubricating oil storage tanks will be self-bunded. Concrete bunding is only provided for the oily water package.
Electrical	• Packaged gas fuelled generators, 2 x 100% arrangement, will be provided to supply site power and lighting requirements, low voltage switch room, control room and workshop. • A packaged diesel generator will also be provided as a back-up. A control system will be provided to manage the generator operation and loading. The diesel generator will be sized for just the essential power requirements until the gas engine is restarted. • General down lighting will be provided throughout the facility to ensure safe levels of illumination for operations and thoroughfare. The compressor packages and key equipment will have local lighting provided. • All instruments will be provided with a sunshade. • A local Programmable Logic Controller (PLC) will be used for process control and allow for communication of data and signals. A high integrity PLC will be installed and dedicated for the process safety and shutdown functions. • A flow computer will look after custody transfer metering calculations for billing. • Communications in this area will be by 4G data network and will incorporate redundant networks for reliability.
Station fencing and security	• The Site will be contained within a security fenced compound. The fence will be a 2.0 m high chain wire type, with gates of a similar design.
Chemical storage	• Fuels and chemicals used on site are: – lubricants; – triethylene glycol; and – diesel. • Stored in bunded facilities. • Fuels and chemicals are supplied to site via fuel/chemical tanker or ISO tanker.

3.6 Supporting third party infrastructure

Supporting infrastructure provided by third parties is summarised in Table 3.6.

Table 3.6 Supporting third party infrastructure

Component	Description
Water/sewer	• Construction water will be purchased from Sunwater under commercial arrangements and be drawn from the Burdekin Moranbah Pipeline using an existing take-off valve established to supply water to construct the Newlands System. The Sunwater pipeline is located on Denham Park. Water will be trucked to site and along the pipeline using water trucks. • Fresh water for amenities during construction and operation will be supplied by a commercial contractor sourcing water from an Isaac Regional Council truck filling station at Moranbah.
Accommodation	• The temporary construction workforce will be housed in existing regional accommodation camps, with mobilisation and demobilisation of the workforce to and from the region, either via drive in drive out (DIDO) or fly in fly out (FIFO) from Moranbah airport for each roster.

3.7 Decommissioning

The operating team will monitor the condition of equipment up to and beyond the end of life to ensure equipment is sound and fit for further service. Continued operation beyond the nominal design life will be subject to specific equipment condition and plant fitness assessments to meet regulatory standards and performance requirements. The compressor station will be decommissioned when there is no further economic potential to continued use.

The GCF and pipeline have an average design life of more than 25 years. It is expected that the GCF and pipeline life will be extended through integrity management. When, and if, the proposed Project is no longer required, it would be decommissioned in accordance with the regulatory requirements and accepted environmental best practices at that time. Currently, decommissioning procedures require the removal of all above ground infrastructure (including all scraper station plant and all pipeline valves and metering stations) and the restoration of associated disturbed areas.

The GCF equipment and plant would be transported off site and re-used and/or recycled if in an appropriate state. All residual, non-suitable equipment would be removed from site and disposed of at a facility licenced to accept the waste. All building foundations and access tracks would be removed and rehabilitated (dependent on agreements made with relevant landholders).

At the time of decommissioning, a decision will be made regarding the opportunities for future use of the pipeline. The following two options will be considered:

- Moth-balling – this would involve depressurising the pipeline, capping and filling with an inert gas (such as nitrogen) or water with corrosion inhibiting chemicals. The cathodic protection would be maintained to prevent the pipe corroding; or

- Abandonment – this could involve purging the pipe of natural gas, disconnecting it from the manifolds and NQGP, and removing all above ground facilities. The pipe would then be filled with water and left to corrode in-situ. Removing the pipe from the ground is unlikely to be an environmentally or commercially viable option. A detailed rehabilitation management plan (RMP) would be developed and implemented in consultation with landholders and the regulatory agencies at the time of abandonment.

The RMP will be submitted 12 months prior to decommissioning commencing. As informed by the RMP, consultation with relevant landholders and, where considered necessary, irregular site inspections will occur post-decommissioning to ensure rehabilitation of disturbed areas is effective.

3.8 Rehabilitation

Clean-up, restoration, and rehabilitation will occur in a 2 staged approach for the Project. Generally, clean-up and rehabilitation will involve removal of foreign material (construction material and waste), surface contouring and respreading topsoil. Existing seed stock within the topsoil is expected to naturally revegetate the disturbed easement. The removal of trees will be offset through the planting of tube stock shrubs or native grasses sourced from local nurseries where considered necessary.

3.8.1 Progressive rehabilitation during construction

Rehabilitation will progressive and as soon as reasonably practicable be undertaken throughout the life of the proposed Project. The target for successful rehabilitation is to ensure that reinstatement of vegetation is equal to or better that pre-construction status, except where permanent operational access is required.

Progressive rehabilitation and stockpiling of soils near the site of excavation will be conducted to minimise potential blending of topsoil with other material. Mulching of green waste will be completed throughout the construction phase of the Project and stockpiled for use in rehabilitation and erosion and sediment control within the authorised construction area (although unlikely, mulch stockpiles are to be no greater than 10 m wide and higher than 2 m). All potential microhabitats features (eg rocks and fallen logs) will be relocated or stockpiled for use in rehabilitation. Watercourse rehabilitation will be consistent with surrounding environment and contours of the channel at the time of construction.

The aim of the progressive rehabilitation and reinstatement is to ensure that the environment is safe, non-polluting and self-sustaining. The intention is to minimise additional management throughout the operational phase of the Project. Ongoing inspection for the management and removal of invasive weed species will be completed throughout all phases of the rehabilitation process. Rehabilitated areas are to be tracked via GIS.

Where feasible to do so, the landscape will be rehabilitated to pre-existing contours with natural drainage lines restored and protected (if required). In certain cases, rehabilitation will be tailored to prior site-specific conditions in consultation with the landholder. To promote vegetation regrowth and promote and protect against the loss of topsoil, the pipeline 30 m wide construction corridor ROW surface will normally be lightly scarified prior to the respreading of topsoil.

3.8.2 Right of way

The construction ROW will shrink to a 15 m wide operating easement. This width will typically include farm tracks and firebreaks alongside a fence line plus four metres to the other side of the pipeline to allow pipeline remediation and protection from deep-rooted trees. This approach will maintain inspection traffic to an existing farm track which will enable the remaining area to become largely rehabilitated. This approach was developed with the assistance of the farm lessee to minimise long term impacts by using existing farm management practises and corridors.

Given that the pipeline would be underground, land users would be able to resume previous land use activities on top of the pipeline provided that they did not include excavation activities. Whilst deep rooted vegetation cannot be re-established within the operating easement, due to the potential for damage to the pipeline's coating, grasslands can be re-established and no long term impacts would be expected to sensitive ecosystems.

Rehabilitation will be undertaken in accordance with best practice and will ensure that:

- topsoil cover is re-established and all land and waterways disturbed by the Project activities are returned to a stable conditions as soon as practicable after construction;
- land is returned as close as possible to its previous productivity;
- stable landforms are re-established to original topographic contours;

- natural drainage patterns are reinstated;
- erosion control measures (eg contour banks, filter strips) are installed in erosion prone zones;
- the pre-construction environment is reinstated, and disturbed habitats recreated;
- fences and gates are restored; and
- pipeline marker signs are installed.

3.9 Construction timing and ramp up

The Project is designed to be constructed in three stages (refer Table 3.7) to match the ramp-up in demand for waste coal mine gas. The design process will consider future capacity so that connection can be made with no major safety, constructability, or operability issues.

Construction of Stage 1 is scheduled to commence in Q1 2023, pending relevant approvals. Subsequent stages will be installed to align with ramp-up of QPM's TECH Project and third-party demand. Construction of the high-pressure pipeline and GCF will take approximately nine months, followed by a commissioning phase which may take up to three months.

Table 3.7 Project staging

Stage	Activities
Stage 1	• Deliver 8 PJ/a (22.8 TJ/d). • GCF receives gas at a normal pressure of 138 kPag (20 pounds per square inch gauge (psig)) from the upstream field system and delivers at a maximum pressure of 15,300 kPag into the NQGP. • Facility includes compression for 8 PJ/a with key equipment (Inlet Slug Catcher, Filter Coalescer, Flare, TEG Package) sized for 12 PJ/a. • All main facility headers, high-pressure pipeline and pig receiver will be sized for 24PJ/a.
Stage 2	• Deliver 16PJ/a (45.6TJ/d). • Additional compressors will be installed based to deliver 12PJ. Beyond 12PJ, additional Inlet Slug Catcher and Filter Coalescer similar to Option 1, additional compression packages to achieve 16PJ/a, and additional 12PJ/a TEG package. Additional flare will be required for the increased 12PJ/a. Additional metering and fuel gas skids to support the additional 12PJ/a.
Stage 3	• Deliver 24 PJ/a (68.5TJ/d). • Additional compression packages will be installed to achieve 24PJ/a.

The ramp up is based on the below flowrates (refer Table 3.8).

Table 3.8 Design rates

Design Rates	Units	Stage 1	Stage 2	Stage 3
Facility capacity	PJ/y	8	16	24
Facility design flowrate (min/max)	TJ/d	22.8 +7%	45.7 +7%	68.5 +7%

3.10 Construction and operational hours

Construction activities are anticipated to take place between 7.00 am and 6.00 pm, seven days per week.

During the commissioning phase, activities will also take place between 7.00 am and 6.00 pm, seven days per week, however for the final two weeks, commissioning activities will be 24 hours per day.

The diesel generator is anticipated to operate for two weeks in the year, and flares are expected to be operational for a maximum of 24 hours in a year and spread across multiple occasions.

3.11 Workforce

3.11.1 Construction

Anticipated workforce numbers are included in Table 3.9.

The temporary construction workforce is expected to be accommodated in existing regional accommodation camps, with mobilisation and demobilisation of the workforce to and from the region, either via DIDO or FIFO.

Table 3.9 Anticipated workforce

Entity	Average workforce	Peak workforce
Project Team	4	10
Earthworks	10	15
Piling	6	6
Structural Mechanical Piping Electrical Instrumentation Construction	30	40
High-pressure pipeline	12	12
Pre-commissioning and Commissioning	12	14

3.11.2 Operations

The GCF is expected have one daytime operator for scheduled maintenance, inspection activities and other routine tasks. This role will be supported by three trained staff.

Operating personnel will live in the surrounding area and transfer to site on a roster arrangement.

If local personnel are not available for the permanent operations, DIDO personnel will be employed and accommodated at existing facilities in the region in either mining camps or with local housing. If DIDO personnel are unavailable, FIFO personnel will be hired with similar accommodation arrangements.

3.12 Water management

The objectives of the stormwater management approach are to avoid impacts to receiving waters on and off-site. The key features of the proposed stormwater management approach include measures to:

- locate the GCF to avoid disturbance to existing watercourses and overland flow paths;
- undertake grading to minimise earthworks and minimise changes to existing flow paths;
- divert upslope runoff around infrastructure;
- implement surface drainage measures to control runoff generated within the GCF;
- implement rock rip rap where flow concentrations cannot be avoided;

- control stormwater discharge and existing overland flow paths to avoid proposed wastewater effluent management areas;
- stabilise disturbed and operational areas, favouring use of hardstand and equivalent impervious surfaces;
- implement sediment and erosion controls; and
- capture runoff from buildings in rainwater tanks for use on site, to minimise demand for imported water.

4 Legislative considerations

4.1 Environmental Protection Act 1994

4.1.1 General Requirements for an EA Application

Section 125 of the EP Act lists the application requirements for an environmental authority. Table 4.1 identifies where this information had been addressed in the application package.

Sections 126 of the EP Act do not apply given the Project is not a *CSG activity* and does not involve exploring or producing coal seam gas. It instead captures waste coal mine gas which would be either flared or directly emitted to the atmosphere as a fugitive emission from an existing mine site.

Table 4.1 Requirements for Environmental Authority Application – *Environmental Protection Act 1994*

Section	Requirement	Reference
125 (1) (a)	be made to the administering authority; and	The EA application has been lodged with Department of Environment and Science (DES) who is the administering authority for the EP Act.
125 (1) (b)	be made in the approved form; and	The application was made using the approved form via the DES portal.
125 (1) (c)	describe all environmentally relevant activities for the application; and	Refer to Section 4.1.2.
125 (1) (d)	describe the land on which each activity will be carried out; and	Refer to Section 2.4 and 2.5, and Table 4.2.
125 (1) (e)	be accompanied by the fee prescribed under a regulation; and	The prescribed application fee was paid at lodgement of the EA application.
125 (1) (f)	if 2 or more persons (joint applicants) jointly make the application—nominate 1 joint applicant as the principal applicant; and	Not applicable QPM Energy is the sole applicant.
125 (1) (g)	state whether the application is - • a standard application; or • a variation application; or • a site-specific application; and	The application is for a site-specific application.
125 (1) (h)	state whether the applicant is a registered suitable operator; and	QPM Energy Pty Ltd has been approved as a suitable operator (#100294011).

Table 4.1 Requirements for Environmental Authority Application – *Environmental Protection Act 1994*

Section	Requirement	Reference
125 (1) (i)	if a development permit under the Planning Act, or an SDA approval under the State Development Act, is required under either of those Acts for carrying out the environmentally relevant activities for the application—describe the permit or approval; and	Not applicable. The Project is not located within a State Development Area (SDA) and as such approval under a development scheme as prescribed by the *State Development and Public Works Organisation Act 1971* (SDPWO Act). Schedule 6, Part 5, Item 22 of the Planning Regulation 2017 (Planning Reg) lists development that cannot be made assessable under a local government planning scheme and includes: • Development for a petroleum activity as defined under the EP Act, Section 111. Schedule 21, Part 1, Item 1 of the Planning Reg identifies vegetation clearing work that is exempt clearing work, for which approval is not required and includes: • (6) A resource activity as defined under the *Environmental Protection Act*, Section 107
125 (1) (j)	if the application is a standard or variation application—include a declaration that each relevant activity complies with the eligibility criteria; and	Not applicable.
125 (1) (k)	if the application is a variation application— for a variation application under Section 123(1)—state the standard conditions for the activity or authority the applicant seeks to change; or (ii) for a variation application under Section 123(2)—state the standard conditions that are not the same as the Coordinator-General's conditions; and	Not applicable.
125 (1) (l)	if the application is a variation or site-specific application— (i) include an assessment of the likely impact of each relevant activity on the environmental values, including—	Responses contained below.

Table 4.1 Requirements for Environmental Authority Application – *Environmental Protection Act 1994*

Section	Requirement	Reference
125 (1) (l) (i) (A)	a description of the environmental values likely to be affected by each relevant activity; and	Environmental values that have the potential to be impacted by the Project are described in Section 5 and Table 5.3 of this report. Further detail is included in the appended technical reporting, listed below: • Air quality (refer Appendix A) • Acoustics (refer Appendix B)) • Matters of State Environmental Significance (refer Appendix C) • Surface Water (refer Appendix D) • Groundwater (refer Appendix E) • Soils (refer Appendix F) • Waste and Contaminated Land (refer Appendix G) • Hazard and risk (refer Appendix I) An assessment of traffic and transport has also been undertaken and is included in Appendix H. A risk assessment has also been completed (refer Section 5.13) to determine the residual impacts of the Project.
125 (1) (l) (i) (B)	details of any emissions or releases likely to be generated by each relevant activity; and	Emissions and releases from the Project are summarised in Section 5 and Table 5.3 of this EAR. Detailed technical information is contained in the respective technical report appended to this EAR.
125 (1) (l) (i) (C)	a description of the risk and likely magnitude of impacts on the environmental values; and	Risk and likely magnitude of impacts on environmental values is contained in Section 5.13.
125 (1) (l) (i) (D)	details of the management practices proposed to be implemented to prevent or minimise adverse impacts; and	Management practices as they relate to each relevant environmental value is summarised in Section 5.1 to Section 5.9. Detailed technical information is contained in the respective technical report appended to this EAR.
125 (1) (l) (i) (E)	if paragraph (n) does not apply—details of how the land the subject of the application will be rehabilitated after each relevant activity ceases; and	Proposed rehabilitation activities are described in Section 3.8.
125 (1) (l) (ii)	include a description of the proposed measures for minimising and managing waste generated by each relevant activity; and	Measures for minimising and managing waste generated by the Project is summarised in Section 5.7. Detailed technical information is contained in Appendix G.
125 (1) (l) (iii)	include details of any site management plan that relates to the land the subject of the application; and	The subject land is not included on a site management plan.

Table 4.1 Requirements for Environmental Authority Application – *Environmental Protection Act 1994*

Section	Requirement	Reference
125 (1) (m)	if the application is for a prescribed ERA—state whether the applicant wants any environmental authority granted for the application to take effect on a day nominated by the applicant; and	Ancillary ERAs are identified in Section 4.1.2.
125 (1) (n)	if the application is a site-specific application for a mining activity relating to a mining lease—be accompanied by a proposed PRC plan; and	Not applicable. The application is not for a mining activity.
125 (1) (o)	include any other document relating to the application prescribed under a regulation.	Not applicable.
125 (2)	Despite subsection (1)(l), if the application is a variation application under Section 123(1), it need only include the matters mentioned in that subsection to the extent it seeks to change the standard conditions for the activity or authority.	Not applicable.
125 (3)	Subsection (1)(l) does not apply for an application if— (a) either— (i) the EIS process for an EIS for each relevant activity the subject of the application has been completed; or (ii) the Coordinator-General has evaluated an EIS for each relevant activity the subject of the application and there are Coordinator-General's conditions that relate to each relevant activity; and (b) an assessment of the environmental risks of each relevant activity would be the same as the assessment in the EIS mentioned in paragraph (a)(i), or the evaluation mentioned in paragraph (a)(ii), if completed.	Not applicable.
125 (4)	Also, subsection (1)(l) does not apply for a variation application under Section 123(2) if the application seeks only to apply the Coordinator-General's conditions.	Not applicable.
125 (5)	Despite subsection (1), if the application is a variation or site-specific application for the prescribed ERA mentioned in the Environmental Protection Regulation 2019, schedule 2, Section 13A— (a) it need only include the matters mentioned in subsection (1)(l)(i)(A) to (D), (ii) and (iii) to the extent the matters relate to fine sediment, or dissolved inorganic nitrogen, entering the water of the Great Barrier Reef or Great Barrier Reef catchment waters; and (b) subsection (1)(l)(i)(E) does not apply for the application.	Not applicable.
125 (6)	Subsection (1)(l) does not apply for a variation application or site-specific application, and subsection (1)(n) does not apply for a site-specific application for a mining activity relating to a mining lease – (a) the chief executive has, under chapter 3, part 2 or 3, approved the voluntary preparation of an EIS for the project the subject of the application and the applicant has— (i) started the EIS process for the application; or (ii) stated in the application that the applicant will prepare an EIS under chapter 3, part 1; or (b) the chief executive has, under chapter 3, part 3, decided that an EIS is required for the application; or (c) the Coordinator-General has, under the State Development Act, section 26(1)(a), declared that the project the subject of the application is a coordinated project for which an EIS under that Act is required.	Not applicable.

4.1.2 Environmentally Relevant Activities

This EA application seeks authorisation to undertake the following ancillary activities as outlined below in Table 4.2.

Table 4.2 Environmentally Relevant Activity (ERA) and location details

Environmentally Relevant Activity/activities	Location(s)
ERA 15 – Fuel burning at threshold(s): • ERA 15 – Using fuel burning equipment that is capable of burning at least 500 kilograms of fuel in an hour.	Lot 2 SP214117 Lot 11 SP262530 Lot 23 SP262530 Lot 100 SP235905

4.1.3 Notifiable Activities

Notifiable activities are those activities identified as likely to cause environmental harm through contamination of land and are described in Schedule 3 of the EP Act. No notifiable activity is proposed to be carried out on the land associated with the Project.

4.1.4 Standard criteria

In deciding an application for a site-specific application, the determining authority must also have regard to the standard criteria. Table 4.3 considers the application and relevance of the standard criteria to the Project.

Table 4.3 Standard Criteria

Standard Criteria	Application and Relevance
(a) the following principles of environmental policy as set out in the Intergovernmental Agreement on the Environment—	The precautionary principle was considered for the application. It is considered that the proposed activities will leverage proven technology and the assessment has considered worst case scenario.
(i) the precautionary principle;	The principle of intergenerational equity was considered for the application. It is considered that the proposed activities would not impact the use of environmental values by future generations.
(ii) intergenerational equity;	The principles of conservation of biological diversity and ecological integrity were considered for the application. The proposed application would not result in significant impacts to biological diversity or ecological integrity.
(iii) conservation of biological diversity and ecological integrity; and	Of note, the Project will utilise waste coal mine gas from the Bowen Basin that would be either flared or directly emitted to the atmosphere as a fugitive emission of methane which has a Global Warming Potential factor of 28 times that of carbon dioxide over a 100 year lifetime and 84 times over the first 20 years.

Table 4.3 Standard Criteria

Standard Criteria	Application and Relevance
(b) any Commonwealth or State government plans, standards, agreements or requirements about environmental protection or ecologically sustainable development; and	The proposed activities will be undertaken in accordance with the requirements of the following: • EP Act; • EPBC Act; • NC Act; • P&G Act; • VM Act; and • Offsets Act. The application and relevance of this legislation has been described throughout the application and supporting material.
(d) any relevant environmental impact study, assessment or report; and	The following environmental assessments have been prepared in support of this application: • Air quality (refer Appendix A); • Acoustics (refer Appendix B); • Matters of State Environmental Significance (refer Appendix C); • Surface Water (refer Appendix D); • Groundwater (refer Appendix E); • Soils (refer Appendix F); • Contaminated Land (refer Appendix G); • Waste (refer Appendix G); and • Hazard and risk (refer Appendix I). An assessment of traffic and transport has also been undertaken and is included in Appendix H.
(e) the character, resilience and values of the receiving environment; and	The character, resilience and environmental values of the receiving environment, and potential impacts to these as a result of the proposed activities, are described Section 5.
(f) all submissions made by the applicant and submitters; and	Where required QPM Energy will consider submissions as required and directed.
(g) the best practice environmental management for activities under any relevant instrument, or proposed instrument, as follows— (i) an environmental authority; (ii) a transitional environmental program; (iii) an environmental protection order; (iv) a disposal permit; (v) a development approval; and	Best practice environmental management of the proposed activities would be achieved through compliance with the conditions of the EA and implementation of management measures as described in this document.
(h) the financial implications of the requirements under an instrument, or proposed instrument, mentioned in paragraph (g) as they would relate to the type of activity or industry carried out, or proposed to be carried out, under the instrument; and	QPM Energy will continue to provide adequate funds, equipment, and staff time to comply with the conditions of its environmental authorities.
(i) the public interest; and	The Project is in the public interest, as it will facilitate the supply of high-grade, ethically derived advanced battery materials.
(j) any relevant site management plan; and	There are no site management plans applicable to the application.

Table 4.3 Standard Criteria

Standard Criteria	Application and Relevance
(k) any relevant integrated environmental management system or proposed integrated environmental management system; and	Under the QPM banner, QPM Energy promotes sustainable environmental practices and transparent communication with our stakeholders. QPM's policies apply to all personnel involved in QPM activities including employees, consultants, contractors and visitors. QPM management are committed to the following throughout design, construction and operation: • managing adverse environmental impacts though identification, setting objectives and targets and implementing mitigation programs; • employing new technologies at the design phase and during our operations to reduce wastes and minimise carbon emissions; • ensuring our operations will comply with environmental laws, regulations and codes of practice; • fostering continuous improvement of our environmental management systems and practices to meet ISO140001; • engaging with our employees, customers and investors on environmental issues and report on our environmental performance; • respecting individuals and their cultures; • supporting local and Indigenous businesses and create lasting opportunities for the development of local and Indigenous workers; and • working with our stakeholders to develop genuine relationships, through open and transparent communication, and reporting.
(l) any other matter prescribed under a regulation	Not applicable.

4.2 Environmental Offsets Act 2014

In accordance with s207(1)(c) of the EP Act, the administering authority may impose an environmental offset condition on an EA. However, s14(1) of the *Environmental Offsets Act 2014* (EO Act) states that an offset condition may only be imposed on an EA if the proposed activity will or is likely to have a significant residual impact (SRI) on the prescribed environmental matter, and all reasonable on-site mitigation measures for the prescribed activity have been, or will be, undertaken.

As per Section 8 of the EO Act, a significant residual impact is generally an adverse impact, whether direct or indirect, of a prescribed activity on all or part of a prescribed environmental matter that:

- remains, or will or is likely to remain, (whether temporarily or permanently) despite on-site avoidance and mitigation measures for the prescribed activity; and
- is, or will or is likely to be, significant.

To avoid duplication of offset conditions between jurisdictions, State and local governments can only impose an offset condition in relation to a prescribed activity, if the same, or substantially the same impact and the same or substantially the same matter has not been subject to the assessment under the EPBC Act.

It has been identified the Project may result in a SRI to Endangered RE11.4.9 and Ornamental Snake habitat. Subject to approvals and detailed design, environmental offsets will be provided by QPM for these residual impacts in accordance with Qld Environmental Offsets Policy (QEOP). As the Ornamental Snake is listed under the EPBC Act, if a SRI is found to occur to the species under the EPBC Act, the species will be offset under the EPBC Act. This is in accordance with the hierarchy specified under the QEOP. The EPBC referral which has been published and is on display (EPBC Number 2022/09329) has concluded a SRI to this species.

Prior to Project commencement, QPM will prepare an Environmental Offset Strategy that will confirm the Project's MSES and Matters of National Environmental Significance (MNES) offset requirements, assess offset delivery options under applicable policies, identify potential offset areas and confirm future steps to finalising an offset package.

4.3 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the principal environmental legislation administered by the Commonwealth Government, regulated by the Department of Climate Change, Energy, the Environment and Water (DCCEEW). Part 3 of the EPBC Act determines that an action cannot be taken that is likely to have a significant impact on MNES without approval from the Minister. An action that the Minister decides is likely to have a significant impact on MNES is deemed a controlled action and requires assessment under the provisions of the EPBC Act.

The *Matters of National Environmental Significance – Significant Impact Guidelines 1.1* outlines how a proponent can determine whether their action is likely to have a significant impact on MNES via a self-assessment process. Where the self-assessment has determined that a significant impact on MNES is likely, assessment under the EPBC Act is to be initiated by the proponent submitting a referral to DCCEEW.

Additionally, impacts to MNES may require biodiversity offsets in accordance with the EPBC Act and *EPBC Act Environmental Offsets Policy 2012*.

A referral under the EPBC Act has been made to DCCEEW for consideration, outlining the likely impact on all MNES for this Project (EPBC Number 2022/09329).

A significance of residual impacts assessment was undertaken of the Project's potential impacts on MNES that have been confirmed present or are considered likely to occur within the subject site. The assessment was made against the *EPBC Act Significant Impact Guidelines 1.1*.

The assessment confirmed that the Project has the potential to result in SRI to Ornamental Snake.

5 Environmental Values

This section of the report provides a description of the environmental values that have the potential to be impacted by the Project.

5.1 Air

An Air Quality Impact Assessment has been completed for the Project and included in Appendix A. A summary is provided below.

Dispersion modelling has been completed for two operational scenarios for the proposed GCF using the AERMET/AERMOD system. The scenarios assessed included:

- Scenario 1: all Project stages, excluding flares; and
- Scenario 2: all Project stages, including flares.

Hourly meteorological observations from 2020, measured at the Moranbah (Utah Dr) air quality monitoring station were used as input to the dispersion modelling.

Concentrations were predicted for the assessment locations listed in Table 5.1.

Table 5.1 Assessment locations – air quality and noise

Assessment location ID	Address	Type	Coordinates (MGA 55)		Distance to the Project
			Easting	Northing	
R1	'Old Denham Park' 535 Mabbin Road, Moranbah (11SP262530)	Residential	596292	7608543	6.6 km to the west
R2	'Wards Well' 8595 Suttor Development Road, Burton (2SP214117)	Residential	601805	7615530	6.2 km to the north

The results of the modelling show that the predicted concentrations for Particulate Matter 10 (PM_{10}), Particulate Matter 2.5 ($PM_{2.5}$), carbon monoxide, nitrogen dioxide (NO_2), sulphur dioxide (SO_2), and individual Volatile Organic Compounds (VOC) concentrations were below the Environmental Protection (Air) Policy (EPP (Air)) air quality objectives at both locations.

Cumulative impacts for particulate matter were also assessed by combining the incremental concentrations for the Project with background concentrations. The cumulative results showed that compliance with applicable EPP (Air) impact assessment criteria was predicted at both assessment locations.

The modelling assessment for the Project is considered to be conservative, as it assumes that all sources are operating for every hour of the year. In reality, sources such as the diesel generator and the flares (included in Scenario 2) would operate for less than two weeks of the year.

QPM Energy has committed to a range of mitigation measures and management practices to minimise pollutant emissions during construction and operation including:

- the Project would be constructed according to conventional methods and would be guided by a Construction Environmental Management Plan (CEMP) to effectively manage environmental impacts;
- use of low NOX engines or catalytic convertors;
- minimise the use of stripping gas as far as practicable;
- minimise the use of diesel generators as far as practicable (noting they are only used as backup); and
- minimise the use of flares as far as practicable.

The risk of dust impacts during the construction of the Project was assessed using the *Guidance on the Assessment of Dust from Demolition and Construction*. It was concluded that that the level of risk is 'negligible', and any effects will not be significant.

5.2 Noise

A Noise Impact Assessment Report has been prepared for the Project (refer Appendix B). The assessment considered the potential for noise impacts of the Project and has been prepared in accordance with the methodologies outlined in the DES *ESR/2016/1935 – Guideline – Noise Assessment – Prescribing noise conditions for environmental authorities for petroleum activities* which considers the noise requirements of the EP Act and EPP (Noise) 2019.

A noise model has been prepared for the Project to determine likely levels of noise impact at surrounding noise sensitive assessment locations. Noise modelling has been undertaken based on preliminary selections of reciprocating compressor plant, compressor engines and ancillary services. An assessment of flaring noise has been undertaken using the source prediction methods of VDI 3732.

Historical meteorological conditions in the area have been reviewed. The review indicates that neither wind nor moderate to strong temperature inversions are characteristic of the area. Accordingly, adverse meteorological conditions have not been used in the noise prediction model.

Noise modelling was conducted at two sensitive receptor locations (refer Table 5.1). Noise emissions from the Project have been assessed using modelling scenarios for the following:

- Normal conditions: describe of the operation of the compression facility in the absence of irregular events such as flaring.
- Upset conditions: the majority of plant equipment will shut down (eg for maintenance) and flaring will occur. Gas powered generators (for site power) will continue to run.

Findings of the assessment are summarised as follows:

- the cumulative noise from all plant (untreated) on the premises is predicted to exceed the night-time noise limits by up to 6dB at assessment location R1 and 7 dB at assessment location R2; and
- noise from flaring is also expected to exceed the night-time noise limits by 4 dB at assessment location R1 and 16 dB at assessment location R2.

An analysis of noise generating equipment (refer Section 7.2 of Appendix B) has been undertaken to minimise the risk of plant selections and locations exceeding noise emission objectives. An analysis of noise from individual equipment types indicates that the predominant source of noise is associated with compressor engines. By reducing source noise from the compressor engines using an acoustically rated enclosure, noise emissions associated with the general operation of the Project is expected to comply with the Project noise limits.

No additional acoustic treatment is expected to be required to the reciprocating compressors or on-site ancillary equipment. While these measures have not been incorporated into the assessment model they have been included for consideration in detailed design.

5.3 Ecology

The complete MSES Report is provided in Appendix C.

The ecological assessment was based on a combination of field surveys and a review of past records of matters of environmental significance within the study area. Multiple field surveys were undertaken including:

- 6–9 December 2021 – general habitat assessments, incidental flora and fauna searches, vegetation community assessments;
- 7–12 March 2022 – late wet season/autumnal season survey; and
- 28 June – 1 July 2022 – verification of regional ecosystems, TEC and habitat mapping.

Key results of the assessment include:

- presence of Endangered regional ecosystems;
- confirmed essential habitat for Ornamental Snake;
- confirmed threatened species habitat, including records of Ornamental Snake and Squatter Pigeon, with records of White-throated Needletail close by (within 3 km); and
- no flora protected under the NC Act recorded.

The assessment identified that throughout the construction, operation and decommissioning phases, the Project has the potential to impact ecological values through the following activities:

- loss of habitat as a result of vegetation clearing;
- habitat fragmentation;
- fauna injury or mortality during vegetation clearing;
- fauna injury or mortality as a result of vehicle strike;
- disturbance to wildlife during construction as a result of noise, light and vibration;
- erosion and sedimentation which may impact on water quality;
- potential spills of hazardous materials;
- increase in numbers of pest animals and weeds due to increased vehicle movements and opening up areas of remnant vegetation from clearing for infrastructure; and
- elevated bushfire risk due to increase in activities on site that may cause a fire to start.

A significance of residual impacts assessment was undertaken of the Project's potential impacts on MSES that have been confirmed present or are considered likely to occur. The assessment was made against *Significant Residual Impact Guideline* for projects requiring assessment under the EP Act.

The significance assessments concluded a significant impact to endangered vegetation (RE 11.4.9) as well as Ornamental Snake habitat. It should be noted that a significant impact to Ornamental Snake habitat was concluded under the separate MNES assessment therefore under the hierarchy of impacts, offsets for that species will be prepared under the EPBC Act framework.

Key avoidance and mitigation measures to be implemented to ensure significant, residual impacts do not occur to MSES are:

- Design the Project to avoid areas of high ecological value where practicable. This has already been a principle in design and micro-siting of infrastructure will continue to be employed where practical.
- Develop a Species Management Program (required by DES under the NC Act when impacting on animal breeding places) to identify specific measures to be implemented that will mitigate impacts to threatened fauna species and animal breeding places during clearing, as well as operation of the Project.
- Sequential clearing is to be implemented. This will ensure impacts to fauna during clearing are avoided and minimised. A suitably qualified fauna spotter-catcher will be present during clearing to ensure native fauna are not impacted.
- Potential indirect impacts to MSES will be managed through implementation of measures such as weed hygiene protocols, managing weeds in retained bushland areas, reducing noise and lighting and managing stormwater runoff. These measures will be detailed in management plans to be prepared during detailed design.

Following the application of mitigation measures a high residual risk was identified for:

- vegetation/habitat – reduced vegetation and available habitat – construction.

No other high (or above) residual risks have been identified for the Project.

5.4 Surface Water

A Surface Water Impact Assessment Report is included in Appendix D. The surface water impact assessment has been prepared in accordance with the DES guideline *Application requirements for activities with impacts to water* and:

- describes the Project and proposed surface water management;
- reviews and summarises the relevant legislative and regulatory context;
- characterises the existing surface water environment based on available data including climate, catchment context, receiving watercourses, other relevant surface water features, water quality and any sensitive downstream receptors;
- identifies and assess potential impacts to the surface water environment from the Project through discharge of stormwater and modification to surface water drainage systems; and
- provides mitigation, monitoring and management measures to minimise potential impacts.

The Project lies on the catchment divide between the upper Fitzroy and Burdekin River Basins. The eastern extent of the Project including the GCF site is located in the headwaters of the upper Isaac River sub-basin. This falls generally to the south and east, draining to the Fitzroy River and ultimately to the coast near Rockhampton. The western extent of the Project is located in the headwaters of the Burdekin River Basin, within the Suttor River sub-basin. This falls generally to the west and north, draining to the Burdekin River and ultimately to the ocean near Home Hill.

Goonyella Creek within the upper Isaac River sub-basin is the main hydrologic feature of relevance to the Project. Goonyella Creek drains generally to the south and crosses the high-pressure pipeline alignment approximately 0.5 km to the west of the proposed GCF. At this location, Goonyella Creek is a 1st order stream and identified as a 'drainage feature' under the *Water Act 2000*.

Other hydrologic features consist only of localised depressions in the landscape that would retain runoff only briefly following rainfall.

Mabbin Creek and Gum Tree Creek are located near the western end of the Project and drain generally to the west. These ephemeral streams will receive runoff from the Project footprint and surrounding areas. Mabbin Creek forms a tributary of the Suttor River, whilst Gum Tree Creek forms a tributary of Diamond Creek, which in turn joins the Suttor River and then Burdekin River further downstream to the north.

Potential surface water related impacts associated with the construction, operation and decommissioning of the Project have been categorised as follows:

- altered surface water quantity (streamflow, surface water availability and flood regime) and impacts to watercourse geomorphology;
- altered surface water quality (increased nutrients, sediment load and turbidity, and other important physical and chemical water quality constituents); and
- altered surface water-groundwater interaction.

Key avoidance and mitigation measures to be implemented to ensure significant, residual impacts do not occur to surface water include:

- development and implementation of construction stormwater management measures as part of an overarching Soil and Water Management Plan or similar;
- development and implementation of erosion and sediment control measures;
- development and implementation of operational stormwater management measures as part of an overarching SWMP, consistent with best practise; and
- design and construction incorporates measures to divert and manage local overland flows around the facility, with the objective of minimising offsite flooding impacts.

The potential risk of impacts to surface water resources and associated environmental values during both construction and operation are considered minor and manageable with proposed mitigation measures in place.

5.5 Groundwater

A Groundwater Impact Assessment (GIA) Report is included in Appendix E. The following aspects have been addressed by the GIA Report:

- assessment of environmental and human users dependent on groundwater, including:
  - Groundwater Dependent Ecosystems; and
  - landholder water supplies;
- management of groundwater during construction of the Project, including:
  - consideration of excavation sequencing and its influence on groundwater inflow and environmental impacts; and
  - changes to water quality due to construction associated with the storage and replenishment of potential contaminants of concern;
- impacts to groundwater during the operation of the Project including potential changes to groundwater quality associated with the uncontrolled release of wastewater generated by both the GCF and as a by-product of hydrostatic pressure testing; and
- assessment of the Project against listed environmental values for the Fitzroy Basin.

The Project is located within the upper Isaac River sub-catchment, flanked to the south-west by the Peak Range, the Denham Ranges to the north-west, and the Broadsound and Connors Ranges to the east and north-east, respectively. Drainage gradients in the Isaac River sub-catchment are generally low across the central part of the sub-catchment and high around the catchment extent, with elevations varying from over 700 m AHD in the elevated region of the Connors Range to approximately 90 m AHD at the Isaac River-Mackenzie River confluence. The central portion of the sub-catchment, specific to the Project, is flat lying with limited relief. There are two drainages of relevance:

- unnamed drainage, tributary of Goonyella Creek (Isaac River sub-catchment); and
- Mabbin Creek, tributary of Diamond Creek (Suttor River sub-catchment).

The Project is located within the Permo-Triassic aged Bowen Basin, a geological depression occupying an area of approximately 200,000 km^2, extending from Collinsville in the north to Rolleston in the south.

The local hydrogeological regime comprises:

- shallow, unconfined and temporary groundwater of limited extent associated with the near-surface Quaternary sediment deposits occupying valley flats and riparian corridors;
- shallow and deep, unconfined to semi-confined groundwater in Tertiary sediment deposits;
- localised fractured rock groundwater systems in Tertiary basalt deposits; and
- a regional fractured rock groundwater system associated with the underlying Permian sedimentary sequences.

The assessment identified 26 groundwater bores within a 10 km search radius of the Project, consisting of:

- six private landholder bores, three of which have been abandoned/decommissioned;
- nineteen monitoring bores registered for mine monitoring; and
- one bore registered for petroleum and coal seam gas exploration.

The Project is not expected to interact with groundwater through the construction, operational or decommissioning phases and as such, the risk of impacts to groundwater quantity, groundwater quality and surface water-groundwater interactions are expected to be negligible.

5.6 Land

A Soils Impact Assessment Report (refer Appendix F) and Contaminated Land and Waste Report (refer Appendix G) have been prepared for the Project. A summary of findings is presented below.

5.6.1 Contaminated Land

The Project footprint is characterized predominantly by Late Tertiary and Quaternary unconsolidated sediments (colluvium and alluvium). The main soil types include:

- grey self-mulching cracking clays;
- red massive earths; and
- black self-mulching cracking clays.

The topography of the region is flat to rolling with varying elevation in the vicinity of the Project. Elevation ranges from approximately 290 m AHD at its western margins to 330 m AHD in the vicinity of the proposed GCF along Red Hill Ridge. In the vicinity of the GCF, the land surface slopes to the southwest towards Goonyella Creek.

One property within the Project footprint is listed on the EMR (Lot 2 SP214117).

The Australian Soil Resource Information System (ASRIS) has mapped the study area as Extremely Low Probability of Occurrence for Acid Sulfate Soils (ASS), the lowest probability allocation.

A search of the EA registers indicated there were no currently prescribed ERAs within 1 km of the study area.

The proposed high-pressure pipeline is located within the following EA areas:

- EA0002608 permit holder Winfield Group Investments Pty Ltd;
- EA0002845, permit holder BHP Mitsui Coal Pty Ltd (now Stanmore BMC Pty Ltd); and
- EPML00815613, permit holder Peabody (Bowen) Pty Ltd.

A search of Department of Defence online mapping identifies no areas of Unexploded Ordnance (UXO) potential.

Potential contaminated land impacts for the Project can be considered under two categories:

- disturbance of existing contamination; and
- creation of contaminated land.

The likelihood of significant contamination occurring because of the Project is considered to be low.

5.6.2 Soils

Soil survey results are consistent with regionally available soil mapping, with the identification of four soil profile classes, grouped into two soil mapping units, consisting primarily of deep, well-structured clay soils, predominantly cracking clay Vertosols, and deep red, weakly structured loamy soils, typically Kandosols. Sodic soils are present increasing with depth.

An erosion risk assessment has been undertaken to establish the baseline conditions relevant to erosion risk and provide guidance on the need and type of erosion and sediment control measures required and the design standards for control measures. The erosion risk assessment is highly variable but ranges from very low to extreme erosion risk. It is high during construction, due to soil exposure and the potential for site soils to disperse in the event of rainfall. The erosion risk assessment generally demonstrates a high to extreme.

Potential soils impacts for the Project have been classified under two categories:

- reduced soil quality and land capability; and
- increased erosion and sedimentation.

To manage and minimise potential soil impacts, relevant mitigation measures will be implemented during the construction and operational phases of the Project and include:

- implementing suitable soil management measures around soil stripping, handling, stockpiling, amelioration and backfill contained within a Soil Stripping Management Plan; and
- implementation of best practice erosion and sediment control in accordance with the applicable best practice guidelines.

Following the application of the recommended mitigation measures, residual impacts are low to medium.

5.7 Waste

Waste generation has been considered as part of the Contaminated Land and Waste Report (refer Section 7, Appendix G). Waste generation will occur during the construction and operational phases of the Project with the report identifying anticipated:

- waste streams and their potential project activity source;
- construction waste types and quantities; and
- operational waste types and quantities.

Confirmation of these waste and volumes will be occur as the Project is further developed.

All waste materials, hazardous chemicals, corrosive substances, toxic substances, gases and dangerous goods will be stored and handled in accordance with relevant Australian standards. Where no Australian Standard exists, all materials will be stored within an effective on-site containment system that prevents contamination of land or waters. Recyclable material will be segregated from landfill, where considered feasible and removed from site by personnel.

Wastes requiring transportation for recycling and/or disposal will be stored within designated waste storage areas located at each activity location.

Regulated waste will be stored in accordance with the thresholds of ERA 62 – no more than 6 t/m^3 of general waste, no more than 4 t/m^3 of Category 1 regulated waste and no more than 1 t/m^3 of Category 2 regulated waste. Where Category 2 waste is produced, appropriate segregation of the material will be completed and stored in accordance with the above requirements. General waste materials will be temporarily stored in containers, skips and compacted mounds around site to ensure practicability for site operations.

5.8 Indigenous Cultural Heritage

QPM Energy has engaged with native title lawyers and Traditional Owners and their advisers to assess the relevant Cultural Heritage and Native Title parties for the areas spanning the Project.

QPM Energy respects the unique and important association Traditional Owners (TOs) and local Indigenous communities have for 'country' - the land, environment, culture and traditional way of life.

QPM Energy has established and will maintain a strong relationship with TOs and Aboriginal people associated with the Project.

QPM Energy is committed to negotiating agreements with TOs in relation to our project.

Initial advice indicates that there are four distinct native title agreements that apply to Project. These are:

- Widi People of the Nebo Estate #1 represented by Gangal Narra Widi Aboriginal Corporation Registered Native Title Body Corporate (RNTBC) (Widi#1);
- Wiri People #2 represented by Wiri Community Ltd (Wiri#2);
- Widi People of the Nebo Estate #2 represented by Gangal Narra Widi Aboriginal Corporation RNTBC (Widi#2); and
- Jangga People represented by Bulganunna Aboriginal Corporation RNTBC.

QPM Energy has met with and visited site on two occasions with the Widi #1, Widi #2 and Wiri #2 People including completion of a cultural heritage survey. The 1 week survey was also undertaken jointly with both these parties and their selected archaeologist.

The survey identified a number of artifacts which have been logged and, where appropriate (eg isolated items), relocated off the proposed project footprint. High density sites will be managed through the proposed Cultural Heritage Management Plan (CHMP) to be developed by both the parties with the supporting advice of the archaeologist.

Discussions with the Jangga People for the last four kilometres of the pipeline corridor have commenced with respect to carrying out a cultural heritage survey and developing a CHMP (if required).

Native title is relevant for Widi #1 People in respect of impacted areas on Dabin Station which is held under leasehold.

Preliminary discussions related to an Indigenous Land Use Agreement have been held including a meeting in Mackay with representatives of the Widi #1 People.

Following completion of the Cultural Heritage survey, this discussion will now be accelerated with a better understanding of the area informed by the survey, and Part 7 notices will be issued to the four groups.

5.9 Non-Indigenous Cultural Heritage

Table 5.2 summarises the heritage registers reviewed for historic places within the Isaac Regional LGA and the associated findings. The heritage registers were reviewed on 22 August 2022. The registers search did not identify any significant places within the Project footprint.

Table 5.2 Non-indigenous Cultural Heritage – heritage register findings

Component	Findings
World Heritage List	None
Commonwealth Heritage List	None
The National Heritage Register List	None
The State Heritage Register	None
Isaac Regional Council Planning Scheme 2021	None

Based on the assessment, there are no known non-Indigenous cultural heritage constraints to the Project.

Pursuant to Part 9 of the *Queensland Heritage Act 1992* (Heritage Act), QPM Energy will be subject to the New Finds procedure. In the unlikely event that significant historic archaeological evidence is discovered, work will be stopped and suitably qualified archaeologist consulted.

5.10 Traffic and Transport

A Traffic Impact Assessment Report is included in Appendix H. A summary is provided below. The assessment:

- reviews the relevant statutory and policy controls that apply to the site and land use;
- provides details of:
  - description of the proposed construction and operational details;
  - the location of proposed access points;
  - estimated number of construction and operational vehicle movements (light and heavy); and
  - any potential impacts to general traffic within the vicinity of the site from construction and operational vehicles;
- assesses the risks associated with deliveries of construction materials and equipment and operations of the site.

The assessment was undertaken in accordance with DTMR guidelines and specifications.

Key findings include:

- the traffic generation due to the Project is expected to have minimal impact to the existing road network. Further discussions are being held with Isaac Regional Council in terms of road maintenance under a Road Maintenance Deed during the construction period;
- any oversize over mass vehicle accessibility is subject to NHVR approval for the Project;
- a construction traffic management plan will be prepared, associated with necessary traffic control plan which will minimise any potential risks generated by construction vehicles in the locality;

- the appointed construction contractor will implement Drivers Code of Conduct to ensure safety to all road users; and
- further stakeholder consultation will be undertaken in due course and appropriate community complaint management strategy will be in place.

5.11 Hazard and Risk

A hazard and risk assessment is included in Appendix I, with a summary provided below.

The assessment combined the findings of:

- the Hazard and Operability Study (HAZOP) undertaken for the GCF;
- the Safety Management Study (SMS) undertaken for the pipeline; and
- the GCF and Pipeline Front End Engineering and Design Control Philosophy (FEED) study for the Project.

Further, the report examines the health and safety aspects associated with the Project by identifying potential hazards and risks that may occur during the life of the Project and outlining the controls to be implemented.

A risk assessment consistent with the requirements of Australian Standards (AS) ISO31000 (2018) *Risk Management* – Guidelines was undertaken. Hazards were identified for each of the Project phases and evaluated qualitatively to determine residual risks after the implementation of risk management strategies and mitigation measures. With the implementation of mitigation measures, many hazards were determined to have a low residual risk. No risks were assessed as having a high residual risk.

Potential hazards assessed as having a medium residual risk included:

- natural hazards: bushfire, extreme climatic conditions, wildlife injury, vehicle collision with fauna;
- project hazards: worker fatigue, road and rail incidents, interface with existing infrastructure, gas flare activities, leaks and spills causing contamination, gas leak, shutdown or incident with NQGP; and
- storage, handling, use and transport of dangerous goods.

A medium residual risk is considered tolerable if reduced as far as practicable given the low frequency of occurrence or minor impact if the event occurred after the mitigations were implemented.

5.12 Environmental objectives and performance outcomes

An Environmental Objectives and Performance Outcomes cross reference table is presented below (Table 5.3). The Environmental Objectives and Performance Outcomes cross reference table has been developed to assist in demonstrating how the Project will address the objectives and outcomes identified in the EP Reg, where relevant.

Table 5.3 Environmental objectives and performance outcomes (EP Regulation 2019)

EV	Environmental Objective	Performance outcomes	Project response
Air	The activity will be operated in a way that protects the environmental values of air.	1. The activity will be operated in a way that protects the environmental values of air. 2. All of the following: a) fugitive emissions of contaminants from storage, handling and processing of materials and transporting materials within the site are prevented or minimised; b) contingency measures will prevent or minimise adverse effects on the environment from unplanned emissions and shut down and start up emissions of contaminants to air; and c) releases of contaminants to the atmosphere for dispersion will be managed to prevent or minimise adverse effects on environmental values.	The conservative air quality modelling undertaken for the Project shows that the predicted concentrations and deposition rates for incremental particulate matter (TSP, PM10, PM2.5 and dust deposition) are below the applicable EPP (Air) quality objectives at all assessment locations. Cumulative impacts for particulate matter were assessed by combining the incremental concentrations for the Project with background concentrations. The cumulative results showed that compliance with applicable EPP (Air) impact assessment criteria was predicted at all assessment locations. QPM Energy has committed to a range of mitigation measures and management practices to minimise pollutant emissions during construction and operation. The risks of residual impacts, after mitigation measures are applied, would also remain negligible.

Table 5.3 Environmental objectives and performance outcomes (EP Regulation 2019)

EV	Environmental Objective	Performance outcomes	Project response
Water	The activity will be operated in a way that protects environmental values of waters	1. There is no actual or potential discharge to waters of contaminants that may cause an adverse effect on an environmental value from the operation of the activity. 2. All of the following: a) the storage and handling of contaminants will include effective means of secondary containment to prevent or minimise releases to the environment from spillage or leaks; b) contingency measures will prevent or minimise adverse effects on the environment due to unplanned releases or discharges of contaminants to water; c) the activity will be managed so that stormwater contaminated by the activity that may cause an adverse effect on an environmental value will not leave the site without prior treatment; d) the disturbance of any acid sulfate soil, or potential acid sulfate soil, will be managed to prevent or minimise adverse effects on environmental values; e) acid producing rock will be managed to ensure that the production and release of acidic waste is prevented or minimised, including impacts during operation and after the environmental authority has been surrendered; f) any discharge to water or a watercourse or wetland will be managed so that there will be no adverse effects due to the altering of existing flow regimes for water or a watercourse or wetland; g) for a petroleum activity, the activity will be managed in a way that is consistent with the coal seam gas water management policy, including the prioritisation hierarchy for managing and using coal seam gas water and the prioritisation hierarchy for managing saline waste; and	The potential risk of impacts to water resources and associated EVs during both construction and operation are considered minor and manageable with proposed mitigation measures in place, including those listed below. Development of a Construction Environmental Management Plan and a Soil and Water Management Plan (or similar) that includes procedures for suspected contaminated soils or materials Appropriate storage of chemicals and appropriate fuel storage and handling an in accordance with Australian Standards and Workplace Health and Safety Regulation Spill kits made available at all active work areas, and in vehicles and machinery. Refuelling of mobile plant and vehicles to occur at designated areas within the Project footprint with appropriate bunding and an oil-water separator installed where applicable and suitably distanced from surface water bodies and drainage lines. Vehicles and plant maintenance will be conducted at designated paved laydown areas as much as practicable to minimise spills and leaks reaching soils, surface water bodies or shallow aquifers via seepage. In the unlikely event that suspected PASS is encountered during excavations, the material will be stockpiled, lined and covered to minimise infiltration of rainfall and subsequent leaching. Suspected PASS will be managed in accordance with the Queensland Acid Sulfate Soil Technical Manual: *Soil Management Guidelines* – 2014 Oil storage with pumps for the gas compressors and engines are to be bunded. Stormwater from upstream catchments and clean water runoff areas will be diverted around the premises to reduce loading on the internal water management system.

Table 5.3 Environmental objectives and performance outcomes (EP Regulation 2019)

EV	Environmental Objective	Performance outcomes	Project response
		h) the activity will be managed so that adverse effects on environmental values are prevented or minimised.	Provide water quality treatment to enable water reuse to reduce any residual water quality risks or to treat stormwater to an acceptable level (based on agreed water quality objectives) to mitigate potential water quality impacts to downstream environments and environmental values. Retain, manage and treat contaminated water within the site that cannot be safely discharged. All contaminated waste materials must be transported and disposed of in accordance with the EP Act through a licensed waste transported and licenced disposal facility.
Wetland	The activity will be operated in a way that protects the environmental values of wetlands.	1. There will be no potential or actual adverse effect on a wetland as part of carrying out the activity. 2. The activity will be managed in a way that prevents or minimises adverse effects on wetlands.	There are no wetlands of high or general ecological significance mapped within the Project footprint. The closest Wetlands of International Importance are Bowling Green Bay, located approximately 250 km to the north of the Project footprint and Shoalwater and Corio Bays approximately 250 km to the southeast of the Project footprint. Lake Elphinstone (listed in the Directory of Important Wetlands in Australia) is located approximately 30 km north-east of the Project footprint.
Groundwater	The activity will be operated in a way that protects the environmental values of groundwater and any associated surface ecological systems.	1. Both of the following apply: a) there will be no direct or indirect release of contaminants to groundwater from the operation of the activity; and b) there will be no actual or potential adverse effect on groundwater from the operation of the activity. 2. The activity will be managed to prevent or minimise adverse effects on groundwater or any associated surface ecological systems.	The Project is not expected to interact with groundwater through the construction, operational or decommissioning phases and as such, impacts to groundwater quantity, groundwater quality and surface water-groundwater interactions are expected to be negligible. Indirectly, identified sensitive environmental receptors and the Fitzroy Basin EVs are not anticipated to be impacted by the Project.

Table 5.3 Environmental objectives and performance outcomes (EP Regulation 2019)

EV	Environmental Objective	Performance outcomes	Project response
Noise	The activity will be operated in a way that protects the environmental values of the acoustic environment.	1. Sound from the activity is not audible at a sensitive receptor. 2. The release of sound to the environment from the activity is managed so that adverse effects on environmental values, including health and wellbeing and sensitive ecosystems, are prevented or minimised.	Noise modelling identified night-time exceedances for: unmitigated cumulative noise from all plant by 6–7 dB; and, flaring by 4–16 dB. An analysis of noise from individual equipment types indicates that the predominant source of noise is associated with compressor engines. By reducing source noise from the compressor engines using an acoustically rated enclosure, noise emissions associated with the general operation of the Project is expected to comply with the Project noise limits. No additional acoustic treatment is expected to be required to the reciprocating compressors or on-site ancillary equipment. While these measures have not been incorporated into the assessment model they have been included for consideration in detailed design. Flaring activities will typically occur rarely (eg quarterly during manual shutdowns) or during emergency shutdowns. Given the infrequency of such events, noise from flaring has been assessed against the ESR/2016/1935 Guideline short term criteria. It is expected that flaring will only occur during maintenance and upset conditions and is projected to operate four times per year including one forced start to test the system. A 30 minute full burn is expected for each shutdown. Noise associated with flaring during manual shut downs can be suitably managed by limiting such events to daytime periods. Noise associated with flaring during emergency shut downs can be suitably managed with community consultation in the absence of practical noise mitigation treatments.

Table 5.3 Environmental objectives and performance outcomes (EP Regulation 2019)

EV	Environmental Objective	Performance outcomes	Project response
Waste	Any waste generated, transported, or received as part of carrying out the activity is managed in a way that protects all environmental values.	1. Both of the following apply— a) waste generated, transported or received is managed in accordance with the waste and resource management hierarchy under the *Waste Reduction and Recycling Act 2011*; and b) if waste is disposed of, it is disposed of in a way that prevents or minimises adverse effects on environmental values.	All waste materials will be stored and handled in accordance with relevant Australian standards. Where no Australian Standard exists, all materials will be stored within an effective on-site containment system that prevents contamination of land or waters. Recyclable material will be segregated from landfill, where considered feasible and removed from site by personnel. Wastes requiring transportation for recycling and/or disposal will be stored within designated waste storage areas located at each activity location. Regulated waste will be stored in accordance with the thresholds of ERA 62 -no more than 6 t/m^3 of general waste, no more than 4 t/m^3 of Category 1 regulated waste and no more than 1 t/m^3 of Category 2 regulated waste. Where Category 2 waste is produced, appropriate segregation of the material will be completed and stored in accordance with the above requirements. General waste materials will be temporarily stored in containers, skips and compacted mounds around site to ensure practicability for site operations.

Table 5.3 Environmental objectives and performance outcomes (EP Regulation 2019)

EV	Environmental Objective	Performance outcomes	Project response
Land	The activity is operated in a way that protects the environmental values of land, including soils, subsoils, landforms and associated flora and fauna.	1. There is no actual or potential disturbance or adverse effect to the environmental values of land as part of carrying out the activity. 2. All of the following apply: a) activities that disturb land, soils, subsoils, landforms and associated flora and fauna will be managed in a way that prevents or minimises adverse effects on the environmental values of land; b) areas disturbed will be rehabilitated or restored to achieve sites: i) that are safe and stable; ii) where no environmental harm is being caused by anything on or in the land; and iii) that are able to sustain an appropriate land use after rehabilitation or restoration; c) the activity will be managed to prevent or minimise adverse effects on the environmental values of land due to unplanned releases or discharges, including spills and leaks of contaminants; and d) the application of water or waste to the land is sustainable and is managed to prevent or minimise adverse effects on the composition or structure of soils and subsoils.	The Project will result in disturbance to land. All land disturbance areas will be managed throughout the life of the Project to minimise and mitigate potential for adverse environmental impacts. Rehabilitation will progressive and as soon as reasonably practicable be undertaken throughout the life of the proposed Project. The target for successful rehabilitation is to ensure that reinstatement of vegetation is equal to or better that pre-construction status, except where permanent operational access is required. Progressive rehabilitation and stockpiling of soils near the site of excavation will be conducted to minimise potential blending of topsoil with other material. Mulching of green waste will be completed throughout the construction phase of the Project and stockpiled for use in rehabilitation and erosion and sediment control within the authorised construction area (although unlikely, mulch stockpiles are to be no greater than 10 m wide and higher than 2 m). All potential microhabitats features (eg rocks and fallen logs) will be relocated or stockpiled for use in rehabilitation. Watercourse rehabilitation will be consistent with surrounding environment and contours of the channel at the time of construction. The aim of the progressive rehabilitation and reinstatement is to ensure that the environment is safe, non-polluting and self-sustaining. The intention is to minimise additional management throughout the operational phase of the Project. Ongoing inspection for the management and removal of invasive weed species will be completed throughout all phases of the rehabilitation process. Rehabilitated areas are to be tracked via GIS. Where feasible to do so, the landscape will be rehabilitated to pre-existing contours with natural drainage lines restored and protected (if required). In certain cases, rehabilitation will be tailored to prior site-specific conditions in consultation with the landholder. To promote vegetation regrowth and promote and protect against the loss of topsoil, the pipeline 30 m wide construction corridor ROW surface will normally be lightly scarified prior to the respreading of topsoil.

Table 5.3 Environmental objectives and performance outcomes (EP Regulation 2019)

EV	Environmental Objective	Performance outcomes	Project response
			A significance of residual impacts assessment was undertaken of the Project's potential impacts on MSES that have been confirmed present or are considered likely to occur. The significance assessments concluded a significant impact to endangered vegetation (RE 11.4.9) as well as Ornamental Snake habitat. It should be noted that a significant impact to Ornamental Snake habitat was concluded under the separate MNES assessment therefore under the hierarchy of impacts, offsets for that species will be prepared under the EPBC Act framework.

5.13 Risk Assessment

The risk assessment has been undertaken in accordance with the likelihood, consequence and risk matrices as it applies to each technical assessment.

Risks that were assessed as retaining a high residual risk (or above) included:

- vegetation/habitat – reduced vegetation and available habitat – construction.

There are no other residual risks categorised as high (or above) identified for the Project.

6 Conclusion

This EAR has been prepared by EMM on behalf of QPM Energy in support for an application for a new EA for a resource activity, as part of the proposed QPM Energy Project.

This assessment provides sufficient detail to support an application for a site-specific EA and complies with the mandatory information requirements specified in Section 125 of the EP Act.

Environmental values that have the potential to be impacted by the Project were assessed. Key findings include:

- Air quality modelling shows that predicted concentrations for PM_{10}, $PM_{2.5}$, CO, NO_2, SO_2, and individual VOC concentrations are below the EPP (Air) air quality objectives.
- Cumulative assessment for particulate matter (combining both incremental and background concentrations showed that compliance with applicable EPP (Air).
- Cumulative noise from all plant (untreated) on the premises, and flaring activities is predicted to exceed the night-time noise limits. However, by reducing source noise from the compressor engines using an acoustically rated enclosure, noise emissions associated with general operation is expected to comply with the noise limits.
- Impact to endangered vegetation and Ornamental Snake habitat is anticipated and offsets will be required.
- Surface water and groundwater interactions are expected to be negligible. Indirectly, identified sensitive environmental receptors and the Fitzroy Basin EVs are not anticipated to be impacted by the Project.
- The likelihood of significant contamination occurring because of the Project is considered to be low.
- Erosion risk (residual) is considered high for the Project.
- Waste generation will occur during the construction and operational phases of the Project and will be managed in accordance with relevant Australian Standards, guidelines and regulation.
- Cultural heritage surveys and consultation with TO has been undertaken. Field surveys identified a number of artifacts which have been logged and relocated as appropriate. Discussions with TOs will be ingoing throughout the development of the Project.
- There are no non-indigenous cultural heritage places/interests within or proximate to the Project.
- Traffic generation is expected to have minimal impact to the local road network.
- Only one matter was assessed as retaining a high residual risk (or above) as follows:
    - vegetation/habitat – reduced vegetation and available habitat – construction.

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