A Montrose Environmental Company

Preliminary Documentation

Comet Ridge Limited
Mahalo North Coal Seam Gas Project
the Proposed action area (Petroleum Lease 1128)
BAA250074.01
2 September 2025

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EXECUTIVE SUMMARY

Comet Ridge Mahalo North Pty Ltd (Comet Ridge) is proposing a greenfield coal seam gas (CSG) development, the Mahalo North CSG Project (the Project) located in Central Queensland. The Project is located north of Rolleston and 70 kilometres (km) southeast of Emerald, within the Central Highlands Regional Council. The Project is contained within Petroleum (PL) 1128 application, which covers an area of approximately 14,000 hectares (ha), and is expected to operate over a lifespan of 30 years, supplying gas to the domestic Australian gas market. The development includes a total of 68 CSG wells, a gas compression facility (GCF), gas and water gathering pipelines, water management infrastructure, and associated access tracks.

Epic Environmental Pty Ltd (Epic) has prepared this Preliminary Documentation Report (PD report) on behalf of Comet Ridge for the Project. The PD report is prepared in response to the controlled action determination by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) on 19 March 2024. Further information in the form of a preliminary documentation was requested as the Department considers whether the Project is likely to have a significant impact on the following matters, protected under Part 3 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act):

- Listed threatened species and communities (sections 18 & 18A)
- A water resource in relation to unconventional gas development and large coal mining development (sections 24D & 24E)

On 16 January 2025, DCCEEW requested that the Independent Expert Scientific Committee on Unconventional Gas Development and Large Coal Mining Development (the IESC) provide comment on the Project. On 11 March 2025, the IESC responded to DCCEEW with 24 comments.

The PD report consolidates and references all relevant information, including the original referral, the Request for Information (RFI) issued by DCCEEW, the response to the IESC's advice and updated technical impact assessments to allow the Minister to make an informed decision whether to approve, under Part 9 of the EPBC Act, the taking of the action for each controlling provision.

Listed threatened species and communities

The RFI identified the Brigalow TEC (*Acacia harpophylla* dominant and co-dominant) as one that the Project may significantly impact. The terrestrial ecology field assessment results identified the presence of Brigalow TEC within the Proposed action area. The TEC is listed as Endangered under the EPBC Act. Remnant and regrowth vegetation identified as Brigalow woodland are considered analogous to Brigalow TEC and comprised the following remnant and regrowth REs: 11.3.1, 11.4.7, 11.4.8, 11.4.9, 11.4.9a and 11.5.16.

The overall extent of Brigalow TEC within the Proposed action area, subject to the ground-truthing survey effort, is estimated to be 259.44 ha. Additional areas in the north of the Proposed action area, mapped as partially comprising RE 11.5.16 (10 % or 30 % of mapped polygons), were not subject to flora surveys as they were not close to the Project and therefore not considered relevant to potential impacts.

A single area of SEVT TEC has been previously mapped (EMM 2022) as occurring in the south-east corner of the Proposed action area. Approximately 1 hectares (ha) occurs on a southern-facing slope on basaltic geology. There are no condition thresholds associated with the SEVT TEC listed in the relevant conservation advice (DCCEEW 2023). As such, it is assumed all occurrences of the community are considered representative of the TEC. The patch is surrounded by Mountain Coolibah woodland and is located approximately 300 m from the nearest Project infrastructure.

The impacts of the Project will largely occur in lands that are already highly modified as a result of cattle grazing activity. Through ongoing design refinement, the direct impact of the overall Project footprint on potential Matters of National Environmental Significance (MNES) habitat has been minimised to 1.28 ha of woodlands and 0.89 ha of cleared gilgais.

All occurrences of Brigalow TEC and SEVT TEC have been avoided, and no potential for significant impacts is considered possible. Two TECs, 11 threatened species, and four bird species listed as Migratory under the EPBC Act have some potential to occur in the Proposed action area. An assessment of the potential for significant impacts resulting from the Project activities was carried out only on those MNES considered as

potentially subject to substantial impacts. The assessments have been carried out in accordance with the *MNES significant impact guidelines 1.1* (MNES Guidelines) (DE 2013)

Based on the SRI assessments for MNES associated with the potential impacts of the Project, there are no predicted impacts to environmental values potentially requiring environmental offsets.

Assessment of the impact of groundwater drawdown on terrestrial GDEs

A terrestrial GDE assessment was undertaken to provide a detailed field-based investigation and assess the presence and nature of terrestrial GDEs within the Proposed action area and areas directly adjacent, which may be subject to an impact due to groundwater drawdown.

Four significant factors indicate that woody vegetation within the Proposed action area does not rely on groundwater to support transpiration:

- LWP values for all trees sampled from a range of habitats, including both brigalow and eucalypt woodlands, are consistently strongly negative, suggesting that woody vegetation is either reliant on soil moisture from unsaturated portions of the soil profile that is held tightly in a clay matrix or trees are using a highly saline groundwater source
- SMP values for the four deeper augers sampled during the field assessment overlap with LWP values reported for trees sampled at the individual assessment sites, implying that moisture in the soil profile's unsaturated regions supported transpiration at the time of sampling
- Analysis of stable isotope trends confirms that the unsaturated zone is the dominant moisture source supporting transpiration across the Proposed action area. There is no overlap between the isotopic composition of sampled xylem moisture and groundwater samples, while strong isotopic overlap exists between twigs and soils. Downhole $\delta^{18}O$ profiles also support a source of moisture from shallow regions in the soil profile.
- Groundwater within the tenement, confirmed by dedicated GDE monitoring bores, is both too deep (>19 metres (m)) and too saline (>30,000 µS/cm) to provide a functional source of moisture for deep-rooted woody vegetation

Consequently, Watermark Eco (2024) draws the following major conclusions from their assessment:

- Brigalow predominantly draws moisture from the shallow soil profile down to depths of 2.4 metres below ground level (mbgl), where extremely dry and hard clays arrest deeper penetration. This is consistent with previous studies on brigalow, which suggest a shallow rooting system
- There is no evidence from LWP measurement recorded in brigalow that trees rely on permanent or seasonal groundwater sources, supported by the observed susceptibility of the species to drought. SMP measurements confirm that unsaturated regions of the soil profile can support the moisture availability measured in leaves
- Stable isotope analysis also supports brigalow deriving moisture from shallow regions in the unsaturated soil profile, with strong isotopic overlap between twig xylem and soils and limited overlap between twig xylem and groundwater sources
- Eucalypts across the area are mostly shallow-rooted box species that rely on moisture from the shallow soil profile. Some species, such as Dawson gum, have a strong affinity with brigalow, suggesting that they derive moisture from similar shallow regions of the soil profile. Based on LWP values, there is no indication of any substantial groundwater utilisation for any eucalypt species in the Proposed action area. The lack of evidence for groundwater usage is further supported by stable isotope analysis demonstrating a strong affinity between soil and twig xylem moisture sources and limited interaction between twig xylem moisture and groundwater sources.

A follow-up GDE field assessment survey will be undertaken (currently scheduled for August 2025), which will be a repeat of the survey that was completed in August 2024. This additional field assessment will be completed during the same seasonal period, being the end of the dry season, as this is the time that GDEs (i.e. Brigalow) would most likely be drawing water from the groundwater rather than from surface water runoff. The follow-up survey aims to address annual variability and strengthen the evidence base for the absence or presence of GDEs within the project area.

Water resources

The potential groundwater impacts associated with the Project have been assessed, and a summary of the findings with respect to the *Significant impact guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources* has been provided.

The assessment found that the predicted water level drawdown from CSG production:

- May result in the exceedance of the Water Act trigger threshold in one active water supply bore due to the Project as a standalone development. When considered in a cumulative context, drawdown is predicted to exceed the trigger threshold in two bores. Potential impacts to authorised water bores will be managed in accordance with the responsible tenure holder obligations of the most recent UWIR and the 'make good' provisions of Chapter 3 of the Water Act.
- Is unlikely to impact aquatic GDEs, terrestrial GDEs or stygofauna
- None of the scenarios, within the tested parameter ranges, resulted in drawdown exceeding the 0.2-metre threshold in either the alluvial or Tertiary units located above the Arcturus Fault.

It is therefore concluded that the Project will not have a significant impact on the water resources.

Chemical Risk

A chemical risk assessment was prepared for the Project to evaluate the potential risk and effects of drilling fluids and water treatment products and their constituent chemicals on MNES. The chemical risk assessment identified twelve chemicals that were deemed to be potentially hazardous to the environment. The assessment included consideration of both surface and subsurface pathways for contamination. The assessment found that with management measures such as adopting the DNRME Code of Practice and implementing a site-specific environmental management plan, impacts to MNES would be highly unlikely.

Environmental Management

Comet Ridge will implement an EMP to minimise the potential for environmental harm from the Project. The EMP has been prepared with consideration of Comet Ridge's likely approval obligations and relevant legislative requirements. The scope of the EMP includes Project construction, operation, and rehabilitation activities undertaken by (or on behalf of) Comet Ridge for the Project. Additionally, the Project holds an Environmental Authority (EA) under the *Environmental Protection Act 1994*. The EA outlines key aspects of the Project, including strict limits on disturbance to sensitive ecological areas, noise, air emissions, and the release of contaminants into waters. These conditions ensure that the impacts of the Project are carefully managed to preserve environmental values over the long term.

Cumulative Impacts

The Project occurs in a region with existing mining projects in the wider area, including Whitehaven's Blackwater Coal Mine (10 km to the east at its closest point) and Glencore's Rolleston Open Cut mine, 38 km to the south. Cumulative impacts associated with these projects may be associated with impacts to ecological and groundwater values. Assessment of these potential cumulative impacts has been undertaken, and no potential or likely cumulative impacts associated with the Project and surrounding projects are predicted.

In response to the IESC advice (Item 20), a cumulative impact assessment has been undertaken and is provided in Section 9 of the WMMP (**Appendix L**).

Rehabilitation Requirements

A Rehabilitation Management Plan is provided in the EMP. This plan outlines the environmental protection commitments and control strategies to be implemented, maximising the effectiveness of rehabilitation activities. The Rehabilitation Management Plan and Rehabilitation Objectives and Criteria have been developed keeping regulatory requirements at both a State and Commonwealth level in mind. Rehabilitation activities and measures have been provided to ensure a safe, stable, non-polluting, and self-sustaining

landform, including restoration of habitat for listed threatened species, including the Koala, and avoidance of sedimentation/erosion within the site generally.

In the absence of specific landowner agreements, the proposed final land use will be consistent with the current pre-disturbed land use (agricultural or native ecosystem). Any land that is contaminated as a result of the Project activities will be remediated in accordance with accepted industry practice at the time and the relevant current regulatory and administrative requirements.

Ecologically Sustainable Development

Under Section 3A of the EPBC Act, Project ESD is guided by the following core principles:

- **Integration principle:** Comet Ridge demonstrates the integration principle through its governance frameworks, cultural heritage protections, environmental risk mitigations, and focus on economic and social benefit. This approach ensures decision-making integrates long-term and short-term considerations
- **Precautionary principle:** Comet Ridge has demonstrated a commitment to aligning the Project with the precautionary principle, as defined under the Intergovernmental Agreement on the Environment (IGA) and the EPBC Act, through applying the following:
  - Careful evaluation and avoidance of environmental damage
  - Mitigation of known risks
  - Risk-weighted assessment and responsible decision-making
- **Inter-generational Equity Principle:** The Project has been designed with robust environmental controls to minimise its Disturbance footprint. EA conditions regulate key aspects of the Project, including strict limits on disturbance to sensitive ecological areas, noise, air emissions, greenhouse gas emissions and the release of contaminants into waters. These conditions ensure that the impacts of the Project are carefully managed to preserve environmental values over the long term
- **Biodiversity diversity and ecological integrity principle:** Comet Ridge has taken a proactive approach to avoid and minimise environmental impacts on biodiversity. The Project's disturbance footprint was designed following extensive ecological surveys and iterative planning to avoid high-value ecological areas and minimise habitat fragmentation. A significant majority of the disturbance footprint occurs within non-remnant vegetation, with only 1.17 ha of remnant vegetation impacted. This strategic siting of infrastructure preserves critical habitats and maintains landscape connectivity, thereby supporting the ecological integrity of the Proposed action area.

Economic and Social Matters

This Project is crucial for both the state and national economy, particularly as the East Coast gas market faces a predicted shortfall by 2027. This shortage could lead to gas supply issues and power outages in southern states, as pipeline capacity from Queensland is limited. The development of new gas import terminals in Victoria and NSW has been delayed due to environmental concerns, government interventions, and commercial issues. With moratoriums on onshore gas development in those states, Queensland is expected to meet domestic gas needs. This Project will help maintain Australia's reputation as a reliable gas supplier and support critical industries, including manufacturing. Comet Ridge's Project will contribute significantly, with a seven-year gas sales agreement with CleanCo Queensland to support low-emission energy. The Project promises economic benefits such as job creation and regional income, but may also cause negative impacts like increased traffic during construction. Comet Ridge is committed to mitigating these impacts and engaging with local communities.

Public Engagement

Comet Ridge was founded to develop gas opportunities in the Comet region and has maintained close relationships with local stakeholders for over 19 years. The company prioritises respectful engagement with landholders, traditional owners, government authorities, and the wider community, reflecting its deep ties to the Mahalo Gas Hub area.

Community engagement has been extensive, including regular briefings to local councils and the Central Highlands Development Corporation, sponsorship of local events such as the Rolleston Wild Horse Cutting competition, and direct communication with traditional owners, particularly the Gaangalu Nations People (GNP). Public consultation during the EA process in 2024 generated no local objections, with only Lock the Gate appealing, though their challenge was dismissed after review by DETSI. Both councils, CHDC, local groups, and the GNP expressed appreciation for Comet Ridge's transparency and raised no major concerns.

Comet Ridge has developed strong landholder relationships, executing conduct and compensation agreements with key properties such as Meroo and Togara, and previously with landholders in the Mahalo JV area while acting as Agent for Santos. Ongoing negotiations and discussions ensure landholders are informed about drilling plans, schedules, and potential impacts, with landholder support confirmed for initial development.

The company also collaborates with neighbouring coal companies, including Whitehaven Coal, to address overlapping tenures and support sustainable co-development of resources. Comet Ridge's project team brings decades of experience in coal seam gas development, underpinned by strong community trust, long-term stakeholder relationships, and a consistent approach to landholder and cultural engagement.

Indigenous Engagement

Comet Ridge began engaging with the GNP in 2019 after being awarded Authority to Prospect (ATP) 2048, which includes the Proposed action area. The company has held annual discussions on exploration and development, including cultural heritage surveys prior to ground disturbance. Comet Ridge negotiated Native Title agreements with the GNP for ATP 2048 and ATP 2063 in 2020-2021, though the GNP's Native Title claim was rejected in 2024. While Native Title does not exist in the proposed area, Comet Ridge continues to engage with the GNP and other stakeholders on cultural heritage surveys and will maintain compliance with relevant legislation throughout the Project.

Environmental Record

Comet Ridge was founded in 2003, with its headquarters in Brisbane, Queensland. Comet Ridge has operated in Queensland, New South Wales and New Zealand, and is currently operating in Queensland. Comet Ridge (and its subsidiaries) currently hold seven ATP, two PLAs and one Petroleum Survey License (PSL), with associated Environmental Authorities (EA) in Queensland. Comet Ridge has engaged in petroleum gas well drilling, corehole drilling, 2D seismic acquisition programs and pilot production testing, since its inception. Comet Ridge is proud of its environmental credentials.

There are no past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against or naming Comet Ridge Limited (COI), any of its subsidiary company's listed, or any of the executive officers (details of which are listed below) of the body corporate and its subsidiaries. Nether is COI, its subsidiaries or the executive officers of those entities are of any pending or proposed action to be taken for the protection of the environment or conservation and sustainable use of natural resources in any of the permits or licences held or previously held by them.

1 CROSS REFERENCE TABLE

1.1 Request for Further Information

A cross-reference table for the RFI is provided in **Table 1** to detail the relevant section addressed in this report to the RFI item, and the applicability of the item to the Project.

Table 1. Cross-reference for RFI item

RFI Number	Item Description	Applicability / Section Referenced
1. Description of the Action		
1.1	Provide all information presented in the referral on the description of the action in the preliminary documentation.	**Section 3**
1.2	Include updated information if any changes have been made to the proposed action since the referral documentation was submitted.	**Section 2.5**
1.3	A description of all components of the action, including the anticipated timing and duration (including start and completion dates) of each component of the proposed action. All construction, operational, decommissioning and rehabilitation components of the proposed action should be described in detail. In addition, any components which were included in the referral material, but are no longer part of the proposed action, must be clarified.	**Section 3**
1.4	Provide a description of any approval that has been obtained from a State or Commonwealth agency or authority, including any conditions that apply to the action. Include a statement identifying any additional approval that is required.	**Section 2.4**
2. Listed Threatened Species and Ecological Communities		
2.1 Habitat Assessment		
2.1.1	Provide a habitat assessment for relevant listed threatened ecological communities, including any outside the proposed action area where they have the potential to be impacted.	**Section 5.2**
2.1.2	Identify and describe known historical records of the listed threatened ecological communities in the broader region. All known records must be supported by: • an appropriate source (i.e. Commonwealth and State databases, published research, publicly available survey reports, etc.) • the year of the record • description of the habitat in which the record was identified, if available.	**Section 5.2.1**
2.1.3	Include an assessment of the adequacy of any surveys undertaken (including survey effort and timing). Assess the extent to which these surveys were appropriate and undertaken in accordance with relevant departmental survey guidelines for the listed species or community.	**Section 5.1.2.1** and **5.1.2.2**
2.1.4	Include the total area of habitat (in hectares) for each relevant protected matter, including: • total habitat within the proposed action area • where relevant, total habitat in the proposed action area and surrounds.	**Table 12** and **Table 13**
2.1.5	An assessment (in a cross-reference table) of vegetation composition against the key diagnostic characteristics and condition thresholds for Brigalow TEC, including consideration of remnant and regrowth Brigalow TEC within the proposed action area.	**Section 5.2.2, Table 9** and **Table 10**
2.1.6	The total area (in hectares) of identified remnant and regrowth Brigalow TEC within the proposed action area.	**Table 9**
2.1.7	Conduct an investigation to determine whether any linkage between Brigalow TEC and groundwater exists. This investigation must be done using validated, ground-truthed methods such as Doody et al. (2019). Discuss the findings of these investigations within the PD and provide supporting evidence to inform whether these linkages exist and, if so, to what extent.	**Section 5.3**

RFI Number	Item Description	Applicability / Section Referenced
2.2 Summary of habitat assessment		
2.2.1	Provide a summary table stating: • the relevant departmental documents used for the listed species or ecological community • the survey requirements for the listed species or community within these documents • the survey methods utilised • the survey effort undertaken	**Section 5.1.2.2**
2.2.2	Provide a summary table of the area (in hectares) of habitat for each listed threatened ecological community within the proposed action area and the disturbance footprint.	**Table 9**
2.3. Impact Assessment		
2.3.1	An assessment of the likely impacts associated with the proposed action, including the construction, operational, maintenance and decommissioning components of the proposed action.	**Section 5.4**
2.3.2	Include the direct, indirect and consequential/facilitated loss and/or disturbance of protected matters and their habitat as a result of the proposed action. This must include the area (in hectares) and quality of the habitat to be impacted.	**Table** 13
2.3.3	An assessment of the impacts of habitat fragmentation in the proposed action area and surrounding areas.	**Section 5.4.2**
2.3.4	An assessment of the likely duration of impacts to protected matters as a result of the proposed action.	**Section 5.4.13**
2.3.5	A discussion of whether the impacts are likely to be repeated, for example as part of maintenance.	**Section 5.4.13**
2.3.6	A discussion of whether any impacts are likely to be unknown, unpredictable or irreversible.	**Section 5.4.13**
2.3.7	Justify, with supporting evidence, how the proposed action will not be inconsistent with: • Australia's obligations under the Biodiversity Convention, the Convention on Conservation of Nature in the South Pacific (Apia Convention), and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and • a recovery plan or threat abatement plan.	**Section 5.6.2**
2.3.8	An assessment of the impacts of the proposed action on Brigalow TEC with respect to changes to surface hydrology and potential decline in groundwater availability and quality and whether this may reduce the condition of the community to the extent in which it would not meet the threshold to be classed as Brigalow TEC.	**Section 5.4.11**
2.3.9	Assess, if relevant, how changes to hydrology associated with the proposed action may impact on other listed threatened species and threatened ecological communities, taking into consideration both surface and groundwater dependence and other potential impacts listed above.	**Section 5.4.8, Section 5.3** and **Section 5.4.11; Section 7 in Appendix E**
3. A Water Resource in Relation to Unconventional Gas Development and Large Coal Mining Development		
3.1 Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development		
3.1	Under section 131AB of the EPBC Act, the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC), which is a statutory body under the EPBC Act, will provide advice to the Minister on the proposed action. The Information guidelines for IESC advice on coal seam gas and large coal mining development proposals (IESC guidelines) provides guidance on the IESC's information needs and can be found at the following website: http://www.iesc.gov.au/information-guidelines The information provided in the draft PD will be reviewed by the IESC. The	**Section 6.7**

RFI Number	Item Description	Applicability / Section Referenced
	draft PD must cross reference the IESC checklist, found in the IESC guidelines, to ensure that the IESC's information guidance has been considered and addressed. The IESC advice and the proponent's response to that advice, including any necessary additions and/or revisions to the draft PD, must be included in the PD package that will be published for public comment. The IESC provides a number of publications and resources, including the IESC explanatory notes, which can be used as guidance material in drafting the PD. These publications can be found at the following website: http://iesc.environment.gov.au/publications. Where the approach to assessment of impacts and management of water resources differs from that outlined in the IESC guidance documentation, provide detailed reasoning and justification.	
3.2 Joint Industry Framework		
3.2	Please note the joint industry framework (JIF) will likely apply to the proposed action. The JIF can be found here: www.dcceew.gov.au/environment/epbc/publications/coal-seam-gas-joint-industry-framework The JIF provides an outcomes and risk-based approach to groundwater impact management and outlines standard conditions for groundwater management of coal seam gas (CSG) developments in the Surat Cumulative Management Area (CMA). The JIF incorporates relevant management framework/s that must be followed by an approval holder if a risk threshold for a protected matter is predicted to be exceeded. The management of surface water and other impacts to a water resource unrelated to groundwater is outside the scope of the JIF.	**Section 6.1**
3.3 The hydrology relevant to the proposed action area, including surface water and groundwater		
3.3.1	Provide a regional overview of the proposed action area, including a description of the geological basin, coal resource, surface water catchments, groundwater systems and water dependent assets.	**Section 6.2;** **Section 2** of **Appendix D** **Section 3** of **Appendix F,** Section 4 and Section 5.2 of **Appendix G;** Section 4.3 and Section 5.1 of **Appendix L;** and Section 3 of **Appendix M**
3.3.2	Describe any potential third-party users of water in areas potentially affected by the proposed action, including municipal, agricultural, industrial, recreational and environmental uses of water.	**Section 6.3, Section 6.6.1.1, Section 6.6.1.4,** , **Section 5.1** of **Appendix G; Section 5.1** of **Appendix L**
3.3.3	Provide details of the surface water and groundwater hydrology and quality associated with, adjacent to and downstream of the proposed action area and how they relate to groundwater dependent ecosystems. Information about surface water and groundwater must: • be informed by at least two years of systematic water quality monitoring with sufficient temporal coverage to best capture seasonality and trends, including: - monthly sampling of groundwater - monthly sampling, if possible, of surface water, and event-based sampling as needed. • follow relevant Commonwealth, State and/or best practice guidelines to conduct a baseline study and derive water quality guidelines, such as ANZG (2018): https://www.waterquality.gov.au/anz-guidelines/framework/baseline-study	**Section 6.2** Monthly groundwater data is being collected and will continue to be monitored until production commences. For surface water data, as the Project does not impact any surface water resources, quarterly data collection will be conducted until production commences.

RFI Number	Item Description	Applicability / Section Referenced
	- include measurement of physico-chemical parameters, nutrients, metals and metalloids, and any other relevant parameters, such as hydrocarbons, needed to understand potential impacts - describe, if relevant, how baseline hydrological conditions may be influenced by activities associated with nearby mining operations.	See also **Section 6, Section 8** of **Appendix L**
3.3.4	Provide a discussion with supporting evidence of the occurrence of terrestrial, aquatic and subterranean GDEs within, adjacent to and downstream of the proposed action area. Groundwater dependency should be ground-truthed using a validated method, such as Doody et al. (2019).	**Section 6.3.2**
3.4 Impact assessment		
3.4	The preliminary documentation must include an assessment of direct, indirect and consequential/facilitated impacts on water resources as a result of the proposed action and must be assessed in accordance with relevant departmental policies and guidelines. The department considers the proposed action may result in, but is not limited to, the following impacts: • contamination via seepage, unplanned releases of CSG contaminated water, chemicals or fuel or during drilling of wells (noting drilling fluid is likely to be extracted during dewatering) • changes to ground and surface water quality • surface flow regimes • groundwater drawdown and associated impacts on: - groundwater dependent ecosystems - third-party bores - springs potentially occurring in the proposed action area - groundwater baseflow contribution to surface flows • cumulative impacts with other CSG operations in the region. The PD must include a description and assessment of the potential impacts to water resources, giving consideration to relevant departmental policies and guidelines, including the JIF and Significant Impact *Guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources* (2022). These guidelines can be found at the following website: http://www.dcceew.gov.au/environment/epbc/publications/significant-impact-guidelines-13-coal-seam-gas-and-large-coal-mining-developments-impacts The PD must provide robust scientific information and supporting evidence for every assertion, assumption and/or conclusion made in the assessment of potential impacts, or lack of impacts, on water resources. Collection of baseline data by further field surveys would further inform the models presented, and assist in validating the conclusions presented in the referral documentation.	**Section 6.6**
3.5 Chemical Risk		
3.5.1	Details of how the risks of adverse impacts on protected matters posed by chemicals will be assessed and managed consistent with best practice risk assessment methodology. These details must include: • the process lifecycle for chemicals • how risk from geogenic chemicals in CSG produced water and recovered drilling fluids will be managed to prevent adverse impacts to protected matters	**Section 7.1; Table 37, Table 38,** and **Table 39** in **Section 7.4;** and **Section 7.5** See also **Section 2.2** of **Appendix H**

RFI Number	Item Description	Applicability / Section Referenced
	• minimum mitigation and management measures to be undertaken as part of CSG operations • chemical spill management protocols.	
3.5.2	Details of the criteria by which chemicals will be categorised, based on the properties of each chemical. Criteria must include, but not be limited to: • combined persistence, bioaccumulative and toxicity assessment • chemical database of concern assessment • specific persistence, bioaccumulative and toxicity assessment.	**Table 33** and **Table 35**
3.5.3	Detail a risk assessment process for each chemical to determine risk to protected matters from the chemical's use. This process must: • identify the risk assessment requirements based on the chemical's category • consider the chemical's intended use and function, and an estimation of the quantity of the chemical likely to be used, and at what concentration, in a typical year • consider the likely environmental fate of the chemical • consider what, if any, mitigation and management measures are needed to prevent adverse impacts to protected matters from that chemical for the duration of this approval.	**Section 7.1, Section 7.2, Section 7.3, Section 7.4,** and **Section 7.5** See also **Section 2, Section 5, Section 6, Section 7 Section 8** and **Section 9** of **Appendix H**
3.5.4	Details of the process by which risk assessments for low-risk chemicals will be peer reviewed by an independent chemical risk assessment expert. This process must: • consider any checklists completed by the independent chemical risk assessment expert, to demonstrate that risks have been adequately assessed • include provision of a signed and dated statement from the independent chemical risk assessment expert confirming that the chemical has been correctly categorised.	**Section 7.6.3**
3.5.5	Details of the process for recording each chemical's risk assessment in a register on the approval holder's website and for the provision of each chemical's risk assessment to the department.	**Section 7.6.5** See also **Appendix B** of **Appendix H**
3.5.6	Details of a process to monitor and report on the implementation of any mitigation and management measures undertaken during use and handling of chemicals, to demonstrate no adverse impacts to protected matters.	**Section 7.6.1**
3.5.7	Details of the process by which information in the risk assessments will be adaptively used to address any accidental release of a chemical to prevent adverse impacts to protected matters.	**Section 7.6.6**
4. Avoiding, Monitoring, Mitigating and Managing Impacts		
4.1	Include any relevant plans relied upon for the mitigation or management of impacts on listed threatened species or ecological communities or water resources (in approved or draft format) as appendices to the preliminary documentation.	**Section 8** and **Appendix I** See also **Section 7** of **Appendix C;** **Section 6** of **Appendix D;** **Section 4, Section 5** and **Section 6** of **Appendix F;** **Section 8** of **Appendix G;** **Section 9 of Appendix H;** and **Appendix I;** **Section 8.8** of **Appendix L**; **Section 3, Section 5,** and **Section 6** of **Appendix N**

RFI Number	Item Description	Applicability / Section Referenced
4.2	A detailed summary of measures proposed to be undertaken by the proponent to avoid, mitigate and manage relevant impacts of the proposed action on relevant protected matters (including any measures required through other Commonwealth, State and/or local government approvals). Proposed measures must be based on best available practices, appropriate standards, evidence of success for other similar actions and supported by published scientific evidence. All commitments must be drafted using committal language (e.g. 'will' and 'must') when describing the proposed measures. All proposed measures must also be drafted to meet the 'S.M.A.R.T' principle: S – Specific (what and how) M – Measurable (baseline information, number/value, auditable) A – Achievable (timeframe, money, personnel) R – Relevant (conservation advices, recovery plans, threat abatement plans) T – Time-bound (specific timeframe to complete).	**Section 5.5, Section 6.2.6, Section 6.3.2, Section 6.6, Section 7.5, Section 8.1,** specifically **Section 8.1.1** and **Appendix I** See also, **Section 7** of **Appendix C;** **Section 6** of **Appendix D;** **Section 4, Section 5,** and **Section 6** of **Appendix F;** **Section 8** of **Appendix G;** **Section 9** of **Appendix H;** **Section 8.8** of **Appendix L; and** **Section 6** of **Appendix N**
4.3	Information on the timing, frequency and duration of the proposed avoidance, mitigation and management measures to be implemented.	**Section 5.5, Section 8.1** and **Appendix I**
4.4	Details of specific and measurable environmental outcomes to be achieved for relevant protected matters, including an assessment of the expected or predicted effectiveness of the proposed measures.	**Sections 8.1.9, Section 8.1.10, Section 8.1.17**
4.5	Any statutory or policy basis for the proposed measures, including reference to the SPRAT Database and relevant approved conservation advice, recovery plan or threat abatement plan, and a discussion on how the proposed measures are consistent with relevant plans.	**Section 8.1.10, Section 5** and **Section 9** of **Appendix C,** and **Section 1.2** of **Appendix I**
4.6	Details of ongoing management and monitoring programs, including timing, to validate the effectiveness of proposed measures and demonstrate that environmental outcomes will be, or have been, achieved.	**Section 8**
4.7	Details of tangible, on-ground corrective actions that will be implemented, including timing, in the event that monitoring programs indicate that the environmental outcomes have not been, or will not be, achieved.	**Section 8.1.4** and **Section 8.1.5** See also: **Section 9** of **Appendix H;** and **Appendix I**
Groundwater and groundwater dependent ecosystems		
4.8	Include a commitment to ongoing water monitoring regimes to ensure the detection of any potential impacts and their source.	**Section 8.1.17** See also: **Section 8** of **Appendix L;** and **Section 5** of **Appendix M**
4.9	Commit to management actions when monitoring suggests impacts to water resources may occur (i.e. creation of a Trigger Action Response Plan).	**Section 8.1.17;** **Section 7** of **Appendix L;**
4.10	Include monitoring, mitigation and management measures relating to potential groundwater impacts or water quality impacts on the following values, including but not limited to: • potential aquatic, terrestrial or subterranean GDEs present within, adjacent to, or downstream of, the proposed action area and surrounding region • water supply bores. This should also include corrective actions and offsets if required.	**Section 8.1.17;** **Section 8, Section 9** and **Section 10** of **Appendix L;** and **Section 5** of **Appendix M**

RFI Number	Item Description	Applicability / Section Referenced
Surface water		
4.11	Details of the monitoring, mitigation and management measures relating to potential impacts to surface water, such as: • chemical spills, waste leaching, or seepage into surface water features surface flow regimes and the downstream environment (i.e. the Comet River).	**Section 8.1.16** See also **Section 8.6**, **Section 8.7,** and **Section 8.8** of **Appendix L** **Section 5** and **Section 6** of **Appendix N**
Cumulative impacts		
4.12	The proposed action, although not inextricably linked to other actions, is part of the Mahalo CSG Hub involving existing and potentially future developments by the proponent and other developers. The PD must identify and assess the scale and extent of all the potential and likely cumulative impacts on water resources from the proposed action and other nearby resource projects. Where cumulative impacts are predicted, avoidance, mitigation and management measures must be proposed. This should also include corrective actions and offsets if required.	**Section 5.4.12, Section 6.5, Section 6.6,** and **Section 8.2** See also **Section 7** of **Appendix G** and **Section 9** of **Appendix L**
5. Rehabilitation Requirements		
5.1	The details of any rehabilitation activities proposed to be undertaken and how they meet best practice standards, including for the restoration of habitat for relevant MNES and avoidance of sedimentation/erosion.	**Section 2, Section 7, Section 8**, and **Section 9** See also **Section 15** of **Appendix I**
5.2	The details of any rehabilitation activities proposed to be undertaken as required by any Commonwealth, state, and/or local government approvals.	**Section 9, Table 61**
5.3	A summary of the vegetation community/habitat that is being rehabilitated and the dominant species that will be included in the rehabilitation site. **Note:** climate suitable local seed mix should be included in the rehabilitation methodology where appropriate.	**Section 9.2**
5.4	The proposed final landform, including rehabilitation completion criteria, and its relation to the pre-disturbance vegetation community. Include an assessment of the expected or predicted effectiveness of the proposed rehabilitation activities.	**Sections 9.3, 9.4** and **Table 61**
5.5	Information on the timing, frequency and duration of proposed rehabilitation activities to be implemented, including anticipated time to completion (refer to 'S.M.A.R.T' principle above). All commitments must be drafted using committal language (e.g. 'will' and 'must') when describing the proposed activities.	**Section 9**
5.6	Details of ongoing management and monitoring programs, including timing, to validate the effectiveness of proposed rehabilitation activities and demonstrate that completion criteria will be, or have been, achieved.	**Section 8, Table 61**
5.7	Details of tangible, on-ground corrective actions that will be implemented, including timing, in the event that monitoring programs indicate that the completion criteria have not been, or will not be, achieved.	**Section 9, Table 61**
6. Offsets		
6.1	An assessment of the likelihood of residual significant impacts occurring on relevant protected matters, after avoidance, mitigation and management measures have been applied.	No environmental offsets required for the Project (Refer **Section 5.6** for SRI assessment and **Section 5.7** for offsets conclusion)
6.2	If a residual significant impact is likely, provide a summary of the proposed environmental offset and key commitments to achieve a conservation gain for each protected matter in accordance with the Offsets Policy.	
6.3	If an offset area has not been nominated, include a draft OMS as an appendix to the preliminary documentation. The draft OMS must meet the information requirements set out in Appendix B1.	

RFI Number	Item Description	Applicability / Section Referenced
6.4	Where offset area/s have been nominated, include a draft OMP as an appendix to the preliminary documentation. The draft OMP must meet the information requirements set out in Appendix B2, and must be prepared by a suitably qualified ecologist and in accordance with the department's Environmental Management Plan Guidelines (2024), available at: www.dcceew.gov.au/environment/epbc/publications/environmental-management-plan-guidelines	
7. Ecologically Sustainable Development (ESD)		
7.1	A description of how the proposed action meets the principles of ESD, as defined in section 3A of the EPBC Act. The following principles are principles of ecologically sustainable development: • decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations • if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation • the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations • the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making • improved valuation, pricing and incentive mechanisms should be promoted.	**Section 10**
8. Economic and Social Matters		
8.1	An analysis of the economic and social impacts of the action, both positive and negative.	**Section 11.1**
8.2	Details of any public consultation activities undertaken and their outcomes.	**Section 11.2**
8.3	Details of any consultation with Indigenous stakeholders. **Indigenous engagement** Identify existing or potential native title rights and interests, including any areas and objects that are of particular significance to Indigenous peoples and communities, possibly impacted by the proposed action and the potential for managing those impacts. Describe any Indigenous consultation that has been undertaken, or will be undertaken, in relation to the proposed action and their outcomes. The department considers that best practice consultation, in accordance with the Guidance for proponents on best practice Indigenous engagement for environmental assessments under the EPBC Act (2016) includes: • identifying and acknowledging all relevant affected Indigenous peoples and communities • committing to early engagement • building trust through early and ongoing communication for the duration of the proposed action, including approvals, implementation and future management • setting appropriate timeframes for consultation • demonstrating cultural awareness. Describe any state requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action with regards to Indigenous peoples and communities.	**Section 11.3**
8.4	Projected economic costs and benefits of the proposed action, including the basis for their estimate through cost/benefit analysis or similar studies.	**Section 11.4**

RFI Number	Item Description	Applicability / Section Referenced
8.5	Employment opportunities expected to be generated by the proposed action (including construction and operational phases).	**Section 11.5**
9. Environmental Record of the Person Proposing to Take the Action		
9.1	Include details of any past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against: • the person proposing to take the action • for an action for which a person has applied for a permit, the person making the application • if the person is a body corporate—the history of its executive officers in relation to environmental matters • if the person is a body corporate that is a subsidiary of another body or company (the parent body)—the history in relation to environmental matters of the parent body and its executive officers.	**Section 12**
Appendix A. Preliminary Documentation Content, Style and Formatting Requirements		
I. Content requirements		
I.1	Be a stand-alone document containing sufficient information to avoid the need to search out appendices, previous submissions, or supplementary reports for key information.	Incorporated throughout document.
I.2	Enable interested stakeholders and the Minister to easily understand the consequences of the proposed action on matters of national environmental significance (MNES).	
I.3	Be written so that any conclusions reached can be independently assessed. Include all key claims, findings, proposals and undertakings in the main document.	
I.4	Refer to all relevant standards, policies and other guidance material published by the department. Any instances where published guidance is not followed must be justified. Where no Commonwealth standards exist, state government and industry standards may be useful.	
I.5	Include the names, roles and qualifications (where relevant) of all persons involved in preparing the preliminary documentation.	**Section 2.3**
I.6	Include a copy of this request for information and a cross-reference table indicating where the information fulfilling this request is included in the preliminary documentation (e.g. Section 4.2.2 and Appendix A, Chapter 2.1).	As per this cross-reference table.
I.7	The preliminary documentation must state the following for all information provided: • the source and date of the information • how the reliability of the information was tested • the uncertainties (if any) in the information • the guidelines, plans, and/or policies considered.	Incorporated throughout document
II. Format and style requirements		
II.1	Be in a suitable format to be published in hardcopy (A4 or A3 size, with maps and diagrams in A4 or A3 size and in colour) and published in electronic format (e.g. MSWord or PDF) on the internet. All maps must follow the Guide to providing maps and boundary data for EPBC Act projects - DCCEEW.	Incorporated throughout document
II.2	Include detailed technical information, studies or investigations necessary to support the information in the stand-alone document as appendices. The main findings and a summary of the appendices are to be included in the main document.	**Section 2.2**
II.3	Be objective, clear, succinct, avoid technical jargon and, where appropriate, be supported by maps, plans, diagrams, data or other descriptive detail.	Incorporated throughout document
II.4	Reference all sources using the Harvard standard of referencing. Ensure that other supporting documents (e.g. academic studies, regulatory standards) are publicly accessible, with electronic links provided where possible.	
II.5	Redact the names and contact details of departmental officers.	

RFI Number	Item Description	Applicability / Section Referenced
II.6	Not contain any commercial-in-confidence markings. If the preliminary documentation contains sensitive information, please discuss this with the assessment officer.	
III. Ecological data provision		
III.1	The preliminary documentation must include an appendix of occurrence records (both sightings and evidence of presence) for all listed threatened and migratory species identified during field surveys for the proposed action. This data may be used by the department to update the relevant species distribution models that underpin the publicly available Protected Matters Search Tool (PMST).	No listed threatened or migratory species identified during field surveys
III.2	The species occurrence records must be provided in accordance with the department's Guidelines for biological survey and mapped data (2018) using the department's Species observation data template. Sensitive ecological data must be identified and treated in accordance with the department's Sensitive Ecological Data – Access and Management Policy V1.0 (2016) or subsequent revision.	
Appendix B. Information Requirements for the EPBC Act Offset Proposals		
B1 Minimum Requirements for a draft Offset Strategy		
B1.1	Details of the residual impacts to protected matters as a result of the proposed action. This must include the methodology, with justification and supporting evidence, used to inform the inputs of the Offsets Assessment Guide in relation to the impact site for each relevant protected matter, including: • total area of habitat (in hectares) • habitat quality (see Section B1.2 below).	No environmental offsets required for the Project, as such an Offset Strategy is not required (Refer **Section 5.6** for SRI assessment and **Section 5.7** for offsets conclusion)
B1.2	A methodology that is suitable for the species in question must be used to assess habitat quality (i.e. endorsed by the department or supported by literature), noting the same scoring mechanism must be used at both the impact site and the offset site. The department encourages proponents to consult and seek endorsement from the department on a proposed method prior to undertaking any habitat quality assessment at both impact and offset site(s). The department currently prefers the use of the Modified Habitat Quality Assessment (MHQA) method, an adaptation of the Queensland Guide to determining terrestrial habitat quality v1.2 (2017) available at: https://environment.des.qld.gov.au/__data/assets/pdf_file/0015/90312/habitat-qualityassessment-guide.pdf. MHQA was developed to better reflect the requirements of the EPBC Act Environmental Offsets Policy for determining habitat quality. To support the habitat quality assessment, a copy of the MHQA scoring spreadsheet template and guidance material is attached. Please note, the 'absence of threats' component of the score must only contain indicators that reflect the current habitat quality of the site (e.g. presence of pest species). Indicators that instead relate to a site's potential future condition must be excluded (e.g. risk of clearing or development). These threats are appropriately dealt with in consideration of future risk of loss in the Offsets Assessment Guide and so should not be included in the score for current habitat condition.	
B1.3	Details of the potential offset area/s (including a map) to compensate for the residual impacts of the proposed action on relevant protected matters.	
B1.4	Specific details of the nature of the conservation gain to be achieved for relevant protected matters, including the creation, restoration, and revegetation of habitat in the proposed offset area/s.	

RFI Number	Item Description	Applicability / Section Referenced
B1.5	Details, with supporting evidence, of how the environmental offset/s meets the requirements of the EPBC Act Environmental Offsets Policy (2012) (Offsets Policy), available at: https://www.dcceew.gov.au/environment/epbc/publications/epbc-actenvironmental-offsets-policy.	
B1.6	The methodology, with justification and supporting evidence, used to inform the inputs of the Offsets Assessment Guide in relation to each potential offset area/s for each relevant protected matter, including: • total area of habitat (in hectares) • habitat quality (see B1.1 above) • time over which loss is averted (max. 20 years) • time until ecological benefit • risk of loss (%) without offset • risk of loss (%) with offset • confidence in result (%). Please note, risk of loss should not include consideration of stochastic events (e.g. bushfires), activities that contribute to changes in habitat quality scores, or impacts that would otherwise require an offset under any relevant legislation.	
B1.7	Evidence that the relevant protected matter, and/or their habitat, can be present in the potential offset area/s.	
B1.8	Information about how the potential offset area/s provides connectivity with other relevant habitats and biodiversity corridors.	
B1.9	Details and execution timing of the mechanism to legally secure the environmental offset/s (under Queensland legislation or equivalent) to provide enduring protection for the potential offset area/s against development incompatible with conservation.	
B2. Minimum Requirements for a draft Offset Management Plan		
B2.1	Details of the residual impacts to protected matters as a result of the proposed action. This must include the area/s of habitat (in hectares) and its quality (see Section B1.2 above) within the impact site for which the offset/s is to compensate (i.e. the quantum of impact).	No environmental offsets required for the Project, as such an Offset Management Plan is not required (Refer **Section 5.6** for SRI assessment and **Section 5.7** for offsets conclusion)
B2.2	A description of the offset area/s, including location, size, condition, environmental values present, and surrounding land uses.	
B2.3	Maps and shapefiles to clearly define the location and boundaries of the offset area/s, accompanied by the offset attributes (e.g. physical address of the offset area/s, coordinates of the boundary points in decimal degrees, the relevant protected matter that the environmental offset/s compensates for, and the size of the environmental offset/s in hectares).	
B2.4	Baseline data and other supporting evidence that documents the presence of the relevant protected matter/s within the offset area/s.	
B2.5	Details, with supporting evidence, to demonstrate how the environmental offset/s compensate for residual significant impacts of the proposed action on relevant protected matters, and/or their habitat, in accordance with the principles of the Offsets Policy and all requirements of the Offsets Assessment Guide, including: • total area of habitat (in hectares) • habitat quality (see B1.1 above) • time over which loss is averted (max. 20 years) • time until ecological benefit • risk of loss (%) without offset • risk of loss (%) with offset • confidence in result (%). Please note, risk of loss should not include consideration of stochastic events (e.g. bushfires), activities that contribute to changes in habitat quality scores,	

RFI Number	Item Description	Applicability / Section Referenced
	or impacts that would otherwise require an offset under any relevant legislation.	
B2.6	Details of how the offset area/s will provide connectivity with other habitats and biodiversity corridors and/or will contribute to a larger strategic offset for the relevant protected matter.	
B2.7	Specific, committal, and measurable environmental outcomes that detail the nature of the conservation gain to be achieved for each protected matter, including the creation, restoration, and revegetation of habitat in the proposed offset area/s.	
B2.8	Specific offset completion criteria derived from the offset area habitat quality to demonstrate the improvement in the quality of habitat in the offset area/s over a 20- year period.	
B2.9	Details of the management measures, and timeframes for implementation, to be carried out to meet the offset completion criteria. All proposed management measures must be written using committed language (e.g. 'will' and 'must').	
B2.10	Details of the management measures, and timeframes for implementation, to be carried out to meet the offset completion criteria. Management measures must: be targeted towards the needs of the protected matter that is offset and must align with the recovery objectives for the species as identified in relevant National Recovery Plans or Conservation Advices • take into account relevant threat abatement plans • be site-specific (e.g. informed by surveys at the offset site) • have timeframes for implementation • be written using committal language (e.g. 'will' and 'must') • be specifically linked to the attribute of the protected matter for which the management measure applies • be derived from recognised principles, practice, or guidelines, and is justified – technically, scientifically and legally (e.g., by recommendation in a national recovery plan) – as an effective and appropriate measure to attain and/or maintain the plan's completion criteria and/or performance targets.	
B2.11	All management measures be drafted to meet the 'S.M.A.R.T' principle: S – Specific (what and how) M – Measurable (baseline information, number/value, auditable) A – Achievable (timeframe, money, personnel) R – Relevant (conservation advices, recovery plans, threat abatement plans) T – Time-bound (specific timeframe to complete).	
B2.12	Interim milestones that set targets at 5-yearly intervals for progress towards achieving the offset completion criteria.	
B2.13	Details of the nature, timing and frequency of monitoring to inform progress against achieving the 5-yearly interim milestones (the frequency of monitoring must be sufficient to track progress towards each set of milestones, and sufficient to determine whether the offset area/s are likely to achieve those milestones in adequate time to implement all necessary corrective actions).	
B2.14	Proposed timing for the submission of monitoring reports, which provide evidence demonstrating whether the interim milestones have been achieved.	
B2.15	Details of the tangible, on-ground corrective actions, and timeframes for implementation, if monitoring activities indicate an interim milestone has not been achieved, including an approach to monitoring the effectiveness of the corrective actions. All proposed corrective actions must be written using committed language (e.g. 'will' and 'must').	

RFI Number	Item Description	Applicability / Section Referenced
B2.16	Risk analysis and a risk management and mitigation strategy for all risks to the successful implementation of the OMP and timely achievement, and continued maintenance, of the offset completion criteria, including a rating of all initial and post-mitigation residual risks in accordance with a risk assessment matrix. Where relevant, address the risk of any management measures resulting in a perverse outcome (e.g. control of feral predators results in an increase in feral herbivores).	
B2.17	Details and execution timing of the mechanism to legally secure the proposed offset area/s, such that legal security remains in force over the offset area/s for at least 20 years to provide enduring protection for the offset area/s against development incompatible with conservation.	

1.2 Response to IESC Advice

The IESC provided advice on the Project (**Appendix J**). A response memo has been prepared by the Proponent (Comet Ridge 2025a) to address each of the IESC's comments (**Appendix K**). All original supporting reports remain appended to this PD report. Further works were commissioned to respond to the IESC's advice, this includes the following new technical reports:

- Water Monitoring and Management Plan 2025 (WMMP), prepared by Terra Sana (Terra Sana 2025a)
  (Appendix L)
- Rewan Connectivity Plan (RCP) 2025, prepared by Terra Sana (Terra Sana 2025b) **(Appendix M)**
- Stormwater and Water Balance Assessment (SWBA), prepared by Anderson Consulting (Anderson Consulting, 2025) **(Appendix N)**
- DCCEEW IESC Ecohydrological Model, prepared by Comet Ridge (Comet Ridge 2025b) **(Appendix O)**

These new technical reports should be read and referenced in conjunction with the original supporting information and are not to be read in isolation.

2 INTRODUCTION

Epic Environmental Pty Ltd (Epic) has prepared this Preliminary Documentation Report (PD report) on behalf of Comet Ridge Mahalo North Pty Ltd (Comet Ridge) for the Mahalo North Project (the Project). The PD report is prepared in response to the controlled action determination by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) on 19 March 2024. Further information in the form of a preliminary documentation was requested as the Department considers whether the Project is likely to have a significant impact on the following matters, protected under Part 3 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act):

- Listed threatened species and communities (sections 18 & 18A)
- A water resource in relation to unconventional gas development and large coal mining development (sections 24D & 24E)

The Project involves a greenfield coal seam gas (CSG) development located approximately 45 kilometres (km) north of Rolleston and 70 km southeast of Emerald, within the Central Highlands Regional Council Local Government Area of Central Queensland (refer **Figure 1**). The Project is contained within Petroleum Lease (PL) 1128 application, which covers an area of approximately 14,000 hectares (ha).

Comet Ridge aims to operate the Project over an estimated lifespan of 30 years, supplying gas to the domestic Australian gas market. The key components of the Project are as follows:

- 68 CSG wells (using a combination of vertical and lateral wells)
- Gas and water gathering pipelines
- Gas compression facility (GCF)
- New access tracks, with existing tracks used where possible
- Water management infrastructure

For the purpose of this report, the following definitions are applied throughout (refer **Figure 2**):

- **Proposed action area**[1]: The boundary of the PL 1128 application, which encompasses all possible final layouts of the Project, including adjustments for micro-siting or property boundary considerations
- **Disturbance footprint:** This represents the specific area within the final layout that will be cleared or disturbed by the Project
- **Study area:** is defined by the individual technical reports, as this area varies dependent on the technical subject matter being assessed

2.1 Purpose

The PD report aims to provide the Minister (or delegate) with sufficient information to make an informed decision on whether to approve, under Part 9 of the EPBC Act, the taking of the action for the purposes of each controlling provision. It consolidates all technical findings and assessment to ensure a clear understanding of the Project.

2.2 Scope

The scope of the PD report is limited to addressing the specific requirements outlined in the following:

- RFI issued by the DCCEEW (refer **Table 1** for cross-refence table)
- IESC advice issued by IESC (refer to **Section 1.2**)

The PD report is informed by multiple technical assessments conducted by specialists. In addition to these technical assessments, the PD report also includes two other documents that provide context regarding the approval process for the Project:

[1] This may be referred to as the Project Area in the documents attached to this Preliminary Documentation Report.

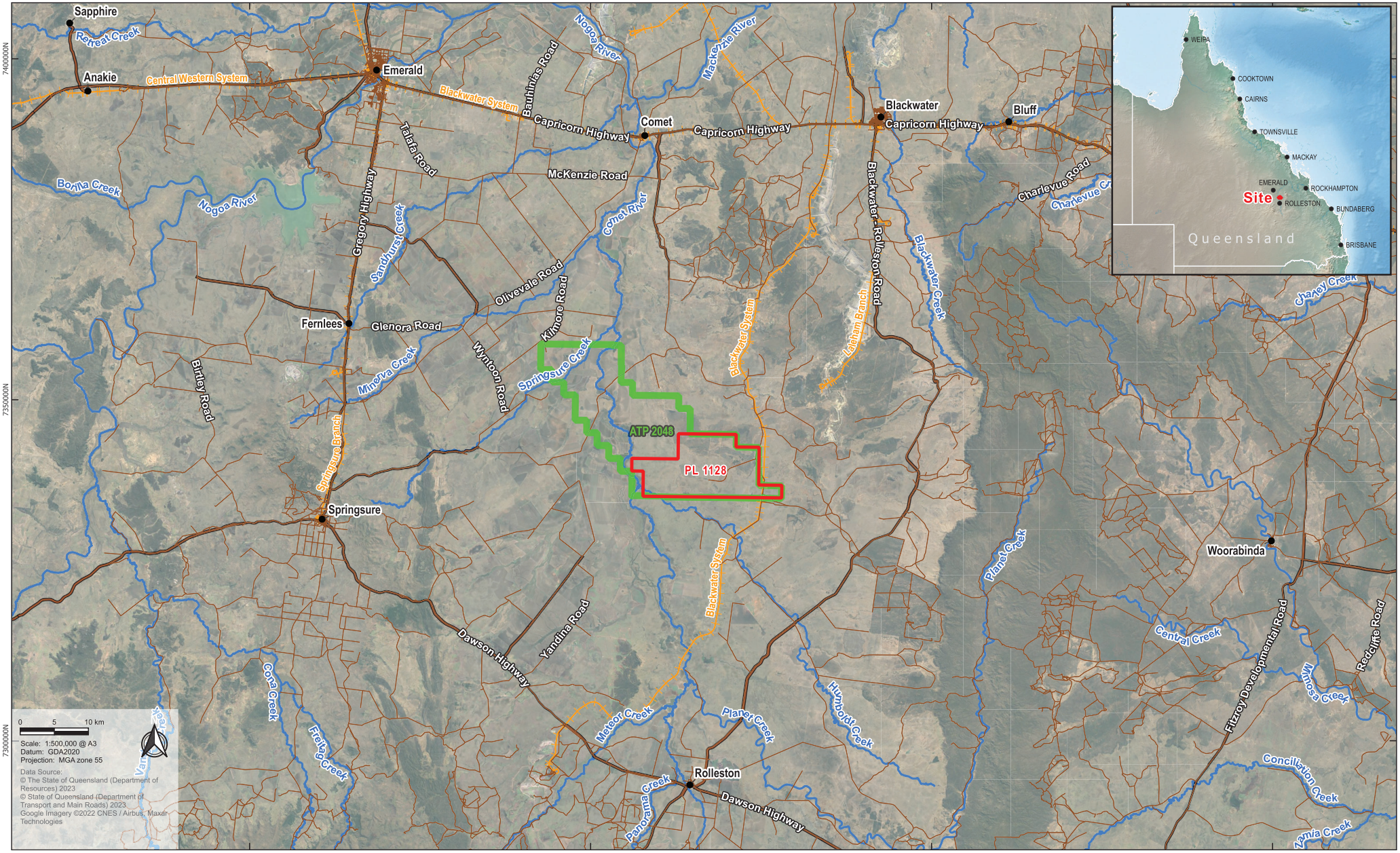
- Department of the Environment, Tourism, Science and Innovation (DETSI) Environmental Authority (EA) Conditions **(Appendix A**)
- DETSI Internal review decision and statement of reasons **(Appendix B**)
- IESC Advice (**Appendix J**)

The technical assessments provided include:

- Matters of National Environmental Significance: Ecological Assessment Report, prepared by Epic Environmental (Epic 2024a) **(Appendix C)**
- Aquatic Ecology Assessment, prepared by DPM Environmental (DPM 2023) **(Appendix D)**
- Groundwater Dependent Ecosystems Assessment, prepared by WaterMark Ecohydrology (WaterMark 2024) **(Appendix E)**
- Water Management Plan, prepared by RDM Hydro (RDM Hydro 2023) **(Appendix F)**
- Groundwater Impact Assessment (GIA), prepared by RDM Hydro (RDM Hydro 2024) **(Appendix G)**[2]
- Chemical Risk Assessment, prepared by Epic Environmental (Epic 2024b) **(Appendix H)**
- Environmental Management Plan, prepared by Comet Ridge (Comet Ridge 2024) **(Appendix I)**
- DCCEEW IESC Advice Response, prepared by Comet Ridge (Comet Ridge 2025a) **(Appendix K)**
- WMMP 2025, prepared by Terra Sana (Terra Sana 2025a) **(Appendix L)**
- RCP 2025, prepared by Terra Sana (Terra Sana 2025b) **(Appendix M)**
- SWBA, prepared by Anderson Consulting (Anderson Consulting, 2025) **(Appendix N)**
- DCCEEW IESC Ecohydrological Model, prepared by Comet Ridge (Comet Ridge 2025b) **(Appendix O)**

The PD report is designed to serve as a stand-alone document, presenting sufficient detail to substantiate all claims and conclusions made within. Where additional context or more detailed technical explanations are beneficial, the PD report provides references to specific sections of the above assessments.

[2] The WMMP (Terra Sana 2025 – **Appendix L**) and RCP (Terra Sana 2025 - **Appendix M**) provides information in addition to the GIA Assessment (RDM Hydro 2023) and should be read in conjunction to each other.



Filepath: ~BAA\BAA220014.01 Comet Ridge Mahalo North\Workspaces\BAA220014.01 Mahalo North\1. Petroleum Lease\11. Preliminary Documentation\Rev 0\Figure 1 Project location.qgz

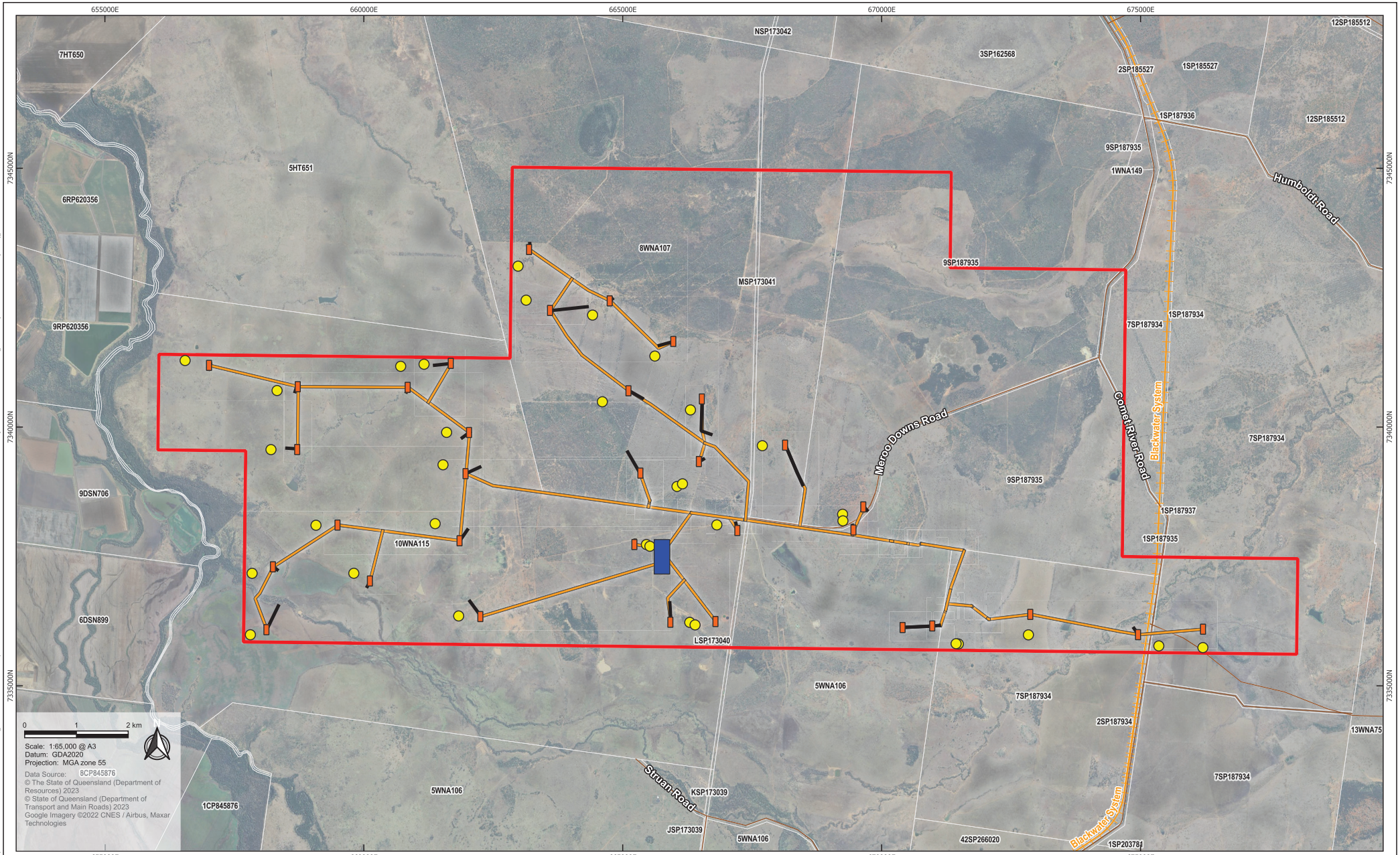
Legend

- Petroleum Lease Boundary
- Exploration permits for petroleum
- State controlled roads
- Railways
- Roads and tracks
- Major watercourses

epic
A Montrose Environmental Company

Comet Ridge
Mahalo North CSG Project
Preliminary Documentation

Figure 1
Project location



Legend

- Petroleum Lease Boundary
- Cadastre (DCDB)
- Roads and tracks
- Railways

Infrastructure (indicative only)

- Gas compression facility
- New access tracks
- Indicative gathering lines

Gas production wells

- Indicative lateral well
- Indicative vertical well

epic
A Montrose Environmental Company

Comet Ridge
Mahalo North CSG Project
Preliminary Documentation

Figure 2
Project infrastructure layout

2.3 Suitably Qualified Personnel

Multiple personnel have contributed to the preparation of this PD report and were selected by Comet Ridge based on their suitability and qualifications. These personnel have been detailed in **Table 2**.

Table 2. Personnel involved in the preparation of the PD report

Responsibility	Names	Roles	Qualification / Experience
Terrestrial Ecology Technical Assessment	Brett Taylor	• Lead author • Field lead – flora survey	Brett completed his Honours (1st Class) degree (BSc in Ecology and Conservation Biology) in 2006 and has extensive fauna survey experience in Queensland, New South Wales and Papua New Guinea. Brett has conducted fauna work in habitats throughout Queensland for over 14 years. This includes using targeted survey techniques for a variety of conservation-significant fauna. He has substantial experience carrying out ecological impact assessments and EPBC Act referrals. He has participated as a fauna expert on the expert panel review of the Biodiversity Planning Assessment for the North-west Highlands Bioregion in 2019.
	Oliver Robertson	• Lead author • Field lead – aquatic ecology survey	Oliver holds a PhD in Ecology from the University of Queensland, as well as a Bachelor of Environmental Science and a Bachelor of Science (Zoology) from Deakin University and the University of Melbourne, respectively. With almost 9 years in the industry, Oliver has extensive experience in undertaking surveys for listed weeds and threatened fauna and flora species as part of environmental monitoring and compliance programs for projects throughout Queensland for a broad range of industries and government sectors, including road and rail transport, energy, communications and defence. He is familiar with environmental legislative requirements in Queensland and NSW. Oliver is suitably qualified to complete Protected Plant Flora Surveys under the Queensland Department of Environment and Science Protected Plants Flora Survey Guidelines (DES 2020).
Aquatic Ecology Technical Assessment	David Moore	• Lead author • Field lead – aquatic survey	David holds a Bachelor of Applied Science in Ecology and Environmental Science. He is an accredited ecologist for the Australian River Assessment System (AusRivAS) in Queensland and NSW, a Senior Operator in electrofishing practice, and a 'suitably qualified ecologist' as recognised by the Commonwealth Department of Agriculture, Water and the Environment. David is an environmental scientist with over 19 years of experience in ecology, environmental impact assessment and management. He combines scientific knowledge with industry experience to devise practical impact mitigation and management measures to facilitate sustainable development. David has developed skills across a broad range of environmental sciences, including aquatic and terrestrial ecology, soil and water management. He has applied these skills across many sectors, including water, transport, agriculture, waste, Defence, coal seam gas, mining, power generation and transmission. David maintains relevant inductions in the construction, petroleum, and mining industries, and has gained substantial experience in the environmental aspects of a broad range of projects. This includes site secondment in the roles of Senior Environmental Advisor and Environment Superintendent for BMA, as well as Environmental Advisor and Ecologist roles for Origin Energy.

Responsibility	Names	Roles	Qualification / Experience
Groundwater Technical Assessment and Water Management Plan	Ryan Morris	• Lead author • Field lead – groundwater survey	Ryan holds a BSc (Hons) degree in geology with an undergraduate major in botany. Of his 24 years of professional experience, over 15 years have been directly related to hydrogeology associated with the unconventional gas industry (CSG and shale) in Queensland, the Northern Territory, New South Wales and overseas. This experience has included impact assessment, the design and implementation of monitoring and management programs, GDE field surveys, subsidence monitoring and assessment, and aquifer injection. Ryan was a key member of the industry team that prepared the Joint Industry Framework (JIF).
Terrestrial Groundwater Dependent Ecosystems (GDE) Technical Assessment	Dave Stanton	• Lead author • Field lead – Terrestrial GDE survey	David holds a Bachelor of Biology and Earth Sciences (Hons Class 1 – Geology) from James Cook University. David Stanton has a professional career that spans over 30 years, acquiring extensive experience in the disciplines of resource mapping (vegetation, geology and geomorphology), floristic assessment of terrestrial and marine ecosystems, groundwater-dependent ecosystems and conservation planning. His expertise has been utilised by sectors which include mining, infrastructure, government and indigenous organisations, and his work has been undertaken in Queensland, the Northern Territory, north-western Australia and Papua New Guinea. David's expertise is landscape-scale ecology and ecological processes, including the relationships between vegetation, geology, geomorphology, hydrology and hydrogeology. He has published vegetation mapping of the Wet Tropics World Heritage area and the Torres Strait Islands on behalf of the Australian Government. He has worked extensively on the management of floristic biodiversity in northern Australia. Vegetation mapping produced for the Wet Tropics Management Authority formed the core of the Queensland Herbarium's regional ecosystem mapping for the Wet Tropic Bioregion, including contiguous areas of the Einasleigh Uplands from Cooktown south to Townsville. David has co-authored several technical papers on issues relating to landscape-scale ecology and fire management.
Chemical Risk Assessment	Emily Maddison	• Lead author	Emily holds a Bachelor of Urban and Environmental Planning (First Class Honours) from Griffith University. Emily is an environmental scientist with seven years' experience consulting across the water, resources, transport and power sectors with a high level of capability in project management of complex projects. Emily has considerable knowledge of Queensland's environmental planning and management systems and legislation, including the recent draft industry decarbonisation plan policy. Emily has a wealth of experience in planning and environmental approvals required under Local, State and Commonwealth legislation, including Development Approvals, Environmental Authorities, Progressive Rehabilitation and Closure Plans, Environmental Impact Statements and EPBC Referrals. Emily has been at the forefront of climate change and decarbonisation legislation, having recently worked on a large-scale resource project. She played a crucial role in

Responsibility	Names	Roles	Qualification / Experience
			supporting the client on climate change and decarbonisation aspects for the Project's environmental impact statement. Emily's technical expertise on projects extends from the feasibility stage through to design and construction. She can undertake a wide range of tasks, including options analysis, application preparation, report writing, review and editing. Emily is also a competent project manager and is able to foster good relationships with clients, regulators and stakeholders.
	Dit Sang Lee	• Supporting author	Dit holds a Bachelor of Architectural Design from Griffith University and a Master of Planning and Urban Design from James Cook University. Dit Sang is a Project Environmental Planner with experience in Environmental Impact Assessment and Statutory approvals. Dit Sang has a wide range of experience within the local and state government, working in the Office of the Coordinator General and State Assessment and Referral Agency. Dit Sang brings a holistic, balanced approach to a project to ensure that the best outcomes can be achieved.
PD report	Romin Nejad	• Supporting Author • Lead Reviewer	Romin holds a Bachelor's in Environmental Engineering, a Graduate Certificate in Environmental Management, and a Graduate Certificate in Carbon Accounting. Romin is a Principal Environmental Engineer with over 20 years of experience navigating Queensland's environmental approvals framework. His expertise encompasses primary and secondary approvals, compliance, and closure. Romin has worked extensively across Australia in various sectors, including mineral extraction, coal seam gas, coal, construction, power, land development, waste management, and ports. Throughout his career, Romin has managed the delivery of statutory approval projects, large-scale impact assessments, on-site compliance, assurance and due diligence, as well as closure planning and implementation. In addition to his expertise in approvals, Romin is an accomplished environmental auditor, having completed over 50 independent system and compliance audits across Australia. His broad experience enables him to contribute effectively to any project, effectively engage with the regulator and consistently find novel solutions for proponents.
	Yan Suen	• Lead Author	Yan holds a Master's in Environmental Management from the University of Queensland. Yan is a Project Environmental Scientist and GIS Analyst with over five years of experience in environmental consulting. Yan provides scientific environmental services in three key areas: environmental reporting and approvals, terrestrial ecological surveys, and GIS management. Yan provides environmental reporting and facilitates the approval processes, including the preparation of Environmental Impact Statement (EIS) and environmental authority (EA) applications. Her work also extends to terrestrial ecological fieldwork, encompassing flora and fauna assessments, survey planning, and data collection.

2.4 Associated Approvals Process Overview

The status and timeline of associated approvals for the Project are outlined below.

2.4.1 Resource Authority

Comet Ridge lodged a resource authority application with the formerly titled Department of Resources (DoR)[3] for the petroleum lease. An acknowledgement letter was received from the DoR on 13 October 2023. The PL application is currently awaiting approval, subject to EPBC approval.

2.4.2 Environmental Authority

Comet Ridge applied for an Environmental Authority (EA) to the formerly titled Department of Environment, Science and Innovation (DESI)[1] on 20 October 2023. The approval process involved multiple stages, as detailed below:

- **31 January 2024:** DESI issued an information request seeking clarification on matters including vegetation clearing, predicted subsidence impacts within the strategic cropping area, impacts on bats, noise modelling, air modelling, and greenhouse gas emission modelling.
- **10 February 2024:** The application was publicly notified for the first time. However, after receiving the applicant's declaration of compliance, DESI determined that the public notification did not meet the requirements under sections 156(2) and 156(3) of the *Environmental Protection Act 1994* (EP Act).
- **19 March 2024:** Comet Ridge responded to the information request, clarifying the matters raised.
- **15 April 2024:** DESI issued a notice directing the application to be publicly notified in a manner specified by the department.
- **27 April 2024 to 28 May 2024:** The application was publicly notified online and in the Emerald Today newspaper. On 28 May 2024, a statutory declaration confirmed that the public notification requirements under sections 152, 153, and 156 of the EP Act had been substantially complied with.
- **28 May 2024:** Two public submissions were received, one from Lock the Gate Alliance and another from Environmental Advocacy in Central Queensland. Both submissions were considered during the assessment process.
- **5 August 2024:** DESI issued the decision notice to the applicant and the two submitters, approving the EA application under Environmental Authority number P-EA-100522021 (refer **Appendix A**)
- **10 September 2024**: Lock the Gate Alliance lodged an internal review application with DESI, challenging the decision to approve the EA application.
- **23 October 2024**: Following consideration of all evidence, DESI confirmed the original decision. The full Internal review decision and statement of reasons notice from DESI has been included as **Appendix B** for reference.

2.5 Changes from Referral

No Project changes have been made since the referral submission, additionally, no Project changes have been made following the IESC advice.

[3] As declared on 24 November 2024, the Queensland department names have been updated to align with cabinet portfolios, specifically:

a. The former Department of Resources, has now been titled the Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development
b. The former Department of Environment, Science and Innovation, has now been titled the Department of the Environment, Tourism, Science and Innovation

3 DESCRIPTION OF THE ACTIVITY

The Project encompasses the construction, operation, decommissioning, and rehabilitation of a CSG development, which includes the following key components:

- GCF (including water treatment and water storage infrastructure)
- Gas wells
- Gas and water gathering pipelines
- New access tracks (extension of existing access tracks)

An estimated Disturbance footprint has been calculated and is detailed in **Table 3** and depicted in **Figure 2**. It is important to note that these calculations are based on individual Project components and may involve some degree of overlap. For example, the gas and water gathering pipelines and new access tracks have been calculated as individual components; however, some of this infrastructure will likely be co-located, which would reduce the overall disturbance footprint and would be refined during the detailed design phase of the Project.

The following subsections provide a detailed description of each component.

Table 3. Estimated maximum disturbance footprint

Component	Description	Estimated area (ha)
GCF	• Two gas compression units, gas dehydration/separation units, safety and control systems, water tanks, safety flare, water treatment plant, water storage, permanent operational camp, workshop, office, washdown bay, parking	20
Gas wells	• 68 wells, with a combination of vertical and lateral wells • Each well site constructed in an area of up to approximately 1 ha (100 metres (m) x 100 m) • The majority of this disturbance will be temporary, as each well site will be partially rehabilitated after construction is completed, leaving an area of approximately 20 m x 20 m (0.04 ha) for well maintenance and access • Production wells will be fenced and generally include gas and water metering and separation equipment, electrical and control systems, particulate filter separator and manifolds to connect the water and gas pipelines	68
Gas and water gathering pipelines	• Construction disturbance area of up to 18 m wide, with the exception of areas of environmental significance, where it is reduced to 6 m wide • Power lines and communication may be co-located within the gas and water gathering trench • Includes excavation of a trench (up to 0.85 m wide) • The majority of this disturbance will be temporary as the disturbed area will be restored to pasture as soon as practicable, and available to the landholder for grazing/cropping purposes	92
New access tracks	• Existing access tracks will be utilised during all phases of the Project wherever possible • New access tracks only installed where necessary to connect to proposed infrastructure, estimated 8 km of new access tracks, at 6 m wide	5
	Estimated Maximum Disturbance Total	**185**

Note: Final disturbance areas will be calculated as the design of the processing area progresses and site constraints define the infrastructure layout. Pre-clearance ecological and cultural heritage assessments will be undertaken and reconciled to ensure they comply with the requirements under the relevant legislation.

3.1 Gas Compression Facility

A 10 terajoules (TJ)/day GCF would be constructed to centrally gather gas and water produced from the production wells and pressurise this gas for export to domestic markets. The GCF will be located within a fenced compound and include the following equipment during operations:

- Gas compression units (two in operation)
- Gas dehydration / separation units
- Associated instrumentation and control systems
- Water infrastructure, refer to **Section 3.1.1.4**
- Water tanks
- Safety systems
- Safety flare
- Site office
- Workshop
- Storage of fuel and chemicals
- Vehicle washdown bay
- Potable water
- Vehicle parking
- Accommodation camp (5-person capacity during operation phase)

3.1.1 Proposed Activities

3.1.1.1 Construction

Construction activities for the GCF would include:

- **Planning and surveying:** survey of the proposed Disturbance footprint, conduct pre-clearance ecological and cultural heritage surveys
- **Site preparation:** establishment of access tracks, installation of erosion and sediment controls, clearing and grubbing the disturbance boundary, stripping, and stockpiling top soil and cleared vegetation, site levelling (if required)
- **Building works:** constructing and installing buildings, plant, and equipment
- **Site restoration:** spreading top soil and grass seed on disturbed areas not required for operation

3.1.1.2 Operations

Operations of the GCF would include:

- **Separation:** further separation of water, gas and solids, within the gas stream (initial separation occurs at the well site, at the gas/water separator)
- **Gas compression:** increase the gas pressure for the pipeline transfer
- **Water Infrastructure:** refer to **Section 3.1.1.4**
- **Maintenance:** maintenance of plant and equipment and facilities to ensure safe and reliable operation of the GCF
- **Flaring:** gas flaring undertaken only in an emergency situation

3.1.1.3 Sewage treatment

The treatment of sewage will utilise a truck mounted bio-cycle system with the waste treated to Class C and the treated sewerage effluent or greywater, and disposed of at a licenced waste facility (same condition as an Environmental Authority Model Condition PESCC28). The bio-cycle system will be located at the mobile temporary accommodation camp near the drilling sites.

3.1.1.4 Water Infrastructure

A water treatment facility will be constructed to treat produced water to facilitate the beneficial use of water at a nominal treatment rate of up to 0.5 megalitres (ML)/day. The water treatment facility will include the following infrastructure:

- A package water treatment plant
- Above-ground lined ring tanks to store:
  - Produced water from the wells
  - Treated produced water
  - Brine
- Aboveground pipes to connect the water treatment plant and the ring tanks
- Pumping equipment to facilitate the transfer of treated produced water for beneficial re-use

Treated produced water from any treatment process will be stored in up to 100 ML of above-ground storages (e.g. lined ring tanks), constructed and operated in accordance with the manufacturers' specifications. Treated produced water generated from the Project will be beneficially used to support irrigation and industrial activities, as well as development and operational activities (including drilling of the wells and dust suppression).

Brine from any treatment process will be stored in up to 100 ML of above-ground storages (e.g. lined ring tanks), constructed and operated in accordance with the manufacturers' specifications, from where it may be further concentrated via solar and mechanical evaporation to a concentrated slurry or solid salt. The concentrated waste product will be disposed of at a licensed waste facility.

The overall produced water management process has been described in detail within the Water Management Plan (refer **Appendix F**)

3.1.1.5 Decommissioning and Rehabilitation

Decommissioning and rehabilitation of the GCF would include:

- Removal of the plant and equipment
- Disposal of salts from the lined ring tanks
- Decompaction of the soil and returning it to its previous landform
- Reseeding with pasture species

The GCF will be the last component of the Project to be decommissioned and rehabilitated, as it is required to be operational throughout the entire life of the Project.

3.2 Gas Production Wells

A maximum of 68 coal seam gas wells will be installed, comprising a combination of vertical and lateral wells. The lateral wells will intersect the vertical wells within the section drilled within the coal seam. Gas and water will be collected from the vertical wells. There will be no hydraulic fracturing/stimulation or blasting activities as part of the proposed activities. A conceptual diagram illustrating the connection between a vertical and lateral well is provided in **Figure 3.**

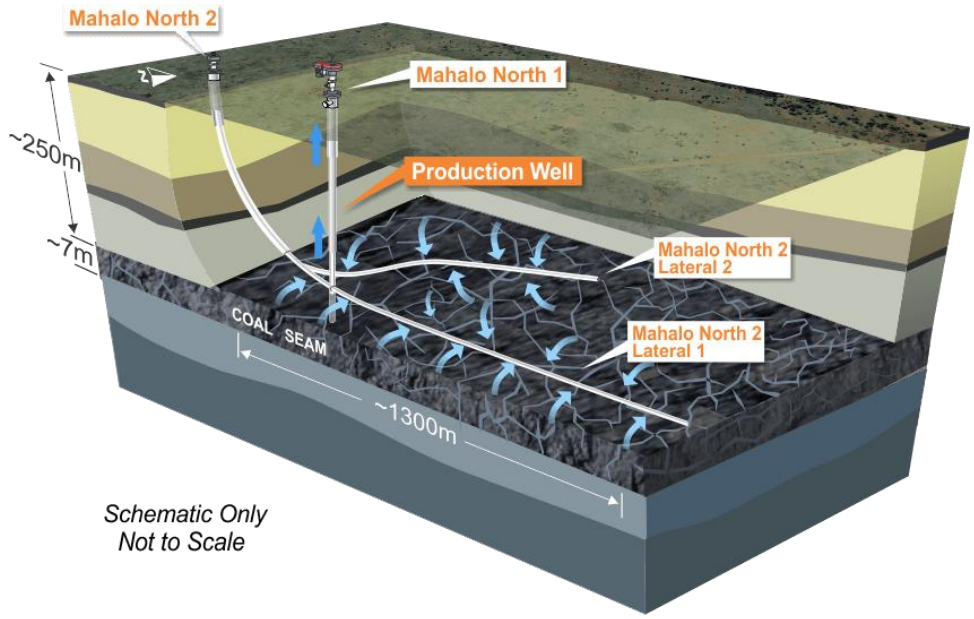


Figure 3. Conceptual diagram of vertical and lateral gas wells

Source: Comet Ridge, 2022

Each production well will be located within a fenced compound of approximately 20 m x 20 m and include the following equipment during operations:

- Well head
- Gas and water meter
- Gas and water separation equipment
- Electrical and control systems
- Particulate filter separator
- Manifolds to connect to water and gas gathering pipeline
- Fuel storage
- Mixed fuel generator (initially using diesel, then transferred to gas when the well is producing gas)
- Fence and gate

Each associated lateral gas well will be in a suspended well state, and will have cattle panels installed around the well head, of approximately 8 m x 8 m. No other plant or equipment will be installed at a suspended lateral well site.

3.2.1 Proposed Activities

3.2.1.1 Construction

Construction activities for each gas well would include:

- **Planning and surveying:** survey of the Disturbance footprint, conduct pre-clearance ecological and cultural heritage surveys
- **Site preparation:** establishment of access tracks, installation of erosion and sediment controls, clearing and grubbing the disturbance boundary, stripping and stockpiling top soil and cleared vegetation, site levelling (if required)
- **Well establishment:** installation of **a** well pad, drilling of wells using rotary mud or air drilling, setting up a drill rig and associated equipment, completion of wells using a completion rig, installation of a pump within the production well to reduce the hydrostatic pressure of the coal seam and facilitate gas production, installation of fencing and gate

- **Site restoration:** At completion of well construction, the disturbance footprint will be reduced to approximately 0.04 ha (20 m x 20 m). Top soil and grass seed will be spread over disturbed areas not required for operation

Wells would be constructed in accordance with the *Code of Practice for the construction and abandonment of petroleum wells and associated bores in Queensland V2* (DNRME 2019).

3.2.1.2 Operations

Operations of the gas wells would include:

- **CSG extraction:** engines (i.e. generators) will power wellhead pumps to extract water from the production well and facilitating gas to flow
- **Maintenance:** maintenance of plant and equipment and workover of wells to ensure safe and reliable operation of each well

Workovers of wells will be completed as required and are not expected to be a frequent occurrence.

3.2.1.3 Decommissioning and Rehabilitation

Decommissioning and rehabilitation of the gas wells, once no longer operational, would include:

- Vertical wells will be fully cemented back to the surface from the bottom
- Lateral wells will be cemented from the bottom of the 7-inch casing back to the surface
- Removal of all plant, equipment, and fencing
- Spreading top soil and grass seed on disturbed areas

Each well is expected to be operational for 12-15 years. Decommissioning of each well is proposed to be completed progressively as wells are depleted, plugged, and abandoned over the life of the Project.

3.3 Gas and Water Gathering Pipelines

Gas and water from each of the well sites will be transported through a network of gathering pipelines to connect to the GCF. The gathering pipelines will be installed underground. The gathering pipelines will comprise the following components:

- Polypipe underground low-pressure gas pipelines
- Water pipelines, power and communications may be co-located with the gas gathering network to connect to the GCF
- Mainline valves to allow maintenance activities to be undertaken in sections along the pipeline

3.3.1 Proposed Activities

3.3.1.1 Construction

Construction activities for the gathering pipelines would include:

- **Planning and surveying:** survey of the pipeline route, conduct pre-clearance ecological and cultural heritage surveys
- **Site preparation:** installation of erosion and sediment controls, clearing and grubbing, stripping, and stockpiling top soil and cleared vegetation in windrows
- **Excavation:** excavating a trench along the proposed gas and water gathering route to the appropriate depth and width (up to 0.85 m wide)
- **Welding and stringing:** laying the pipeline adjacent to the trench and welding sections of pipe together to create a continuous length of pipeline
- **Pipe laying:** placing the welded pipeline into the trench
- **Watercourse and waterway crossings:** refer to **Section 3.3.1.2**
- **Backfilling:** backfill the trench with excavated material and compacting
- **Testing:** pressure testing the pipeline to ensure that it is safe and functioning properly

- **Partial restoration:** spreading top soil and grass seed across the disturbed area

3.3.1.2 Watercourse and Waterway Crossings

The gathering pipelines will intersect watercourses (as defined under the *Water Act 2000* (Water Act)) and waterways (as defined under the *Fisheries Act 1994* (Fisheries Act)). Installation of the gathering pipeline across these watercourses will be via open-cut trenching or horizontal directional drilling (HDD). The installation method will be determined with consideration to environmental constraints, geotechnical characteristics, and standard conditions at each proposed crossing location. The construction of each crossing is expected to take approximately one week.

Waterway crossings would be designed with consideration of the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF 2018). Watercourse crossings will be designed with consideration of the *Riverine Protection Permit Exemption Requirements* (DRDMW 2023a).

Each method of crossing has been described further below.

Open-Cut Trenching

Open-cut trenching will be used where impacts to identified environmentally sensitive areas or significant ecological values can be avoided. The open-cut trenching method will only be undertaken at times during no/low flow in the watercourse.

The method for open-cut trenching will involve:

- **Planning and surveying:** survey of the proposed access route, conduct pre-clearance ecological and cultural heritage surveys
- **Site preparation:** establishment of access tracks, installation of appropriate erosion and sediment control within the disturbed areas and on either side of the watercourse/waterway
- **Vegetation clearing:** clearing vegetation on either side of the banks (if required)
- **Trench excavation:** trench dug across the watercourse/waterway
- **Pipeline installation:** pipeline is laid within the trench
- **Backfilling:** trench is backfilled with excavated material
- **Testing:** pressure testing the pipeline to ensure that it is safe and functioning properly.
- **Scour protection:** additional scour protection (e.g., rock mattress) may be installed to prevent exposure of the pipeline through natural scouring processes
- **Site restoration:** once the trench is backfilled and scour protection installed, the bed and banks will be rehabilitated to the pre-disturbance condition

Horizontal Directional Drilling

A HDD method will be used in environmentally constrained watercourse crossings. This approach is a form of trenchless construction, which reduces the disturbance footprint and limits the environmental impact associated with the Project.

This trenchless method of construction involves the following activities:

- **Clearing and preparation:** entry and exit pits (approximately 1 m x 2 m wide) on either side of the crossing
- **Lowering:** the drilling equipment into the entry pit
- **Drilling:** a pilot bore underground from the entry pit toward the exit pit
- **Pulling:** the strung pipe through the pilot bore
- **Retrieving:** the drilling equipment from the exit pit
- **Testing:** pressure testing the pipeline to ensure that it is safe and functioning properly
- **Site restoration:** the entry and exit pits will be restored to pre-disturbance condition

3.3.1.3 Decommissioning and Rehabilitation

Decommissioning and rehabilitation of the gathering lines would include:

- The gas and water gathering line will be purged
- Underground infrastructure will be made safe and remain in the ground
- Each end of the line will be cut off below ground level
- These areas will be restored to pre-disturbance condition (top soil installed and reseeded)

Decommissioning of gathering pipelines is proposed to be completed progressively as wells are depleted, plugged, and abandoned over the life of the Project. This will also include the associated water, power and communications infrastructure.

3.4 New Access Tracks

3.4.1 Proposed Activities

The majority of access tracks required for the Project will utilise existing access tracks. In areas where no access tracks exist, new tracks will be established to allow access to project infrastructure. Based on the current Disturbance footprint, the Project requires approximately 8 km of new access tracks to be established to access project infrastructure.

3.4.1.1 Construction

Construction activities for the new access tracks would include:

- **Planning and surveying:** survey of the proposed access track route, conduct pre-clearance ecological and cultural heritage surveys
- **Site preparation:** installation of erosion and sediment controls, clearing and grubbing the access track, stripping and stockpiling top soil and cleared vegetation
- **Access track establishment:** levelling and grading the access tracks
- **Site restoration:** spreading top soil and grass seed on disturbed areas not required for operation

3.4.1.2 Operations

Operations of the new access tracks would be limited to maintenance of the access tracks to ensure safe and reliable access to plant, equipment, and facilities

3.4.1.3 Decommissioning and Rehabilitation

Decommissioning and rehabilitation of access tracks is proposed to be completed progressively as project infrastructure is no longer required for operations, provided the access tracks are not required by the landholder. Rehabilitation of the access tracks would include spreading top soil and grass seed on disturbed areas.

3.5 Surface Water Changes

All components of the Project will be constructed in a manner that will not influence the existing surface water resources. Specifically, the Project will:

- Not involve the release of any associated or produced water to the receiving waters
- Return any impacted land to pre-disturbance contours following construction and therefore will not impact the hydrological flows of the Proposed action area
- Employ best practice erosion and sediment control during construction to ensure no sediment-laden runoff is released from disturbed areas to receiving waters (refer to **Section 8.1.12** for the management measures)
- Employ horizontal directional drilling under watercourses to avoid direct impacts to the bed and banks of watercourses

3.6 Workforce

3.6.1 Construction

The anticipated peak construction workforce numbers for the Project are provided in **Table 4.** The workforce for drilling the wells will be housed in a temporary drilling camp located on each property where the wells are located. The workforce required for the construction of the GCF (which will be constructed prior to drilling activities), construction of access tracks and gathering network, will drive in from the local towns each day. Local towns may include but are not limited to Rolleston, Springsure, Comet and/or Emerald.

Drilling of the wells and construction of the gas and water gathering network may occur concurrently; the GCF and access tracks will be constructed prior, so that the maximum workforce at any one time may be up to 41 people.

Table 4. Anticipated workforce

Project component	Peak workforce numbers	Drive in, drive out (DIDO)
Drilling of the wells	35	Not required, workers will stay in the temporary drill camp on site
Constructing access tracks	3	Yes, workers will drive from local towns
Constructing GCF	8	Yes, workers will drive from local towns
Constructing the gathering network	6	Yes, workers will drive from local towns
Anticipated Total	**41**	-

3.6.2 Operations

The anticipated peak operational workforce numbers are expected to be two personnel per day shift. Operators will be employed for scheduled maintenance, inspection activities and other routine tasks. Operating personnel will either drive to the site each day from the local towns or stay in the five-person permanent camp located at the GCF for the duration of their shift. Telemetry will be installed on the wells and at the GCF, which means that the site can also be monitored and operated remotely if required.

3.7 Timing and Duration

Construction works are proposed to be undertaken between 6:30 am and 6:30 pm, Monday to Sunday. During operations, the Project will operate 24 hours a day, seven days a week. The timing and duration of each Project phase are provided in **Table 5.**

Table 5. Timing and duration of the Project

Project phase	Timing (Commencement)	Duration
Construction	Year 1	Approximately 9 – 10 months of activity per annum, weather dependent (approx. 4 production wells proposed to be drilled per annum)
Operations	Year 2	30 years
Decommissioning and Rehabilitation	2050	Progressive rehabilitation is to occur as gas wells come to the end of their life. Gas well life is expected to be around 12-15 years.

4 SURROUNDING RESOURCE ACTIVITIES

The Proposed action area is located in Central Queensland, approximately 45km north of Rolleston, 56 km southwest of Blackwater and 73km southeast of Emerald (**Figure 4**). The Proposed action area is surrounded by a number of existing and proposed resource developments and exploration activities, as summarised in **Table 6** and shown on **Figure 4**.

Table 6. Surrounding Resource Activities

Tenement	Name	Description	Status	Distance and direction from the nearest PL boundary
PL1082, PL1083	Mahalo	CSG development of up to 141 wells. Operated by Santos, but Comet Ridge is a major joint venture partner	Proposed (with environmental approvals in place)	Immediately adjacent to the southern boundary
PL41, PL42, PL54, PL67, PL1086	Denison North	Six conventional gas fields with 37 gas wells targeting deep Bowen Basin formations	Operating	Adjacent to the western boundary
Authority to Prospect (ATP) 2063, ATP804, ATP1191, ATP2049, ATP2050	-	CSG exploration tenements	Exploration	East, south and west in an arc of 10 - >25km
ML70167, ML70319, ML1907, ML1829*	Blackwater Mine	A large coal mine that has been in operation since the 1960s, with some historical underground workings in the south. Currently, there is limited mining development in the southern MLs	Operating	Northeast
ML700070, ML700071	Blackwater Mine	Southern tenements of the blackwater mine	ML application	Overlaps with the northeastern corner and is adjacent to the eastern boundary
ML70149	Togara North	Proposed underground coal mine	Proposed	7 km northwest
ML70486	Springsure Creek Coal Mine	Proposed coal mine	ML application	15 km northwest
ML70307, ML70415, ML70452	Rolleston/Orion Downs Coal mine	Open-cut coal mine, operating since 2005	Operating	37 km southwest

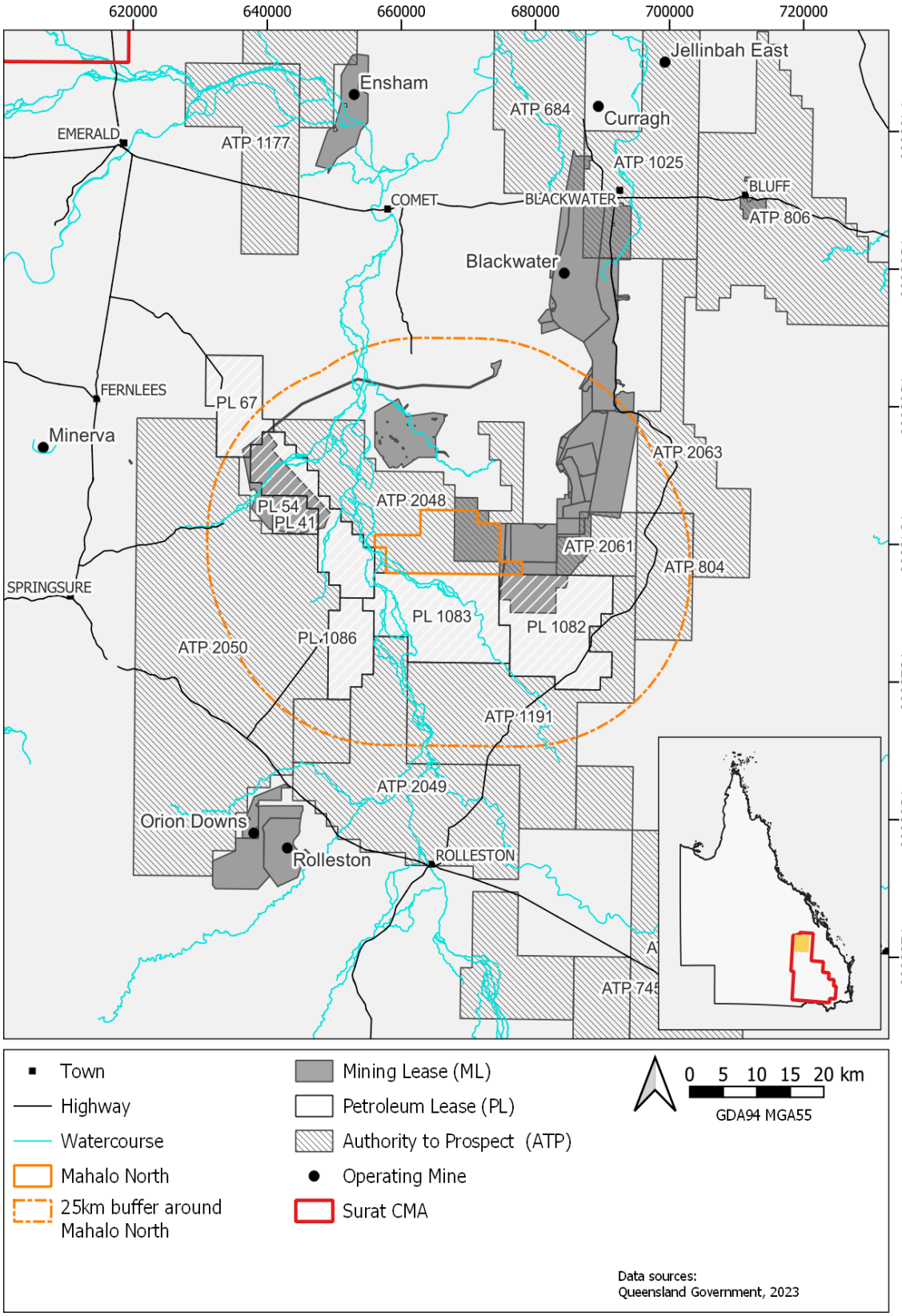


Figure 4. Surrounding Resource Activities

5 LISTED THREATENED ECOLOGICAL COMMUNITIES

The RFI identified the following threatened ecological community (TEC) that may be significantly impacted by the Project:

- Brigalow (*Acacia harpophylla dominant and co-dominant*) TEC (Brigalow TEC) – Endangered.

This section addresses Item 2 of the RFI regarding the above matter. It is informed primarily by the terrestrial ecology technical assessment detailed in the Ecological Assessment Report (EAR report), prepared by Epic Environmental (Epic 2024a) **(Appendix C).**

Key information from this technical assessment has been extracted and incorporated to address the specific requirements outlined in RFI.

5.1 Assessment Method – Terrestrial Ecology

5.1.1 Desktop Assessment

Prior to commencing the terrestrial ecology field survey, desktop assessments were carried out to identify species and ecological communities of conservation significance (both MNES and Matters of State Environmental Significance (MSES)) that potentially occur within the Proposed action area. Flora and fauna values of conservation significance in this PD report refer to:

- Flora and fauna species listed as Critically Endangered, Endangered or Vulnerable under the EPBC Act and/or the *Nature Conservation Act 1992* (NC Act)
- Regional Ecosystems (RE) listed as Endangered or Of Concern under the *Environmental Protection Act 1994* (EP Act)
- Fauna species listed as Migratory under the EPBC Act due to their inclusion under one or more of the following:
  - Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
  - China-Australia Migratory Bird Agreement (CAMBA)
  - Japan-Australia Migratory Bird Agreement (JAMBA)
  - Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)

The desktop assessment also aimed to identify other State-listed environmental values relevant to the site including Environmentally Sensitive Areas (ESAs) and MSES.

5.1.1.1 Data Sources

Flora and fauna records listed in publicly available databases and other resources were investigated to identify ecological matters relevant to the Proposed action area. These resources included the following:

- DCCEEW Protected Matters Search Tool (PMST) (search based on 10 km buffer of the Proposed action area) (DCCEEW 2023 & 2024)
- Queensland Government Wildlife Online (WildNet) database (records within a 50 km radius around the point -24.0489, 148.6281)
- Species Profile and Threats Database maintained by DCCEEW (DCCEEW 2024)
- Atlas of Living Australia (ALA), a web-based search tool that is a partnership between CSIRO, Australian museums, herbaria and other biological collections, and the Australian Government (ALA 2023)
- DES MSES mapping
- Department of Resources (DoR) Regulated Vegetation Management Map and Vegetation Management Supporting Map, including Regional Ecosystems (RE), essential habitat, watercourse and wetland mapping
- DESI certified RE mapping (Version 13.01)

5.1.1.2 Previous Studies

There has been extensive ecological assessment work in the local area in recent years, some of which includes lands within or adjacent to the current Proposed action area. Where considered relevant, the desktop assessment and discussion of field results within this assessment include information from the following reports:

- *Mahalo Gas Project: Ecology technical report* (Golder 2018) – project encompassed lands to the immediate south and south-east of the current Proposed action area
- *Blackwater terrestrial ecology survey report* (EMM 2022) – project encompassed lands within the eastern portion of the current Proposed action area (on Togara property), as well as lands to the immediate east
- *Blackwater South terrestrial ecology survey report* (Epic 2024) – survey work encompassed lands within the north-eastern portion of the Togara property within the Proposed action area. Used to inform ground-truthed vegetation mapping where relevant.

5.1.2 Field Assessment

5.1.2.1 Survey Timing and Conditions

Three rounds of terrestrial ecology field surveys were completed, including the following:

- A baseline flora and fauna assessment, including RE verification and threatened fauna habitat assessments from 4-7 April 2022
- A targeted threatened fauna survey including trapping and spotlighting from 30 January – 3 February 2023
- Follow up surveys to provide further confirmation of the extent of Threatened Ecological Communities (TECs) present in the Proposed action area from 9-11 July and 26-30 August 2024

The nearest weather station providing continuous temperature and rainfall data is the Rolleston Airport station (approximately 41 km to the south). During the April 2022 survey, temperatures ranged between 21.9 degrees Celsius (°C) and 38.9°C. For the January-February 2023 survey, the temperature ranged from a minimum of 21.4°C to a maximum of 36.2°C (BoM 2023). Patchy rain fell on the Proposed action area during the survey period. The region recorded 269.2 millimetres (mm) of rainfall in the three months prior to the field survey, which is slightly more than the long-term average for this period (248.5 mm). Over 135 mm was recorded in January prior to the 2023 survey (BoM 2023).

During the July 2024 survey, temperatures ranged from a minimum of 7°C to a maximum of 25.7°C (BoM 2024). The region recorded 34.6 mm of rainfall in the two weeks prior to the field survey.

5.1.2.2 Survey Effort

A summary table outlining relevant species documentation and survey effort is presented in **Table 7.**

Table 7. Survey effort for TECs and threatened fauna for the Proposed action area – comparison with Commonwealth guidelines.

Community/Species	Relevant Commonwealth documents	Survey requirements	Project survey effort
TECs			
Brigalow	*Approved Conservation Advice for the Brigalow (*Acacia harpophylla *dominant and co-dominant) ecological community* (DE 2013)	Patches of relevant Brigalow REs were checked against key diagnostic characteristics and condition thresholds detailed in DE 2013. Survey timing to consider disturbance events (natural or human-induced) and seasonal factors regarding flowering of associated shrub species and weed growth.	Targeted TEC surveys carried out in winter months. No onsite disturbance processes noted (e.g. fire, clearing for grazing management). Limited shrub species occurring were identified as required. Relevant site data collected during vegetation surveys, including: • 26 Quaternary survey sites • 27 Tertiary survey sites • 6 Biocondition survey sites
Natural Grasslands	*Commonwealth Listing Advice on Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* (TSSC 2009)	Patches of native grassland REs checked against key diagnostic characteristics and condition thresholds detailed in TSSC 2009	Not relevant – no grassland REs identified within the Proposed action area
Poplar Box on alluvial plains	*Conservation Advice (including listing advice) for the Poplar Box Grassy Woodland on Alluvial Plains* (DCCEEW 2017)	Patches of Poplar Box on alluvium checked against key diagnostic characteristics and condition thresholds detailed in DEE 2019	Not relevant – no relevant Poplar Box woodland on alluvium identified within the Proposed action area
Threatened species			
Australian Painted Snipe (*Rostratula australis*)	*Survey Guidelines for Australia's Threatened Birds. EPBC Act survey guidelines 6.2* (DEWHA 2010) *Approved conservation advice for* Rostratula australis *(Australian Painted Snipe)* (DSEWPC 2013) *National recovery plan for the Australian Painted Snipe (*Rostratula australis*)* (DCCEEW 2022)	Area searches for sites of less than 50 ha when water is present (but not flooded) – 10 hours (hr) over 3 days Targeted stationary observations (dawn and dusk) – 10 hr over 5 days (DEWHA 2010)	2022 survey – water restricted to open dam sites (habitat unsuitable) – 4 hr survey effort at dam sites 2023 – water present in scattered gilgais (Togara property only), 8 hr of stationary observations (over 4 days) at trap sites, an additional 2 hr of survey effort elsewhere across the site
Sharp-tailed Sandpiper (*Calidris acuminata*)	*EPBC Act Policy Statement 3.21 – Industry guidelines for avoiding, assessing and mitigating*	Non-tidal areas:	Surveys were carried out over 4 days in early April (late in the migrant season) and 5 days in late January-early February (within the migrant

Community/Species	Relevant Commonwealth documents	Survey requirements	Project survey effort
Latham's Snipe (*Gallinago hardwickii*)	*impacts on EPBC Act-listed migratory shorebird species* (DE 2015a) *Conservation advice for* Calidris acuminata *(Sharp-tailed Sandpiper)* (DCCEEW 2024a) *Conservation advice for* Gallinago hardwickii *(Latham's Snipe)* (DCCEEW 2024a)	• Timed to occur during the summer migratory season in Australia and when water is present with a minimally vegetated, exposed margin • Ideally, four surveys across the period when the majority of shorebirds are present (DE 2015)	season). Very little shorebird habitat was observed. Water-filled gilgais (February 2023) generally occurred with heavy adjacent grass cover
Squatter Pigeon (southern) (*Geophaps scripta scripta*)	*Survey Guidelines for Australia's Threatened Birds. EPBC Act survey guidelines 6.2* (DEWHA 2010) *Conservation advice* Geophaps scripta scripta *Squatter pigeon (southern)* (TSSC 2015)	Area searches (where less than 50 ha) for sites of less than 50 ha – 15 hr over 3 days Flushing surveys (where less than 50 ha) – 10 hr over 3 days (DEWHA 2010)	The proposed action area is far larger than 50 ha. Approximately 22 hr of bird survey effort across 2022 and 2023 surveys. Bird surveys comprised both area searches and flushing survey
Painted Honeyeater (*Grantiella picta*)	*Conservation advice* Grantiella picta *Painted Honeyeater* (DE 2015b) *National recovery plan for the Painted Honeyeater (*Grantiella picta*)* (DAWE 2021) No Commonwealth survey guideline recommendations applicable to this species	State guideline for species (Rowland 2012a) recommends: • Best timed to occur early spring to late summer • Area searches of 4 hr over 4 days in 50 ha of suitable habitat	Proposed action area is far larger than 50 ha. Approximately 22 hr of bird survey effort across 2022 and 2023 surveys. Survey in 2023 carried out in late summer.
Koala (*Phascolarctos cinereus*)	*Conservation Advice for* Phascolarctos cinereus *(Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory* (DAWE 2022) *National Recovery Plan for the Koala* Phascolarctos cinereus *(combined populations of Queensland, New South Wales and the Australian Capital Territory)* (DAWE 2022b) No Commonwealth survey guideline recommendations for Koala. *A review of koala habitat assessment criteria and methods* (Youngentob 2021) consulted for identifying suitable forage tree species for region.	The *EPBC Act referral guidelines for the vulnerable koala* (DE 2012) are no longer in use but do at least suggest the following survey methods (but with no survey effort detailed): • Daytime strip transects • Spotlighting • Call playback during breeding season • Remote cameras • Mark recapture • Radio/satellite collars • Detection dogs	Surveys carried out over 4 days in early April and 5 days in late January-early February • Spotlighting surveys (undertaken both from in vehicle and on foot) – 8 hrs • Approximately 16 hr of area searches in wooded habitat across 2022 and 2023 surveys

Community/Species	Relevant Commonwealth documents	Survey requirements	Project survey effort
Ornamental Snake (*Denisonia maculata*)	*Draft Referral guidelines for the nationally listed Brigalow Belt reptiles v1.1* (DSEWPC 2011) *Approved conservation advice for* Denisonia maculata *(Ornamental Snake)* (DE 2014)	Range of methods: • Diurnal search – 1.5 person hour per hectare over 3 days • Spotlighting – 1.5 person hour per hectare over 3 days • Vehicle surveys – no effort detailed, best occurring after heavy rainfall in warm weather • Pitfall/funnel trapping – 6 x pitfall with 2 funnel along 30 m drift fence, 2 per habitat, carried out over 4 days (DSEWPC 2011)	Surveys carried out over 4 days in early April and 5 days in late January-early February (in hot weather following heavy rainfall in the region) • Passive nocturnal search – 8 hrs • Approximately 450 km of road and track searches across 2022 and 2023 surveys, including regional driving to and from the site • Funnel trapping – 118 trap nights at 4 sites, 2 sites for 4 nights and 2 for 3 nights
Grey Snake (*Hemiaspis damelii*)	*Conservation advice for* Hemiaspis damelii *(Grey Snake)* (DCCEEW 2022) No Commonwealth survey guideline recommendations applicable to this species	State guideline for species (Rowland 2012) recommends: • Best timed to occur in January to March after heavy rainfall • Passive nocturnal search – 1 hr per hectare plot (3 plots where site is greater than 5 ha), 2 survey periods • Vehicle transect – approximately 250 km spread over 2 nights, 2 surveys • Diurnal search – 1 hr per 50 x 50 m plot (3 plots where site is greater than 5 ha), 2 survey periods • Pitfall/funnel trapping – 50 trap nights/ha	Surveys carried out over 4 days in early April and 5 days in late January-early February (in hot weather following heavy rainfall in the region). • Passive nocturnal search – 8 hrs • Approximately 450 km of road and track searches across 2022 and 2023 surveys, including regional driving to and from the site • Funnel trapping – 118 trap nights at 4 sites, 2 sites for 4 nights and 2 for 3 nights

5.1.2.3 Limitations

In accordance with the *Terrestrial vertebrate fauna survey guidelines for Queensland* (Eyre et al. 2022), surveys in the Brigalow Belt Bioregion should be carried out in spring to early summer (September to mid-November) and autumn (March-mid-May). The 2022 survey was carried out in the autumn period. A survey planned to be carried out in November 2022 was cancelled due to the onset of heavy rains affecting site access. This survey was rescheduled for February 2023.

Site access during the surveys was restricted to two properties: Togara and Meroo Downs. Project infrastructure located outside the boundary of these properties has been assessed via desktop review only.

Survey planning considered relevant DCCEEW documents with regard to survey methods and intensity. It is noted that these are not available for many species. A summary table outlining relevant species documentation and survey effort is presented in **Table 7**.

5.1.2.4 Baseline Flora and Fauna Assessment – April 2022

Native vegetation within the Proposed action area was assessed and mapped into analogous REs. The survey and mapping of REs were in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland V6.0* (Neldner et al. 2022). A combination of tertiary and quaternary RE sites were used to verify the on-ground vegetation communities present. Rapid assessments were carried out where simple confirmation of the RE present was considered based on the results of the more detailed quaternary assessments carried out elsewhere in the Proposed action area.

Tertiary sites were used to identify REs with the quantification of vegetation community condition and floristic species composition. Twenty-seven tertiary sites were collected during the 2022 flora survey. At a minimum, the following data were recorded at each quaternary survey site:

- RE type
- Vegetation condition
- Dominant, co-dominant, sub-dominant and associated flora species, median height and cover for each strata level
- Ecologically dominant layer (EDL)
- Structural classification (Specht & Specht 2000) (i.e. grassland, open-woodland, woodland etc.)
- Structure category (i.e. dense, mid-dense, sparse, very sparse)
- Landform
- Soil type
- Weed species and density
- Disturbance

Quaternary sites were used to ground-truth the extent, classification and condition of vegetation communities within the Proposed action area. Twenty quaternary sites were collected during the 2022 flora survey. At each quaternary site, the following data were recorded:

- RE type
- Condition (i.e. remnant, regrowth, non-remnant)
- Dominant flora species at each strata level
- EDL strata
- EDL cover and median height
- Structural classification (Specht & Specht 2000) (i.e. grassland, open-woodland, woodland etc.)

Where REs were considered analogous to the Brigalow (*Acacia harpophylla* dominant and codominant) TEC (Brigalow TEC) the RE site data collected was compared with the key diagnostic characteristics and condition thresholds designating occurrences of the TEC, as detailed in the associated approved conservation advice (DE 2013).

The flora survey site locations are shown in **Figure 6.** Site data sheets and an overall list of flora species present within the Proposed action area was derived from the flora assessment (refer Appendix B of the EAR report).

General searches for threatened flora species derived from the desktop review were carried out where suitable habitat was observed at flora sites.

The fauna assessment comprised non-invasive methods and included the following:

- Bird surveys and habitat searches for herpetofauna at habitat assessment points
- Deployment of an Anabat Swift microbat call detector for two nights
- One night of spotlighting (undertaken both from the vehicle and on foot)
- Opportunistic observations throughout the survey

Fauna habitat assessments were conducted at sites across the Proposed action area to ascertain the quality and availability of habitat present for threatened species. Habitat assessments particularly identified values suitable for the potential presence of Ornamental Snake (Denisonia maculata) as detailed in the Draft Referral guidelines for the nationally listed Brigalow Belt reptiles (DSEWPC 2011). Fifty-one assessment sites were collected during the 2022 and 2023 fauna surveys and assessed for the following features:

- Tree cover
- Ground cover
  - Grass cover
  - Bare ground
  - Non-native cover
- Presence of gilgais and cracking clay soils
- Rocky habitat
- Nearby water source
- Tree hollows
- Woody debris
- Level of cattle disturbance (lack of grass cover and surface soil trampling)

Habitat assessment data from the 2022 and 2023 surveys are collated in Appendix C of the EAR report. Assessment locations are depicted in **Figure 6.**

5.1.2.5 Targeted Threatened Fauna Survey – January-February 2023

The terrestrial fauna survey catalogued all species of terrestrial vertebrates recorded within and immediately adjacent to the Proposed action area, with consideration of the methods described in the *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* (Eyre et al. 2022). The recommended survey guidelines for Ornamental Snake were also considered in this methodology from the *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (DSEWPC 2011).

A single, 2-person team fauna focussed survey led by a senior fauna ecologist carried out a five-day four-night trapping program and observations of fauna within the Proposed action area during the January-February 2023 survey. The fauna survey focused particularly on the Ornamental Snake, which is listed as Vulnerable under the NC Act and EPBC Act. Survey conditions were considered highly suitable for detecting the Ornamental Snake. There were very warm overnight temperatures with high humidity and some rainy periods, numerous scattered waterholes within the Proposed action area, and frogs were active. Nevertheless, all terrestrial vertebrate fauna species present were documented. The trapping methods are described in **Table 8.** Trap locations are depicted in **Figure 6**.

Table 8. Project fauna trapping methods

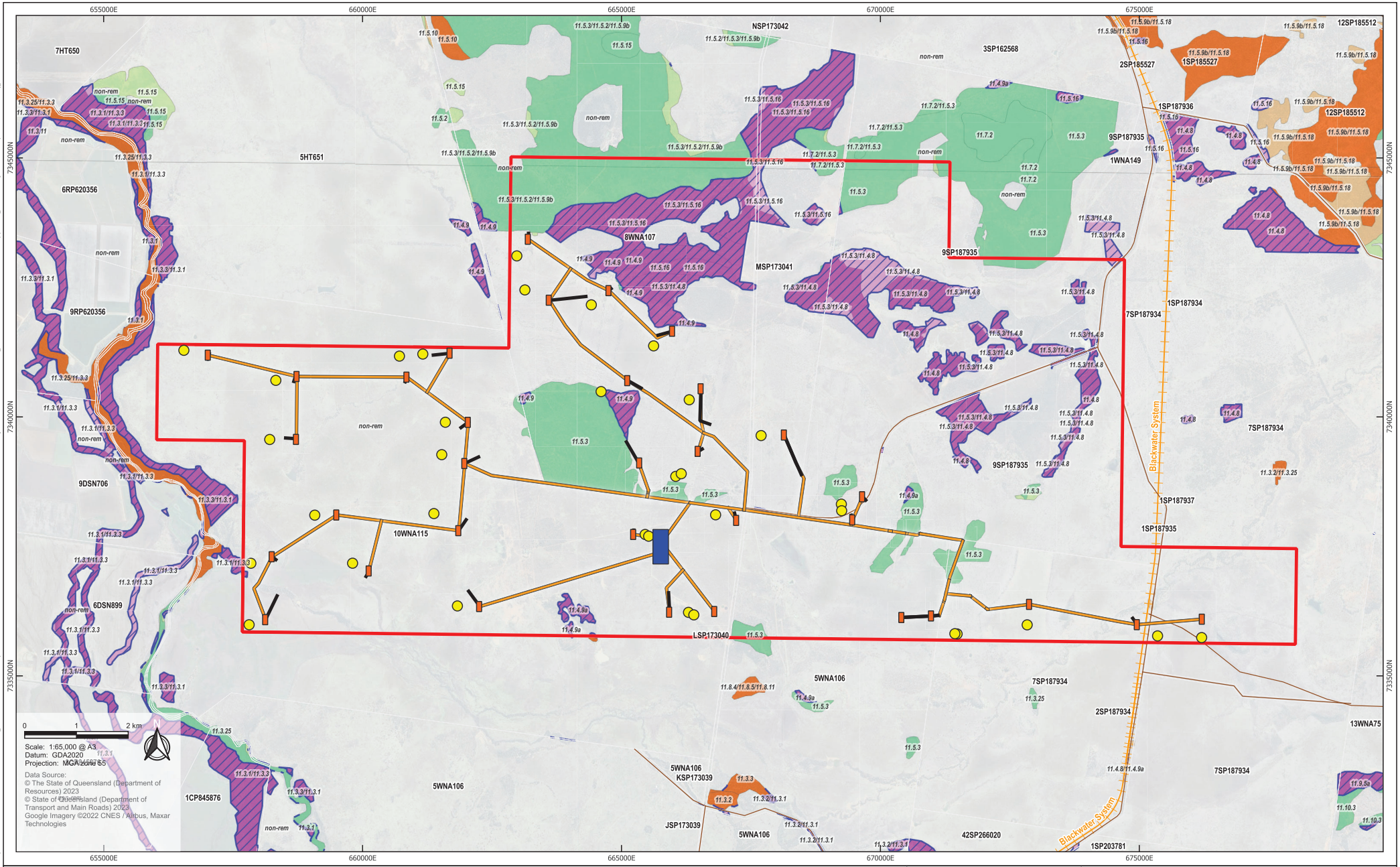
Survey Method	Description	Target Taxa/Species
Elliot trapping	At each trap site, 25 Type-A Elliott Traps were placed 20-25 m apart and baited with a mix of peanut butter, oats, oil and honey. Traps were checked early in the morning. Two sets of traps were left out for four nights and a third site was left out for three nights. Total of 275 trap nights.	Small mammals

Survey Method	Description	Target Taxa/Species
Funnel trap lines	Four pairs of funnel traps were placed per trap site. Funnel traps were arranged in two parallel lines, either side of a 20-30 m long drift fence. All sites were placed in close vicinity to an adjacent waterhole on dark clay soils with scattered regrowth of Brigalow present. Shade cloths were placed over each funnel trap to protect trapped animals during the day. Traps were operational for four nights at two survey sites and three nights at a further two sites. Traps were checked and cleared each morning and late afternoon. Total of 112 trap nights.	Frogs, snakes, other small-medium sized reptiles – in particular targeting the Ornamental Snake
Spotlighting	Spotlighting was undertaken along vehicle tracks and where waterbodies were accessible (targeting Ornamental Snake). Approximately eight person hours of spotlighting was carried out within the Proposed action area boundary across the 2022 and 2023 surveys.	Nocturnal fauna including arboreal mammals and herpetofauna
Habitat searches for herpetofauna	Inspections of potential shelter sites (e.g. fallen timber, debris, rocks, leaf litter) were carried out during the day to search for additional species (largely herpetofauna) not recorded using other survey techniques.	All herpetofauna
Bird surveys	Bird species were recorded at each systematic site during daily visits to check traps. Birds were identified by sight or call. An area with an approximate radius of 100 m around each trap-line was included in these bird censuses. At least two hours of survey effort were devoted to each trap site across the survey period. Additional surveys (20 minutes over 2 ha) were carried out at habitat assessment sites in 2022 and 2023. Approximately 22 hours of survey effort across the 2022 and 2023 survey periods.	
Opportunistic records	Searches were carried out opportunistically throughout the survey and included some records located outside the immediate boundary of the Proposed action area.	All fauna

5.1.2.6 TEC and RE Assessment – July/August 2024

The additional July and August 2024 assessments were focused on the occurrence and extent of TECs within the Proposed action area, primarily occurrences of the Brigalow TEC and Poplar Box grassy woodland TEC. The assessments utilised quaternary RE sites as per Neldner et al. (2023) (as detailed in **Section 5.1.2.4**) to verify the vegetation communities present. BioCondition sites were used to collect structural and floristic data. They were undertaken in accordance with the Queensland Herbarium *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland, Assessment Manual, Version 2.2 (*Eyre et al. 2015). Potential Brigalow TEC site data were compared with the key diagnostic characteristics and condition thresholds designating occurrences of the Brigalow TEC as detailed in the associated approved conservation advice (DE 2013). No potential occurrences of Poplar Box grassy woodland TEC were observed. The assessments comprised six BioCondition assessments and six quaternary assessments.

The flora survey site locations are shown in **Figure 6**. Site data sheets and an overall list of flora species present within the Proposed action area were derived from the flora assessment (refer to Appendix B of the EAR report, **Appendix C**).



Legend

- Petroleum Lease Boundary
- Cadastre (DCDB)
- Roads and tracks
- Railways

Infrastructure (indicative only)

- Gas compression facility
- New access tracks
- Indicative gathering lines

Gas production wells

- Indicative lateral well
- Indicative vertical well
- Potential TEC

Regional Ecosystems v13

- Category A or B area containing endangered
- Category A or B area containing of concern
- Category A or B area that is least concern
- Category C or R area containing endangered
- Category C or R area containing of concern
- Category C or R area that is of least concern
- Non-remnant

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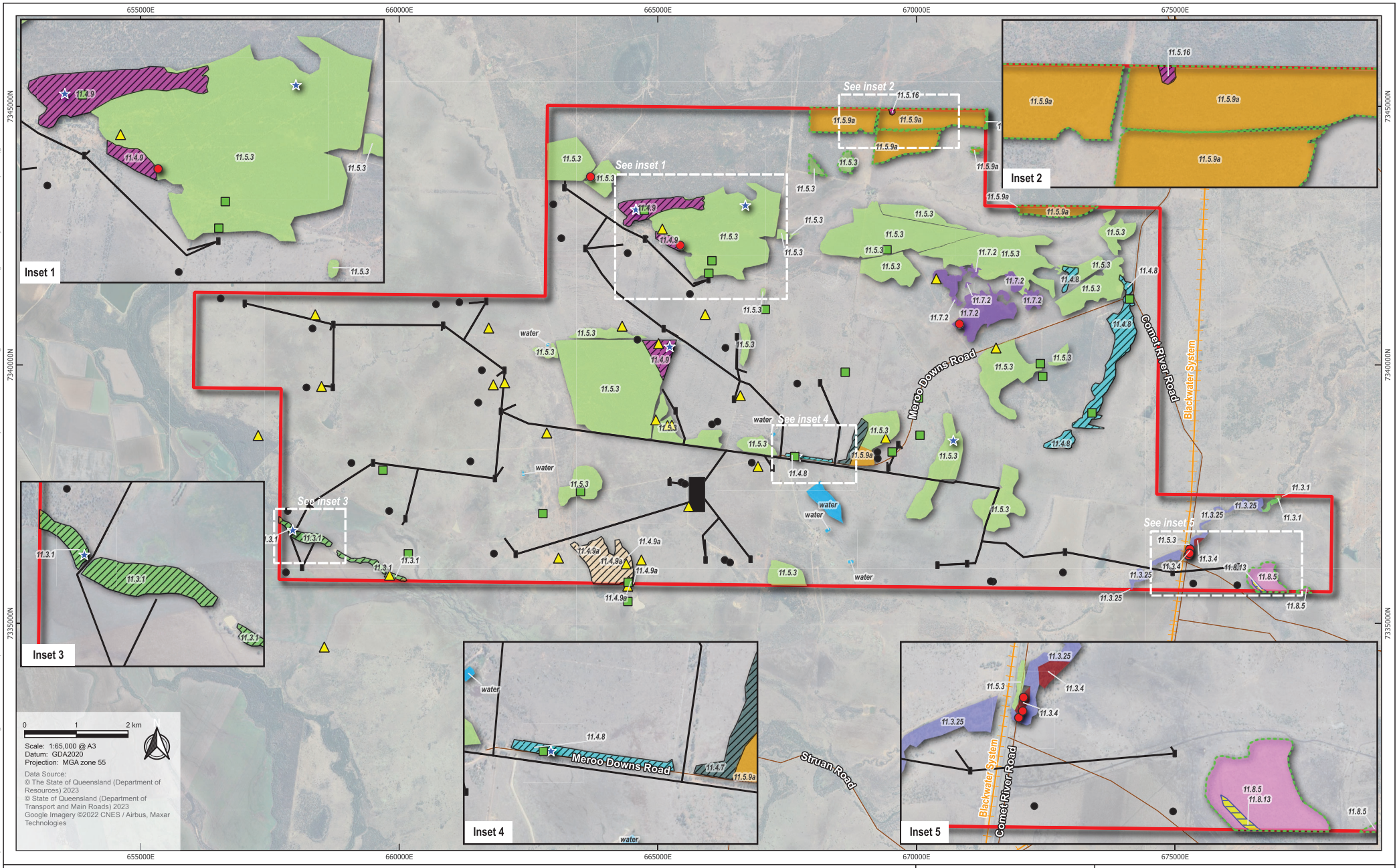
Mahalo North CSG Project
Preliminary Documentation

Figure 5
Queensland Government mapped regional ecosystems and potential TECs



Legend

- Petroleum Lease Boundary
- Roads and tracks
- Railways

Infrastructure (indicative only)
- Gas compression facility
- Infrastructure lines

Gas production wells
- Indicative lateral well
- Indicative vertical well

Threatened Ecological Community
- Brigalow
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions

Ground-truthed regional ecosystems
- 11.3.1
- 11.3.25
- 11.3.4
- 11.4.7
- 11.4.8
- 11.4.9
- 11.4.9a
- 11.5.16
- 11.5.3
- 11.5.9a
- 11.7.2
- 11.8.13
- 11.8.5
- water

Ecological survey data (EMM, 2022)

Survey sites (Epic, 2022)
- Quaternary

Survey sites (Epic, 2024)
- Secondary
- BioCondition
- Quaternary

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Figure 6
Ground-truthed Regional Ecosystems and survey sites

5.2 Habitat Assessment (TECs)

5.2.1 Desktop Assessment Result

The PMST report identifies the following five TECs as possibly present in the Proposed action area:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) (Brigalow TEC)
- Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin (Natural Grasslands TEC)
- Poplar Box Grassy Woodland on Alluvial Plains (Poplar Box TEC)
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions (SEVT TEC)
- Weeping Myall Woodlands

There are five REs mapped as present throughout the Proposed action area, which are considered analogous to the Brigalow TEC: RE 11.3.1, 11.4.8, 11.4.9, 11.4.9a and 11.5.16 (refer **Figure 5.** Queensland government mapped regional ecosystems and potential TECs). These occur as remnant and regrowth RE polygons and include single and mixed vegetation polygons where the RE is analogous to the TEC and comprises 10-30% of the overall area. The mapping indicates there is 445.48 ha of potential Brigalow TEC predicted to occur within the Proposed action area.

There is one RE considered analogous to the Natural Grasslands TEC: 11.8.11. This RE is mapped across one remnant mixed vegetation polygon (1.73 ha in size) intersected by the southern boundary of the Proposed action area. The mapping indicates 0.13 ha of potential Natural Grasslands TEC occurring within the Proposed action area. Analysis of aerial imagery demonstrates that the entire mapped area is wooded (i.e., it is not a grassland).

There is one RE considered analogous to the Poplar Box TEC: 11.3.2. This RE is mapped across two regrowth mixed vegetation polygons (0.34 ha and 1.63 ha respectively) in the eastern portion of the Proposed action area adjacent to Comet River Road. The mapping indicates 1.68 ha of potential Poplar Box TEC within the Proposed action area. Analysis of aerial imagery reveals that the larger polygon is intersected by the Comet River Road and the entire mapped area, leaving only 0.98 ha of the area wooded.

There are several REs within the broader region surrounding the Proposed action area, which are also considered analogous to the Brigalow TEC: RE 11.3.1, 11.4.8, 11.4.9, 11.5.16, 11.9.1 and 11.9.5 (refer **Figure 5**) depicts the potential extent of Brigalow TEC within 20 km of the Proposed action area, as based on the current Queensland Government RE mapping. It is important to note that areas outside the Proposed action area have not been field verified. Many of the areas shown are mapped as mixed vegetation polygons, where as little as 10% of the polygon is estimated as potentially comprising Brigalow vegetation.

5.2.2 Field Assessment Result

5.2.2.1 Ground-truthed Regional Ecosystems

A total of 27 tertiary RE sites, 26 quaternary RE sites and six BioCondition assessments were completed across the Proposed action area for the Project (refer **Figure 6**). Vegetation community mapping in the north and far south-east of the Proposed action area has been supplemented by data collected by EMM (2022) and Epic for nearby Projects (Epic 2024). A portion of the Proposed action area in the north-east was not subject to ground-truthing as it was located away from the Project infrastructure and not considered relevant to potential impact from the Project.

Ground-truthing vegetation surveys confirmed the presence of nine vegetation communities encompassing 13 RE types. There are substantial differences with the current State Government RE mapping, which overstates the potential extent of Brigalow communities present within the Proposed action area. The remaining area encompassed water bodies, and non-remnant areas impacted by vegetation clearing. The description, status and extent of each RE are provided in **Table 9** and depicted in **Figure 6**. Further detail regarding vegetation community floristics, structure and representative photos is provided in the following sections.

Table 9. Ground-truthed REs within the Proposed action area

Vegetation community	RE	TEC	EP Act (biodiversity) status	Extent within Proposed action area (ha)
1. Remnant Brigalow woodland	11.3.1	Brigalow (*Acacia harpophylla* dominant and co-dominant)	Endangered	21.77
	11.4.8			84.80
	11.4.9			71.19
	11.4.9a			36.65
	11.5.16			0.82
2. Regrowth Brigalow woodland	11.4.7			13.27
	11.4.8			3.57
	11.4.9a			27.37
	11.3.1	N/A	Endangered	3.89
3. Remnant Acacia woodland	11.7.2	N/A	No concern at present	104.76
4. Remnant Poplar Box woodland	11.5.3	N/A	No concern at present	1,601.14
5. Regrowth Poplar Box woodland	11.5.3			72.83
6. Remnant Queensland Blue Gum open forest	11.3.25	N/A	Of concern	29.31
	11.3.4			2.42
7. Remnant Silver-leaved Ironbark woodland	11.5.9a	N/A	No concern	224.75
8. Remnant Mountain Coolibah woodland	11.8.5	N/A	No concern	27.43
9. Remnant semi-evergreen vine thicket	11.8.13	Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	1.02

5.2.2.2 Brigalow TEC

Brigalow TEC (*Acacia harpophylla* dominant and co-dominant) was identified within the Proposed action area during Project surveys. The TEC is listed as Endangered under the EPBC Act. Remnant and regrowth vegetation identified as Brigalow woodland is considered analogous to Brigalow TEC and comprises the following remnant and regrowth REs: 11.3.1, 11.4.7, 11.4.8, 11.4.9, 11.4.9a and 11.5.16.

There are no survey guidelines associated with the Brigalow TEC. Brigalow is a perennial tree with no seasonal requirements. It is an obvious feature in the landscape where it occurs. The survey effort is considered sufficient for describing the extent of the TEC potentially impacted by the Project within the Proposed action area.

The overall extent of Brigalow TEC within the Proposed action area, subject to the ground-truthing survey effort, is estimated to be 259.44 ha. Additional areas in the north of the Proposed action area, mapped as partially comprising RE 11.5.16 (10% or 30 % of mapped polygons), were not subject to flora surveys as they were not close to the Project and therefore not considered relevant to potential impacts.

As stated previously, the ground-truthed vegetation mapping indicated substantial differences with the State mapping, including the following:

- RE 11.5.16 was not identified as present within the majority of surveyed areas in the north of the Proposed action area. Almost all areas mapped as comprising RE 11.5.16 were found to be wholly occupied by Poplar Box woodland (RE 11.5.3).
- A large patch of RE 11.4.9 in the north of the Proposed action area was found to be correctly mapped (**Plate 1**), although the patch extent was reduced

- Substantial areas mapped as mixed polygons partially including RE 11.4.8 were found to be wholly occupied by 11.5.3. Other areas mapped as RE 11.4.8 were found to be dominated by Lancewood. Brigalow was not present, and these areas do not represent Brigalow TEC
- Remnant RE 11.3.1 was mapped along Humboldt Creek in the south-west of the Proposed action area and Rockland Creek in the east (previously mapped as non-remnant)
- Regrowth RE 11.4.8 analogous to Brigalow TEC occurs as a narrow strip along Meroo Downs Road in the centre of the Proposed action area (**Plate 2**). A nearby area comprises remnant RE 11.4.7. Both areas were previously mapped as non-remnant.
- A large patch of vegetation intersected by the southern boundary of the Proposed action area was observed to be occupied wholly by remnant and regrowth RE 11.4.9a. This increased the extent of Brigalow TEC mapped in this area.

Plate 1. Brigalow TEC represented by remnant RE 11.4.9 north of the Proposed action area (site BC7)

Plate 2. Brigalow TEC represented by a narrow strip of regrowth RE 11.4.8 (site BC1)

The key diagnostic characteristics and condition thresholds identifying occurrences of Brigalow TEC (as detailed in DE 2013) include:

- Key diagnostic characteristics:
  - 1) The presence of Brigalow as one of the most abundant tree species, which is either dominant or codominant
  - 2a) Meets the description of one of the REs described in Section 1.7.1 of the Conservation Advice for the Brigalow TEC (DE 2013). The patches occur in the Brigalow Belt Bioregion and encompass the following REs considered analogous to the Brigalow TEC: 11.3.1, 11.4.7, 11.4.8, 11.4.9/a and 11.5.16
  - 2c) Patches may comprise Brigalow regrowth with species composition and vegetation structure typical of the REs identified above, and that has not been comprehensively cleared in the last 15 years
- Condition thresholds:
  - Patch is 0.5 ha or more in extent
  - Weedy perennial plants comprise less than 50% of the vegetation cover across 0.5 ha within the patch

The ground-truthed floristic data collected were assessed against the criteria, as shown in **Table 10**. Survey data, including RE and Biocondition sites relevant to Brigalow TEC, is provided in Appendix B of the EAR report. In general, weed cover in Brigalow patches was found to be low and all areas of sufficient size (>0.5 ha) were found to be analogous to the description of Brigalow TEC.

Table 10. Brigalow RE patches recorded within the Proposed action area compared with TEC diagnostic criteria/condition class identified in DE 2013a

Analogous RE	Growth status	Brigalow dominant	Weed cover <50%	Area (ha)	Brigalow TEC
11.3.1	Remnant	Yes	Yes	2.13	Yes
11.3.1	Remnant	Yes	Yes	6.82	Yes
11.3.1	Remnant	Yes	Yes	9.96	Yes
11.3.1	Remnant	Yes	Yes	2.86	Yes
11.3.1	Regrowth	Yes	No	3.89	No*
11.4.7	Regrowth	Yes	Yes	13.27	Yes
11.4.8	Remnant	Yes	Yes	65.67	Yes
11.4.8	Remnant	Yes	Yes	10.66	Yes
11.4.8	Remnant	Yes	Yes	3.31	Yes
11.4.8	Remnant	Yes	Yes	5.16	Yes
11.4.8	Regrowth	Yes	Yes	3.57	Yes
11.4.9	Remnant	Yes	Yes	41.52	Yes
11.4.9	Remnant	Yes	Yes	23.29	Yes
11.4.9	Remnant	Yes	Yes	6.38	Yes
11.4.9a	Remnant	Yes	Yes	1.09	Yes
11.4.9a	Remnant	Yes	Yes	35.56	Yes
11.4.9a	Regrowth	Yes	Yes	2.68	Yes
11.4.9a	Regrowth	Yes	Yes	19.03	Yes
11.4.9a	Regrowth	Yes	Yes	5.66	Yes
11.5.16	Remnant	Yes	Yes	0.82	Yes
Total TEC present				**259.44**	-

*Based on assessment by EMM (2022)

5.2.2.3 Other TECs

A single small area potentially comprising Natural Grasslands TEC intersected by the southern boundary of the Proposed action area was observed to be occupied by regrowth RE 11.4.9a (analogous to Brigalow TEC). No patches of Natural Grassland TEC were observed within the Proposed action area.

Patches of vegetation located along Rockland Creek in the south-east of the Proposed action area were mapped as comprising regrowth vegetation potentially analogous to Poplar Box TEC. Site assessments concluded that this area was dominated by Queensland Blue Gum and Poplar Box, with TEC vegetation not present.

A single area of SEVT TEC has been previously mapped (EMM 2022) as occurring in the south-east corner of the Proposed action area. Approximately 1 ha occurs on a southern-facing slope on basaltic geology. There are no condition thresholds associated with the SEVT TEC listed in the relevant conservation advice (DCCEEW 2023). As such, it is assumed all occurrences of the community are considered representative of the TEC. The patch is surrounded by Mountain Coolibah woodland and is located approximately 300 m from the nearest Project infrastructure.

5.3 Terrestrial Groundwater Dependent Ecosystems Assessment

The Project engaged Watermark Eco to undertake a terrestrial GDE assessment. The objective of the study was to provide a detailed field-based investigation and assess the presence and nature of terrestrial GDEs within the Proposed action area and areas directly affected, which may be subject to an impact due to groundwater drawdown. Completion of the assessment was undertaken in 2024 through:

- General field traverse of mapped terrestrial GDE areas to identify any areas of groundwater seepage and assist in targeting field-based assessment sites
- Biophysical assessments to characterise the physical interactions of potentially groundwater-dependent trees with their edaphic controls

- Stable isotope investigations to identify the source, or sources of moisture utilised by areas currently mapped as GDEs

The assessment focused on areas of the Brigalow TEC. However, it also provided broader information on other habitats within and adjacent to PLA 1128 to allow an adequate assessment of the Project's risks to GDE functions. The following sections provide a summary of the Groundwater Dependent Ecosystem Assessment prepared by WaterMark (2024). The complete report has been provided in **Appendix E**.

In response to the IESC advice (Item 17), a follow-up GDE field assessment survey will be undertaken (currently scheduled for August 2025), which will be a repeat of the survey that was completed in August 2024. This additional field assessment will be completed during the same seasonal period, being the end of the dry season, as this is the time that GDEs (i.e. Brigalow) would most likely be drawing water from the groundwater rather than from surface water runoff. The follow-up survey aims to address annual variability and strengthen the evidence base for the absence or presence of GDEs within the Proposed action area.

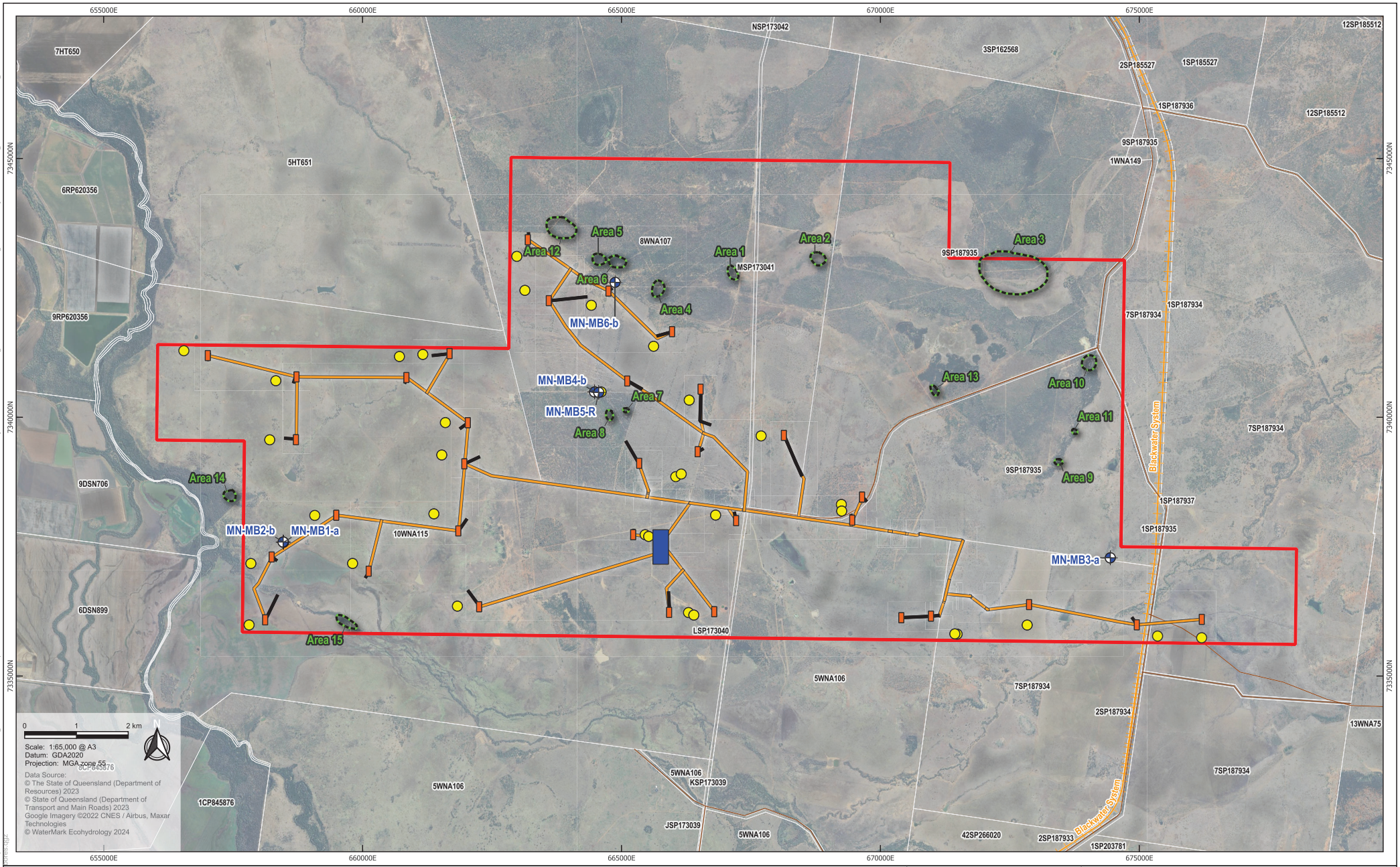
5.3.1 Survey Method

The field survey occurred over five field days between the 26th and 30th of August 2024. The field survey included an assessment of 15 sites, all considered to represent potential GDEs from the BOM GDE Atlas (BOM 2024). At each assessment site, sampling of up to five trees for leaf water potential (LWP) was completed, with twig samples collected to analyse xylem stable isotope composition. Five locations were subject to soil auger profiling to facilitate the collection of soil moisture potential (SMP) and stable isotope data from the soil profile. Groundwater sampling was completed as part of a dedicated quarterly groundwater sampling program. All methods are consistent with GDE assessment protocols detailed by Doody et al. (2019) and Richardson et al., (2011).

The survey focused on areas of the Brigalow TEC, and other areas mapped as terrestrial GDEs in the GDE Atlas, including sites where GDEs have been mapped as linear bands on the edges of residual escarpments. The selected survey sites have been shown in **Figure 7** and a summary of the purpose of each location provided in **Table 11**.

Table 11. GDE assessment sites and sampling purpose

GDE assessment site	Landform	Purpose	Targeted RE
1, 4, 8, 12	Residual landform with loamy clay soils (often red)	Sampling of Low Potential Terrestrial GDEs associated with remnant eucalypt woodland habitats.	11.5.3
3	Residual sandy soils over clay and shallow bedrock	Sampling of Low Potential Terrestrial GDEs associated with remnant eucalypt dominant woodlands.	11.5.9
2	Residual landform with loamy clay soils	Investigation of a Moderate Potential Aquatic GDE associated with the margins of a residual escarpment.	Non-remnant
5, 6, 7	Residual clay plains with gilgai development	Sampling of Brigalow TEC patches. All sampled patches are outside mapped Terrestrial GDEs from the GDE Atlas (BOM 2024).	11.4.9 (Brigalow TEC)
9, 10, 11	Residual clay and clay loam plains over shallow basement (sedimentary) rocks.	Sampling of Low Potential Terrestrial GDEs associated with remnant eucalypt woodland habitats.	11.4.8
14, 15	Alluvial clays associated with riverine floodplain.	Sampling of Low Potential Terrestrial GDEs associated with mapped occurrences of the Brigalow TEC associated with a riverine floodplain.	11.3.1 (Brigalow TEC)



Legend

- Petroleum Lease Boundary
- Cadastre (DCDB)
- Roads and tracks
- Railways

Infrastructure (indicative only)

- Gas compression facility
- New access tracks
- Indicative gathering lines

Gas production wells

- Indicative lateral well
- Indicative vertical well

- GDE assessment area
- GDE monitoring bores

A Montrose Environmental Company

Comet Ridge
Mahalo North CSG Project
Preliminary Documentation

Figure 7
Terrestrial GDE areas targeted for survey and location of groundwater monitoring bores

5.3.1.1 Leaf Water Potential

Leaf Water Potential (LWP) defines the work required per unit quantity of water to transport it from the moisture held in the soil to leaf stomata. LWP balances osmotic potential, turgor pressure, and matric potential. It is a function of soil water availability, evaporative demand, and soil conductivity. LWP was measured pre-dawn (before sunrise) as per standard protocol.

In total, 32 trees were assessed for LWP across the fifteen assessment sites. The following categories were applied as a measure of relative water availability:

- Extremely High: LWP >-0.276 MPa
- Very High: LWP -0.276 to -0.580 MPa
- High: LWP <-0.580 to -0.896 MPa
- Moderate: LWP <-0.896 to -1.21 MPa
- Low: LWP <-1.21 to -1.72 MPa
- Very Low: LWP <-1.72 to -2.21 MPa
- Extremely Low: LWP <-2.21 MPa

While the defining values of these categories are arbitrary, they indicate the likely degree and nature of groundwater dependence or interaction. The 'Extremely High' category would indicate the potential for interaction with a highly fresh groundwater source, while 'Extremely Low' are considered unlikely to utilise groundwater to any degree, regardless of salinity.

5.3.1.2 Soil Moisture Potential

A hand auger was utilised to collect shallow soil samples at regular depths down the soil profile at selected sites and opportunistic sampling of groundwater where intersected. Soil sampling was undertaken regularly (at a minimum of 0.5 m) intervals down the soil profile for analysis of stable isotopes of oxygen ($\delta^{18}O$) and deuterium ($\delta^{2}H$), and duplicate samples were retained for analysis of soil moisture potential (SMP). Soils were sampled at regular intervals down a soil profile for measurement of SMP, with sampling intervals dependent on the degree of structural and lithological heterogeneity. The measurement of SMP was completed in the laboratory with a portable Dew Point Potentiometer (WP4C).

SMP, which includes the matric (water availability) and osmotic (saltiness) potential, measures the energy required to extract moisture from the soil. Water can only move down a hydraulic gradient from soil to root. Areas in the soil profile with a less negative SMP than measured pre-dawn LWP will be accessible as a source of moisture. Large, mature trees are unable to extract moisture from regions in the soil profile where the total SMP is significantly below LWP measured in pre-dawn leaf material (Feikema et al., 2010; Lamontagne et al., 2005; Thorburn et al., 1994; Mensforth et al., 1994; Holland et al., 2009 and Doody et al., 2015).

5.3.1.3 Stable Isotope Sampling and Analysis

This method relies on a comparison between the stable isotope ratios of water contained in plant xylem (from a twig or xylem core) with stable isotope ratios found in the various sources of water, including a shallow groundwater table, potential sub-artesian aquifer water sources or shallow soil moisture. Methods used to assess stable isotopes included:

- **Local Meteoric Water Line (LMWL):** Data interpretation is supported by incorporating isotopic data from rainfall collected in the Bowen Basin between 2018 and 2022, which is applied to construct a best-fit LMWL using simple linear regression (Craig, 1961). The constructed LMWL defines a slope of 6.852 and d-excess of 9.776 (Y = 6.852*X + 9.776), which is shallower than the Brisbane Meteoric Water, which defines a slope of 7.6 and d-excess of 12.8 (Y = 7.6*X + 12.8) (Crosbie et al., 2012). While the construction of the LMWL is based on a limited number of samples, the data provides sufficient utility to support the construction of a preliminary LMWL for the Clermont region
- **Soil Moisture Isotopes:** Sampling was undertaken regularly in auger holes to capture isotopic signatures from a range of potential plant moisture sources from the upper soil surface to the top of the phreatic zone in shallow water tables. The sampling intervals for soil moisture isotope

analyses depended on auger yield and soil variation, but generally the intervals mirrored the interval for the SMP. Collected samples were sent to the Australian National University (ANU) Stable Isotope Laboratory for analysis

- **Xylem Water Isotopes:** Twigs were collected from the outer canopy branches of target trees used to sample LWP. Samples dispatched to the ANU Stable Isotope Laboratory. Multiple samples were taken from a single branch sample at all sampling localities for xylem water analysis. From each branch sampled, the twig samples returning the lowest degree of isotopic enrichment were used as the reference because there may be considerable partitioning of isotope ratios across a twig cross-section (moving from the xylem to the phloem). As fractionation will likely result in isotopic enrichment rather than depletion, the least enriched sample from each tree is considered most likely to be representative of the soil moisture or groundwater source.
- **Water sampling:** To compare the isotopic signature of groundwater to that of vegetation, water samples were collected from various sources including:
  - Shallow groundwater intercepted in soil augers (if present).
  - Surface waters.
  - Selected developed groundwater monitoring bores, including those specifically installed as GDE monitoring bores
- All samples were dispatched to ANU to analyse stable isotope composition. Six dedicated GDE monitoring bores were installed to measure standing water levels (SWLs), water quality, and seasonal variation. The location of all groundwater bores is shown in **Figure 7.**

5.3.1.4 Data Interpretation

Data interpretation followed a structured approach by filtering multiple lines of evidence to assess groundwater dependence. The biophysical measurement of LWP formed the primary assessment, followed by the adjunct comparison with SMP, with stable isotope data used to provide supplementary evidence where ambiguity remained. In addition, an overview of the depth of the groundwater table and groundwater salinity was completed as a final filter to determine the accessibility of groundwater and suitability as a source of moisture to support transpiration at each assessment locality.

5.3.1.5 Data Limitations

Watermark Eco (2024) states that the GDE assessment only provides a snapshot of the ecohydrological process at each of the fifteen GDE assessment sites identified during the pre-survey desktop assessment. Due to the intensive nature of the data collection process, representative areas were chosen for GDE sampling, which were used as a basis for extrapolation over broader areas considered to present similar ecohydrological function. The data collection process aimed to conceptualise the ecohydrological characteristics of any GDEs confirmed to be present in the Study Area and their general distribution.

5.3.2 Field Assessment Result

5.3.2.1 Site Level Ecohydrology

The following ecohydrological characteristics of the major tree species were noted:

- Four eucalypt species were sampled during the GDE assessment, being poplar box (*Eucalyptus populnea*) in RE11.5.3, coolabah (*Eucalyptus coolabah)* as a canopy emergent within RE11.3.1, Dawson gum *(Eucalyptus cambageana)* as a canopy dominant in RE11.4.8 and a canopy emergent within RE11.4.9, and silver-leafed ironbark (*Eucalyptus melanophloia)* as a dominant canopy tree in RE11.5.9. Importantly:
  - Costelloe et al., (2008) concluded that coolabah avoided using hypersaline groundwater (71 000 mg/L[Cl] or 70 290 µs/cm), instead, favouring the use of low salinity soil moisture in the vadose zone above the groundwater table
  - Fensham (1999) consider poplar box, and silver leaf ironbark (*Eucalyptus melanophloia)* to possess a shallow rooting system with limited investment in deep root architecture

  - Dawson gum (*Eucalyptus cambageana)*, the general association of the species with heavy clay soils and brigalow suggests that there will be limited development of deeper sinker roots (Dupuy et al., 2005)
- Brigalow (*Acacia harpophylla)* habitats and individual trees regularly occur adjacent to the floodplain of the major drainage systems and generally occupy heavy clay soils (vertosols) with well-developed gilgai microtopography in the upper soil profile (0.6 m to surface) where the bulk of nutrient recycling occurs. The concentration of the brigalow root mass in the upper soil profile enables the species to resprout profusely from horizontal roots after physical disturbance and limits the capacity for other woody species to compete for moisture and nutrients. Brigalow's shallow rooting habit is evident with the tendency of mature trees to topple because of churning in the upper soil profile, with fallen trees universally exposing a well-developed lateral root system with little evidence for development of deeper sinker roots that would have the capacity to propagate to deeper groundwater tables. Brigalow is not considered to represent groundwater dependent vegetation

Overall, tree rooting depth is a difficult parameter to predict and measure as it depends on several factors, including tree species, substrate, edaphic conditions, and depth to groundwater. Tree root penetration is typically arrested at the capillary fringe (Eamus et al 2006b). DNRME (2013) considers 20 m to represent the maximum potential rooting depth of river red gum (*Eucalyptus camaldulensis)*, the species where the most information on tree rooting depth has been obtained, although this would likely only occur under optimal conditions with favourable soil types and moisture unencumbered by salinity.

Notably, the most relevant groundwater monitoring bores for brigalow TECs are MN-MB4-b, MN-MB5-R, and MN-MB6-b, which have SWLs of approximately 21.5 metres below ground level (mbgl) and salinities ranging from 30,000 to 51,900 µS/cm. Neither of these values renders groundwater a suitable source of moisture to support transpiration. Based on evidence from published literature (Costelloe et al., 2008; Thorburn et al., 1994, Mensforth et al., 1994) and the Watermark Eco's (2024) experience, it is unlikely that the terrestrial woody vegetation that characterises the Proposed action area would have capacity to utilise groundwater that has salinity greater than 30 000 µS/cm, instead relying on whatever fresh moisture that can be extracted from the vadose zone. It is also unlikely that any tree would invest in the development of a deep root system to tap water from a saline water table, where the benefits in terms of increased water availability would be very marginal.

5.3.2.2 Leaf Water Potential

Watermark Eco's (2024) collected data from the fifteen GDE assessment sites demonstrated that average LWP values at most GSE assessment sites were below the standard wilting point, spanning Low to Extremely Low moisture availability ranges (**Figure 8**).

Importantly, the assessment sites associated with the Brigalow TEC, including RE11.4.9 (Sites CM_S5, CM_S6 & CM_S7), RE11.4.8 (CM_S4, CM_S9, CM_S10 & CM_S11), and RE11.3.1 (CMS_14 & CMS_15), were identified with LWP values that fall within the Very Low to Extremely Low range (-1.65 to -3.4 MPa). Therefore, these sites are unlikely to be associated with any degree of groundwater dependence. Overall, the brigalow TEC sites consistently had the lowest moisture availability of all trees, particularly at Sites CM_S5 and CM_S6, indicating the species' tolerance to extremely dry edaphic conditions. Coolabah and Dawson gum, growing in association with brigalow, demonstrated a similar range of LWP values across all assessment sites, generally falling close to or below the standard wilting point.

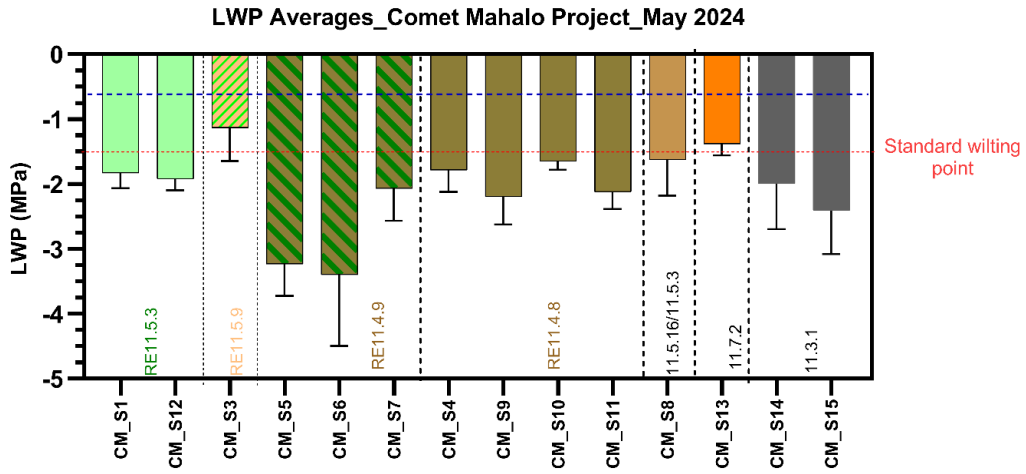


Figure 8. Average LWP values for all assessment sites, with the blue dashed line indicating extremely high moisture availability, and the red dashed line indicating Standard Wilting Point (Watermark Eco 2024)

5.3.2.3 Soil Auger Sampling

Soil moisture potential (SMP) were taken in five locations that focused specifically on habitats associated with the Brigalow TEC and at other locations where LWP values suggested increased moisture availability. A summary of the results included:

- **RE11.3.1**: Augers CM14_AU1 and CM15_AU1 were placed into alluvial clays associated with the Brigalow TEC. Within these augers the following was encountered:
  - Auger CM14_AU1: Downhole profiling at indicates an intersection between LWP and SMP values at 0.75 to 1.0 mbgl and a depth of 1.6 mbgl at the clay base, suggesting that the LWP values can be accounted for by moisture in the shallow soil profile. Auger CM_S14 did not intersect groundwater, and the soil profile remained dry to full depth.
  - Auger CM15_AU1: A significant intersection exists between LWP and downhole SMP values deeper than 1.5 mbgl and at the surface, indicating that the shallow soil profile can account for tree moisture sources. As per auger CM14, CM15 remained dry for its full depth
- **RE11.4.9:** Auger CM7_AU1 was located in an elevated clay plain that hosted a well-developed woodland of brigalow and Dawson gum (RE11.4.8). SMP values became progressively drier at depth in the profile, recording extremely negative SMP values as low as -5.5 MPa at 2.8 mbgl. The intersection of SMP and LWP values occurred at shallow depths (0.3 mbgl), indicating that vegetation was likely to utilise moisture from the shallow part of the soil profile, possibly residual moisture recharge from recent rainfall. The data indicates that unsaturated regions of the soil profile account for the moisture sources of woodland vegetation at the site at the time of the assessment
- **RE11.4.8:** Auger ML10_AU1 intersected 0.7 m of silty loam before intersecting weathered sedimentary rock, with sedimentary basement (Rewan Formation) surface outcrop visible nearby. No deeper auger profiling could be completed
- **RE11.5.9:** Auger CM3_AU1 occurred in sandy residual soils supporting a silver leaf ironbark dominant habitat (RE11.5.9). LWP values for the silver leaf ironbark sampled at the site and SMP values intersect at a depth of approximately 0.75 mbgl. The high moisture availability in the upper 0.5 m of the soil profile is also notable, most likely residual moisture from the rainfall two weeks before the survey. The data indicated that the high to moderate LWP values reported for trees at the site could be readily reconciled with the soil moisture available in the shallow soil profile

5.3.2.4 Stable Isotope Sampling and Analyses

Stable isotope values ($\delta^{18}O$ and $\delta^{2}H$) for soil, twig xylem, groundwater, and surface water for sampling points within Brigalow TEC habitats RE11.3.1, RE11.4.8 and 11.4.9, and the eucalypt woodland habitats RE11.5.3 and 11.5.9 are provided in **Figure 9**, **Figure 10** and **Figure 11**.

Notably, the three groundwater values form a discrete cluster of values that are isotopically lighter than those formed by the twig samples from all habitats (further to the left along the LMWL and enriched in ^{16}O compared to ^{18}O). The groundwater samples are also generally isotopically lighter than the soil samples, with some minor, though insignificant, overlap. Interestingly, the shallowest groundwater bore (MN-MB1-a) has a much lighter isotopic signature than the two deeper bores, which indicates differences in recharge mechanisms and the type of rainfall event responsible for recharge of the two groundwater systems.

For all three vegetation groupings, the scatter of twig xylem isotope values strongly overlaps with the broad scatter of soil isotope values (**Figure 9** to **Figure 11**). While this indicates isotopic heterogeneity of the soil moisture source, it also indicates that moisture from unsaturated regions of the soil profile is supporting tree moisture requirements across all habitats in the study area. Soils demonstrate considerable isotopic spread compared to the groundwater values, with samples from shallow portions of the soil profile subject to evaporative enrichment and deeper soil samples, recharged through deep infiltration of rainfall, having lighter isotopic signatures. For all habitat types, clusters of isotope values from twig xylem overlap with soil values without substantial evidence for groundwater interaction.

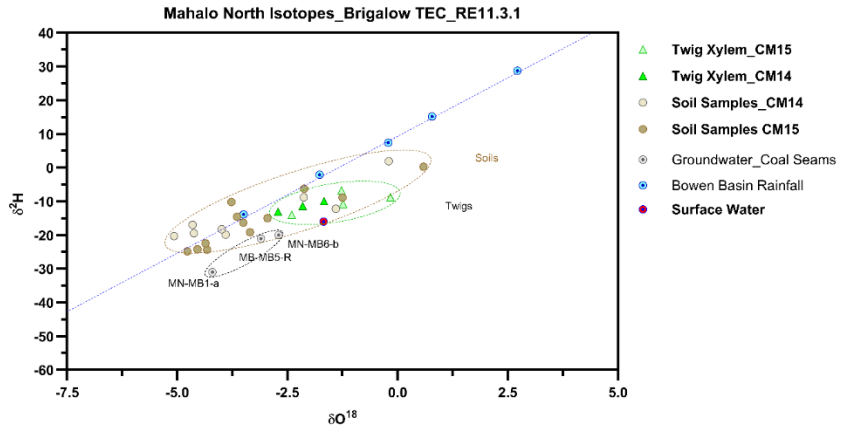


Figure 9. Stable isotope scatter for sites within RE11.3.1 (CM14 and CM15) (Watermark Eco 2024)

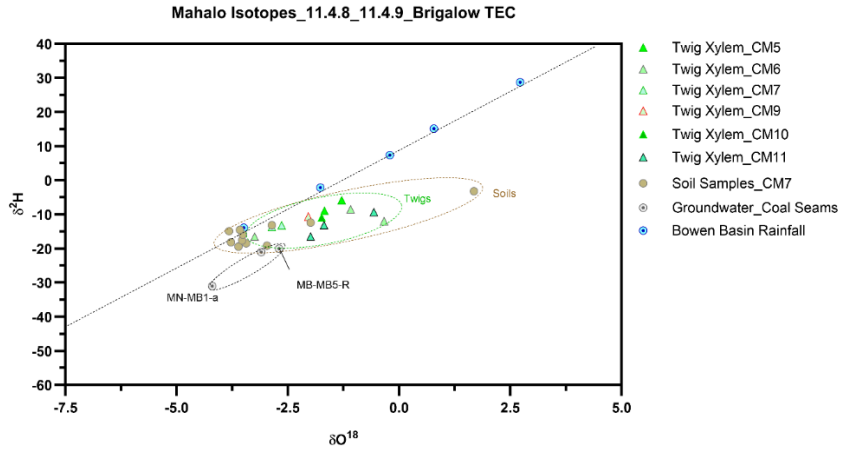


Figure 10. Stable isotope scatter for sites within RE11.4.8/11.4.9 (Watermark Eco 2024)

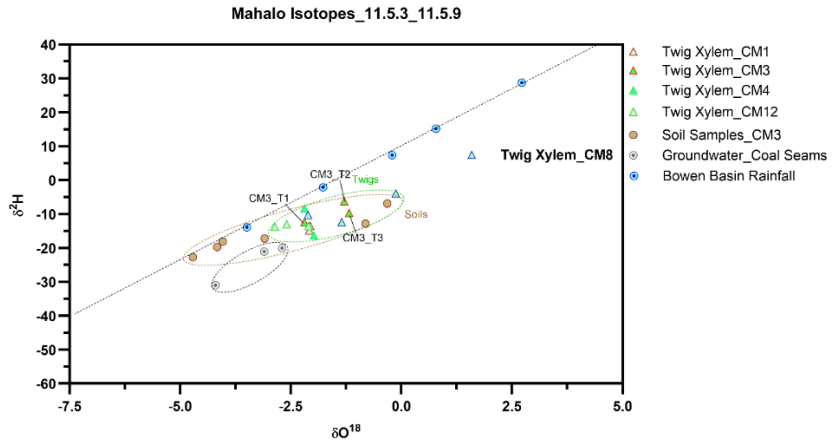


Figure 11. Stable isotope scatter for sites associated with REs 11.5.3 and 11.5.9 (Watermark Eco 2024)

The lc-excess data (**Figure 18**) indicate that the three groundwater samples are the most evaporatively evolved of any of the measured moisture sources, offset considerably below the LMWL, indicative of significant ^{2}H depletion relative to meteoric values. Lc-excess for the soil samples presents a much greater range of values, with some analyses close to a meteoric source indicative of direct infiltration of recent rainfall into the soil profile. Twig xylem samples all fall within the range of values associated with soils, and only CM11 (RE11.4.9), and CM15 (11.3.1) to a lesser extent, directly overlap with groundwater values. This overlap between groundwater and twig xylem values at CM11/CM15 is not an indication of groundwater usage but rather the use of a moisture source that has coincidentally undergone a similar degree of isotopic evolution. The persistent overlap between twig xylem and soil moisture values does, however, confirm that soil moisture predominantly supports vegetation transpiration across the broader tenement.

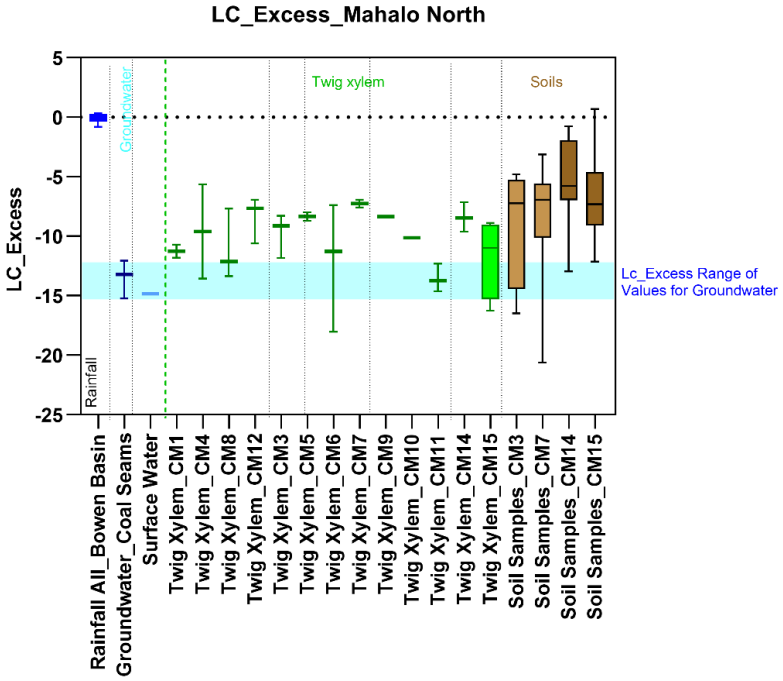


Figure 12. Lc-excess values for all sites including water sources soils and twigs (Watermark Eco 2024)

The data for reconciled for downhole $\delta^{18}O$ values for all auger holes demonstrated:

- **CM14_AU1 & CM15_AU1:** The CM14 data demonstrates an overlap between soil and twig xylem values in the upper 0.3 m of the soil profile and again at 1.25 mbgl. A similar pattern is evident for CM15, with an overlap between twig xylem and soil moisture δ18O values at depths between the surface and 0.3 mbgl and again at 2.0 mbgl. Moisture utilisation from these regions of the soil profile broadly suggests a shallow soil moisture source supporting transpiration rather than groundwater
- **CM7_AU1:** The CM7 data illustrates isotopic overlap between twig xylem and soil moisture at depths <0.5 mbgl and also at 1.5 mbgl, coincident with the intersection of coarse tree roots. Combined with the biophysical data from CM7 suggests that at the time of the assessment, vegetation was utilising moisture predominantly from shallow depths (<0.50 m) in the soil profile
- **CM3_AU1:** The CM3 data presented the lowest LWP values for any site during the assessment. The data illustrates the isotopic overlap between twig xylem and soil moisture at shallow depths (<0.5 mbgl), presenting a slight mismatch with the biophysical data, which suggests slightly deeper moisture utilisation from 0.75 mbgl. The datasets (biophysical and isotopic) indicate a shallow source of moisture is driving transpiration at this locality, and the high LWP values reported from the site are associated with recently infiltrated rainfall.

5.3.2.5 Conclusions

Four significant factors indicate that woody vegetation within the Proposed action area does not rely on groundwater to support transpiration:

- LWP values for all trees sampled from a range of habitats, including both brigalow and eucalypt woodlands, are consistently strongly negative, suggesting that woody vegetation is either reliant on soil moisture from unsaturated portions of the soil profile that is held tightly in a clay matrix or trees are using a highly saline groundwater source
- SMP values for the four deeper augers sampled during the field assessment overlap with LWP values reported for trees sampled at the individual assessment sites, implying that moisture in the soil profile's unsaturated regions supported transpiration at the time of sampling
- Analysis of stable isotope trends confirm that the unsaturated zone is the dominant moisture source supporting transpiration across the Proposed action area. There is no overlap between the isotopic composition of sampled xylem moisture and groundwater samples, while strong isotopic overlap exists between twigs and soils. Downhole $\delta^{18}O$ profiles also support a source of moisture from shallow regions in the soil profile.
- Groundwater within the tenement, confirmed by dedicated GDE monitoring bores, is both too deep (>19m) and too saline (>30,000µS/cm) to provide a functional source of moisture for deep-rooted woody vegetation

Consequently, Watermark Eco (2024) draw the following major conclusions their assessment:

- Brigalow predominantly draws moisture from the shallow soil profile down to depths of 2.4 mbgl, where extremely dry and hard clays arrest deeper penetration. This is consistent with previous studies on brigalow, which suggest a shallow rooting system
- There is no evidence from LWP measurement recorded in brigalow that trees rely on permanent or seasonal groundwater sources, supported by the observed susceptibility of the species to droughting. SMP measurements confirm that unsaturated regions of the soil profile have capacity to support the moisture availability measured in leaves
- Stable isotope analysis also supports brigalow deriving moisture from shallow regions in the unsaturated soil profile, with strong isotopic overlap between twig xylem and soils and limited overlap between twig xylem and groundwater sources
- Eucalypts across the Proposed action area are mostly shallow-rooted box species that rely on moisture from the shallow soil profile. Some species, such as Dawson gum, have a strong affinity with brigalow, suggesting that they derive moisture from similar shallow regions of the soil profile. Based on LWP values, there is no indication of any substantial groundwater utilisations for any

eucalypt species in the Proposed action area. The lack of evidence for groundwater usage is further supported by stable isotope analysis demonstrating a strong affinity between soil and twig xylem moisture sources and limited interaction between twig xylem moisture and groundwater sources.

The follow-up survey, scheduled for August 2025, aims to address annual variability and strengthen the evidence base for the absence or presence of GDEs within the Proposed action area.

5.4 Potential Project Impact Assessment

The Project activities have potential to directly and indirectly impact a range of ecological values, including vegetation communities and habitat for threatened flora and fauna. The majority of impacts are expected to occur during construction of Project infrastructure which comprises the following:

- CSG production well pads (34 lateral wells and 34 production well pads with a maximum disturbance area per well pad of 1 ha). Following construction 0.04 ha (20 m x 20 m) at each well will be retained for the operational phase and the remainder will be rehabilitated (based on the previous flora species/vegetation community present). Production wells will be fenced and generally include gas and water metering and separation equipment, electrical and control systems, particulate filter separator and manifolds to connect the water and gas pipelines
- New access tracks where required (disturbance width of 6 m on average within the gas gathering line disturbance area). Approximately 8 km of new access tracks will be required over the life of the Project
- Gathering flow line disturbance area for gas (disturbance width of 18 m excepting intersection of habitat for threatened fauna where reduced to width of 6 m). Includes excavation of a trench (up to 0.85 m wide) that may include co-located power and communication lines. HDD will be used at sensitive watercourse crossings in order to avoid impacts to surface vegetation and the watercourse structure
- One temporary construction camp requiring 1 ha located in previously cleared grazing lands that are not located in areas mapped as suitable habitat for Ornamental Snake, to be located near site construction works
- Gas compression facility (GCF) (disturbance area of 20 ha) including:
    - CSG processing and water management/storage infrastructure
    - Site offices
    - One permanent operational camp
    - Other ancillary infrastructure (e.g. storage buildings)

The current proposed layout of the Project is depicted on the ground-truthed vegetation mapping for the Proposed action area in **Figure 6**. The design of the Project may be subject to further refinement as the final design phase progresses.

The lifespan of the Project is expected to be 30 years. Wells will be constructed over the first 10 years of the Project (expected to be four wells constructed per year). The lifespan of a single well is expected to be between 12 to 15 years. Decommissioning/rehabilitation works will be carried out when Project infrastructure is no longer required or operational (refer **Section 2.4**). As such, site rehabilitation activity will be ongoing throughout the life of the Project. Decommissioning/rehabilitation of the GCF is expected to be the final activity associated with the Project.

5.4.1 Clearing Vegetation

The clearing of vegetation is the most significant and direct impact of the Project on ecological values of the Proposed action area. Land clearance is listed as a key threatening process under the EPBC Act. The removal of habitat reduces the size of local populations of flora and fauna dependent on that habitat. These impacts are immediate and significant in the short-term. Impacts may persist in the long-term if habitat created during rehabilitation does not closely resemble pre-disturbance ecosystems. In addition, if sufficient habitat refuges are not maintained locally, prior to the maturation of rehabilitated land, local extinction of certain species may occur.

The overall layout of the Project gas field infrastructure currently encompasses a total of 178.27 ha. However, the Project construction will occur over an extended development period and much of the overall layout subject to construction disturbance will not be required for operation and will be subject to ongoing rehabilitation. As such, the disturbance area associated with the overall layout will not be present across the Proposed action area at any one point in time.

Given the heavily modified landscape present, Project infrastructure has been located away from sensitive ecological values as much as is feasible. The disturbance footprint has been subject to several revisions in order to further avoid identified higher value habitats including avoiding Brigalow TEC and gilgai habitat suitable for Ornamental Snake.

The predicted extent of overall impact to vegetation communities and habitat for threatened species (including MNES) is provided in **Table 12** and **Table 13.** The extent of impact is based on the results of the ground-truthed vegetation mapping, analysis of aerial imagery and onsite habitat assessments (particularly with regard to Ornamental Snake). The Project is predicted to impact a maximum of 1.28 ha of remnant woodland vegetation under the current layout. An additional potential impact to threatened fauna species is on gilgai habitat considered suitable for Ornamental Snake which does not require the presence of overhead woody vegetation (i.e. the species can occur in non-remnant areas). Grey Snake and Australian Painted Snipe may also utilise this habitat.

Table 12. Predicted vegetation clearing for Project gas field infrastructure based on current layout

RE	Biodiversity (EP Act) status	Potential MNES habitat	Extent within Proposed action area (ha)	Proposed impact area (ha)
11.3.1	Endangered	Ornamental Snake, Grey Snake, Brigalow TEC	25.66	0
11.3.4	Of concern	Koala, Squatter Pigeon	2.42	0
11.3.25	Of concern	Koala, Squatter Pigeon	29.31	0.11
11.4.7	Endangered	Ornamental Snake, Grey Snake, Koala, Brigalow TEC, Annual Wiregrass	13.27	0
11.4.8	Endangered	Ornamental Snake, Grey Snake, Koala, Brigalow TEC, Annual Wiregrass	88.37	0
11.4.9/a	Endangered	Ornamental Snake, Grey Snake, Brigalow TEC, Ooline, Annual Wiregrass	135.21	0
11.5.3	No concern	Koala, Squatter Pigeon, Ooline	1,673.97	1.17
11.5.9a	No concern	Koala, Squatter Pigeon	224.75	0
11.5.16	Endangered	Ornamental Snake, Grey Snake, Brigalow TEC	0.82	0
11.7.2	No concern	Squatter Pigeon	104.76	0
11.8.5	No concern	Koala, Squatter Pigeon	27.43	0
11.8.13	Endangered	SEVT TEC	1.02	0
Non-remnant (gilgais present)	-	Ornamental Snake, Grey Snake, Wetland birds	1,476.89	0.89
Water	-	Wetland birds	26.11	0
Non-remnant (other)	-	N/A	10,254.74	176.10
		Overall area	**14,084.74**	**178.27**

Table 13. Predicted extent of MNES habitat and vegetation clearing for Project based on current layout

MNES	Extent within Proposed action area (ha)	Proposed impact area (ha)
Brigalow TEC	259.44	0
SEVT TEC	1.02	0
Ooline	1,673.97	1.17
Annual Wiregrass	236.85	0
Koala	2,059.52	1.28
Squatter Pigeon	2,062.64	1.28
Wetland birds (Australian Painted Snipe, Sharp-tailed Sandpiper, Latham's Snipe, migratory species)	1,513.8 (non-remnant gilgai habitat)	0.89
Ornamental Snake	1,777.13 (non-remnant and remnant habitat)	0.89
Grey Snake	1,777.13 (non-remnant and remnant habitat)	0.89

5.4.2 Habitat Fragmentation, Connectivity and Edge Effects

Highly fragmented habitats support fewer species than connected blocks of habitat of the same size. This is because fragmentation restricts dispersal of fauna and plant seeds between available habitat. The impacts of habitat fragmentation depend on the degree to which dispersal is inhibited by habitat gaps, the size of the remaining habitat fragments, and ecological attributes of the species.

The landscape associated with the Project has been heavily impacted by tree clearing for cattle grazing purposes. The Project infrastructure has been situated in areas already cleared of vegetation wherever possible. There will be very little clearing of remnant vegetation required. The only impact to woody vegetation occurs in the south of the Proposed action area and comprises two patches of Poplar Box woodland which are very open and likely already subject to degrading practices (past tree thinning and cattle grazing). The majority of infrastructure will be underground following completion of construction. The pipeline crossing required for Humboldt Creek will use HDD to avoid any requirement for surface disturbance of adjacent Brigalow TEC. As such, the Project will not create fauna movement barriers in the local landscape. There will be no impact to landscape connectivity and habitat fragmentation will not occur as a result of the Project.

The habitats that remain extant in the Proposed action area are likely already subject to the potential for edge effects caused by increased exposure (along the edges of remaining patches) to wind and sun as well as increased weed invasion risk. Many patches within the south of the Proposed action area are of a size or shape (thin remnants) as to be considered all edge. Some areas of extant woodland have been subject to past clearing or tree thinning. As noted above, the two woodland patches impacted by the Project are already very open in structure (**Plate 3** and **Plate 4**). Regardless, the Project is proposing to clear a very minor extent of wooded habitat. The majority of the Disturbance footprint is located well away from any vegetation and will therefore not cause any edge effects to adjacent vegetation. Those portions of the Project located adjacent to extant vegetation communities are located along an existing edge already subject to edge effects. The Project is considered to have a negligible impact on increasing the impact of edge effects on MNES (including Brigalow TEC) within the Proposed action area.

Plate 3. Indicative alignment impacting degraded RE 11.5.3 in south-east of Project (patch 1)

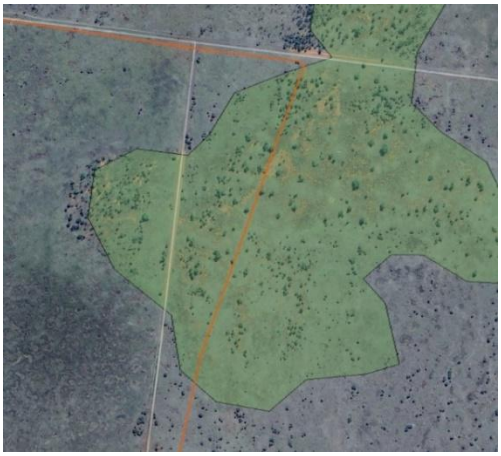


Plate 4. Indicative alignment impacting degraded RE 11.5.3 in south-east of Project (patch 2)

5.4.3 Fauna Mortality

Clearing of vegetation for the Project presents a risk of direct mortality or injury to fauna although this will largely be associated with ground fauna given very little woody vegetation is proposed to be impacted. Ground fauna of low mobility are at risk of injury or death from heavy machinery and vehicular movements during construction activity associated with the Project. Additional impacts include the trapping of fauna in trenches during installation of gas pipelines. The potential impact on fauna of increased vehicular activity in the Proposed action area will be localised and relatively minor (maximum of 41 personnel estimated for construction purposes). Personnel associated with well construction (35 estimated) will reside onsite in the temporary accommodation camp (refer **Section 3.5**), further reducing the requirement for extended vehicle movements to access the site and potential impacts on fauna.

The operational phase is unlikely to add to these impacts due to the small scale of Project operations. Generally, only two personnel will be required onsite to maintain operations. As such, onsite vehicular movements will be minimal for operational works.

Clearing will only occur within designated areas and only during designated time periods. The presence of qualified Wildlife Spotter-Catcher/s to assist with initial clearing and daily checking of trenches will decrease incidences of fauna mortality. Educating employees and contractors with regard to fauna and flora will further reduce direct mortality as part of the Project.

5.4.4 Airborne Dust

Earthworks and vehicular traffic associated with Project construction and operation can generate substantial amounts of dust during dry weather (Field et al. 2010). Dust can have both a physical and chemical impact on plants, either through the smothering of leaves, whereupon the rate of deposition is important, or through chemical changes to the soil or directly to the plant surface. Changes in soil properties, such as pH, can ultimately impact plant species assemblages. Dust can form a hard crust on the leaf surface, increasing leaf temperature and increasing susceptibility to drought. Dust can have adverse impacts on plant photosynthesis, respiration, transpiration and productivity (Farmer 1993; Chaston & Doley 2006). Evidence of potential impacts on entire vegetation communities is scarce. Many studies focus on specific impacts to single species and findings may not be conclusive.

With regard to the Project, there is no available evidence to suggest that Brigalow is noticeably impacted by dust settlement. The pronounced wet and dry seasons associated with the Proposed action area (inland southern Brigalow Belt) may make vegetation in these areas less susceptible to the impacts of dust. In general, the construction disturbance will take place well away from extant woody vegetation communities. The

potential impact from wind entrainment of exposed top soil will be largely limited to construction activity. Post construction, areas no longer required for operation will be rehabilitated to the previous land use (i.e. grassland) and on establishment of vegetation will no longer present a dust risk.

5.4.5 Noise and Lighting

Understanding of the impacts of noise on fauna is limited. There are no current government policies or guidelines that recommend noise thresholds or limits for development activities to mitigate potential harm to fauna. Noise may affect wildlife through a variety of impacts such as: interfering with communication calls; interfering with foraging/defence through cloaking the sound of predators and prey; causing general stress or avoidance reactions; or changes in reproductive or nesting behaviours. Excessive noise may lead some species to avoid noisy areas, which could result in the localised fragmentation of habitat at the species or individual territory level. Radle (2007) states the consensus that terrestrial fauna will avoid any industrial plant or construction area where noise or vibration presents an annoyance to them. Nevertheless, many animals may interpret a new noise as a potential danger at first, but rapidly understand the noise is not associated with any threats (Radle 2007).

Artificial lighting may have a range of impacts across different groups of taxa and between species within these groups. Some taxa such as rodents may avoid brightly lit areas at night. Alternatively, nocturnal fauna such as many microbat species, frogs and some reptiles may congregate at artificial lights to feed on insects attracted to light (Perry et al. 2008; Rich & Longcore 2006). Although, other microbat species may avoid well-lit areas (Threlfall et al. 2013). Artificial light can alter foraging and calling by frogs and probably impairs their vision (Buchanan 1993) and may lead to individuals being killed by vehicles when attracted to lights for feeding on invertebrates.

Noise impacts from the Project to surrounding fauna habitat will largely be restricted to that emitted during construction activities. The gas compression facility is likely to be the only substantial source of noise and lighting impacts during operations. The facility is located in cleared habitat on Meroo Downs with poor habitat for fauna present. It is approximately 650 m away from the nearest patch of woody vegetation and there is no habitat for Ornamental Snake present. Post-construction it is expected that any resident fauna will become accustomed to the ongoing noise generated by the facility. The CSG production wells will be powered by a generator and are expected to emit low level noise that is not expected to impact fauna. Similarly, lighting at well sites will be unnecessary, or restricted to low levels that will not be an impact on fauna.

5.4.6 Weed and Pest Animals

Introduced weeds have the potential to impact on terrestrial and aquatic ecological values as native flora can become displaced through competition with weed species, and adversely affected by browsing and soil trampling caused by feral herbivores. Native fauna populations, particularly small to medium sized species, may be impacted by predation from introduced carnivores such as feral cats and Red Fox. These are indirect impacts which may not manifest themselves in the short-term and are likely to be exacerbated by existing cattle grazing activities on the Project lands. Introduced weed species are already present throughout the Proposed action area which is dominated by Buffel Grass in the ground layer throughout. Buffel Grass is already considered a threat to Brigalow TEC (DE 2013). Parthenium was observed to be common, particularly in the non-remnant grassland areas and is listed as a WoNS and under the State's Biosecurity Act.

The following activities associated with the Project have the potential to promote the proliferation of weeds and pests within the Proposed action area, or introduce new weeds and pests from surrounding areas:

- The use of construction machinery, plant and materials sourced from outside the region and increased vehicular traffic in general may introduce and spread weed seeds if biosecurity hygiene measures are not in place
- Land clearance favours the establishment of weeds due to increased light and soil disturbance
- Inappropriate disposal and storage of putrescible wastes may attract feral animals

The pests and weeds currently occurring within the Proposed action area are not expected to significantly proliferate in response to the Project activities. The main threat is the introduction of new weeds to the area

via contaminated vehicles or soils. Impacts will be managed by implementing biosecurity hygiene and control measures during Project activities.

5.4.7 Fire

The Project is located within largely cleared grazing lands with tracts of sclerophyll woodlands mainly to the north and north-west. The woodland areas have potential to be severely impacted by accidental high-intensity fires caused by Project activities. Fire hazard mapping for Queensland indicates the majority of woodlands within the Proposed action area as having a 'medium potential bushfire intensity'. There are very small pockets of 'high' potential bushfire intensity' associated with woodland remnants in the south of the Proposed action area on Meroo Downs and Memooloo properties.

Fire is noted as a threatening process on Brigalow TEC which occurs within the Proposed action area. Fire intensity may be exacerbated by the dense growth habit associated with the introduced Buffel Grass which often dominates cleared areas within the Proposed action area. Brigalow can recolonise areas subject to high-intensity burns through suckering from the root stock. A long-term study found that a Brigalow community subject to high-intensity burning (removing all trees) may take 50 to 80 years to approach pre-burn conditions (Johnson et al. 2016).

Nevertheless, the potential for the Project activity to cause accidental fires is considered negligible with simple measures in place. Project-specific fire management measures will be developed and implemented in line with Queensland guidelines and in collaboration with local landowners.

5.4.8 Surface Water

Much of the Proposed action area is relatively flat and the Project infrastructure does not require any major earthworks or other changes to landform that would cause an impact/change to surface water flows across the landscape, including downstream of the Project. The only substantial area of land required is that for the GCF (20 ha) which is located in cleared lands subject to blade ploughing and away from any drainage areas. All other infrastructure will be linear, or plots for well sites. Following construction these areas will be largely revegetated.

The construction of gathering lines and associated access tracks could result in the removal of aquatic habitat and riparian vegetation from the bed and banks of waterways. The construction of gathering lines will avoid impacts to riparian vegetation through installation of pipes placed beneath the stream bed using the HDD construction method. The construction right-of-way would be up to 18 m wide and reduced to 6 m wide through waterways. The waterway crossings would comprise bed level or culvert crossings for vehicles and will utilise existing crossing areas.

The landscape has already been subject to artificial hydrological changes with farm dams located along drainage lines impeding downstream flows. Major access tracks (such as Meroo Downs Road) are often maintained above the adjacent landform and therefore also affect localised surface flows. The Project will not cause changes to landscape hydrological values which may impact MNES values such as Brigalow TEC or gilgai habitat suitable for Ornamental Snake.

Other potential impacts to aquatic habitats are associated with increased suspended sediments and resulting impacts to water quality. Even where the impacts go unmitigated these impacts would be localised, transient, and avoid areas of high aquatic value. Further, species inhabiting the waterways of the Proposed action area and downstream are already subject to high sediment loads periodically during flow events as evidenced by high washloads (fine sediments held in suspension) observed during both the wet and dry season aquatic ecology surveys (DPM 2023).

5.4.9 Construction Impacts

The Project has potential to impact surface water and associated aquatic ecology values through a variety of processes:

- During construction disturbance, uncontrolled sedimentation of watercourses (particularly during and following heavy rainfall events) can impact aquatic ecology by smothering stream beds with fine material, and decreasing bed roughness and reducing habitat diversity
- Similarly, uncontrolled sedimentation movements associated with construction disturbance may lead to localised increased turbidity and suspended solids which may negatively impact fish and macroinvertebrates (through reduced respiratory and feeding efficiency), and adversely affect submerged aquatic plants as light penetration (required for photosynthesis) is reduced
- Poorly designed and constructed waterway crossings may create waterway barriers that prevent or impede movements of aquatic fauna
- Waterway crossings may cause bank instability if remediation works are not adequately designed and implemented. This may lead to bank erosion (causing impacts to instream sedimentation and turbidity) and adverse impacts to riparian vegetation

Waterways in the Proposed action area are highly ephemeral and were observed to be largely dry at the time of the 2022 and 2023 ecology surveys. The only waterways of any substantive size are Humboldt Creek and the Comet River (to the west of the Project). The Project will develop and implement an Erosion and Sediment Control Plan (ESCP) to mitigate uncontrolled sediment flows into waterways as a result of Project works.

Pipeline crossings at waterways will be avoided where possible during the final Project design phase. Where pipeline crossings of waterways are required (such as at Humboldt Creek), they will be located underground through the application of HDD. If required, instream construction impacts such as access track construction will utilise existing farm tracks, be temporary and occur during the dry season to minimise the impact of sediment entrainment during rainfall-associated flow events.

5.4.10 Aquatic Pollutant Release

Chemicals used in the CSG well drilling process (such as fracking) may be toxic to the environment and have been subject to a number of assessments with regard to local CSG operations in southern Queensland (ERM 2017; KCB 2018). However, the Project does not require the use of fracking to access the seams for gas extraction. As such, the use of chemicals associated with fracking are not required.

The accidental release of pollutants from Project activities has the potential to degrade the surrounding environment and local waterways within and downstream of the Proposed action area. Potential sources of contaminants may include runoff from chemical and fuel/oil storage areas and general wastewater from vehicle/machinery washdown areas. In the event of a significant fuel spill (>200 litres (L)) to waterways there is potential to have a local impact on both flora and fauna. The extent of impact will of course be dependent on the size of the spill and the volume of water in the waterway (including whether there is flow), thereby influencing the length of stream potentially impacted. This has been assessed further as part of the chemical risk assessment (refer **Section 6.7**). Nevertheless, despite the potential impacts broadly described above, it is noted the creeks in the Proposed action area are highly ephemeral (no flows occurring the majority of the time) and are predominantly likely to be considered to be of low value (other than Humboldt Creek and Comet River). Storage of chemicals associated with Project activities and vehicle refuelling sites will be located a minimum of 200 m from the nearest watercourse to further reduce the potential for accidental spills to impact waterways.

The Project will treat produced water generated by CSG extraction through reverse osmosis processing. Produced water will be stored in ‘feed tanks’ and saline water produce by processing will be stored in separate ‘brine tanks’ within the water treatment facility site. Treated water is proposed to be transferred to landholders for a beneficial use such as agriculture. The Project’s treated wastewater will be managed under the State’s End of Waste Code (EOWC) such that no impacts to aquatic ecological values are expected.

The WMMP 2025 (**Appendix L**) provides for several targeted impact prevention and management measures designed to protect downstream aquatic habitats, including:

- Baseline surface water monitoring and risk identification
- Trigger action response plans (TARPS)
- Stormwater and spill management controls

- Contingency measures to protect aquatic fauna
- Ongoing ecological risk review

5.4.11 Groundwater

Targeted assessments of the potential for groundwater dependent ecosystems (GDEs) have been recently carried out within the Proposed action area, generally with a focus on Brigalow communities. Additional installation of bores for monitoring the shallower aquifers associated with the Project has also been recently carried out.

Results from the monitoring of groundwater bores for the Project GDE assessment indicated some shallow groundwater at approximately 20 mbgl in the main portion pf the Proposed action area and groundwater at 8 mbgl at a bore near the western boundary of the Proposed action area (relatively close to the Comet River and Humboldt Creek). All bores providing shallow groundwater were found to have very high salinity levels (at least 30,000 microsiemens per centimetre (µs/cm)). Saline groundwater is highly unlikely to be used as a source of water for surface vegetation (Watermark Eco 2024).

The results of the GDE assessments identified no GDEs as present within the Proposed action area (Watermark Eco 2024). Brigalow communities were identified as having a maximum rooting depth of approximately 6 mbgl.

The Project is proposing to target CSG development at depths of roughly 120 mbgl to 220 mbgl. This will intersect groundwater associated with the Bandanna Formation which is not connected to the shallower groundwater currently subject to long-term monitoring.

There are no impacts associated with groundwater considered to occur on MNES as a result of the Project, given the depth and salinity of the available groundwater in the Proposed action area and the lack of any GDEs identified as occurring within the Proposed action area.

The WMMP 2025 (**Appendix L**) includes a TARP (Section 7) that outlines a proactive framework for identifying and responding to deviations from baseline or expected environmental performance. Should the monitoring undertaken as part of the WMMP 2025 show a drawdown in the standing groundwater level in the alluvium, field validation and sampling will be initiated, and appropriate further actions will be undertaken.

5.4.12 Cumulative Impacts

The Project occurs in a region with existing mining projects in the wider area including Whitehaven's Blackwater Coal Mine (10 km to the east at its closest point) and Glencore's Rolleston Open Cut mine 38 km to the south. Agricultural development (cropping for wheat and cotton) has substantially impacted lands to the immediate north-west and west of the Proposed action area. It is assumed these activities may have had impacts on MNES values across the surrounding landscape.

Regardless, the Disturbance footprint has been designed to avoid impacts on ecological values as much as is feasible. The Project has a minimal impact on remnant vegetation (1.28 ha) or gilgai habitat (0.89 ha) that may provide value for MNES. The impact assessment for the Project identified a negligible impact overall and no significant impact predicted on relevant MNES (refer **Section 5.6**). As such, the Project is not considered to contribute a cumulative impact to existing impacts in the wider area, or any projects that may be approved or in the planning stage.

The Proponent, Comet Ridge, has another tenement interest directly to the north of the Project (identified as PLA 1132). This tenement is currently under reserve appraisal by Comet Ridge prior to further development and therefore is not confirmed as a proven and possible Project. Further appraisal and development work will require:

- Further drilling works
- Landholder negotiations
- Environmental assessments
- Environmental approval applications (including EA and EPBC approval)

The work required to complete the above will take a number of years to progress and refine. For this reason tenement PLA 1132 has been excluded as a relevant to cumulative impacts for this Project. However should a project within PLA 1132 be confirmed, the approval pathway for that project will consider this Project as part of the cumulative impact assessment for works within PLA 1132.

5.4.13 Project impact summary

The impacts of the Project will largely occur in lands that are already highly modified as a result of cattle grazing activity. Through ongoing design refinement, the direct impact of the overall Project footprint to potential MNES habitat has been minimised to 1.28 ha of woodlands and 0.89 ha of cleared gilgais. Due to the nature of the Project (comprising largely subsurface infrastructure) there will be no impact on landscape connectivity and direct impacts to waterways will largely be avoided. Indirect impacts from the Project such as dust settlement, erosion and edge effects are only a potential impact during the construction phase and considered to be negligible. Following construction, disturbed areas that are not required for operations will be subject to rehabilitation to the former vegetative cover.

Ongoing operational disturbance will be restricted to occasional maintenance activities as well as ongoing weed monitoring and management in rehabilitated areas. The Proposed action area is already subject to irregular vehicle movements associated with cattle grazing activity. There are no impacts associated with the Project which are considered unpredictable or irreversible with regard to MNES values, or ecological values in general.

The lifespan of the Project is expected to be 30 years, with wells constructed progressively over the first 10 years (approximately four wells per year). Rehabilitation activities will occur progressively throughout the life of the Project, with decommissioning of the GCF expected to be the final activity.

There are no impacts associated with the Project which are considered unpredictable or irreversible with regard to MNES values. Areas disturbed during construction that are not required for operations will be rehabilitated to reflect their previous vegetative cover, thereby ensuring minimal long-term impacts.

5.5 Proposed Mitigation Measures

Comet Ridge will commit to a range of measures to minimise impacts to MNES, MSES and general ecological values associated with the Proposed action area. The final design process for the Project will reduce the area of impact to areas representing habitat for threatened species as much as is feasible for the construction of the required infrastructure. This has already been demonstrated through avoidance of vegetation clearing in remnant or regrowth vegetation communities and gilgai areas across the majority of the Project footprint and a commitment to underground pipeline installation at watercourse crossings (avoiding impacts to surface riparian vegetation and aquatic ecosystems). Where avoidance is not possible, a range of mitigation strategies will be implemented under the Project Environmental Management Plan (EMP) (refer to **Section 8**). The EMP is informed by a number of management plans relevant to ecological impacts including (but not limited to):

- Vegetation Clearing Management Plan
- Fauna and Pest Management Plan
- Weed Management Plan
- Soil and Erosion Management Plan
- Land Use Management Plan

The EMP will comprise a range of measures that will mitigate potential impacts to ecological values as detailed in **Table 14**.

Table 14. Recommended mitigation measures proposed for general impacts resulting from Project works

Impact	Management measure	Project timing
Vegetation clearing	The Project will develop a Vegetation Clearing Management Plan prior to works being carried out. Vegetation clearing protocols will be established within the Plan and will include the following mitigations measures at a minimum.	Pre-construction

Impact	Management measure	Project timing
	Cleared paddocks and access tracks will be preferentially utilised for locating assets and tracks to minimise the extent of clearing	Final design
	Pre-clearance surveys will be carried out prior to undertaking clearing activities, by a suitably qualified and experienced person.	Pre-construction
	Where pre-clearance survey results in identification of sensitive ecological values such as threatened flora and fauna species, or threatened ecological communities, in order of preference: • adjust location to avoid ecological values • adjust the activity to prevent impact (e.g. change design or layout) • if there is no viable alternative, seek additional authorisation where that is appropriate, which may include offset conditions	Prior to clearing
	Project employees and contractors should be made aware of environmental obligations and compliance requirements through the induction program.	Project induction
	Vegetation clearing extents will be clearly demarcated with flagging or bunting prior to clearing to limited the area safely and reasonably required for permanent and temporary works	Prior to clearing
	Pipeline crossings of defined watercourses will be via horizontal directional drilling to minimise the disturbance to riparian vegetation and aquatic habitat	Ongoing
	Any cleared vegetation will be stockpiled in windrows adjacent to the area of clearing. Reuse stripped top soil in areas to be rehabilitated with similar top soil characteristics if possible. If top soil cannot be effectively reused immediately, stockpile ensuring the height of the stockpile is no more than 2 m.	Following clearing
Rehabilitation	Rehabilitation within the Proposed action area will be managed as per the Rehabilitation Management Plan within the Project EMP.	Following construction
	Progressive rehabilitation of disturbed areas will be carried out as practicable, including reshaping significantly disturbed land to a stable profile and remediation of contaminated land.	Ongoing
	Re-establish surface drainage lines to prevent erosion and manage sedimentation, and restore natural hydrological function	Ongoing
	Reinstate top layer of soil profile to promote vegetation growth and prevent erosion	Ongoing
	Continue weed management protocols until a minimum of 70% native ground cover is achieved.	Ongoing
	Note where the land disturbed was previously used for cropping, the land will be returned to a suitable state to allow the landholder to continue cropping.	Ongoing
	Promote establishment of vegetation to stabilise soil and prevent erosion	Ongoing
	Regular maintenance of rehabilitated areas until performance standards are met.	Ongoing
Fauna mortality	A suitably qualified and experienced person (i.e. licensed fauna spotter) must be present during clearing of remnant vegetation to identity and relocate native fauna species.	Prior to clearing
	Fauna spotter-catchers (licensed) will inspect sites prior to vegetation clearing. Fauna habitat shelter features (large hollows) will be clearly marked where they are unable to be accessed/inspected prior to tree felling.	Prior to clearing
	Implement measures applicable to trenching activity including fencing and 'fauna ramps'. Trenches left open overnight will be inspected by a qualified fauna spotter each morning prior to works being carried out.	Prior to clearing
	Procedures will be in place where injured fauna are encountered during clearing works. Local wildlife carer and/or veterinarian will be identified prior	Ongoing

Impact	Management measure	Project timing
	to works being carried out and be notified that clearing works are being carried out (prior to clearing).	
	A fauna register to record all fauna encountered during clearing works (as per fauna spotter-catchers) including fauna incidents (injuries and mortality) will be maintained during construction.	Ongoing
	Onsite speed limits (<50 km/h) will be established throughout Proposed action area to limit the potential for road collisions. This speed limit is considered suitable as the Proposed action area is flat with good visibility; the Proponent is utilising existing farm tracks; driving will only be in 4WD mode.	Ongoing
Threatened flora and fauna	Fauna and Pest Flora Management Plan will be in place prior to construction works being carried out. Plan will establish species-specific management procedures for threatened species considered to be potentially or likely to be present in this report.	Pre-construction
	Cleared paddocks and access tracks will be preferentially utilised for locating assets and tracks to minimise impact to flora and fauna habitat	Pre-construction
	Searches for threatened plant and fauna species will be carried out by a suitably qualified ecologist/fauna spotter-catchers as part of pre-clearance surveys in remnant vegetation.	Pre-construction
	Project inductions will outline species of significance that may occur on the Proposed action area.	Project induction
	Project employees will be required to notify fauna spotter/catchers when a species of significance is observed in the Proposed action area. All encounters with a threatened species will recorded in the Project fauna register maintained by the designated Environmental Officer.	Ongoing
	The final Project design process will incorporate components (mechanical) and design elements to reduce ongoing operational noise from permanent Project infrastructure that has potential to impact adjacent fauna habitat (such as the gas processing facility).	Final design
Noise and lighting	The final Project design process will incorporate the use of low light spill lighting components and directional lighting (away from adjacent fauna habitat) where night lighting is considered necessary.	Final design
	All Project-associated construction/operational machinery will be maintained as per manufacturer design specifications to ensure project noise is minimised.	Ongoing
	Monitoring of weather conditions will be carried out to inform Project activities and planning during high-wind weather conditions.	Ongoing
Airborne dust	Ensure employees made aware of potential dust generating activities and mitigation and management measures to prevent nuisance	Ongoing
	Monitoring of air/dust emissions will be carried out in accordance with regulatory requirements.	Pre-construction
	Minimise vegetation clearing and leave root stock in-situ where practicable to minimise potential for causing soil erosion and producing dust sources	Ongoing
	Where practicable, mulch cleared vegetation and spread as protective layer over exposed soil	Ongoing
	Dust from areas likely to be a source of airborne dust (such as tracks and top soil stockpiles) will be suppressed during construction using water trucks/wetting to keep dust related impacts to a minimum. Water used for dust suppression will be obtained from Project-associated produced water where possible.	Ongoing

Impact	Management measure	Project timing
	Onsite speed limits (<40 km/h) will be established to minimise dust caused by vehicle movements	Ongoing
	Areas subject to vegetation clearing and no longer required for construction will be subject to vegetation reinstatement as soon as is practicable.	Ongoing
	Weed Management Plan and Fauna and Pest Management Plan will be in implemented prior to construction works being carried out. Plan will detail all required management measures and monitoring procedures.	Pre-construction
Weeds and pests	Mapping of the extent of weed/pest occurrence within the Project footprint will be recorded during pre-clearance surveys.	Pre-construction
	Weed awareness including in induction and tool box talks for all personnel	Ongoing
	Regular weed inspections will be carried out in areas subject to clearing	Ongoing
	All plant and equipment moving mobilising to and demobilising from the site will be inspected for weed and seeds. If required plant and equipment will be cleared prior to mobilisation or demobilisation. Weed washdown procedures will be implemented where necessary when moving between properties	Ongoing
	Disposal and storage of putrescible wastes must be undertaken appropriately to ensure feral animals aren't attracted to the Proposed action area.	Ongoing
	Storage of construction/operation materials carried out in a manner so as to not encourage the establishment of resident pest fauna.	Ongoing
	Control and manage pest infestations and outbreaks resulting from Project activities in consultation with relevant landowner/s.	Ongoing
	If a new weed infestation is reported or found, appropriate action to contain and eradicate will be implemented (in consultation with an ecologist).	Ongoing
Fire	Monitoring of weather conditions will be carried out to inform Project activities and planning during high fire-risk weather conditions.	Ongoing
	The Project will maintain communications with local representatives for the Queensland Fire and Emergency Services (QFES) regarding Project activities and bushfire hazard conditions.	Ongoing
	Appropriate fire breaks will be maintained around above ground Project infrastructure.	Ongoing
	Site will include designated smoking areas.	Ongoing
	Onsite fire-fighting equipment will be regularly maintained and staff training will be developed and implemented.	Ongoing
Surface water	Every stage of the Project will have a site specific erosion and sediment control plan (ESCP) prior to construction commencing. The ESCP will be developed by a Certified Professional in Erosion and Sediment Control and be in accordance with the International Erosion Control Association Best Practice Erosion and Sediment Control (2008).	Pre-construction
	Vehicle crossings of watercourses will be designed and constructed in accordance with the accepted development requirements for waterway barrier works (DAF 2018) to minimise impacts to fish passage.	Final design
	Erosion and sediment control devices will be inspected following every rainfall event. Where maintenance to devices are required this will be completed immediately	Ongoing
	Avoid works during wet season or heavy erosive rainfall as much as practicable. Activities for construction of pipelines or access tracks or any other linear infrastructure in watercourses, will be undertaken in no or low flow conditions	Ongoing
	Vegetation will not be cleared, nor fill placed in or within: • 200 m from any wetland, lake or spring; or	Ongoing

Impact	Management measure	Project timing
	• 100 m of the high bank of any other watercourse	
	Routine, regular and frequent visual monitoring will be undertaken while construction work is carried out in a watercourse	Ongoing
	Re-establish the bed and banks profile of any waterways or creeks disturbed by Project activities	Ongoing
	Fuels and other flammable liquids will be stored and handled in accordance with *AS 1940:2004 – The storage and handling of flammable and combustible liquids*	Ongoing
	Refuelling of plant and equipment will occur at least 30 m from a watercourse or other drainage feature	Ongoing
	Hazardous and dangerous goods will be stored in bunded facilities located at least 100 m from a watercourse or other drainage feature	Ongoing
	Spill response equipment (e.g. booms and absorbent materials) will be available at refuelling areas and other sites (where relevant). Staff will be trained in the appropriate use of spill response equipment.	Ongoing
	Onsite washdown areas for Project vehicles/machinery will be located and clearly demarcated to prevent contaminated run-off from entering waterways.	Ongoing
	Wherever possible watercourse crossing will avoid instream works including through the use of directional drilling to locate pipelines under the watercourse. Where this is not possible (such as for new access tracks) works within a watercourse will be conducted in the following order of preference: • Conducting works when no water is presence • Conducting works in times of no flow Conducting works in times of flow but in a way that does not negatively impact the flow of water within the watercourse, permanently impound water or permanently divert the flow of water	Ongoing

5.6 MNES Significant Residual Impact Assessment

The EPBC Act defines and protects nine matters considered to be of MNES. Under Part 3 of the EPBC Act, a person must not undertake an action that will have, or is likely to have, a significant impact on a protected matter, without approval from the Minister.

Two TECs, 11 threatened species and four bird species listed as Migratory under the EPBC Act have some potential to occur in the Proposed action area comprising the following MNES (refer to Table 9 and Table 11 for likelihood of occurrence assessment of conservation significant flora and fauna species in the EAR report):

- Known to occur:
  - Brigalow TEC – Endangered
  - SEVT TEC - Endangered
  - White-throated Snapping Turtle – Critically Endangered
- Likely to occur
  - Annual wiregrass – Vulnerable
  - Ornamental Snake – Vulnerable
  - Koala – Endangered
- Possibly occurs - flora:
  - Ooline - Vulnerable
- Possibly occurs - fauna:
  - Australian Painted Snipe – Endangered
  - Latham's Snipe – Vulnerable, Migratory
  - Sharp-tailed Sandpiper - Vulnerable, Migratory

- Squatter Pigeon (southern) – Vulnerable
- Painted Honeyeater - Vulnerable
- Grey Snake – Endangered

- Possibly occurs - migratory
  - Glossy Ibis
  - Gull-billed Tern
  - Caspian Tern
  - Fork-tailed Swift

An assessment of the potential for significant impacts resulting from the Project activities was carried out only on those MNES considered as potentially subject to substantial impacts. The assessments have been carried out in accordance with the *MNES significant impact guidelines 1.1* (MNES Guidelines) (DE 2013)

The Project Disturbance footprint largely avoids impacts woody vegetation.

5.6.1 MNES Not Subject to Significant Impact Assessment

The current layout of the gas field infrastructure impacts a maximum of 1.28 ha of remnant woodland largely comprising Poplar Box woodland (RE 11.5.3). Impacts on riparian vegetation (RE 11.3.25) associated with a drainage line in the east of the Project will be minimised through the use of directional drilling for pipeline installation (refer **Section 3.3.1.2**). All occurrences of Brigalow TEC and SEVT TEC have been avoided and no potential for significant impacts are considered possible.

White-throated Snapping Turtle was recorded to the immediate west of the Proposed action area at a waterhole on the Comet River. There is no suitable habitat present within the Proposed action area itself which comprises ephemeral waterways including Humboldt Creek. No activities associated with the Project will impact the Comet River, either through direct disturbance or indirectly (no impact to habitat or water quality values). The species will not be impacted by the Project.

Impacts to fauna associated with the presence of woody vegetation include the following species: Squatter Pigeon (southern). The species occurs across a very large area within central Queensland. The Project proposes to clear a maximum of 1.17 ha of potential habitat for the species. There is abundant identical habitat remaining in the Proposed action area which will not be impacted. The potential impact on Squatter Pigeon is considered very minor at worst and it is not assessed further. Brigalow communities as well as other acacia dominant communities provide the preferred habitat supporting the mistletoe species associated with Painted Honeyeater. No Brigalow communities will be impacted and as such, there are no impacts expected on this species.

Ooline is known from Cape York Peninsula, including sites near Musgrave, the Irvineband to Petford area, and south-west of Mt Garnet (DEWHA 2008). Suitable habitat for the species occurs throughout the Proposed action area in the form of Brigalow and to a lesser extent Poplar box dominated woodland and open-forest. The species is distinctive (i.e readily observable where it occurs) and was not observed during Project field surveys. The only suitable habitat for the species within the disturbance footprint is provided by remnant RE 11.5.3 (Poplar Box woodland) with a total area of 1.17 ha occurring within the disturbance footprint. Brigalow communities which are more likely to support the species have been avoided. The extent of disturbance is considered negligible given the species was not observed within the disturbance footprint.

Annual Wiregrass is restricted to central Queensland in the Emerald and Springsure districts where it is known to occur in eucalypt woodlands (with *Eucalyptus orgadophila*) and natural grasslands on basalt derived black clay soils (DE 2014a). The species was not detected within the Proposed action area during field surveys but is considered a possible occurrence within the Proposed action area. Potential habitat for the species within the Proposed action area is considered to be restricted to Brigalow habitats on land zone 4 (RE 11.4.7, 11.4.8 and 11.4.9). These communities have been avoided and no impact on the species is expected.

There is a possibility for a number of threatened and migratory wetland-associated bird species to be present. The Project will not impact any of the existing waterbodies, including several farm dams of various sizes, within the Proposed action area. Gull-billed Tern or Caspian Tern will not be impacted by the Project as a result. Following heavy rainfall events three of the species (Sharp-tailed Sandpiper, Latham's Snipe and Glossy Ibis)

may also have a low potential to use water-filled gilgais within the Proposed action area although no migratory species were identified during either Project survey. Any potential impacts on these species are considered to be of a very minor risk and managed under general mitigation measures outlined in **Section 5.5**.

Fork-tailed Swift is an aerial species that may occur over any habitat including inland, coastal and marine areas and disturbed habitat such as urban areas. It has only occasionally been recorded as landing in Australia. The species is highly mobile and may forage anywhere from 1 m up to 100s of metres m above ground (Higgins 1999; DCCEEW 2024). Given the species' aerial habits it is inconceivable the Proposed action area would represent 'important habitat' (as defined in DE 2013) for the species and the Project activities would be highly unlikely to impact the species in any way.

5.6.2 Significant Impact Assessment – Threatened Species

With regard to species listed as vulnerable the significant impact assessments commence with an evaluation of the likely importance of the population of vulnerable fauna species associated with the Proposed action area and immediate surrounds. Under four of the nine assessment criteria identified within the MNES guidelines, vulnerable species are considered as subject to significant impacts when an 'important population' is impacted.

An 'important population' for vulnerable species as defined within the MNES guidelines is as follows:

> *'An important population is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:*
>
> - *Key source populations either for breeding or dispersal*
> - *Populations that are necessary for maintaining genetic diversity and/or*
> - *Populations that are near the limit of the species range*

Given the specificity of the above definition and the often scarce ecological information and occurrence records available for many threatened species and populations in Australia, it is difficult to determine either of:

- Attributes such as breeding and dispersal behaviour and whether the population is a 'key source' or
- The genetic diversity of individuals inhabiting a regional population or sub-population

A single assessment criterion (for vulnerable, endangered and critically endangered species) refers to impacts on 'habitat critical to the survival of a species or ecological community' which is defined under the MNES Guidelines as areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal
- For long-term maintenance of the species or ecological community
- To maintain genetic diversity and long-term evolutionary development and/or
- For the reintroduction of populations or recovery of the species or ecological community

Such habitats may be, but are not limited to habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community

Many species do not have approved recovery plans and 'habitat critical to the survival of a species' is generally not identified in available literature. For species that have a wide distribution/occurrence, habitat considered as that necessary for 'foraging, breeding, roosting or dispersal' is a broad definition that is not necessarily analogous with the definition of critical at a species level. Given the relative lack of information that is often available, significance of impacts to threatened species has been based on the professional expertise of the assessment team and the latest available information relating to species habitat and ecological requirements and distribution.

Assessment of the significance of impact in accordance with the criteria contained within the MNES Guidelines has been undertaken for the six threatened species that are considered to be likely or possibly occurring and potentially subject to substantial impacts from the Project. The significant impact assessments are provided in

the following sections covering species information relevant to the assessment and an assessment table using the criteria set out in the MNES Guidelines.

Under the assessments, a significant impact is not considered to be likely to occur as a result of the Project activities. The Project has incorporated extensive avoidance and mitigation measures, ensuring impacts to key habitats and populations are minimised, consistent with Australia's obligations under the Biodiversity Convention. Additionally, the Apia Convention and CITES are considered not applicable to the Project, as it does not involve international trade in wildlife or cross-boundary ecological impacts.

5.6.2.1 Ornamental Snake – Vulnerable

Ecology

Ornamental Snake is largely restricted to low-lying areas with deep-cracking clay soils, which are subject to seasonal flooding, and adjacent areas of clay and sandy loams. Habitat includes woodland and shrubland, such as Brigalow, and riverine habitats, where the species lives in soil cracks and under fallen timber (Ehmann 1992; Wilson & Swan 2010). The species may be found in areas of simple habitat structure, such as paddocks, grasslands and regrowth if frogs are present (Melzer 2012).

The species apparently feeds exclusively on frogs (Wilson & Swan 2017) and can change from being abundant to absent over a few hundred metres due to changes in soil type or topography (Swan & Wilson 2008). Recent collecting from large-scale trenches for pipelines has shown the species to be much more common than previously thought (Swan & Wilson 2012).

Association with Proposed action area

Not recorded during surveys for the Project despite ideal conditions occurring during the January-February survey period (i.e. frog prey abundant and active, waterbodies commonly present and warm humid nights). There are three database records located within 50 km of the Proposed action area. The nearest of these is from 1995 and located 22 km north but appears to be erroneously located based on the site information associated with the record. There are two other records to the north-west and south which are at least 40 km from the Proposed action area.

Targeted surveys for Ornamental Snake in the area have been carried out in the local region in recent years including the following:

- Ecological reporting for the Mahalo Gas Project (Golder 2018) – included targeted nocturnal surveys across three properties. Four sites located on Struan property to the immediate south of Meroo Downs (6 hours of survey effort – two personnel). Ornamental Snake (14 individuals) recorded to the south-east of the Proposed action area on Humboldt and Somerby properties (7 km south-east and 10 km south of the eastern extent of the Proposed action area respectively) (refer Figure 5 and Figure 14 in Golders 2018 for survey sites and species record locations).
- Ecological reporting for the Blackwater South Project (EMM 2022) – included targeted nocturnal surveys, pitfall and funnel trapping lines and active targeted searches (spotlighting and habitat searches) for Ornamental Snake. Four trap sites and six targeted Ornamental Snake sites located on Togara encompassing the eastern portion of the current Proposed action area. Also, several sites to the immediate east on Memooloo property. Ornamental Snake (16 individuals across two survey periods in 2019 and 2020) recorded to the east and south-east of the eastern extent of the Proposed action area. Not recorded within current Proposed action area. Two individuals recorded 2 km east of the Proposed action area (approximate locations shown on **Figure 14**) (refer Figure 5.1 and Figure 5.4 in EMM 2022 for survey sites and all species record locations).

There is abundant potential habitat present for the species on Togara property in the form of scattered gilgais on cracking clay soils. Some areas appear to have been subject to limited ploughing and soil surface structure was often affected by cattle compaction. Potential habitat is not considered to occur on Meroo Downs which has been subject to intensive land management and has eliminated gilgai structures on the property. An indicative map of potential habitat for Ornamental Snake within the Proposed action area has been developed

based on habitat features observed during onsite habitat assessments (i.e. presence of gilgais and cracking clay soils) and analysis of aerial imagery (refer **Figure 14**).

Nevertheless, it is noted the species was not observed despite ideal survey conditions in January-February 2023. It is also noted Cane Toads were abundant throughout the Proposed action area.

DCCEEW approved species documents

There is no approved recovery plan for the species and no adopted threat abatement plan is considered relevant to the species. The Approved Conservation Advice (DE 2014b) for the species notes the following potentially threatening processes considered relevant to Ornamental Snake:

- Habitat loss and fragmentation due to land clearing (past and present)
- Habitat degradation caused by feral pigs
- Poisoning through ingestion of Cane Toads

There are no identified important populations or definitions of habitat critical to the survival of the species. The *Draft referral guidelines for the nationally listed Brigalow Belt reptiles* (Referral guidelines) (DSEWPC 2011) considers the presence of important habitat for this species a surrogate for an important population. The Proposed action area is mapped as occurring within the known/likely distribution of the species (DCCEEW 2024). Important habitat is described as 'gilgai depressions and mounds' which occur within the Proposed action area. Given gilgais occuring within the Proposed action area, impact to these habitats has potential to comprise important habitat for the species under this definition.

The Referral guidelines notes that clearing of two or more hectares of important habitat may comprise a high risk of a significant impact on the species. The Project habitat mapping for the species (refer **Figure 13**) indicates there is potentially 1,513 ha of suitable habitat within the Proposed action area. The Disturbance footprint currently proposes to impact up to 0.89 ha of cleared gilgai habitat which represents only 0.058% of the mapped habitat occurring within the Proposed action area. At this stage it is predicted that four production wells will be drilled each year limiting the overall impact at any one time.

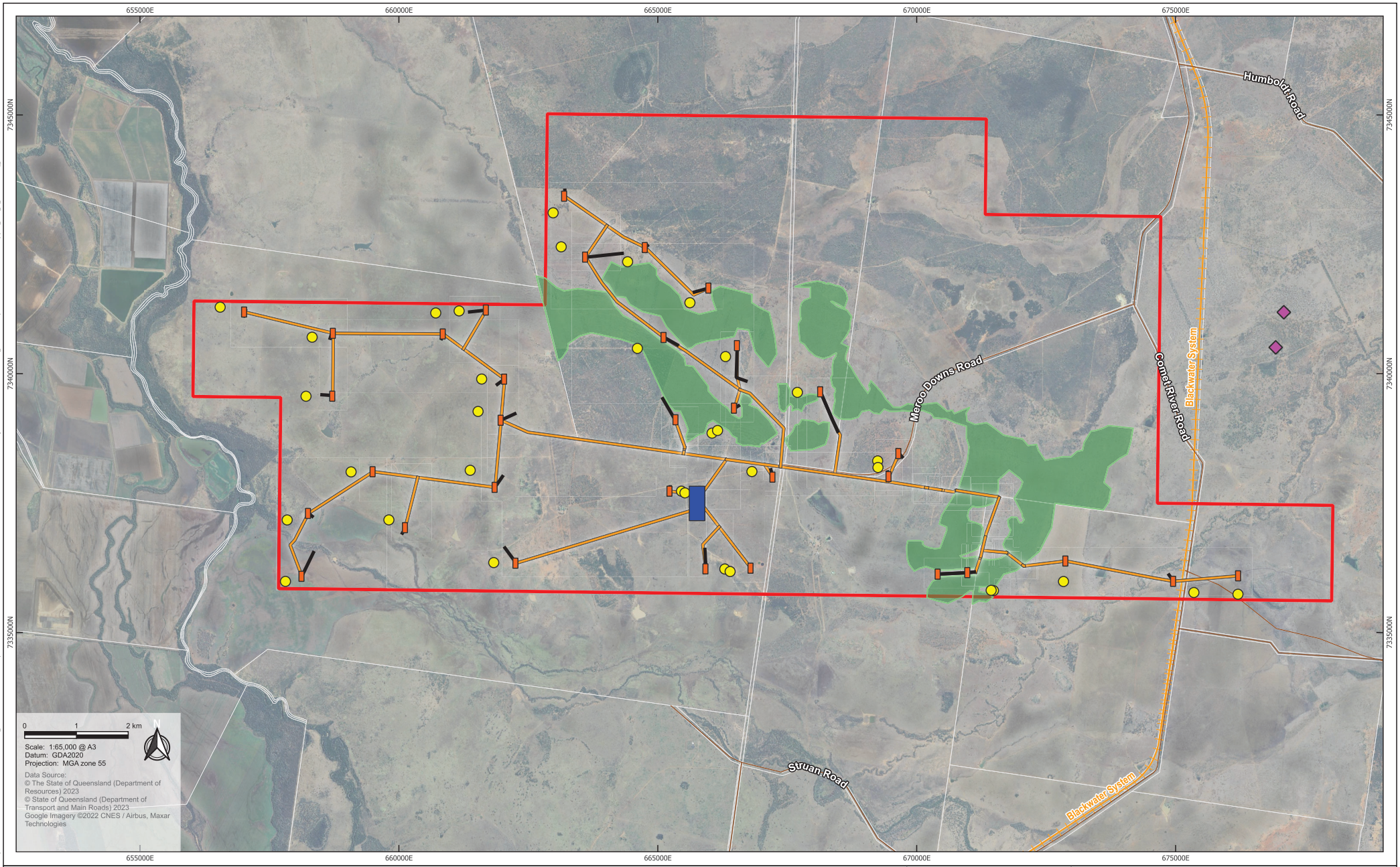
Much of the overall construction disturbance area will be reinstated following completion of construction. Well pads will be reduced from a 1 ha disturbance area to 0.04 ha of operational area with the remainder subject to revegetation. The layout of the gathering pipeline disturbance has been subject to revision in order to minimise impact on the identified gilgai habitat and will be restricted to a width of 6 m in these areas.

Table 15 provides an assessment of the potential for significant impacts on Ornamental Snake from the Project activities using the assessment criteria for vulnerable species outlined in the MNES Guidelines.

Table 15. Significant impact criteria assessment: Ornamental Snake

Criteria	Vulnerable species assessment
Lead to a long-term decrease in the size of an important population of the species	Ornamental Snake was not recorded within the Proposed action area during Project surveys despite ideal conditions for detecting the species. Ornamental Snake has been recorded in the wider area during recent surveys for other projects (Golder 2018; EMM 2022). This includes records located 2-2.5 km east of the Proposed action area. Habitat mapping indicates there is 1,513 ha of gilgai habitat present within the Proposed action area which may be suitable for the species (refer **Figure 13**). Important habitat is considered a surrogate for an important population of the species and may be considered as present. The disturbance footprint will impact a maximum area of 0.89 ha of gilgai habitat over the operational life of the Project. The Project has avoided areas of Brigalow communities comprising gilgai habitat. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. Following well construction at a site any further disturbance will be negligible. Construction noise/vibration disturbance will be localised and temporary. Construction areas no longer required for operations will be revegetated (i.e. well sites only require 0.04 ha of cleared area for operational purposes). The Project is not considered likely to lead to a long-term decrease in the size of an important population of Ornamental Snake.
Reduce the area of occupancy of an important population	Ornamental Snake was not recorded within the Proposed action area during Project surveys despite ideal conditions for detecting the species. Ornamental Snake has been recorded in the wider area during recent surveys for other projects. Important habitat for the species may be considered as present. The disturbance footprint will impact a maximum area of 0.89 ha of suitable habitat over the operational life of the Project. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. Construction areas no longer required for operations will be revegetated (i.e. well sites only require 0.04 ha of cleared area for operational purposes). The Project is not considered likely to reduce the area of occupancy of an important population of Ornamental Snake to the extent a significant impact would be incurred on the species.
Fragment an existing important population into two or more important populations	Ornamental Snake was not recorded within the Proposed action area during Project surveys despite ideal conditions for detecting the species. Ornamental Snake has been recorded in the wider area during recent surveys for other projects. Important habitat for the species may be considered as present. The Project disturbance footprint occupies scattered locations within the Proposed action area, much of which will be revegetated following construction completion. The Project will not fragment an existing important population of the species.
Adversely affect habitat critical to the survival of the species	There is no definition of critical habitat for the species. Important habitat is considered as present in the form of gilgai depressions. The disturbance footprint will impact a maximum area of 0.89 ha of gilgai habitat over the operational life of the Project, much of which will be revegetated following construction completion. Habitat mapping indicates there is 1,513 ha of cleared gilgai habitat within the overall Proposed action area. The Project is considered unlikely to affect habitat critical to the survival of the species to the extent a significant impact would be incurred on the habitat present in the Proposed action area.
Disrupt the breeding cycle of an important population	Ornamental Snake was not recorded within the Proposed action area during Project surveys despite ideal conditions for detecting the species. Ornamental Snake has been recorded in the wider area during recent surveys for other projects. Important habitat for the species may be considered as present. The breeding biology of the species is little known. The disturbance footprint will impact a maximum area of 0.89 ha of suitable habitat over the operational life of the Project. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. These occur in scattered locations within the Proposed action area. While there may be some potential for the Project to disrupt the breeding cycle of individuals of the species (should it be found to be present) it will not be to the extent a population would be significantly impacted.

Criteria	Vulnerable species assessment
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Important habitat for the species may be considered as present. The disturbance footprint will impact a maximum area of 0.89 ha of suitable habitat over the operational life of the Project. The Project has avoided areas of extant Brigalow communities comprising gilgai habitat where possible. The Project disturbance footprint occupies scattered locations within the Proposed action area, much of which will be revegetated following construction completion. The Project is considered unlikely to impact the availability or quality of habitat present to the extent the species would decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	Cane Toads were observed to be abundant and are a known threat to Ornamental Snake. Evidence of feral pigs was observed in the Proposed action area and is also considered a threat to the species. A weed and pest management plan will be developed and implemented, including the construction and operational phases of the Project. The Project will not result in the introduction of a novel invasive species, or proliferation of an existing invasive species in the Proposed action area or surrounds.
Introduce disease that may cause the species to decline	There are no identified introduced diseases or pathogens associated with this species. The Project activities do not require the importation of soils or other biological matters into the Proposed action area. Machinery imported from outside the region for Project earthworks, transportation and other construction activities will be required to be certified free of weed seeds and soil matter prior to entry onsite. It is inconceivable the Project activities will result in the introduction of a disease causing the species to decline.
Interfere substantially with the recovery of the species	The Approved Conservation Advice for the species identifies the following priority actions as relevant for Ornamental Snake: • Monitor known populations, key habitat and conservation areas and the effectiveness of any implemented management actions • Identify high conservation value populations and investigate conservation arrangements on public and private lands • Minimise adverse land use impacts at sites where the species is known to occur • Manage the impact of feral pigs where the species is known to occur • Develop and implement a Cane Toad management plan for the region (DE 2014b) There is no conceivable reason the Project's activities would interfere with any of the management priorities identified above. The Project's disturbance footprint with regard to potential habitat for the species is relatively minor. The Project will not interfere with the recovery of the species.
Assessment result	The species has not been recorded within the Proposed action area but important habitat is considered as potentially occurring. The Project's extent of impact to suitable habitat comprising gilgais in cleared lands is minor given the extent of habitat present within the Proposed action area. Based on the assessment above it is considered unlikely a significant to Ornamental Snake will occur as a result of the Project.



Filepath: ~BAA\BAA220014.01 Comet Ridge Mahalo North\Workspaces\BAA220014.01 Mahalo North\1. Petroleum Lease\11. Preliminary Documentation\Rev 0\Figure 13 Proposed action area of mapping of gilgai habitat.qgz

Legend

- Petroleum Lease application area
- Cadastre (DCDB)
- Gilgai habitat
- Roads and tracks
- Railways
- Ornamental Snake record (EMM2022)

Infrastructure (indicative only)

- Gas compression facility
- New access tracks
- Indicative gathering lines

Gas production wells

- Indicative lateral well
- Indicative vertical well

epic
A Montrose Environmental Company

Comet Ridge
Mahalo North CSG Project
Preliminary Documentation

Figure 13
Proposed action area mapping of gilgai habitat potentially suitable for Ornamental Snake, Grey Snake and Australian Painted Snipe

5.6.2.2 Grey Snake - Endangered

Ecology

Grey Snake occurs in central inland New South Wales, in south-east Queensland and north to Rockhampton in central Queensland. The species is largely confined to the Brigalow Belt bioregion and, although sparsely distributed, can be locally common (Hobson 2012). The species occurs on floodplains (Ehmann 1992) and is often found in seasonally inundated areas, preferring cracking, flood-prone clay or loam soils and areas with gilgais. Habitats include grassland and woodlands such as Brigalow, Belah and Poplar Box (Hobson 2012). The species is often found in riverine habitats near watercourses and natural levees (Ehmann 1992). Grey snakes also inhabit dry eucalypt forest and occasionally pasture (Covacevich & Wilson 1995). Although the species shows some tolerance for such cleared or modified habitats, some regrowth has been present for most records from such habitat (Hobson 2012).

Grey Snakes are crepuscular and nocturnal frog-eating specialists (Wilson & Swan 2017), that occasionally also eat lizards (Ehmann 1992). Individuals are usually found under fallen or embedded logs and flood debris or in soil cracks and burrows, generally near waterbodies (Ehmann 1992; Richardson 2008; Hobson 2012). They are known to give birth to up to 16 live young (Ehmann 1992), but little else is recorded of their breeding biology.

Association with Proposed action area

The species was not recorded during surveys for the Project or for other projects in the local region (Golder 2018; EMM 2022). There is a 2003 record located 38 km north of the Proposed action area. There is a record of uncertain origin located 127 km north north-west of the Proposed action area. The validity of these records cannot be verified. All other records are from the Rockhampton area (>190 km east) or much further south around Roma and Miles (>270 km from the Proposed action area). The distribution of the species appears uncertain and dispersed. The Approved Conservation Advice for the species (DCCEEW 2022a) notes almost all Queensland records are from the southern Brigalow Belt on the Condamine and Macintyre River floodplains, the Darling Downs and Lockyer Valley in south-east Queensland, Currawinya area in south-west Queensland and near Rockhampton.

Commonwealth Government habitat mapping indicates the species 'may occur' within the Proposed action area (rather than being likely to occur). There is substantial gilgai habitat present within the Proposed action area. However, it is noted woody regrowth in this habitat largely only occurs as scattered individual trees or very small patches. In general, the gilgai habitat remains cleared of overhead vegetation which the species appears to prefer.

DCCEEW approved species documents

There is no approved recovery plan for the species and no adopted threat abatement plan is considered relevant to the species. The Approved Conservation Advice (DCCEEW 2022a) for the species notes the following potentially threatening processes considered relevant to Grey Snake:

- Habitat loss and fragmentation due to land clearing, agriculture and grazing impacts
- Diversion of water for irrigated agriculture
- Pesticide and herbicide use on floodplains
- Predation by feral pigs, cats and Red Fox
- Poisoning through ingestion of Cane Toads
- Coal and gas extraction developments
- Increased fire frequency

There are no identified important populations or definitions of habitat critical to the survival of the species. There is suitable gilgai habitat present within the Proposed action area although much of this lacks the woody cover the species is associated with. The actual occurrence of the species in the region is uncertain.

The extent of gilgai habitat within the Proposed action area has been depicted in **Figure 13** and indicates there is potentially 1,513 ha of suitable habitat within the Proposed action area. The Disturbance footprint currently proposes to impact up to 0.89 ha of cleared gilgai habitat which represents only 0.058% of the mapped habitat

occurring within the Proposed action area. At this stage it is predicted that four production wells will be drilled each year limiting the overall impact at any one time.

Table 16 provides an assessment of the potential for significant impacts on Grey Snake from the Project activities using the assessment criteria for Endangered species outlined in the MNES Guidelines.

Table 16. Significant impact criteria assessment: Grey Snake

Criteria	Endangered species assessment
Lead to a long-term decrease in the size of a population of the species	The species has not been recorded within the Proposed action area and has not been recorded in the wider area during recent surveys for other projects (Golder 2018; EMM 2022). There is no evidence a population occurs in the region. Almost all Queensland records are from the southern Brigalow Belt on the Condamine and Macintyre River floodplains, the Darling Downs and Lockyer Valley in south-east Queensland, Currawinya area in south-west Queensland and near Rockhampton (DCCEEW 2022). There is substantial gilgai habitat present within the Proposed action area, although In general, the gilgai habitat remains cleared of the overhead woody vegetation the species is thought to prefer. The Disturbance footprint will impact a maximum area of 0.89 ha of low value gilgai habitat over the operational life of the Project. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. Following well construction at a site any further disturbance will be negligible. Construction noise/vibration disturbance will be localised and temporary. Construction areas no longer required for operations will be revegetated (i.e. well sites only require 0.04 ha of cleared area for operational purposes). The Project is not considered likely to lead to a long term decrease in the size of a population of Grey Snake.
Reduce the area of occupancy a population	The species has not been recorded within the Proposed action area and has not been recorded in the wider area during recent surveys for other projects (Golder 2018; EMM 2022). There is no evidence a population occurs in the region. Almost all Queensland records are from scattered areas much further south or east of the Proposed action area. The Disturbance footprint will impact a maximum area of 0.89 ha of low value gilgai habitat over the operational life of the Project. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. Construction areas no longer required for operations will be revegetated (i.e. well sites only require 0.04 ha of cleared area for operational purposes). The Project is not considered likely to lead to reduce the area of occupancy of a population of Grey Snake.
Fragment an existing population into two or more populations	The species has not been recorded within the Proposed action area and has not been recorded in the wider area during recent surveys for other projects (Golders 2018; EMM 2022). There is no evidence a population occurs in the region. Almost all Queensland records are from much further scattered areas much further south or east of the Proposed action area. The Project Disturbance footprint occupies scattered locations within the Proposed action area, much of which will be revegetated following construction completion. The Project will not fragment an existing population of the species.
Adversely affect habitat critical to the survival of the species	There is no evidence habitat critical to the survival of the species is present. The Disturbance footprint will impact a maximum area of 0.89 ha of low value gilgai habitat over the operational life of the Project. Habitat mapping indicates there is over 1,513 ha of cleared gilgai habitat within the overall Proposed action area. The Project is considered unlikely to affect habitat critical to the survival of the species.

Criteria	Endangered species assessment
Disrupt the breeding cycle of a population	The species has not been recorded within the Proposed action area and has not been recorded in the wider area during recent surveys for other projects (Golder 2018; EMM 2022). There is no evidence a population occurs in the region. The breeding biology of the species is little known. The Disturbance footprint will impact a maximum area of 0.89 ha of low value gilgai habitat. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. These occur in scattered locations within the Proposed action area. While there may be some potential for the Project to disrupt the breeding cycle of individuals of the species (should it be found to be present) it will not be to the extent a population would be significantly impacted.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The species has not been recorded within the Proposed action area and has not been recorded in the wider area during recent surveys for other projects (Golder 2018; EMM 2022). There is no evidence a population occurs in the region. The Disturbance footprint will impact a maximum area of 0.89 ha of low value gilgai habitat over the operational life of the Project. The Project Disturbance footprint occupies scattered locations within the Proposed action area, much of which will be revegetated following construction completion. The Project is considered unlikely to impact the availability or quality of habitat present to the extent the species would decline.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species habitat	Cane Toads were observed to be abundant and are a known threat to Grey Snake. Feral cat was observed in the Proposed action area and is also considered a threat to the species. A weed and pest management plan will be developed and implemented, including the construction and operational phases of the Project. The Project will not result in the introduction of a novel invasive species, or proliferation of an existing invasive species in the Proposed action area or surrounds. The Project will not impact the availability or quality of habitat present to the extent the species would decline.
Introduce disease that may cause the species to decline	There are no identified introduced diseases or pathogens associated with this species. The Project activities do not require the importation of soils or other biological matters into the Proposed action area. Machinery imported from outside the region for Project earthworks, transportation and other construction activities will be required to be certified free of weed seeds and soil matter prior to entry onsite. It is inconceivable the Project activities will result in the introduction of a disease causing the species to decline.
Interfere with the recovery of the species	The Approved Conservation Advice for the species identifies the following conservation and management priorities as relevant for Grey Snake: • Undertake surveys and population monitoring across the species distribution in both known occupied areas and areas in which the species hasn't been recorded • Protect the species habitat from degrading agricultural practices, and the impacts of cattle and feral pigs • Investigate the hydrological requirements to sustain the species habitat and ensure future development maintains hydrological interchange across populations • Ensure land managers target feral pig management • Protect the species habitat with reserves and improve habitat values in other areas • Apply control programs for feral cats, Red Fox and pigs in Grey Snake habitat and allow Cane Toad resistant populations to recover (DCCEEW 2022) There is no conceivable reason the Project's activities would interfere with any of the management priorities identified above. The Project's Disturbance footprint with regard to potential habitat for the species is relatively minor and there is no evidence the species would occur. The Project will not interfere with the recovery of the species.
Assessment result	It is uncertain if the species actually occurs within the Proposed action area or the region. The Project's extent of impact to low-value habitat comprising gilgais in cleared lands is minor given the extent of habitat present within the Proposed action area. Based on the assessment above it is considered unlikely a significant impact to Grey Snake will occur as a result of the Project.

5.6.2.3 Australian Painted Snipe - Endangered

Ecology

Australian Painted Snipe is typically recorded singly or in small groups in freshwater marshes. They are extremely nomadic, moving in response to local rainfall and flooding. Although its occurrence in a location is often erratic, with the bird absent some years and common in others (Marchant & Higgins 1993) there is indication of some regular seasonal migration, e.g. to central and north coastal Queensland in autumn and winter (Black et al. 2010). Breeding only occurs in swamps with temporary water regimes and complex shorelines forming islands, shallow water, exposed wet mud and dense low fringing vegetation (Rogers et al. 2005; Geering et al. 2007). During non-breeding periods they may be found in a wider range of habitats including dams, rice paddocks, waterlogged grasslands, roadside drains and even brackish waterways (Marchant & Higgins 1993).

Association with Proposed action area

The species was not recorded during surveys for the Project or for other projects in the local region (Golder 2018). EMM (2022) note the species had been observed in 2019 on the northern lease associated with the Blackwater Mine (north-east of the Proposed action area). There are two undated Birdlife Australia records of the species located 40 and 50 km east of the Proposed action area (ALA 2023). The species may use farm dams in the Proposed action area. Gilgais may provide ephemeral habitat for the species following heavy rains. It is noted most gilgai areas observed in the Proposed action area were heavily vegetated and were generally unsuitable for the species presence as it requires open shallow, muddy areas for feeding.

DCCEEW approved species documents

The *Draft national recovery plan for the Australian Painted Snipe* (Australian Painted Snipe Recovery plan) (DEE 2020) has not been adopted under the EPBC Act but is considered in this assessment. No adopted threat abatement plan is considered relevant to the species. The Australian Painted Snipe Recovery plan identifies the following potentially threatening processes considered relevant to the species:

- Loss and degradation of wetland habitat including grazing and trampling by livestock and other introduced herbivores
- Diversion of water for irrigated agriculture
- Drainage and fragmentation of wetland habitat and reduced water quality
- Changes to plant cover in wetlands by invasive and native plant species
- Climate change
- Livestock overgrazing
- Predation by invasive species such as cats and Red Fox

Important populations are not relevant to the species as it is listed as endangered under the EPBC Act. The MNES Guidelines require consideration of impacts to populations. However, the species occurs as a single, homogenous breeding population and generally occurs in low numbers at a location (usually <10 individuals) (Garnett et al. 2011). The minimum extent of occurrence is estimated at 7,900,000 km^2 (Garnett & Baker 2021). As such, a population cannot be reliably attributed to the Proposed action area.

Breeding habitat is thought to be quite specific and comprises shallow wetlands, with areas of exposed mud, and mixed heights of vegetative cover. Nests are almost always associated with small islands in freshwater wetlands (Rogers et al. 2005). Gilgai landforms comprising extensive systems of small mounds (1-3 m diameter) and hollows are also thought to be suitable (DEE 2020). Gilgais in the Proposed action area occurred largely as scattered shallow depressions which were densely vegetated. A dense cover of the introduced Buffel Grass is dominant throughout. Breeding habitat is not considered to occur in the Proposed action area.

Habitat considered critical to the survival of Australian Painted Snipe is considered in the Australian Painted Snipe Recovery plan to include:

- Habitat where the species is mapped as known or likely to occur especially where suitable breeding habitat occurs
- Locations outside the area identified above that may be periodically occupied when conditions are favourable

The Proposed action area is located outside the species distribution mapped as known or likely to occur and suitable breeding habitat is not considered to occur. Given the paucity of records from the surrounding area and the habitat values observed as present there is no reason to believe habitat within the Proposed action area would be considered as periodically occupied by the species Habitat considered critical to the survival of the species is not considered to be present.

Potential habitat for Australian Painted Snipe within the Proposed action area encompasses permanent waterbodies (farm dams) and to a lesser extent ephemeral waterbodies associated with gilgais. The extent of gilgai habitat has been depicted in (refer **Figure 13**). There is potentially 1,513 ha of suitable habitat within the Proposed action area. The Project will not impact any existing farm dams. The Disturbance footprint currently proposes to impact 0.89 ha in locations in the south-east of the Proposed action area. This represents only 0.058% of the available gilgai habitat within the Proposed action area. At this stage it is predicted that four production wells will be drilled each year thereby limiting the overall impact at any one time.

Table 17 provides an assessment of the potential for significant impacts on Australian Painted Snipe from the Project activities using the assessment criteria for vulnerable species outlined in the MNES Guidelines.

Table 17. Significant impact criteria assessment: Australian Painted Snipe

Criteria	Endangered species assessment
Lead to a long-term decrease in the size of a population of the species	The species is not known to occur within the Proposed action area but may occur in the wider area. The species occurs as a single, sparsely distributed homogenous population across its range. If the species does occur it is only likely as transient individuals. A population will not be restricted to the Proposed action area. The species may occur on farm dams within the Proposed action area. It's uncertain how suitable the gilgai habitat present is for the species given the dense cover observed across much of the Proposed action area. The Disturbance footprint will impact a maximum area of 0.89 ha of marginally suitable gilgai habitat over the operational life of the Project. No farm dams will be impacted by Project activities. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. Construction will necessarily take place in the dry season avoiding wet conditions that may be favourable to the species presence. Following well construction at a site any further disturbance will be negligible. Construction noise/vibration disturbance will be localised and temporary. Construction areas no longer required for operations will be revegetated (i.e. well sites only require 0.04 ha of cleared area for operational purposes). The Project is not considered likely to lead to a long term decrease in the size of a population of Australian Painted Snipe.
Reduce the area of occupancy a population	The species occurs a single, sparsely distributed homogenous population across its range. If the species does occur it is only likely as transient individuals. A population will not be restricted to the Proposed action area. The disturbance footprint will impact a maximum area of 0.89 ha of marginally suitable gilgai habitat over the operational life of the Project. Habitat mapping indicates there is 1,513 ha of identical habitat within the overall Proposed action area. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. Construction will necessarily take place in the dry season avoiding wet conditions that may be favourable to the species presence. Construction noise/vibration disturbance will be localised and temporary. The Project is not considered likely to reduce the occupancy of a population of Australian Painted Snipe.
Fragment an existing population into two or more populations	The species occurs a single, sparsely distributed homogenous population across its range. If the species does occur it is only likely as transient individuals. A population will not be restricted to the Proposed action area. The Project disturbance footprint occupies scattered locations within the Proposed action area, much of which will be revegetated following construction completion. The species is highly mobile. The Project will not fragment an existing population of the species.
Adversely affect habitat critical to the survival of the species	There is no evidence habitat critical to the survival of the species is present. No farm dams will be impacted by the Project. The disturbance footprint will impact a maximum area of 0.89 ha of marginally suitable gilgai habitat over the operational life

Criteria	Endangered species assessment
	of the Project. Habitat mapping indicates there is over 1,513 ha of identical habitat within the overall Proposed action area. The Project is considered unlikely to affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	The species occurs a single, sparsely distributed homogenous population across its range. If the species does occur it is only likely as transient individuals. A population will not be restricted to the Proposed action area. Breeding habitat is not considered to be present. The Project is not considered likely to disrupt the breeding cycle of a population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The species is not known to occur within the Proposed action area but may occur in the wider area. The species occurs as a single, sparsely distributed homogenous population across its range. If the species does occur it is only likely as transient individuals. No farm dams will be impacted by the Project. The disturbance footprint will impact a maximum area of 0.89 ha of marginally suitable gilgai habitat over the operational life of the Project. Habitat mapping indicates there is over 1,513 ha of identical habitat within the overall Proposed action area. The Project disturbance footprint occupies scattered locations within the Proposed action area, much of which will be revegetated following construction completion. The Project will not impact the availability or quality of habitat present to the extent the species would decline.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species habitat	Weed invasion is considered a potential threat to the species habitat. Buffel Grass occurs throughout suitable habitat areas for the species. Browsing and land degradation by cattle is considered a threat to the species habitat and is present in the Proposed action area. Feral cat is also present and may be a predator on the species. A weed and pest management plan will be developed and implemented, including the construction and operational phases of the Project. The Project will not result in the introduction of a novel invasive species, or proliferation of an existing invasive species in the Proposed action area or surrounds.
Introduce disease that may cause the species to decline	There are no identified introduced diseases or pathogens associated with this species. The Project activities do not require the importation of soils or other biological matters into the Proposed action area. Machinery imported from outside the region for Project earthworks, transportation and other construction activities will be required to be certified free of weed seeds and soil matter prior to entry onsite. It is inconceivable the Project activities will result in the introduction of a disease causing the species to decline.
Interfere with the recovery of the species	The Australian Painted Snipe Recovery plan identifies the following recovery objectives for Australian painted snipe: • Manage and protect known breeding habitats at the landscape scale • Develop methods to accurately observe changes in population trajectory and measure success of recovery activities • Reduce, or eliminate threats at breeding and non-breeding habitats • Improve knowledge of the habitat requirements, biology and behaviour of Australian Painted Snipe • Engage community stakeholders to improve awareness of the conservation of Australian Painted Snipe • Coordinate, review and report on the recovery process (DEE 2020) There is no conceivable reason the Project's activities would interfere with any of the recovery objectives identified above. The Project's disturbance footprint with regard to potential habitat for the species is relatively minor and there is no evidence the species would occur. The Project will not interfere with the recovery of the species.
Assessment result	It is uncertain if the species actually occurs within the Proposed action area. Suitable habitat for breeding is unlikely to occur. The Project's extent of impact to potential habitat comprising gilgais is minor given the extent of habitat present within the Proposed action area. Based on the assessment above it is considered unlikely a significant impact to Australian Painted Snipe will occur as a result of the Project.

5.6.2.4 Koala - Endangered

Ecology

Koalas have a distinct association with eucalypt woodland and forest habitats comprising suitable food trees, mainly of the following genus: Eucalyptus, Corymbia, Angophora and Melaleuca (Moore & Foley, 2000; Martin et al. 2008). They are not necessarily restricted to bushland areas and are known to occur and breed where suitable tree species occur within farmland and the urban environment (Dique et al. 2004). Similarly, movement is not confined to vegetated corridors, as they also move across cleared rural land and through suburbs (Martin et al. 2008). They may use a variety of trees, including many non-eucalypts, for feeding, shelter and breeding purposes (Dique et al. 2004; Martin et al. 2008).

They are known to have localised and variable preferences throughout their range, favouring some tree species over others (Pahl & Hume 1990). At the local level they are known to prefer individual trees. It has been suggested this could be a response to a number of factors such as high leaf moisture and/or nitrogen content, and low levels of toxic chemical compounds which are expressed by eucalypts as a result of herbivory (Pahl & Hume 1990; Hume & Esson 1993; Moore & Foley 2000).

Breeding occurs in spring / summer when males become territorial. Young permanently leave the pouch after seven months but may continue to ride on the mothers back until approximately 12 months. After this time adolescent females may remain in the natal habitat. Males generally disperse to new territories from one to three years of age (Dique et al. 2003; Martin et al. 2008).

Association with Proposed action area

No Koalas, or signs of presence (scats or tree scratches) have been recorded within or near the Proposed action area during the Project surveys in 2022 or 2023. There are a large number of database records in the wider area including two records (1976 and 1996) located within the Proposed action area itself (refer **Figure 14**). The nearest recent record is from 2012 and located 17 km south-east of the Proposed action area. In recent surveys for other projects in the area Koalas were detected approximately 7 km west and south-west of the Proposed action area in riparian and Acacia woodlands with emergent gums (EMM 2022). In addition, Koala scats were identified along Humboldt Creek approximately 22 km south of the Proposed action area by Golder (2018).

In the region of the Project, River Red Gum is a primary, or preferred, forage tree species of Koala. Dawson Gum is considered a secondary forage species (AKF 2015). This habitat occurs along Humboldt Creek and Comet River. Remnant eucalypt woodlands occur in scattered patches within the northern and northeastern portions of the Proposed action area. The canopy of these habitat patches is generally dominated by Poplar Box. Poplar Box is also a forage tree species for Koala, although is less preferred. The only habitat featuring the preferred forage tree species from the region (River Red Gum and Dawson Gum) impacted by the Project is narrow strips of riparian vegetation along Humboldt Creek and Comet River.

DCCEEW approved species documents

The *National recovery plan for the Koala Phascolarctos cinereus combined populations of Queensland, New South Wales and the Australian Capital Territory* (the Koala Recovery Plan) (DAWE 2022a) was approved on 8th April 2022. The Koala Recovery plan notes the following threats to the species:

- Habitat loss, fragmentation and modification including the impact of native forestry activities
- Drought, extreme heat events including associated with climate change
- Altered fire regimes
- Mortality from dog attack and vehicle collisions
- Diseases including Chlamydia and Koala retrovirus
- Plant pathogens impacting Koala habitat such as Myrtle Rust

The *Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory* (DAWE 2022b) notes (with relevance to Queensland) the priority management actions associated with the south-east Queensland population and that sub-populations on the western edge of the species range may be 'climate-sensitive' and comprise genes adapted to environmental extremes which may prove critical to populations elsewhere in the future through translocation programs.

The Koala Recovery plan does not specifically identify any areas comprising 'valued populations' of Koala but does note an imperative to conserve populations:

- That may act as source populations to adjacent areas
- Occur in areas of climatic refugia (specifically from droughts and heat waves)
- Genetically diverse
- Contain adaptive genes to potential environmental stressors or
- Are geographical or environmental outliers

Koalas have not been observed in or near the Proposed action area either currently or recently. The woodlands associated with the area comprise widespread communities much of which is disturbed and located within a heavily cleared landscape. There is no reason to believe this habitat would serve as a climate refuge or that a population (should one occur) would be part of a valued population.

Similarly, the Koala Recovery plan does not provide a clear description of 'habitat critical to the survival' of Koala. It does note that in order to halt the decline and promote recovery of the species the following activities should be avoided:

- Clearing of habitat used by Koalas
- Reducing connectivity between patches used by Koala
- Clearing habitat used during extreme events
- Avoiding activities that will expose Koalas to additional threats

The Proposed action area is largely heavily disturbed by past vegetation clearing and there is little evidence that Koala currently uses habitat within the Proposed action area or surrounds to any substantive degree. The Project will not erect structures that will provide an impermeable barrier to movement across the landscape. The Project will not increase additional threats to the species in the area. The Disturbance footprint avoids impacting riparian eucalypt habitat which may be considered as a refuge during drought or extreme heat events. The species has not been observed in the Proposed action area and there is no reason to believe the habitat present would be used during an extreme heat event, or there would be habitat critical to the survival of the Koala present within the Proposed action area or the immediate surrounds.

There is 1,470 ha of Poplar Box dominated habitat (RE 11.5.3) within the Proposed action area. The Project gas field infrastructure proposes to impact 1.17 ha of this habitat (i.e. 0.079% of the available habitat within the Proposed action area). This impact occurs as linear patches scattered in the east of the layout. There will be extensive tracts of identical vegetation remaining in the adjacent landscape which will not be impacted by the Project. There is an additional 0.11 ha of riparian Queensland Blue Gum habitat within the Project footprint. Impacts on this vegetation will be minimised through the use of directional (underground) drilling for pipeline installation.

Table 18 provides an assessment of the potential for significant impacts on Koala from the Project activities using the assessment criteria for Endangered species outlined in the MNES Guidelines.

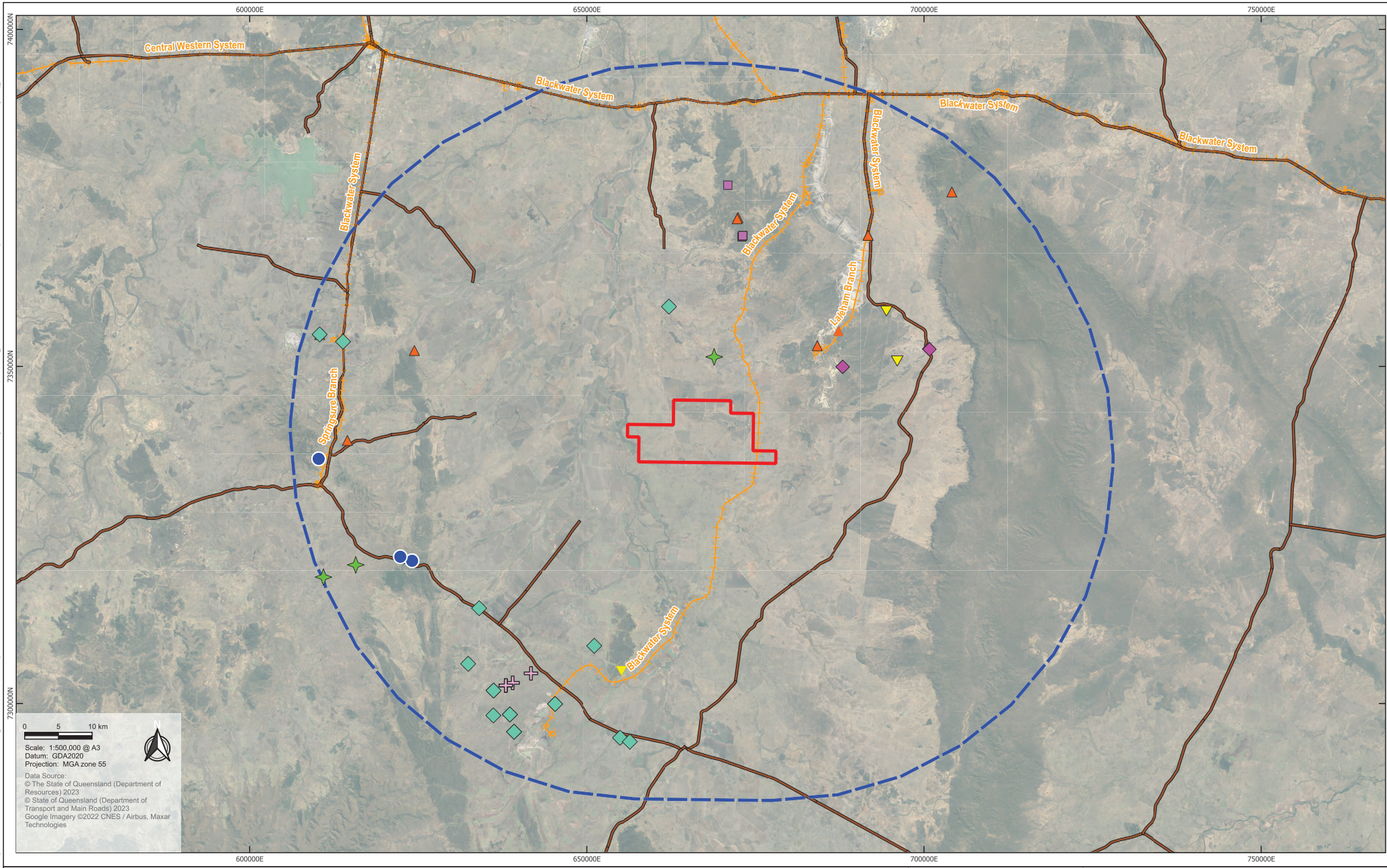
Table 18. Significant impact criteria assessment: Koala

Criteria	Endangered species assessment
Lead to a long-term decrease in the size of a population of the species	The species (including any signs of presence) was not recorded within the Proposed action area or surrounds during surveys (including spotlighting) carried out in 2022 and 2023. There are older database records located within the Proposed action area (ALA 2023) and recent records of Koala in the wider area from other studies (Golder 2019; EMM 2022). Preferred forage tree species in inland Queensland includes habitat supporting River Red Gum. The gas field layout does not proposes to clear such habitat. The Project will impact 1.17 ha of habitat comprising Poplar Box as the dominant canopy species. Poplar Box is less preferred for foraging in the region although Koala is known to feed on the species. There is abundant similar habitat in the surrounding area and region that will remain undisturbed. There is an additional 0.11 ha of riparian Queensland Blue Gum habitat within the Project footprint which the Koala is known to feed on. The majority of the Proposed action area that will be impacted comprises cleared habitat sometimes with scattered regrowth Brigalow (which is not a forage tree for Koala). A fauna spotter is recommended to be present during vegetation clearing within suitable habitat for Koala to eliminate any potential impact on Koala individuals (should any be present at the time). Indirect impacts to Koala habitat from Project activities (such as noise, lighting and dust settlement) will be temporary and have a very minor impact at worst. The Project is considered highly unlikely to lead to a long-term decrease in the size of a population of Koala.
Reduce the area of occupancy a population	The species is not known from the local area associated with the Project but may occur. There is no evidence the remnant vegetation associated with the Proposed action area would support all or part of a local population of Koala. The Proposed action area is largely cleared of remnant vegetation which may support the species. The Project proposes to clear 1.28 ha of potential habitat for Koala. This area is spread across scattered patches within the overall layout. There is abundant identical habitat located adjacent to the Project infrastructure which will remain undisturbed. Cleared habitat within the disturbance area largely comprises sparse regrowth Brigalow which does not comprise forage habitat for Koala. The Project is considered highly unlikely to reduce the area of occupancy of a population of Koala.
Fragment an existing population into two or more populations	There is no evidence the minor area of remnant vegetation associated with the gas field layout would support all or part of a local population of Koala. The Proposed action area is largely cleared of remnant vegetation which may support the species. The Project does not require elements that will represent a barrier to the species movement across the Proposed action area and surrounds. The Project will not fragment an existing population of Koala.
Adversely affect habitat critical to the survival of the species	There is no evidence habitat critical to the survival of the species is present. The gas field layout does not propose to clear riparian habitat which may be used as a refuge during drought conditions. The disturbance footprint will impact a maximum area of 1.28 ha of potentially suitable habitat over the operational life of the Project. Habitat mapping indicates there is over 1,353 ha of identical habitat within the overall Proposed action area. The Project is considered unlikely to affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	There is no evidence the small area of remnant vegetation associated with the Proposed action area would support all or even part of a local population of Koala. It is considered unlikely the Project will disrupt the breeding cycle of an important population of Koala.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	It Is not known if the species occurs within the Proposed action area, although suitable habitat occurs. The Project proposes to clear 1.28 ha of potential habitat for Koala. This area is spread across scattered patches within the overall layout. There is abundant identical habitat located adjacent to Project infrastructure which will remain undisturbed. The Project impacts largely occur in unsuitable grasslands, much of which will be reinstated following completion of construction. The Project will not impact the availability or quality of habitat to the extent that the species is likely to decline.

Criteria	Endangered species assessment
Result in invasive species that are harmful to an endangered species becoming established in the endangered species habitat	Weed invasion is not considered a threat to the species. Feral and domestic dogs are a known threat to the species and are likely present to some degree in the landscape. Dingo was observed onsite in 2022. A weed and pest management plan will be developed and implemented, including the construction and operational phases of the Project. The Project will not result in the introduction of a novel invasive species, or proliferation of an existing invasive species in the Proposed action area or surrounds.
Introduce disease that may cause the species to decline	Myrtle rust may impact a range of eucalypt species and may be a potential threat to habitat for Koala (DAWE 2022a). The Project activities do not require the importation of soils or other biological matters into the Proposed action area. Machinery imported from outside the region for Project earthworks, transportation and other construction activities will be required to be certified free of weed seeds and soil matter prior to entry onsite. It is inconceivable the Project activities will result in the introduction of a disease causing the species to decline.
Interfere with the recovery of the species	The Koala Recovery plan outlines a number of recovery strategies and actions for the species including the following: • Identify nationally important populations and strategic areas for restoration, climate/fire refugia and movement corridors • Coordinate research programs including implementing a national monitoring program • Increase the area of protected Koala habitat through incorporation into State protected areas and on private lands and improve land management practises • Ensure koala conservation is integrated into policy, and statutory and land-use plans • Develop and implement strategic restoration of habitat including through natural resource management and land care groups and develop revegetation and restoration guidelines • Develop a strategy of active management practices Koala metapopulations including monitoring population health, fire management, and guidelines for managing Koala translocations and post-care release of individuals (DAWE 2022a) It is uncertain to what extent the species actually occurs in the local area. The majority of the Proposed action area has been heavily impacted by previous grazing practices. Should the species occur within or near Project works any impact will be very minor and is considered unlikely to interfere substantially with the management actions identified above or the recovery of the species.
Assessment result	It is uncertain to what extent the species actually occurs within the Proposed action area. The Project's extent of impact to potential foraging habitat comprising is very minor given the extent of habitat present elsewhere within the Proposed action area. Based on the assessment above it is considered unlikely a significant impact to Koala will occur as a result of the Project.

5.7 Offsets

Based on the SRI assessments for MNES detailed in the previous sections associated with the potential impacts of the Project, there are no predicted impacts to environmental values potentially requiring environmental offsets.



Legend

- Petroleum Lease Boundary
- 50 km buffer
- State controlled roads
- Railways

Threatened flora records

- Aristida annua
- Bertya opponens
- Cadellia pentastylis
- Dichanthium queenslandicum
- Dichanthium setosum
- Leichhardtia brevifolia
- Solanum dissectum
- Polianthion minutiflorum

epic
A Montrose Environmental Company

Comet Ridge
Mahalo North CSG Project
Preliminary Documentation

Figure 14
Threatened MNES flora species records within 50 km radius of the Project

6 A WATER RESOURCE IN RELATION TO UNCONVENTIONAL GAS DEVELOPMENT AND LARGE COAL MINING DEVELOPMENT

The Project engaged RDM Hydro to undertake a GIA. The objective of the assessment was to evaluate the potential impacts to groundwater resources, groundwater-dependent assets and groundwater environmental values resulting from the Project's CSG production. Following delivery of the GIA, further works were commissioned to deepen the understanding of the nature of interconnectivity between groundwater and surface water resources at, and beneath, the Project and to outline the strategies and monitoring programs to guide the management of water resources for the Project. Terra Sana were engaged to prepare a WMMP (Terra Sana 2025a) and a RCP (Terra Sana 2025b).

The WMMP and RCP were prepared to support RDM Hydro's initial GIA; as such the three documents should be read and referenced in conjunction and are not to be read in isolation.

The following sections provide a summary of the water resource assessment as discussed in the GIA, WMMP and RCP. Complete reports are provided in **Appendix G**, **Appendix L** and **Appendix M** respectively.

6.1 Joint Industry Framework

The Coal Seam Gas - *Joint industry framework Managing impacts to groundwater resources in the Surat Cumulative Management Area under EPBC Act approvals* (APPEA, 2021) (JIF) was collaboratively developed between the Australian Petroleum Producing and Exploration Association (APPEA), the Commonwealth regulator, and Queensland government agencies.

The stated purpose of the JIF is to establish a consistent post-approval framework for the management of impacts on groundwater caused by CSG developments within the Surat CMA that are subject to approvals under the EPBC Act. The JIF provides a risk management framework to achieve stated outcomes for relevant MNES. It is intended to reduce duplication between regulation at the Commonwealth and State levels.

The JIF applies to approvals based on potential impacts to GAB discharge springs or to the water trigger and relates only to groundwater and all aspects of the groundwater resource (including groundwater, organisms and other components and ecosystems that contribute to the physical state and environmental value of the groundwater resource). The significance of impacts to a water resource is determined through the reduction in the current or future utility of the water resource to third party users (associated users) caused by changes to hydrology and water quality from CSG and large coal mining developments. For the purposes of the JIF, associated users are water supply bores and GDEs.

The EPBC Act does not protect these associated users as MNES in their own right, but conditions controlling the impact of an action on these associated users are used to ensure the management of impacts on a water resource. The Commonwealth regulator identified outcomes for each associated user, and the JIF establishes the management frameworks to achieve those outcomes. The application of the outcomes and management frameworks to projects through approval conditions aims to ensure the acceptability of impacts by an action on a water resource.

Should the Project be approved as a controlled action with respect to aquatic GDEs, terrestrial GDES or subterranean GDEs under the EPBC Act, management measures will be implemented in accordance with the conditions of approval and will align with the JIF (APPEA, 2021).

6.2 Hydrogeological / Hydrological Setting

6.2.1 Geological Setting

The regional geology of the Study area comprises sediments from the Early Permian to Middle Triassic age Bowen Basin. The Bowen Basin is an elongated, north to south trending basin extending over 160,000 km2 from central Queensland, south beneath the Surat Basin, and into New South Wales, where it connects with the Gunnedah and Sydney basins (Office of Groundwater Impact Assessment (OGIA) 2016).

The Bowen Basin contains up to 10 km of terrestrial and shallow-marine sediments (Korsch and Totterdell, 2009). The southern Queensland and northernmost New South Wales portion of the basin is overlaid by up to 2.5 km of Early Jurassic to Early Cretaceous Surat Basin sedimentary sequences (Fielding et al. 2000; Korsch and Totterdell, 2009). In the vicinity of the Proposed action area, the Bowen Basin units reside under Cainozoic cover.

The Proposed action area is located on the mid-western extent of the Bowen Basin, on the southern end of the Comet Ridge crest, and is flanked by the Taroom Trough to the east and the Denison Trough to the west (Fielding et al. 2000; Korsch and Totterdell, 2009). Having developed inbound of an active convergence margin during the New England Orogeny, the Bowen Basin formed within a back arc tectonic setting (Korsch and Totterdell 2009).

6.2.2 Site Specific Hydro Stratigraphy

A hydrostratigraphic column for the geological units present in the Proposed action area and their hydrostratigraphic designation based on OGIA (2021a) is provided in **Table 19**. The distribution of the units within the Proposed action area is also provided in **Table 19.**

Cross-sections of the geological model demonstrating the regional stratigraphy have been prepared based on extensive geological exploration, comprising in excess of 1,000 exploration boreholes, drilled at an approximate 1 km by 1 km grid. The cross-sections are provided in **Appendix G**. The geological model will continue to be refined as additional investigations are undertaken (refer **Section 6.2.3**).

Detailed discussion of the geological units present across the Proposed action area is provided in the GIA (**Appendix G)** and RCP (**Appendix M)**, with a brief description of each of the relevant units provided below:

6.2.2.1 Quaternary Sediments

Unconsolidated Quaternary-age alluvial deposits occur adjacent to the Comet River and Humboldt Creek. The alluvium was deposited by its associated watercourses, with the sediment source from the surrounding outcropping formations. Due to the fine-grained and clay rich nature of the geology, discontinuous aquifers may form within the alluvium where there is a greater volume of connected coarser material with lesser amounts of clay. The aquifers are often ephemeral and perched above the regional water table. The extent, thickness and composition of the alluvium is locally variable. Pearce and Hansen (2006) report the Comet Rive alluvium to be typically 20 m thick, reaching thicknesses of up to 50 m near Comet and south of Rolleston where is it much wider than in the vicinity of the Study area. The Quaternary Alluvium reaches a maximum width of approximately 6.5 km to the southwest of the Proposed action area. The Project's monitoring bore MN-MB1-a encountered 12.4 m of unconsolidated alluvial material in the southwest of the Proposed action area. Bore yields from the GWBD within the Proposed action area range from 0.1 L/s to 50 L/s, but with a median of only 1.1 L/s from 164 values, indicating that high yielding bores are an exception.

6.2.2.2 Tertiary Strata

The majority of the Proposed action area and surrounds east of the Proposed action area is underlain by Tertiary aged sediments, predominantly of the Emerald Formation, which is described as fluviatile and lacustrine claystone and siltstone, sandstone and gravel with interbedded basalt. It is often deeply weathered. Pearce and Hansen (2006) reports that this unit has poorly developed porosity due to the predominantly fine-grained nature of the sediments and poorly developed fracture networks due to the semi- to unconsolidated nature of the material.

Small outcrops within the Proposed action area extent, and to the north where it is exposed in the drainage lines and descriptions of basalt in water bore strata logs from the Queensland Groundwater Bore Database (GWBD) attest to its presence beneath the Tertiary Sediments in the east of the Proposed action area. The Tertiary Basalts forms a discontinuous fractured rock aquifer with varying degrees of hydraulic connectivity both laterally and vertically.

The Tertiary Strata are used extensively for water supply for agricultural purposes, particularly to the west of the Comet River, with the majority of the supply coming from the basalts. Bore yields from the GWBD within

the Study area range from 0.1 L/s to 50 L/s, but with a median of only 1.1 L/s from 164 values, indicating that high yielding bores are an exception.

6.2.2.3 Clematis Group

The Clematis Group comprises sandstone, siltstone and mudstone which are relatively resistant to weather compared with the other Permo-Triassic sediments, and it forms the elevated topography of the Expedition Ranges to the east of the Proposed action area. While the Clematis Group was formerly included in the Great Artesian Basin (GAB), Ransley and Smerdon (2012) identify the base of the Precipice Sandstone (Jurassic-aged) of the Surat Basin as the margin of the GAB.

6.2.2.4 Rewan Group

The Rewan Group is partially present in the sub-surface beneath the Proposed action area. It dips to the southwest, reaching a thickness in excess of 200 m at the Proposed action area boundary and outcrops to the northeast of the Proposed action area within the Blackwater Creek catchment, where OGIA (2023) indicates its reaches in excess of 500 m thickness. The Rewan Group comprises interbedded mudstone, siltstone and sandstone with a minor conglomeratic zone at the base of the formation. OGIA (2021a) designates the Rewan Formation as a tight aquitard.

Ten bores with yield data were identified from the GWBD with the Study area of the GIA for upper Permian formation, which is predominantly the Rewan Formation. The range in reported yields was 0.2 L/s to 5.6 L/s with a median of 0.7 L/s.

6.2.2.5 Bandanna Formation/Rangal Coal Measures

The Bandanna Formation is the lateral equivalent of the Rangal Coal Measures (Sliwa et al., 2015) and is the target of CSG production for the Project. The Bandanna Formation/Rangal Coal Measures comprises interbedded mudstone and siltstone with relatively thin coal seams that are regionally distinguishable but not regionally continuous. This unit outcrops within the Blackwater Mine leases (to the east of the Proposed action area) and subcrops beneath the Tertiary strata within the Proposed action area, and dips centrifugally around the Comet Anticline. The Project will target CSG development at depth of roughly 120 mbgl to 220 mbgl. OGIA (2023) indicates a total formation thickness generally less than 200 m. The zero-thickness margin is roughly coincident with the northern boundary of the Proposed action area.

The Rangal Coal Measures are the lateral equivalent of the Bandanna Formation. Hair (1987) concluded that aquifers were restricted to the coal seams. From field permeability testing, they found that the interseam sediments had a permeability about two orders of magnitude less than that of the coal seams, individual coal seam aquifers are hydrologically isolated within the Rangal Coal Measure sequence and are internally significantly anisotropic. The major thrust fault at Curragh behaved as a barrier boundary during a pumping test.

Sliwa et al. (2017) identify extensive small-scale faulting within the Rangal Coal Measures at the Blackwater mine. There is no preferential orientation to the faults, thus it is likely that some will be hydraulically conductive, while others may seal. While not mapped, it is likely that similar faulting is present within the Study area and therefore is likely to provide hydraulic connection between the individual coal seams to some degree. Fourteen bores with yield data were identified from the GWBD within the GIA Study area, with a reported of between 0.1 L/s and 2.5 L/s. The median yield was 1.1 L/s.

6.2.2.6 Back Creek Group

The Back Creek Group underlies the Bandanna Formation/Rangal Coal Measures throughout the Proposed action area and surrounds and since there are no recognised aquifer within it, forms the hydrogeological basement to the area. The Back Creek Group outcrops within the core of the Comet Anticline to the north of the Proposed action area and to the southwest of the Proposed action area.

Yield estimates from 25 bores were identified from the GWBD for the Back Creek Group within the GIA Study area, with a range of 0.01 L/s to 3.0 L/s, and a median of 0.6 L/s.

Table 19. Stratigraphy and hydrostratigraphy of the Study area

Age		Formation		Hydrostratigraphic Description (after OGIA, 2021)	Location in Study area
Quaternary		Alluvium		Partial aquifer	Associated with the Comet River and Humboldt Creek. Distribution within the Proposed action area limited to the southeastern and southwestern corners
		Colluvium		Aquitard*	Extensively present to the west of the Comet River, associated with the lower slopes of Tertiary Basalt outcrop.
Tertiary		Tertiary Sediments		Aquitard*	Surficial deposits across the majority of the Proposed action area and to the north and east of the Study area
		Tertiary Basalt		Partial aquifer*	Small areas of outcrop throughout the Proposed action area and Study area, predominantly in the west.
Triassic	Middle	Moolayember Formation		Tight aquitard	Does not outcrop or subcrop within the Study area
		Showground Sandstone	Clematis Group	Regional aquifer	Outcrops as the Expedition Ranges to the east of the Study area, with a small inlier of outcrop to the south of the Study area adjacent to the Inderi Fault.
	Early	Rewan Group		Tight aquitard	Outcrops to the northeast of the Study area and subcrops beneath the Tertiary strata within the Proposed action area, forming the primary aquitard.
Permian	Late	Bandanna Formation/Rangal Coal Measures		Interbedded aquitard	Target formation. Subcrops beneath the Tertiary Strata within the Proposed action area and outcrops to the northeast of the Study area within the Blackwater mine tenements.
		Back Creek Group	Black Alley Shale	Tight Aquitard*	Outcrop and subcrop within the Comet Anticline to the north of the Study area. Also subcrops with a small amount of outcrop to the southwest of the Study area
			Peawaddy Formation		
			Burngrove Formation		
			Fair Hill Formation		
			MacMillan Formation		
			Crocker Formation		
			Maria Formation		

Age		Formation		Hydrostratigraphic Description (after OGIA, 2021)	Location in Study area
			Catherine Sandstone Ingelara Formation Freitag Formation		
	Early		Upper Aldebaran Sandstone		Does not outcrop or subcrop within the Study area
			Lower Aldebaran Sandstone	Interbedded aquitard*	
			Cattle Creek Formation	Tight Aquitard*	
			Reids Dome Beds	Tight Aquitard*	

* No hydrostratigraphic designation by OGIA (2021)

6.2.3 Aquifer Interconnectivity

An assessment of the interconnectivity between underlying aquifers is required to determine potential or likely impacts resulting through drawdown related to Project operations.

An assessment methodology was prepared by Terra Sana (2025b) to support the limited site-specific information available and provide sufficient detail to allow any potential impacts to be quantified. The proposed investigation comprises the installation of four nested groundwater wells/piezometers constructed within four key hydrostratigraphic units, including the Bandanna Formation, Rewan Formation, Tertiary Basalt and Quaternary Alluvium, at four targeted locations within the PL.

Across the piezometer network, the investigation will incorporate:

- In-situ hydraulic conductivity testing and collection and analysis of core samples throughout the stratigraphy to ascertain its permeability and ability to act as an aquitard
- Assessment of borehole geophysical data
- Hydrochemical and isotopic analysis of groundwater samples to fingerprint potential groundwater sources, recharge signatures and to further assess aquifer interconnectivity.

Further details of the proposed investigation, including network design and strategy, approach rationale and methodology are provided in Section 6.2.3 of the RCP (**Appendix M**) and WMMP (**Appendix L**).

6.2.4 Groundwater Levels

6.2.4.1 Temporal Trends

The GWBD was interrogated to identify bores with temporal water level data within the GIA Study area and surrounds. The locations and attributed formations of those bores with five or more water level measurements are shown on **Figure 15**. There are no bores within the Proposed action area with timeseries water level data available. Composite hydrographs for the bores outside of the Rolleston area are presented as Figure 22 to Figure 24, with descriptions of the water level trends provided in Table 5, and key findings summarised as follows:

- Almost all of the hydrographs from the Tertiary Strata (**Figure 16**) show connection between the aquifer and the ground surface through a recharge response to rainfall. The magnitude and lag of this response differs between bores indicting that the Tertiary Strata is not a single, homogeneous isotropic aquifer with consistent hydraulic connection to the ground surface
- There is a nest of three collocated bores 21 km northwest of the Proposed action area with a bore screened in each of the Tertiary basalt, the Rewan Group and Bandanna Formation (**Figure 17**). The water level monitoring record for these bores is short (less than one year) and shows the Bandanna Formation and Rewan Group water levels rising rapidly by roughly 7 m and 23 m respectively over a fortnight at the very beginning of the monitoring record. This type of response is typical of the water level recovery in a bore recently constructed in a low permeability formation. The water levels stabilised over the period of available data, with the relative water levels indicating a downward gradient from the Tertiary basalt to the Rewan Group and an upward hydraulic gradient from the Bandanna Formation to the Rewan Group
- Two bores are co-located bores both screened in the Tertiary Basalt (**Figure 18**) and are 71.6 m and 25.6 m deep respectively. Both bores showed a lag in their response to rainfall, however the shallower bore, RN1305024, responded much more rapidly to significant rainfall with a much quicker recession compared with the deeper bore which also declined much more slowly. This may be due to hydrostatic loading or may indicate that the deeper bore is connected to a greater volume of storage in the aquifer. When plotted on the same scale axes, it become evident that the vertical hydraulic gradients within the aquifer change, indicating that the aquifer is not isotropic and homogeneous and that the location of the recharge sources to each bore may be spatially different.

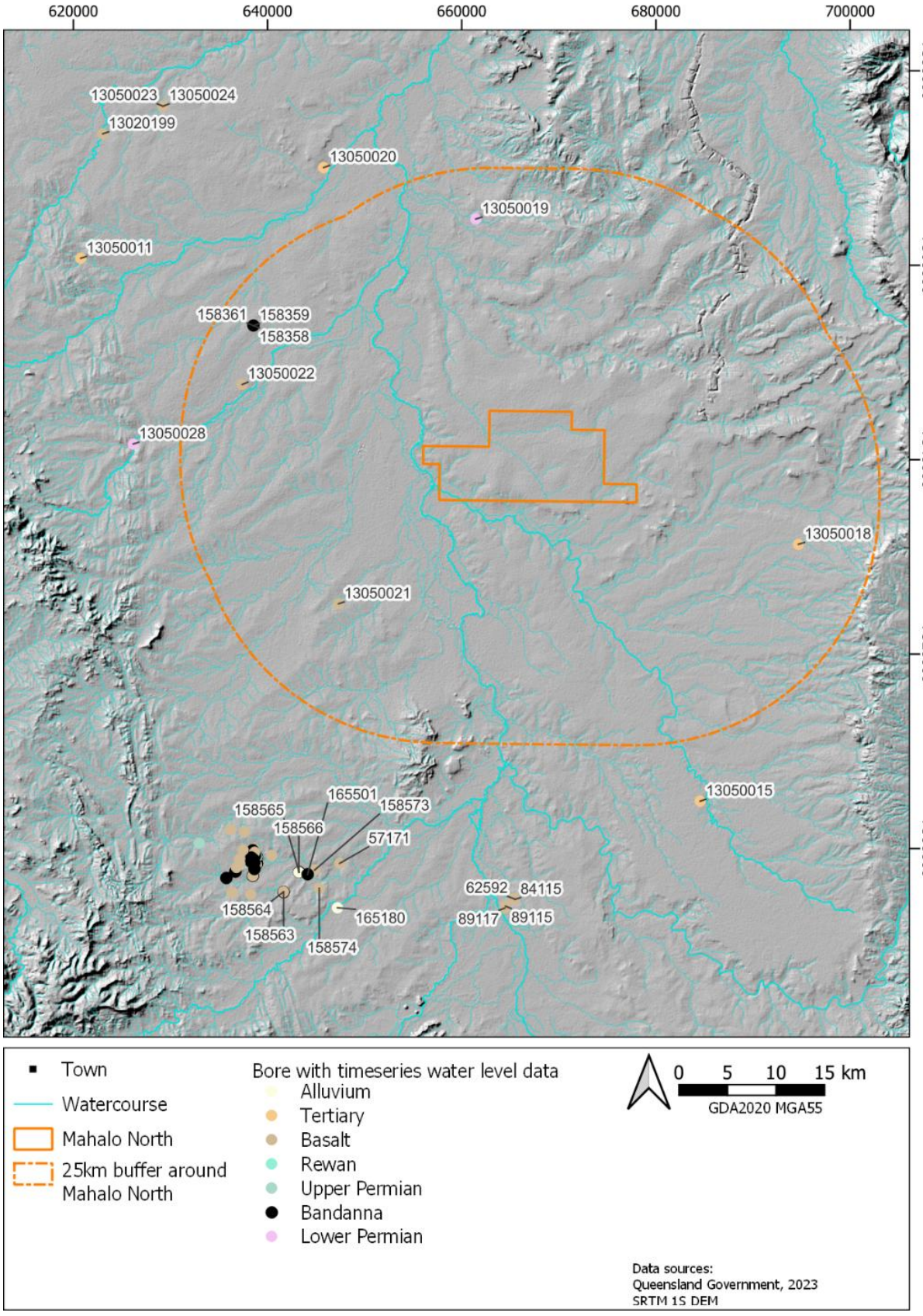


Figure 15. Bores with more than five water level measurements (RDM Hydro 2024)

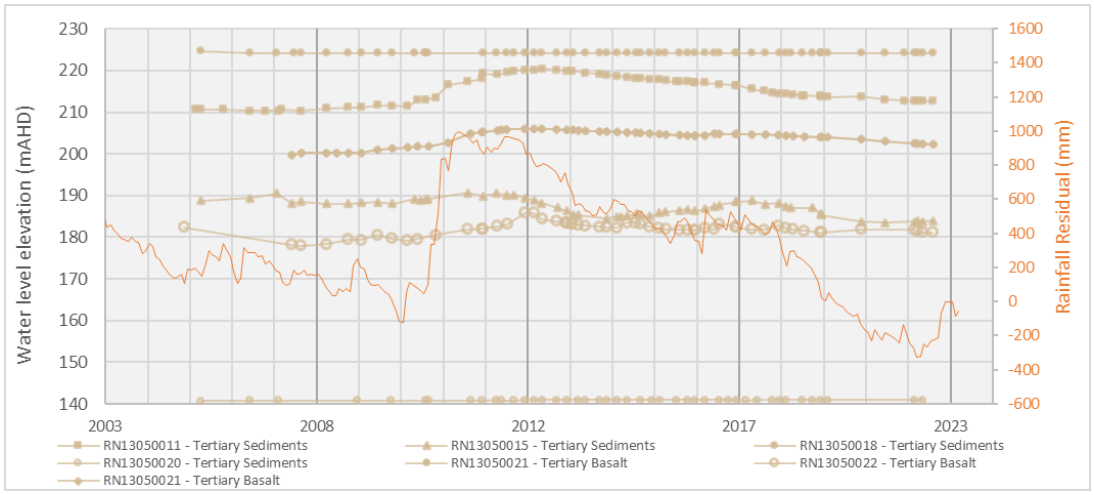


Figure 16. Combined timeseries water level responses - Tertiary strata (RDM Hydro 2024)

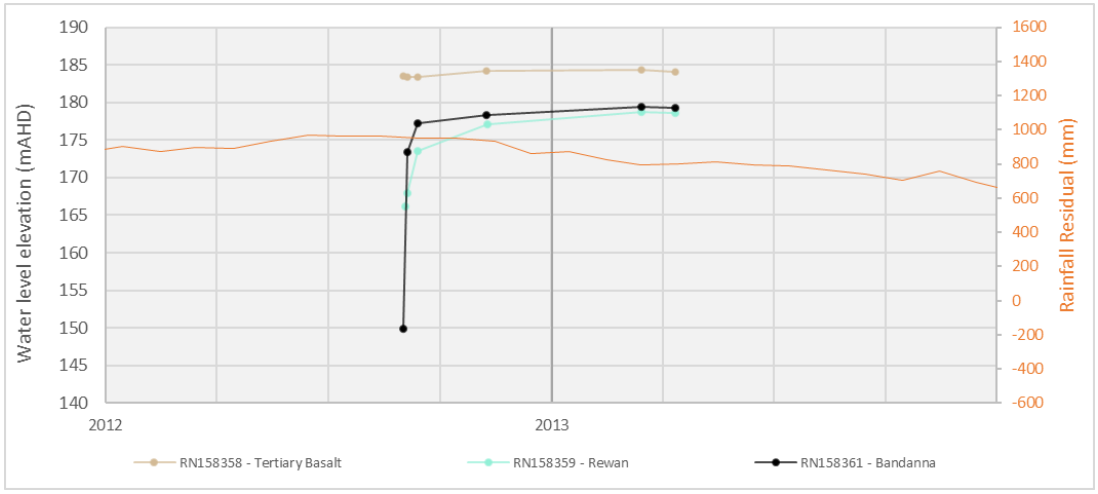


Figure 17. Combined timeseries water level responses – Multi-formation nested site (RDM Hydro 2024)

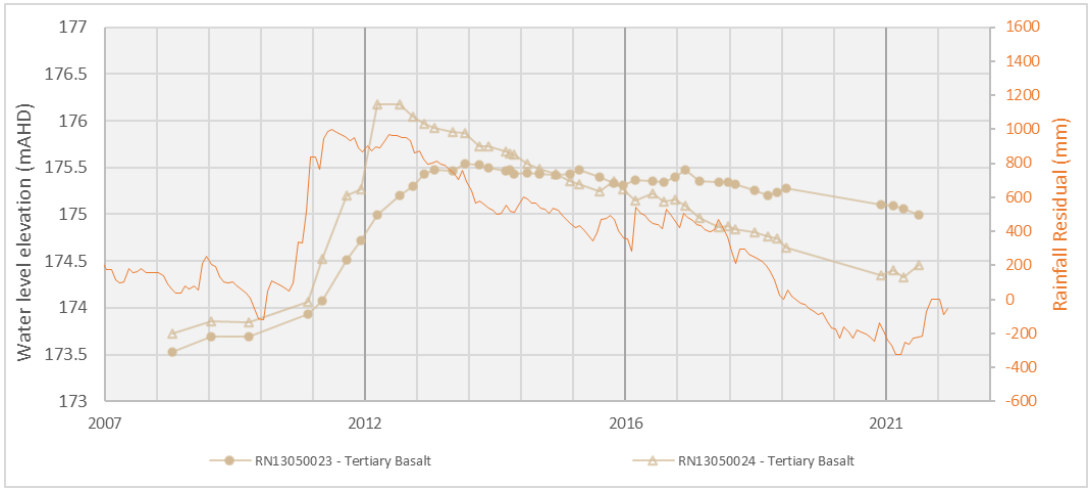


Figure 18. Combined timeseries water level responses – Tertiary basalt nested site (RDM Hydro 2024)

6.2.4.2 Spatial Trends

For the Bandanna Formation potentiometric surface, the GWBD data was augmented with reservoir pressures calculated from DST or MDT data. The water level elevation was calculated by subtracting the water level measurement from the ground surface elevation. The discrete data was then interpolated using the Kriging algorithm in Surfer©. For the Tertiary and Bandanna surfaces, twenty-meter contours were extracted, whereas for the alluvium surface, ten meter contours were extracted. The contours were then clipped to the mapped extent of the formation and/or available data distribution. The surfaces are acknowledged to represent composites of different times and climatic conditions however they are considered to be hydrogeological sensible and to reasonably the general flow directions and elevations at a regional scale. Greatest uncertainties will be in the local vicinity of active groundwater extraction, such as the Rolleston mine.

The potentiometric surfaces indicate the following:

- A northerly groundwater flow direction along the Denison Trough in all three of the potentiometric surfaces, consistent with the ground surface elevation and indicating a gravity-controlled groundwater flow system with discharge to the north of the Proposed action area
- In the vicinity of the Proposed action area, upward hydraulic gradients from the Bandanna Formation to the Tertiary Strata and similar hydraulic heads between the Alluvium and the Tertiary Strata. It is recognised that due to the dynamic water levels in the alluvium and Tertiary Strata that hydraulic gradients and directions of groundwater movement may change temporally.
- There was insufficient data available to prepare potentiometric surfaces for the Upper and Lower Permian strata.

Figure 19, **Figure 20** and **Figure 21** present potentiometric surfaces for the alluvium, Tertiary strata (combined basalt and sediments) and the Bandanna Formation/Rangal Coal Measures. These surfaces were primarily prepared using water level data sourced from the GWBD.

6.2.4.3 Water Table Depth

The water table depth map for the Proposed action area is provided in **Figure 22** and shows:

- The water table depth as mapped is a subdued reflected of topography
- Shallowest water levels are associated with watercourses, where they are generally mapped to be within 10 m of ground surface. Water depths associated with Humboldt Creek to the south of the Proposed action area are mapped to be within 5 m of the ground surface over a relatively wide area. There was limited data to constrain the interpolation in this area
- Water levels across the Comet River alluvium may be up to 15 m deep, and water levels beneath the unnamed water course that transects the Proposed action area tend to be greater than 20 m deep.
- The water table depth across most of the Proposed action area exceeds 25 mbgl.

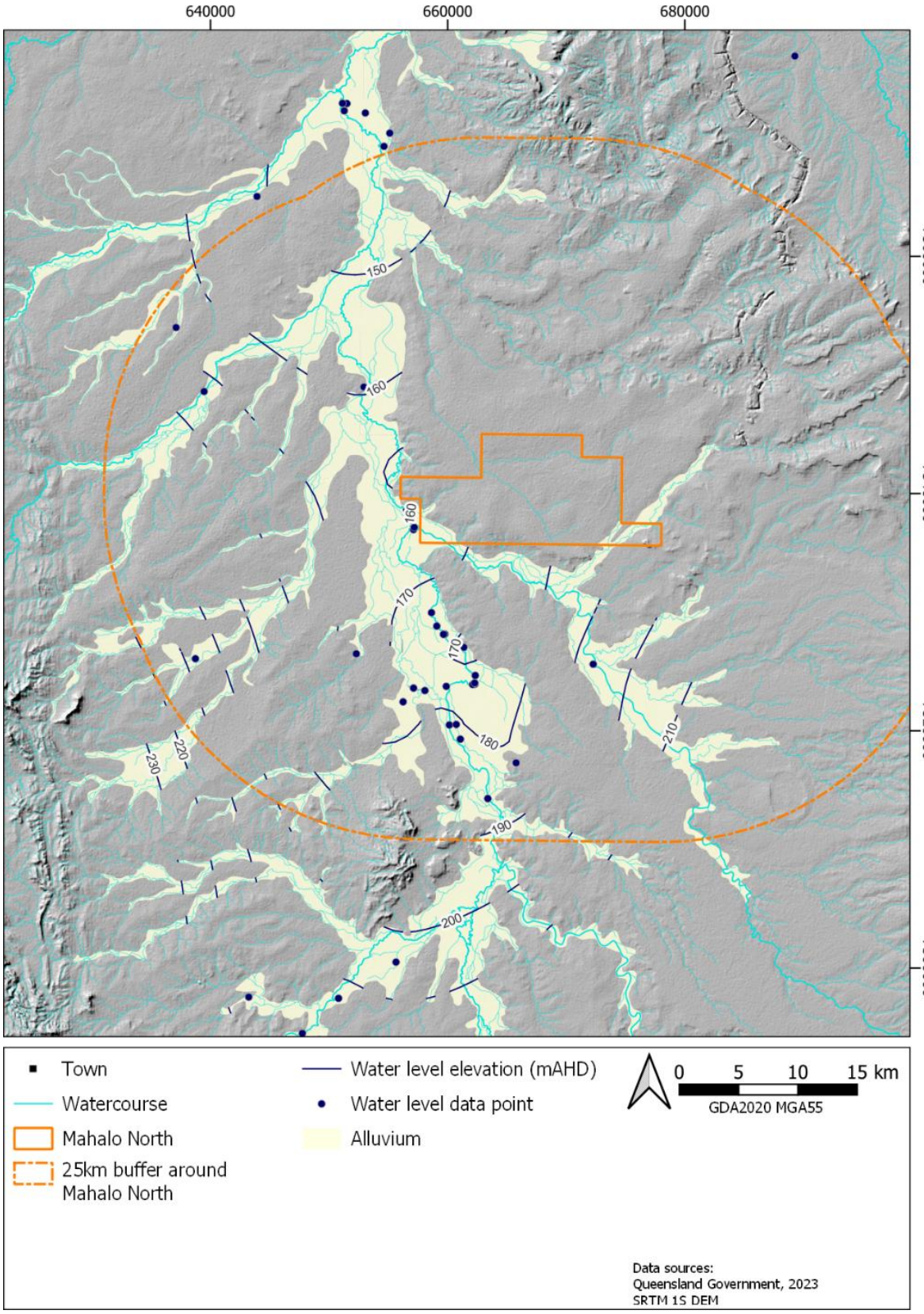


Figure 19. Water level elevation – Alluvium (RDM Hydro 2024)

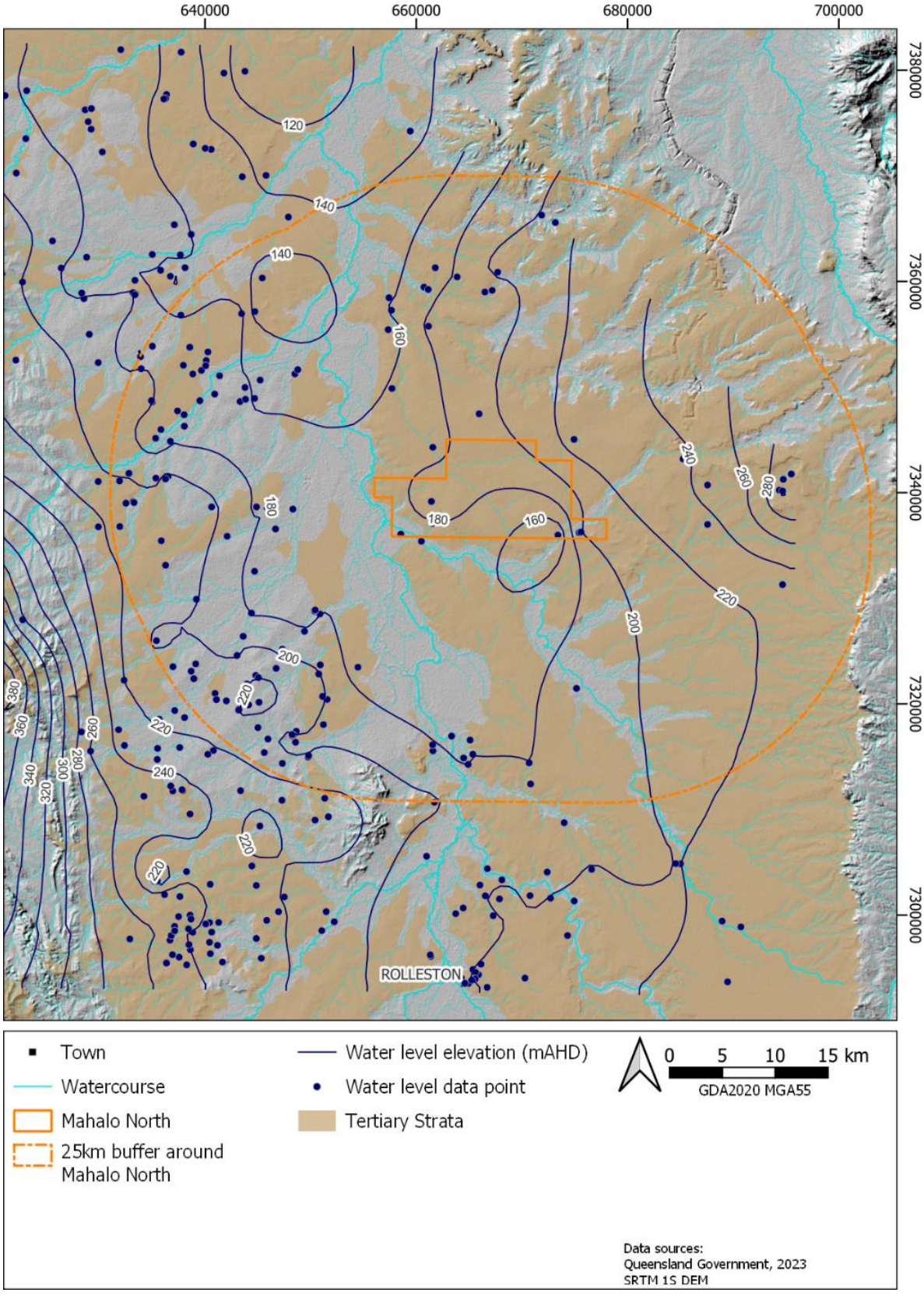


Figure 20. Water level elevation - Tertiary strata (RDM Hydro 2024)

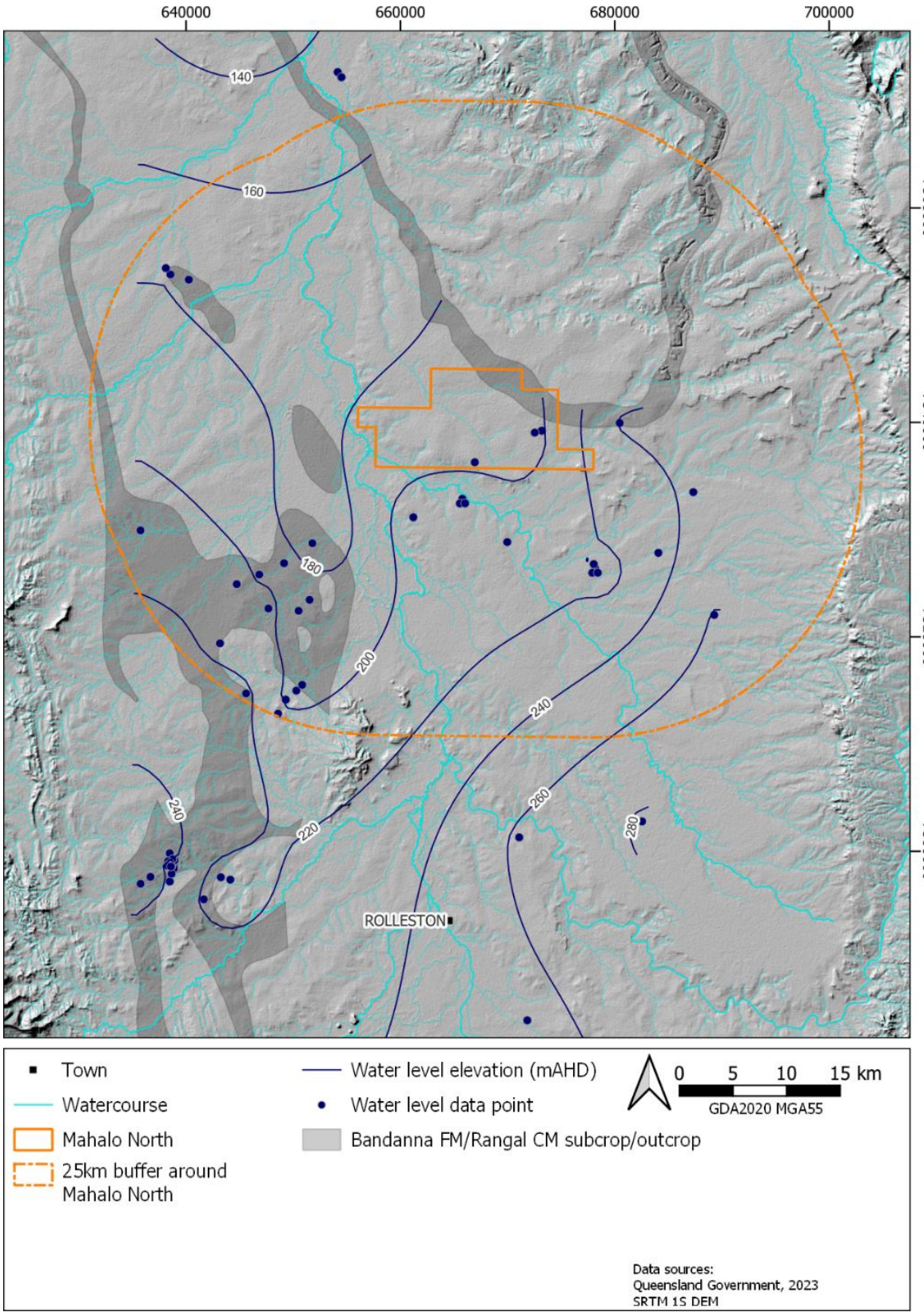


Figure 21. Water level elevation - Bandanna Formation/Rangal Coal Measures (RDM Hydro 2024)

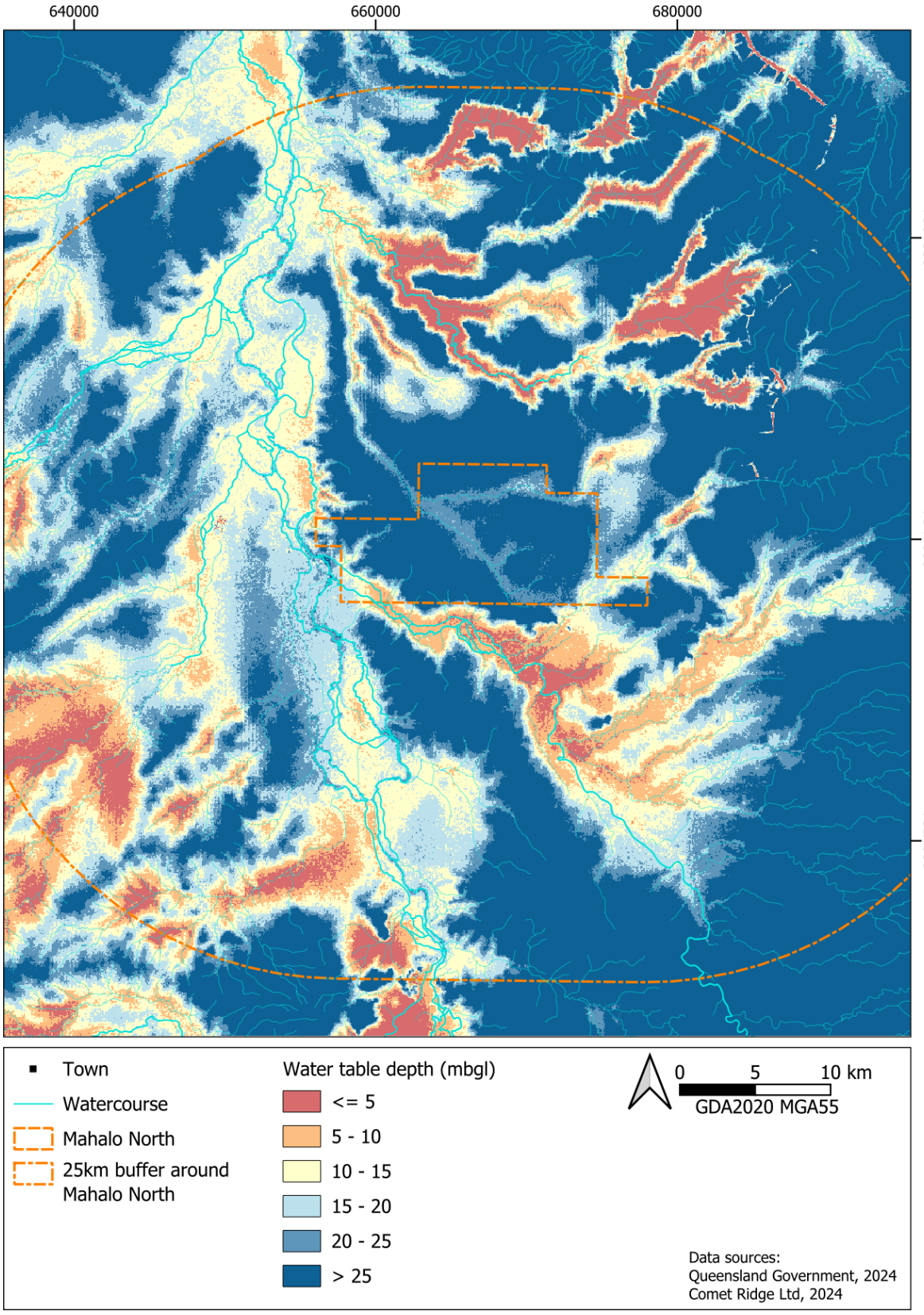


Figure 22. Water table depth (mbgl) (RDM Hydro 2024)

6.2.5 Surface Water Catchment

The Proposed action area is wholly within the Comet River catchment of the Fitzroy Basin. The topography across the Proposed action area generally falls from east to west, towards the Comet River, which is the main drainage feature in the region. Humboldt Creek, a tributary to the Comet River transects the southwestern corner of the Proposed action area.

Unnamed ephemeral watercourses drain the central parts of the Proposed action area, flowing into Sirius Creek near its confluence with the Comet River, approximately 18 km north of the Proposed action area.

Within the Proposed action area the elevation ranges from 190 m Australian Height Datum (AHD) to ~250 m AHD, with the outcrop of the Clematis Group forming the high ground of the Expedition Ranges to the east, rising to ~800 m AHD along the escarpment of the Clematis Group outcrop.

Daily discharge for three surface water gauging stations within the Proposed action area sourced from the Queensland Government Water Monitoring Information Portal (State of Queensland, 2023) are presented in **Figure 23**. Stations 130506A and 130510A (shown on **Figure 23**) on the Comet River are active gauging stations (upstream and downstream of the Proposed action area respectively), whereas 130505A on Humboldt Creek is no longer active. These streamflow data indicate:

- Flow in the Comet River and Humboldt Creek is ephemeral, with extended periods of no flow
- The majority of flow occurs during December to March, corresponding to the wet season
- In wetter periods, streamflow may be sustained through the dry season, indicating the potential for significant volumes of bank storage

The Geoscience Australia (2023) Water Observations from Space (WoFS) displays historical surface water observations derived from satellite imagery for the period 1987 to present. The frequency that surface water is observed based on the WoFS product indicates the following:

- Areas with permanent presence of water is limited to water storages such as irrigation dams, stock watering dams, mine pit lakes and tailings dams
- There is a distinct difference between the areas underlain by Quaternary Alluvium to the west of the Comet River and those underlain by Tertiary Strata to the east of the Comet River, with the former being lower lying and more frequently inundated, albeit with surface water detected on less than 5% of observation thus related to flooding
- Water is detected in less than 1% of observations along most of the Comet River except for small, disparate areas where pools may form after surface water flows
- Water is not detected along most of the smaller watercourses, including Humboldt Creek

The streamflow gauging data and the WoFS statistics support the assertion that the watercourses in the Proposed action area are of a non-perennial nature, which is further supported by the surface water monitoring undertaken on behalf of the Project by DPM Enviroscience (2023) (**Appendix D**).

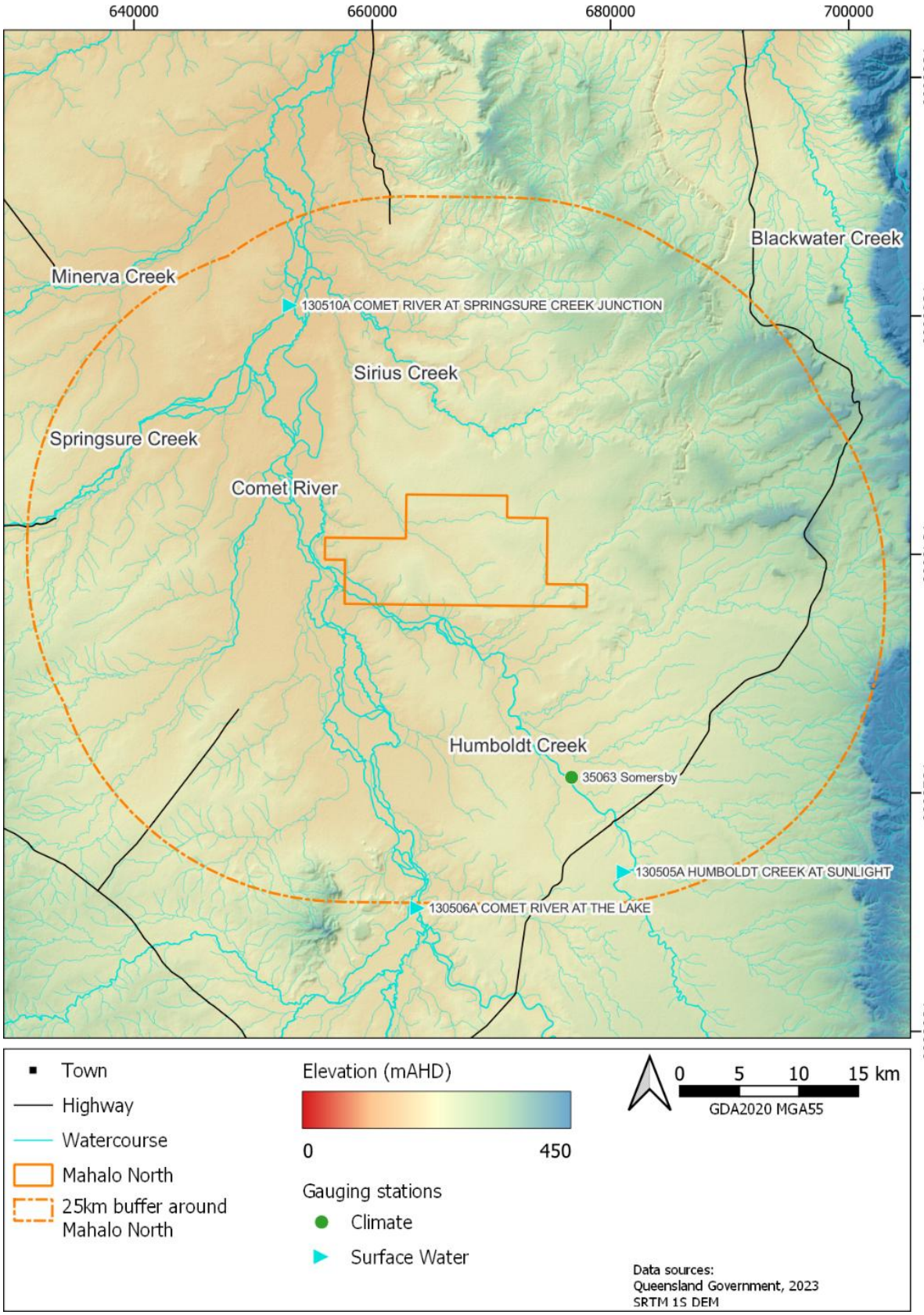


Figure 23. Topography and drainage (RDM Hydro 2024)

6.2.6 Surface and Groundwater Quality

Groundwater quality data has been sourced from the GWBD, Comet Ridge monitoring bores and baseline assessment samples from Comet Ridge samples of produced water from gas production pilots. Where multiple samples were available for a particular bore, the most recent sample with a suitable balance of major ions (+/- 10%) was used. Surface water samples collected by the Project have also incorporated.

A robust groundwater monitoring plan has been developed to provide spatially and temporally representative data across the four hydrostratigraphic units present; this plan is provided in full in the WMMP (**Appendix L**). The monitoring plan has been prepared in consideration of guidance provided by IESC (2024) and relevant water quality guidance documentation (i.e. ANZG 2018).

The WMMP (**Appendix L**) also outlines the surface water and stormwater monitoring works to be implemented across the catchment, at four strategic locations to allow for assessment of current baseline conditions, providing a robust reference point against which operational-period water monitoring can be assessed.

Conceptual groundwater and surface water models and analytical summaries will continue to be revised as monitoring continues to be conducted across the Proposed action area to ensure potential impacts are appropriately characterised and managed.

The electrical conductivity results of these water quality samples are summarised in **Figure 24**. Observations of the overall water quality characteristics based on information currently available include:

- The surface water samples and the samples from the alluvium generally show similar major ion composition, with a predominance of the bicarbonate anion (some chloride) and a more variable and mixed cation composition. Overall, the surface water and alluvium samples have the lowest salinities, except for the Project's monitoring bore (MN-MB1-a) installed in the alluvium which was highly saline. The otherwise general similarity between the alluvium and surface water samples suggests limited geochemical evolution of the rainfall recharge as it enters the alluvial aquifer. The dissimilarity of MN-MB1-a indicates that the permeable material within the alluvium may not be hydraulically connected spatially, with localised aquifers within the wider mapped alluvium
- The Tertiary Strata exhibit a wide range in water types, generally showing an evolution from mixed cations to a sodium dominance and an associated increase in chloride. There is no clear spatial pattern to this trend, with most of the samples from the southwestern portion of the study area. The variability in major ion composition and no clear spatial pattern suggest that the Tertiary Strata are internally heterogeneous with limited lateral connectivity between water-bearing zones. The Tertiary Strata generally have a brackish salinity, higher than the alluvium and surface water, but much fresher than the underlying Permian Strata. The relatively low salinity suggests relatively short residence time and a reasonably active hydrodynamic regime.
- Only five samples were available for bores attributed to the Rewan Group, two of which were the Project's shallow monitoring bores. These showed water chemistry tending towards sodium-bicarbonate-chloride, but with some variability and no discernible spatial trend. The salinity statistics for the Rewan Group are heavily skewed by the high salinity of the monitoring bores. Of the other three samples, the range in salinity was similar to the alluvium (and fresher than the Tertiary Strata), it is likely that this was affected by the small number of samples and the relatively shallow bore depths (21 - 100 m)
- Groundwater quality in the Bandanna Formation can be separated into two distinct groups: higher salinity (~4,000 – 10,000 mg/L TDS) sodium-chloride waters present in the central part of the study area, where the Bandanna is separated by the Rewan Group and/or Upper Permian Formations and lower salinity (<1,000 mg/L) sodium-bicarbonate waters in the southwestern portion of the study area where the Bandanna Formation subcrops directly beneath Quaternary or Tertiary Strata. It is likely that there is direct hydraulic connection between the cover and the Bandanna Formation in the southwest of the Study area that allows recharge of fresher water to the Bandanna Formation. The higher salinity samples are mostly from CSG pilot wells that are also deeper than surrounding

water bores. This indicates long residence times and limited hydraulic connection with fresher, surficial waters
- There are only seven samples from the Upper and Lower Permian Formations combined. Their major ion chemistry is relatively similar with sodium-bicarbonate-chloride water, however the Upper Permian formations appear to be fresher than the Lower Permian formations

A general grouping of Project collected water samples by source is evident with a distinct difference between the surface water (low TDS, low chloride, and highly variable cations) and groundwater quality (**Figure 25**). Furthermore, while there is some overlap between the basalt water quality and the Bandanna Formation, the different source formation generally plot separately, suggesting limited interaction.

Other observations include:

- A basalt bore which appears to have similar chemical properties to a surface water sample. This bore is immediately adjacent to the Comet River, which may provide a localised recharge source. The surface water sample adjacent to which in plots on the Durov diagram was not collected from close proximity to the bore
- A basalt bore which has similar chemical properties to the Bandanna Formation. The lithological log for this bore is poor, therefore it is possible that some of its supply is sourced from the Bandanna Formation and the bore is incorrectly attributed
- The sample collected from the Comet River alluvium is significantly more saline (20,000 mg/L) than the surface water samples, basalt and Bandanna Formation samples, and is only exceeded by one of the Rewan Formation bore samples. The distinct stratigraphic differences in the groundwater salinity, with the most saline samples coming from shallowest in the profile are indicative of poor hydraulic connectivity.

Stable isotopes were analysed from samples collected from the Project's monitoring bores (**Figure 26**) for the primary purpose of assessing the source of the water used by potential terrestrial GDEs and secondary objective of improving understanding of the recharge regime. Two rounds of stable isotope analysis had been performed at the time of preparation of the GIA. The following observations can be made when this data is compared with local meteoric water lines (LMWL) for Brisbane and Charleville and spot rainfall data for Injune and Clermont:

- The similarity between the Charleville LMWL, Brisbane LMWL and the spot samples (albeit limited in number) suggest the LMWL likely provides a reasonable representation of the local isotopic conditions of rainwater at the site
- The three groundwater samples plot on a line that is offset from the LMWL but with a relatively similar gradient. The samples do not have an evaporative signature, which would be shown by samples plotting on a line with a flatter gradient relative to the LMWL. This suggests that the groundwater samples are unlikely to be recharged under the current climatic conditions. This is consistent with the low permeability of the formation (particularly MN-MB5-R and MN-MB6-b) and high TDS, both of which suggest low recharge rates and longer groundwater residence times
- The shift in isotopic composition of the groundwater samples is likely due to the influence of the introduction of compressed air into the formation during drilling (particularly MN-MB1-a) and the groundwater's subsequent re-equilibration.

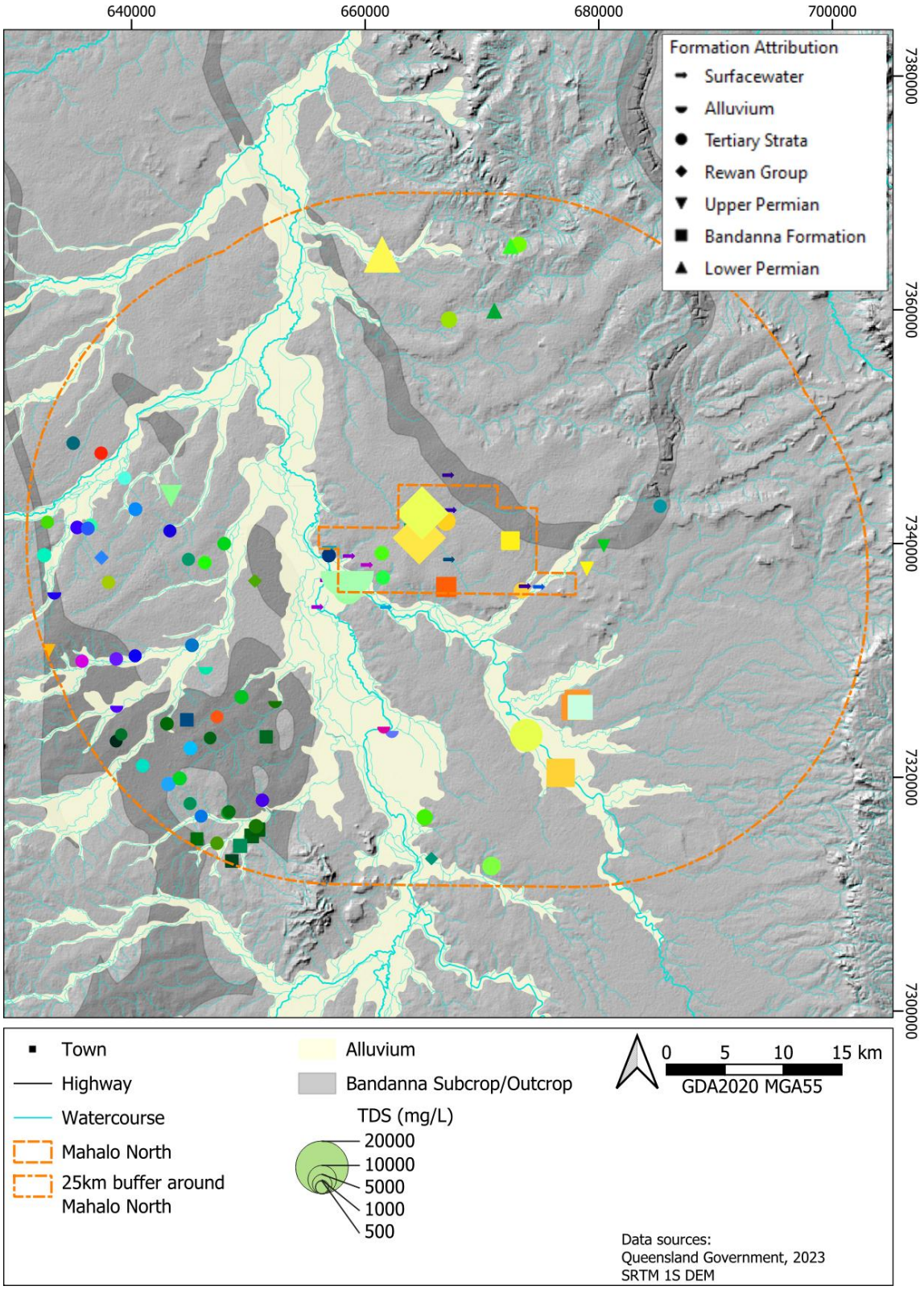


Figure 24. Water quality samples plotted by water type and electrical conductivity (RDM Hydro 2024)

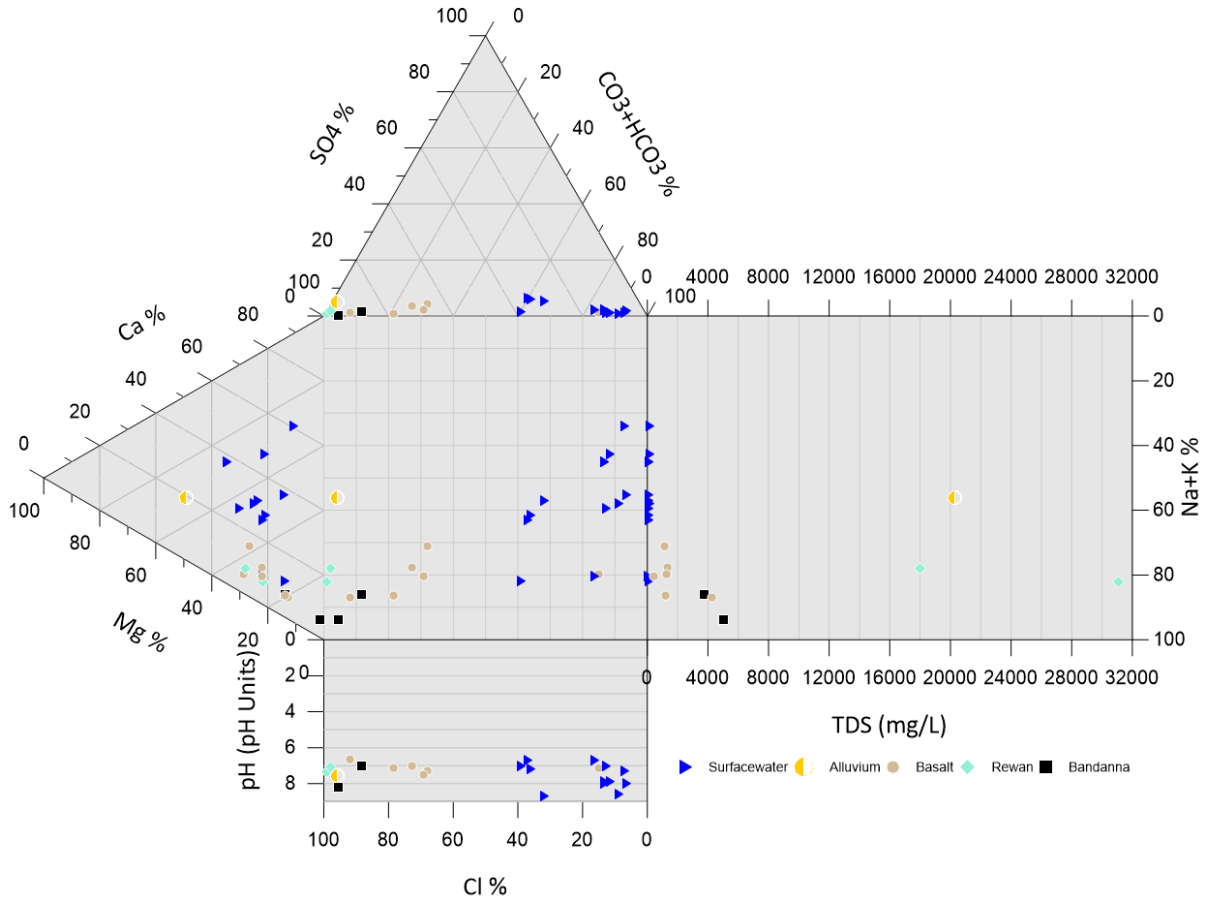


Figure 25. Durov diagram of site-specific water quality data (RDM Hydro 2024)

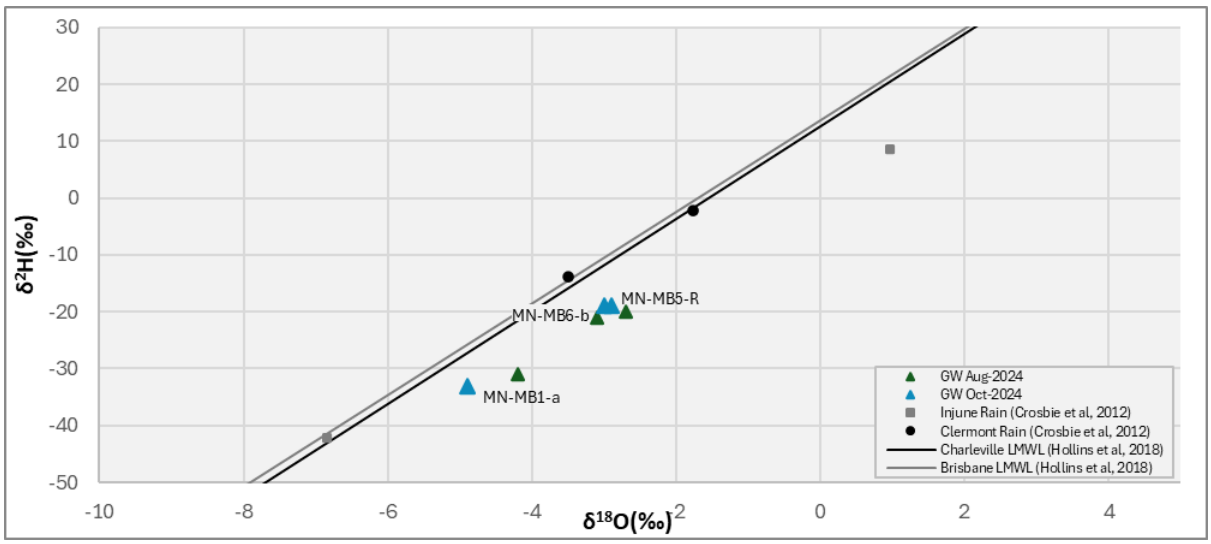


Figure 26. Stable isotope results relative to LMWL (RDM Hydro 2024)

6.3 Environmental Values

The environmental values (EVs) of water are the qualities that make it capable of supporting aquatic ecosystems and human uses. The Queensland Government's *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (EPP Water and Wetland Biodiversity) is the primary regulation through which the EVs of waterways in Queensland are protected. The following EVs are applicable to the Proposed action area:

- Aquatic ecosystems associated with high ecological value, slightly disturbed moderately disturbed and highly disturbed waters
- Irrigation
- Farm Supply/Use
- Stock watering
- Primary recreation
- Drinking water
- Industrial use
- Cultural and spiritual values.

The exercise of underground water rights has the potential to impact on these EVs through the degradation of water quality or the reduction in water availability through depressurisation. The EVs are supported by either groundwater supply bores (e.g. aquaculture, agriculture, drinking water and industrial use) or through the surface expression of groundwater via springs and baseflow to surface water bodies and their associated wetlands (e.g. aquatic ecosystems, recreation and cultural and spiritual values). Aquatic ecosystems also include terrestrial GDEs, for which there may not be a surface expression of the groundwater.

The EVs within the vicinity of the Proposed action area are described in the following sections.

6.3.1 Groundwater Bores

Of the 426 registered bores identified within the Study area:

- 21 were petroleum or CSG wells
- 53 were monitoring or investigation bores
- 352 were presumed to be used for water supply purposes, of which 277 are still active and 75 are inactive.

The number of active water supply bores per attributed formation is listed in **Table 20**. The vast majority of active water supply bores in the GIA Study area access the Tertiary strata, predominantly the basalt, and are located to the west and southwest of the Proposed action area. Within the Proposed action area, one active water supply bore was identified that accesses the Bandanna Formation, and one that accesses the Rewan Formation. There are several bores that access the Bandanna Formation Rewan Formation to the southwest and west of the Proposed action area.

In 2021, and in accordance with its Baseline Assessment Plan, Comet Ridge completed bore baseline assessments across two of the properties within the Proposed action area (Terra Sana, 2021a and 2021b). A total of nine active groundwater bores were identified, of which four were considered unregistered. All bores were indicated to source their water from the Tertiary Basalt and were all used for stock watering.

The groundwater monitoring network nominated for continued monitoring includes landholder bores, GDE monitoring bores, stormwater monitoring bores (seepage detection) and clustered bores targeting multiple hydrogeological features. Monitoring frequency for the network ranges includes a variety of monthly, quarterly, biannually, annually and event-based monitoring events. Detailed information on the monitoring network and the ongoing monitoring program is provided in **Appendix L**.

Figure 27 shows the locations of water licenses. For groundwater-related licences, the most intensive authorised purpose has been shown. The "other" category includes purposes identified as agriculture, aquaculture or other. From **Figure 27**, there are no groundwater licences within the Proposed action area but there are surface water licences immediately surrounding and within the Proposed action area. There are irrigation, stock intensive and other purpose groundwater licences in the southwest of the Proposed action

area, with one licence at the north of the Proposed action area. The majority of the groundwater licences authorise extraction from the Tertiary Strata (basalt) or alluvium.

Table 20. Aquifer attribution of active water supply bores within the Study area (RDM Hydro 2024)

Unit	Number of bores
Alluvium	35
Tertiary Sediments	5
Basalt	168
Rewan Group	17
Upper Permian	7
Bandanna Formation	23
Lower Permian	22
Total	**277**

6.3.2 Groundwater Dependent Ecosystems

The broad types of GDEs are (Eamus et al., 2006):

- Aquatic GDEs - Ecosystems dependent of surface expression of groundwater including springs, groundwater fed wetlands or baseflow fed streams or rivers;
- Terrestrial GDEs - Ecosystems dependent on sub-surface use of groundwater; and
- Subterranean GDEs – stygofauna habitat

Further details of each of these types of GDEs has been discussed in the following sections.

6.3.2.1 Aquatic GDEs

The locations of the nearest springs to the Proposed action area and the mapped confidence in the presence of springs and watercourse springs and wetlands in the vicinity of the Proposed action (**Figure 28**). Notable observations from **Figure 28**:

- The closest mapped springs (verified and are named the Kullanda complex) are approximately 28 km east of the Proposed action area. They have been identified to be sourced from the Clematis Group. They are identified as riverine springs in the upper catchments of active watercourses
- The Arduarad complex is located approximately 32.5 km to the northeast of the Proposed action area and comprises two springs vents – Arduarad and Rockland. The mapping identifies these springs to be sourced from the Clematis Group
- Additional springs are present within the Expedition Ranges and Blackdown Tablelands. These are all underlain by the Clematis Group
- The closest spring complexes identified to host a listed species under the EPBC Act or host a community of native species dependent on natural discharge of groundwater from the Great Artesian Basin, and hence be classified as a MNES in their own right are the:
  - Cleanskins complex, approximately 46 km to the east of the Proposed action area
  - Elgin complex, over 55 km southeast of the Proposed action area
- Several short reaches of moderate confidence aquatic GDEs are mapped along and within approximately 3 km of the Proposed action area. These are identified to be locally recharged, unconfined and associated with the Tertiary Strata (basalt) which underlies them
- There is a roughly 250 m length of high confidence mapped aquatic GDE to the south of the Proposed action area, with the same characteristics as the surrounding moderate confidence mapped aquatic GDEs
- There is a moderate confidence aquatic GDEs mapped within the northern portion of the Proposed action area, with the same characteristics as the surrounding moderate confidence mapped aquatic GDEs
- Across the Proposed action area, the water table depth (within the Tertiary Strata) is estimated to be 20 m to 40 m below ground level. These mapped aquatic GDEs are unlikely to be supported by

the regional groundwater system but may be supported by shallow short flow path groundwater flow systems

- Within the wider GIA Study area, particularly to the west of the Proposed action area, there are extensive reaches of watercourses mapped as high to moderate potential aquatic GDEs.

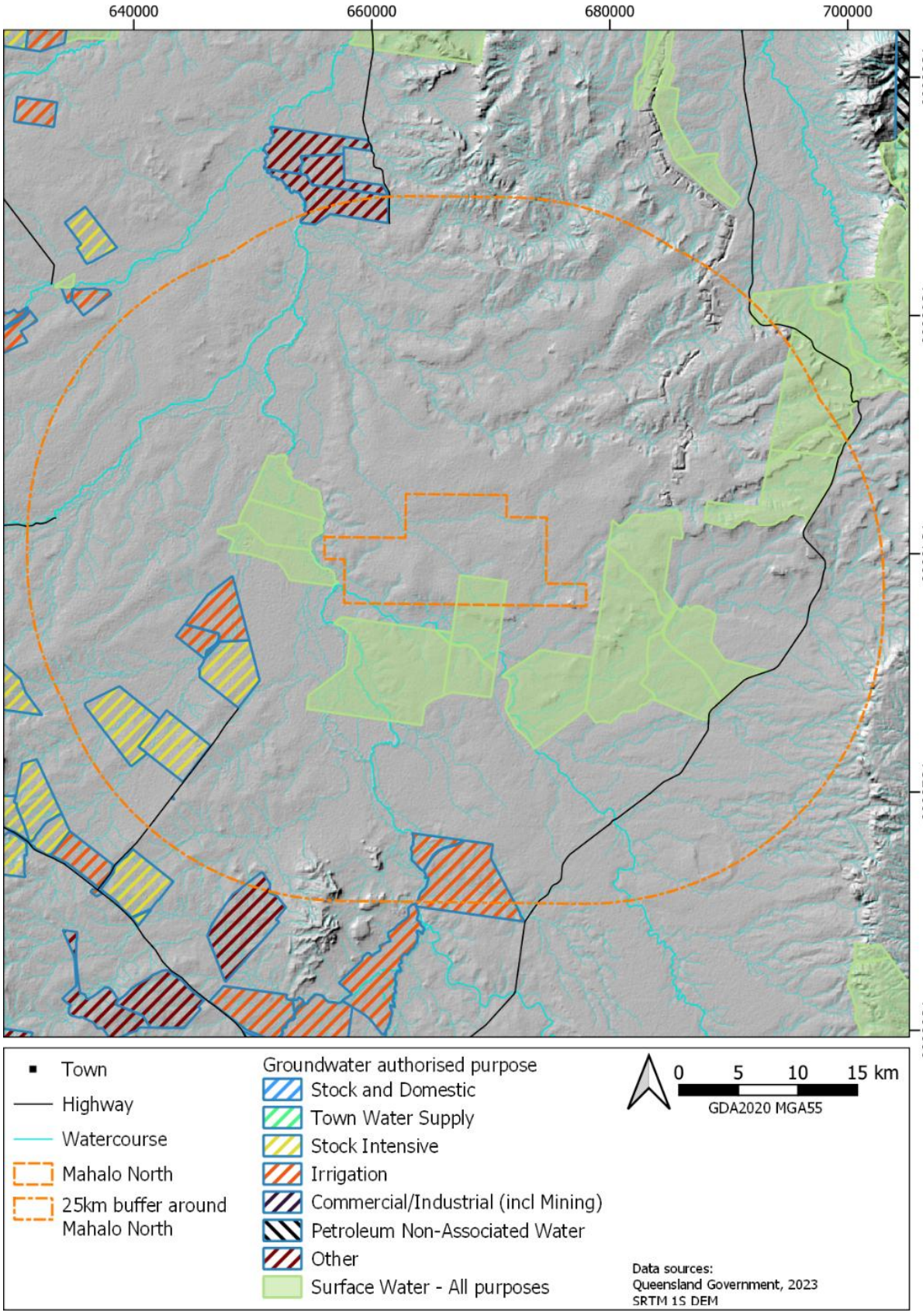


Figure 27. Water licence locations and authorised purpose (RDM Hydro 2024)

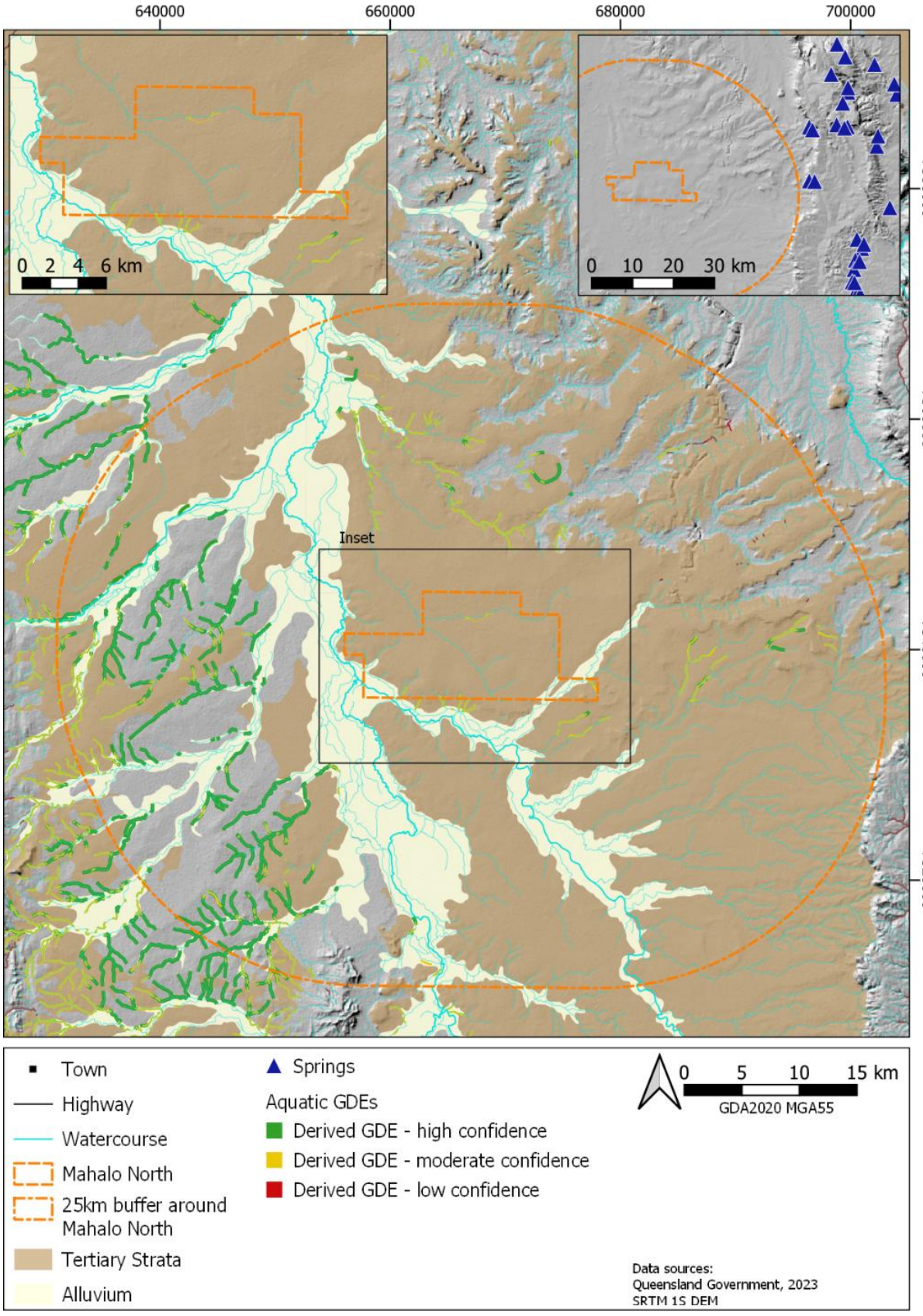


Figure 28. Mapped locations of aquatic GDEs (RDM Hydro 2024)

6.3.2.2 Terrestrial GDEs

Comet Ridge engaged Watermark Eco to undertake the terrestrial GDE assessment. A summary of this assessment is provided in **Section 5.3** and the complete report is provided in **Appendix E**.

6.3.2.3 Subterranean GDEs

Stygofauna are predominantly crustaceans that are between 0.3 mm and 15 mm in length (Humphreys 2006). They are predominantly found in aquifers with large (mm or greater) pore spaces, especially alluvial, karstic and some fractured rock aquifers (Hose et al. 2015). The size of the pore spaces is a key determinant of the suitability of an aquifer as stygofauna habitat. Stygofauna have been recorded occasionally in coal seam aquifers, particularly where those aquifers are hydrologically connected to a shallow alluvial aquifers (Hose et al. 2015). Hose et al. (2015) indicates the following related to the presence of stygofauna:

- The abundance and diversity of stygofauna typically decreases with depth below ground. Stygofauna are rarely found more than 100 m below ground level.
- Stygofauna are found across a range of water quality conditions (from fresh to saline), but most common in fresh and brackish water (electrical conductivity less than 5,000 µS/cm).
- Stygofauna are rarely found in hypoxic groundwater (< 0.3 mg O2/L).
- Stygofauna are more abundant in areas of surface water-groundwater exchange, compared to deeper areas or those further along the groundwater flow path remote from areas of exchange or recharge.

In the context of the Project, it is unlikely that stygofauna will be present within the target coal seams due to the depth below ground level. However, there is the potential for stygofauna to be present within the alluvial and basalt aquifers, which are shallower in depth, and likely be a more favourable habitat for stygofauna (e.g. more suitable water quality and nutrients available and larger pore spaces).

6.3.2.4 GDE Monitoring

The ongoing monitoring of potential risks to GDEs will be assessed through a groundwater monitoring network installed within the alluvium, proximate to the potential GDE location. The monitoring network is described in the WMMP (**Appendix L**), alongside details of the ongoing monitoring program and mitigation and management measures.

6.4 Summary Conceptual Hydrogeological Model

The following item form the basis of the assessment of potential impacts associated with the Project on the groundwater environment and its associated users (both human and environmental):

- The target for the CSG production is the Bandanna Formation of the Bowen Basin. The Bandanna Formation dips to southwest through the Proposed action area, and subcrops beneath Tertiary-aged strata in the north of the Proposed action area. The Bandanna Formation comprises interbedded mudstone and siltstone with relatively thin coal seams that are regionally distinguishable but not regionally continuous. The coal seams are water (and gas) bearing, whereas the interburden forms aquitards. Small scale faulting may connect the individual coal seams
- The Project will target CSG development at depth of roughly 120 mbgl to 220 mbgl. CSG will be produced via pairs of lateral and vertical wells. The laterals will be approximately 1,500 m long
- The Tertiary-aged strata comprises basalt and sediments, which cover the majority of the Proposed action area. The Tertiary Strata forms the main productive aquifer in the region. The aquifer is heterogeneous with limited lateral and vertical connectivity between individual water beds as evidenced by the variability in groundwater chemistry and water level responses to rainfall recharge
- The area where the Bandanna Formation subcrops beneath the Tertiary-aged strata is a potential hotspot for water level drawdown due to the greater potential for hydraulic connectivity. This area is located in the northeast corner and to the north of the Proposed action area

- Quaternary-aged alluvium is associated with the Comet River and its larger tributaries. The alluvium is hydrogeologically dynamic, with fluctuations in water level (observed up to 1 m) directly related to rainfall events, and water quality similar to surface water. While the alluvium may host aquifers, site-specific data (specifically the groundwater chemistry) indicates that these aquifers may be hydraulically disconnected from each other and the river. Information relating to the interconnectivity of the aquifers is discussed in the RCP (**Appendix M**) and summarised in **Section 6.2.3**
- The Rewan Formation, a regional scale aquitard, separates the Bandanna Formation from the overlying Tertiary Strata downdip of the sub-crop. Water quality stratification, with the Rewan Formation being significantly more saline than both the overlying Tertiary Strata and the underlying Bandanna Formation provides evidence of the low permeability of the Rewan Formation on sub-regional scale
- Faults are mapped to the southwest of the Proposed action area. These faults are of Permian or earlier age and therefore do not penetrate the Tertiary Strata. However, the subcropping of the faults may provide a conduit between the production zone and the Tertiary Strata. The hydraulic nature (sealing or conductive) of the fault is uncertain, however the argillaceous nature of the lithologies of the Bowen Basin formations suggests that it is more likely to be sealing
- The regional water table is predominantly hosted by the Tertiary Strata, and is estimated to be at depths of between 20 mbgl and 40 mbgl across the Proposed action area
- There appears to be a downward hydraulic gradient between the Tertiary Strata and the underlying Bowen Basin geology. The hydraulic gradient between the Tertiary Strata and the alluvium varies depending on preceding rainfall and location
- The watercourses within the Proposed action area are ephemeral and typically flow only during significant rainfall events. Pooled water may remain for many months after significant rainfall events
- Potential terrestrial GDEs associated with the watercourses, if groundwater dependent at least in part, would likely source the groundwater from the alluvial sediments. However, the observed salinity of the groundwater alluvial sediments may preclude its use by vegetation
- The closest Spring complexes are present over 25 km to the west of the Proposed action area and are associated with the Clematis Group. There is no mapped Clematis Group within the Proposed action area
- Groundwater is primarily used for stock purposes, with some irrigation use, and predominantly from the Tertiary Strata. There are no licensed groundwater allocations within the Proposed action area

Based on this conceptual understanding, the following potential impact pathways may be realised from the Project:

- CSG production will necessarily reduce the pressure in the Bandanna Formation to enable gas desorption and production. The pressure reduction may result in water level drawdown in overlying hydrostratigraphic units
- Where the Bandanna Formation subcrops beneath the Tertiary Strata creates an area where the intervening aquitard(s) (primarily the Rewan Formation) are thin and/or absent, providing a more direct pathway to induce drawdown in surficial aquifers that may host potential GDEs and water courses
- Faults may provide potential preferential pathways to propagate drawdown between the Bandanna Formation and the Tertiary Strata (potential hotspot)

6.5 Assessment Method

Potential groundwater level drawdown associated with the Project has been assessed using multilayered transient numerical groundwater flow models. The Proposed action area is in the northern extent of the Surat CMA where there is lower confidence in the Surat CMA UWIR model due to the sparsity of data with which to

construct it. To address the lower confidence, a multi-model approach has been employed to assess predicted drawdowns:

- The 2021 Surat Cumulative Management Area (CMA) Underground Water Impact Report (UWIR) model was used as a base case to assess the potential Project case and Cumulative case drawdown predictions. OGIA ran the model based on the development scenario provided by Comet Ridge.
- OGIA used the Surat CMA UWIR model to perform uncertainty analysis of drawdown predictions utilising 550 stochastic parameter sets and model files from the 2021 UWIR numerical groundwater model. Model output was provided as 5th (best case), 50th (most likely case) and 95th percentile (worst case) probability predictions and was only provided for the Cumulative Case
- A site-specific numerical groundwater flow model constructed using the Comet Ridge geological model through the heart of the Proposed action area and calibration to the Mahalo North 1 pilot data. This model was primarily used to assess the potential drawdown associated with the potential effects of the local faulting and the hydraulic properties of the Tertiary Strata on the surficial aquifers

6.5.1 Surat CMA UWIR model

For the Surat CMA, OGIA has developed a regional scale numerical groundwater flow model to predict groundwater level drawdown resulting from the cumulative development of multiple CSG, conventional petroleum and coal mining within the Surat and southern Bowen Basins. OGIA was engaged by Comet Ridge to assess the water level drawdown associated with the Project in isolation and through its incremental increase in water level drawdown associated with the cumulative regional development.

OGIA provided two sets of model output:

- The 2021 UWIR predictions, which accounts for the cumulative drawdown excluding the Project
- Predictions of the cumulative drawdown from the 2021 UWIR model development scenario including the Project

The predicted drawdown associated with the Project as a standalone development was calculated by subtracting the former from the latter output. In addition, uncertainty analysis predictions from 550 model runs using stochastic parameter sets were provided for the cumulative development scenario (i.e. inclusive of the 2021 UWIR development and the Project for key layers only).

Detailed descriptions of the hydrogeological conceptualisation that underpins the numerical groundwater flow model and the construction of the numerical groundwater flow model can be found in the following reports, with a brief summary provided in **Table 21:**

- OGIA (2016) Hydrogeological conceptualisation report for the Surat Cumulative Management Area.
- OGIA (2021b) Geology and 3D geological models for Queensland's Surat and southern Bowen basins
- OGIA (2019) Groundwater Modelling Report Surat Cumulative Management Area
- OGIA (2021c) Modelling of cumulative groundwater impacts in the Surat CMA: approach and methods

Table 21. Summary of the OGIA regional groundwater flow model construction

Component	Description
Platform	Modflow-USG with modifications for: • Simulation of water desaturation due to gas production in coal seams around CSG wells • More accurate representation of CSG wells using a descending MODFLOW drain methodology • Simulation of reinjection of treated CSG water into the Precipice Sandstone
Domain	The numerical model domain extends beyond the boundaries of the Surat CMA (refer **Table 22**), with an extent of 460 km x 650 km.

Component	Description
Layering	The model comprises 35 layers, of which layers 25 to 35 represent the Bowen Basin formations Layer 1 represents the overlying Tertiary strata. The individual coal seams are not discretely modelled. The layers representing the coal seams are modelled with a dual-domain set-up to encourage strong vertical head gradients.
Parameterisation	Initial hydraulic parameters were assigned in a two-step upscaling process: • Hydraulic properties are assimilated from local measurements and assigned to pilot points using numerical permeameters • Hydraulic properties are spatially interpolated from the pilot points to all of the nodes of the model grid The initial parameter estimates were then calibrated through comparison with a range of groundwater level and other observation targets incorporated into the regional model calibration workflow. Maps of the final calibrated horizontal and vertical hydraulic conductivities for the model layers relevant to the Project are included in Appendix D of the GIA (**Appendix G**).
Faults	Thirty-five regional scale faults represented as "non-neighbourhood connections" to simulate flow from one stratigraphic unit to another across the fault plane. The fault width and damage zone were estimated from geophysical logs where available. The Arcturus and Inderi faults, located to the southwest of the Proposed action area was not explicitly incorporated.
Calibration	Three stage calibration of the groundwater flow model: • **Steady-state pre-development (1947)**: to replicate conditions that existed prior to the commencement of any significant groundwater extraction • **Steady-state pre-CSG (1995)**: to replicate groundwater conditions prior to the commencement of CSG extraction • **Transient (1995-2020)**: to replicate the initiation and expansion of CSG, initially in the Bandanna Formation (Bowen Basin) and then including the Walloon Coal Measures (Surat Basin)
Uncertainty analysis	Calibration-constrained uncertainty analysis that attempts to express all heterogeneity in a manner that is geologically sensible remaining consistent with historical system response. Performed as Null Space Monte Carlo Analysis using PEST and ultimately providing 550 realisations.

Table 22. Groundwater model layering relevant to the Proposed action area (after OGIA, 2023)

Model Layer	Formation	Classification
1	All Alluvium and Basalt (including Main Range Volcanics)	Partial aquifer
27	Rewan Group	Tight aquitard
28	Bandanna Formation non-productive zone	Interbedded aquitard
29	Upper Bandanna Formation	Interbedded aquitard
30	Lower Bandanna Formation	Interbedded aquitard
31	Lower Bowen 1	Interbedded aquitard

6.6 Groundwater Impact Assessment

Groundwater extraction is necessary to depressurise the coal seams to enable the gas to be liberated and produced. The water and gas will be produced via 34 pairs of horizontal and vertical wells. The right to extract water in association with gas production is conferred to the tenure holder under the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act), however the tenure holder is then subject to obligations under the *Water Act 2000* (Water Act), which identify triggers and management measures required to mitigate potential impacts due to the exercise of underground water rights by the tenure holder.

Potential impacts due to CSG water production include:

- Decline in groundwater level / pressure at water bores, reducing water availability for its authorised use
- Reduction in groundwater head resulting in a reduction of groundwater discharge at springs, potentially causing degradation of GDEs

- Increase in water table depth resulting in a reduction of the availability of groundwater to terrestrial GDEs
- Reduction of baseflow to watercourses, potentially resulting in degradation of GDEs and reduced water availability to potential users downstream

These potential impacts, where receptors exist within the vicinity of the Proposed action area, have been assessed against the Water Act trigger thresholds.

Other potential impacts to groundwater associated with the Project include:

- Potential to introduce a connection between hydrostratigraphic units, which were previously isolated units, through drilling and construction of CSG production wells, resulting in the potential for alteration of groundwater flow regimes and quality
- Degradation of groundwater quality from:
  - drilling fluids and additives used during the drilling process
  - seepage or unplanned releases from CSG water surface storages,
  - fuel or chemicals leaks and spills resulting in localised potential impacts to soil and groundwater
- Salinisation or waterlogging is CSG water is used to irrigate in an inappropriate manner.

Throughout Project operations, ongoing regular groundwater and surface water monitoring will be undertaken to enable early identification of any potential impact resulting from the exercise of underground water rights. Detailed information on the monitoring network to be incorporated into the ongoing monitoring program, including the monitoring infrastructure, rationale, monitoring frequency and analytical suites is provided in the WMMP (**Appendix L)**.

6.6.1 Predicted Impacts to Environmental Values

The *Water Act 2000* (Water Act) identifies the bore trigger threshold for water level decline as 5 m for a consolidated aquifer and 2 m for an unconsolidated aquifer. For spring impacts, the trigger threshold is defined as a water level decline of 0.2 m. Since the Water Act does not define a trigger threshold for terrestrial GDEs, the spring trigger threshold has been utilised (in alignment with the JIF).

6.6.1.1 Potential Impacts to Water Supply Bores

Potential long-term impacts to groundwater bores have been assessed against the Water Act bore trigger threshold of 2 m for an unconsolidated aquifer (i.e. alluvium) and 5 m for a consolidated aquifer (i.e. the Tertiary Strata and the Bowen Basin units) using the outputs and drawdown predictions from the UWIR numerical model. The maximum predicted drawdown has been used for this assessment, irrespective of the timing of the predicted drawdown.

Many of the groundwater bores within the vicinity of the Proposed action area are constructed to intersect multiple formations. However, given the uncertainties in the attributed formations, and for conservatism in undertaking the impact assessment, the potential impacts against the OGIA bore attribution have also been assessed. Where bores were attributed to multiple formations, the impacts have been assessed against the maximum predicted drawdown for each model layer that the bore is attributed to. For example, if the bore is attributed to the basalt (layer 1) and the Bandanna Formation (layers 29 and 30), the maximum predicted drawdown at the bore's location in model layers 1, 29 and 30 was extracted, and the maximum of those values was assigned to the bore for the purposes of assessing potential impacts.

Only active water supply bores have been included in the assessment (per **Table 20**). A summary of the numbers of bores for which the maximum predicted drawdown exceeded the Water Act trigger threshold for both the Project Case and the Cumulative Case is provided in **Table 23**.

For the Project Case no bores are predicted to be impacted using either the aquifer attribution assigned by this study or by OGIA (2023). Sensitivity Case 9 of the site-specific model prediction results in the predicted drawdown exceeding the trigger threshold in one bore located within the Proposed action area.

For the Cumulative Case, only two bores are predicted to exceed the Water Act trigger threshold for both attributions, however only one bore is common to both datasets. The bore predicted to be impacted in the site-specific model and the UWIR model, and common to both interpretations is located within the Proposed action area and is identified to be 100 m deep, with two thin coal seams present at 64 mbgl and 85 mbgl, which roughly corresponds to the top Bandanna Formation coal seam (Aries seam) in the Comet Ridge geological model. The UWIR model does not discretise the individual coal seams and therefore, under responsible tenure holder rules for the Surat CMA, the Project will be responsible for 'make good' obligations.

The other two bores are located more than 10 km from the Proposed action area with the majority of predicted drawdown again due to the effects of other tenure holders.

The locations of the bores where the trigger threshold is predicted to be exceeded are shown on **Figure 29**.

Table 23. Numbers of bores with predicted drawdown exceeding the Water Act trigger thresholds

Hydrostratigraphic Unit(s)	Model Layer(s)	Project Case[1]		Cumulative Case – Base Case	
		This study[2]	OGIA	This study[2]	OGIA
Alluvium and Tertiary Strata	1	0	0	0	0
Rewan Formation	27	0	0	0	0
Bandanna Formation Non-productive zone	28	0	0	0	0
Bandanna Formation	29,30	0	0	2	2
All underlying units	31	0	0	0	0

[1] Includes both the Surat CMA UWIR model predictions and the site-specific model predictions
[2] Refers to the registered water bore formation attribution performed for this study.

To further support the UWIR model presented, further assessment was undertaken as described in the Project WMMP (**Appendix L**) and the RCP (**Appendix M**).

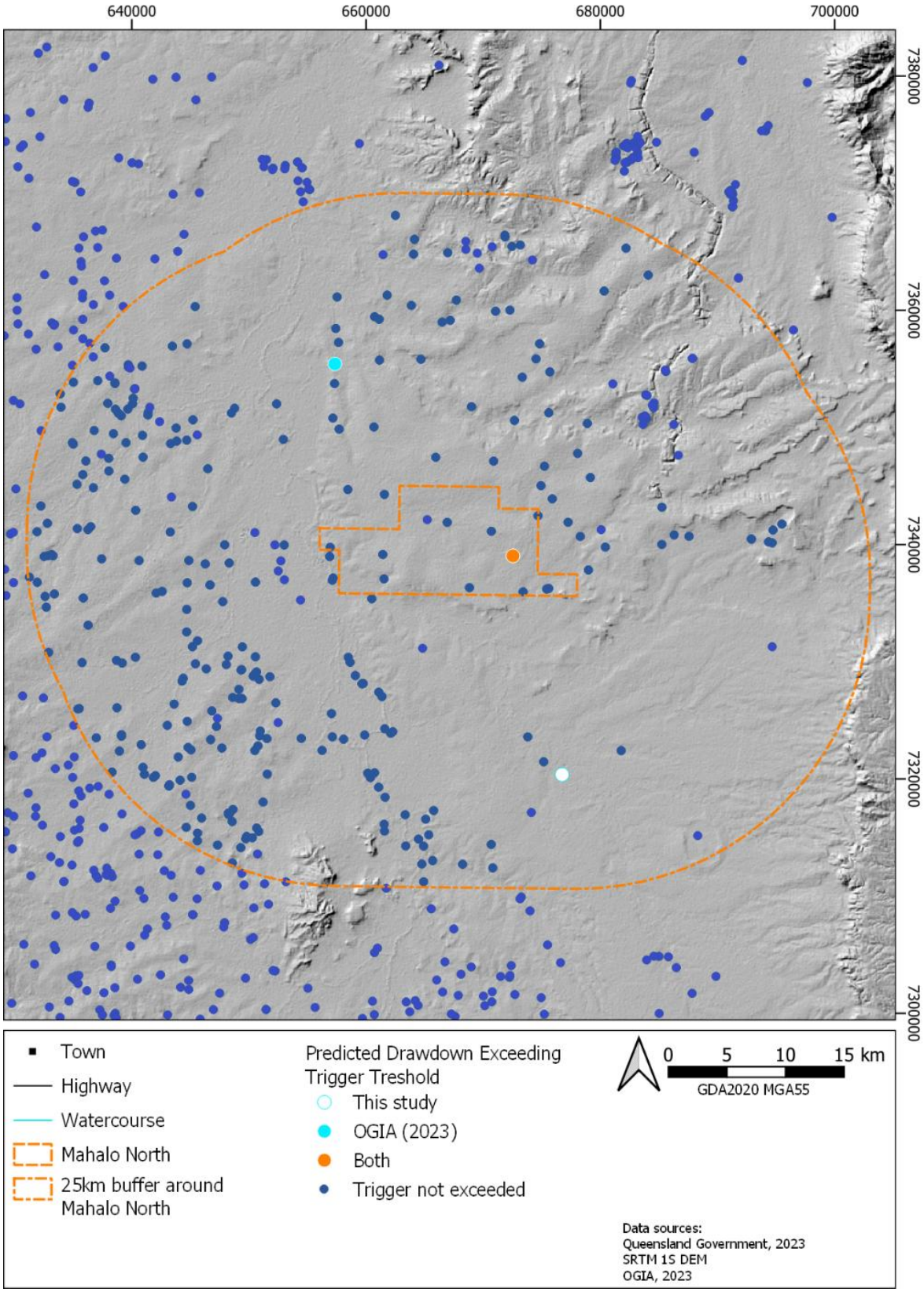


Figure 29. Cumulative case - bores where Water Act trigger threshold is predicted to be exceeded (RDM Hydro 2024)

6.6.1.2 Potential Impacts to Springs

The closest identified springs are roughly 27.5 km to the east of the Proposed action area. These springs are identified to be sourced from the Clematis Sandstone. The Clematis Sandstone is not present in the Proposed action area and there is no drawdown predicted in the Clematis Sandstone in either the Project Case or the Cumulative Case.

There are no springs identified within the maximum extent of drawdown exceeding the Water Act spring trigger threshold (0.2 m) for the Rewan Formation (model layer 27), the Bandanna Formation (model layers 28, 29 and 30) or the underlying Bowen Basin Formations (model layer 31) for either the Project Case or the Cumulative Case. There are no predicted impact to springs from the exercise of underground water rights by the Project.

6.6.1.3 Potential Impacts to Watercourse Springs and Associated Aquatic GDEs

Mapped areas of aquatic GDEs associated with the watercourses are identified to have intermittent groundwater connectivity. The majority of mapped aquatic GDEs are identified to be associated with alluvial or basalt aquifers, which are both included in layer 1 of the Surat CMA UWIR model.

In the absence of specific trigger values for watercourse springs, the 0.2 m drawdown value applied to springs is used as a screening value. Predicted drawdown values in layer 1 of the model do not exceed 0.2 m, for either the Project Case or the Cumulative Case.

There are some areas where consolidated sedimentary rock aquifers with an intermittent groundwater connectivity regime were identified. These areas were outside of the Proposed action area, and are associated with local scale groundwater flow systems. They will therefore not be affected by predicted water level drawdown.

There will be no predicted impact to watercourse springs and associated aquatic GDEs from the exercise of underground water rights by the Project.

6.6.1.4 Potential Impacts to Terrestrial GDEs

Since there is no trigger threshold for terrestrial GDEs defined by the Water Act, the spring trigger threshold of 0.2 m is adopted.

Terrestrial GDEs are potentially located in the riparian zones of watercourses, and likely source groundwater from the alluvial aquifers. Site-specific investigations of woody vegetation (Watermark Eco 2024) (**Section 5.3** and **Appendix E**) concluded that the Brigalow and eucalypts across the Proposed action area utilise moisture from the shallow soil profile, consistent with previous studies. Furthermore, the regional water table depth and salinity (30,000 µS/cm) render vegetation use unlikely, therefore the woody vegetation is unlikely to be groundwater dependent.

The predicted drawdown in the surficial layer of the model, representing the alluvium and the Tertiary Strata did not exceed the adopted trigger threshold (0.2 m) in the either the Project Case or the Cumulative Case model predictions.

There will be no planned discharges to watercourses from the Project. There will therefore be no impact to terrestrial GDEs from the exercise of underground water rights by the Project.

6.6.1.5 Potential Impacts to Subterranean Fauna

Numerical modelling, including 95th percentile from the uncertainty analysis, predicts a maximum drawdown of less than 0.2 m of drawdown to the surficial layer in the model, within which subterranean fauna would be associated. The alluvial aquifers with which subterranean fauna would most likely be associated are seasonally variable, with observed water level fluctuations of up to 1 m (refer to RN 165180 in Appendix A in **Appendix G**). Therefore, it is unlikely that subterranean fauna will be impacted by the Project.

6.6.2 Potential Impacts to Formation Integrity and Surface Subsidence

The extraction of water and gas from the subsurface will result in compaction of the strata from which they are produced. This compaction can be translated through the overlying rock and result in subsidence of the land surface.

Australia Pacific LNG (APLNG, 2018) describes a model of simple elastic theory to estimate compaction based on the drawdown resulting from CSG production, the thickness of the formation and the formation compressibility. The model was used to calculate the compressibility (equivalent to the specific storage) of the coals based on the magnitude of ground motion measured using interferometric synthetic aperture radar (InSAR). The model assumed that all the compaction occurs within the coal and that all the compaction is translated into subsidence. The model is shown diagrammatically as **Figure 30**. APLNG found good agreement between the calculated compressibility and the expected specific storage. This analytical method of calculating subsidence is consistent with the analytical method employed by OGIA in 2021 UWIR (OGIA, 2021a).

The potential magnitude of subsidence associated with the Project activities has been calculated using the APLNG (2018) model but applied to model layers 27 (Rewan Formation), 28 (Upper Bandanna Formation) and 29 (Lower Bandanna Formation) rather than just the coal thicknesses. The model was parameterised with:

- Maximum predicted groundwater level drawdowns from the deterministic OGIA (2023) cumulative model
- Specific storage grids from the UWIR model
- Thickness grids from the UWIR model. The thickness of each of layer 29 and 30 was assumed to be half the total Bandanna Formation thickness.

Model layer 28 was excluded as the thickness was not explicitly available and was included in the thicknesses of layers 29 and 30. Because there is greater predicted drawdown for layers 29 and 30 compared with layer 28, this is a conservative assumption and will result in greater predicted compaction.

The predicted maximum magnitude of subsidence was approximately 2 mm (0.002 m) for the Project Case, which is predicted to occur within the southwestern sector of the Proposed action area where the coals are deepest. For the Cumulative Case, the maximum predicted subsidence was 20 mm (0.02 m), however this occurred in association with the Mahalo development to the south where the coal seams are deeper and predicted drawdown is greater. In the Cumulative Case, the maximum predicted subsidence within the Proposed action area was roughly 10 mm (0.01 m).

While the 2021 UWIR includes a significantly improved assessment of the magnitude of subsidence associated with CSG development in the Surat CMA compared with the 2019 UWIR, it does not include a risk assessment framework. However, in the 2019 UWIR, OGIA used three risk categories of likelihood for which low risk was less than 0.1 m of subsidence (OGIA, 2019). Based on the OGIA (2019) categories, the risk associated with subsidence due to the Project is low. Based on the maximum predicted magnitudes of subsidence, the potential for impacts to formation integrity and the water resource is considered negligible.

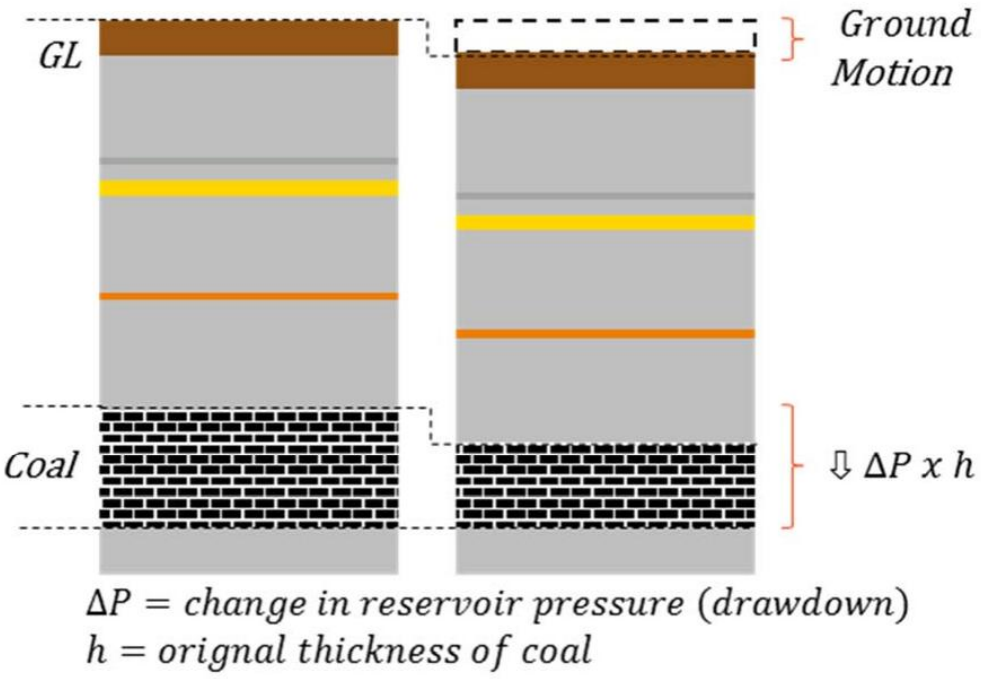


Figure 30. Diagrammatic representation of linear elastic theory to estimate the magnitude of subsidence (APLNG, 2018)

6.6.3 Predicted Impacts to Groundwater Quality

Potential impacts to groundwater quality due to the Project may occur due to:

- Impacts of drilling fluids on the formation water quality
- Seepage from CSG water storages potentially impacting on the water quality within the underling water table aquifer
- Potential localised groundwater quality impacts from chemical and fuel spills during transport, transfer and storage

The latter two of these potential impacts are most likely to be realised at the major facilities, i.e. at the planned gas compression facility, where activities and fluid storage are concentrated. The water table depth at the facilities is predicted to be greater than 25 mbgl, specifically (from the underlying gridded data) 44 mbgl. There is therefore a very low potential for leaks or spills to reach the water table following detection and management.

Epic Environmental (Epic, 2024) prepared a chemical risk assessment for the Project to evaluate the potential risk and effects of drilling fluids and water treatment products and their constituent chemicals on MNES. The chemical risk assessment identified twelve chemicals that were deemed to be potentially hazardous to the environment. The assessment included consideration of both surface and sub-surface pathways for contamination. The assessment found that with management measures such as adopting the DNRME Code of Practice and implementing a site-specific environmental management plan, impacts to MNES would be unlikely to highly unlikely.

The Project will undertake its development in ways consistent with the wider CSG industry in Queensland and will employ very similar management and mitigation measures. These include drilling and well construction in accordance with the DNRME Code of Practice, the prohibition of oil based drilling mud and BTEX chemicals, and undertaking operations in accordance with Environmental Management Plans (see Sections 8) including spill response procedures.

The potential for the Project to impact groundwater quality is low.

6.6.4 Ecohydrological Conceptual Model

In response to the IESC advice, an ecohydrological conceptual model (ECM) has been developed in accordance with the IESC Information Guidelines (2024) methodologies. The purpose of the ECM is to synthesise geological, hydrogeological, hydrological, and ecological data and describe key aquifer relationships, recharge processes, and groundwater–surface water interactions (refer **Appendix O**).

6.6.5 Significant Impact Assessment Results

The potential groundwater impacts associated with the Project has been assessed, and a summary of the findings with respect to the *Significant impact guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources* has been provided in **Table 24** (hydrological characteristics) and **Table 25** (water quality).

A significant impact is defined as "an impact which is important, notable, or of consequence, having regard to its context or intensity". The general criteria (5.2) identifies that an action is likely to have a significant impact on a water resource if there is a real, or not remote, chance or possibility that it will directly or indirectly result in a change to: the hydrology of a water resource, the water quality of a water resource, that is of sufficient scale or intensity as to reduce the current or future utility of the water resource for third party users, including environmental and other public benefit outcomes, or to create a material risk of such reduction in utility occurring.

The P&G Act imparts underground water rights for petroleum tenure holders, and in summary states that the holder of a petroleum tenure may take or interfere with underground water. Comet Ridge intends to exercise its underground water rights to extract CSG from the Proposed action area.

The assessment found that predicted water level drawdown from CSG production:

- May result in the exceedance of the Water Act trigger threshold in one active water supply bores due to the Project as a standalone development. When considered in a cumulative context, drawdown is predicted to exceed the trigger threshold in two bores. Potential impacts to authorised water bores will be managed in accordance with the responsible tenure holder obligations of the most recent UWIR and the 'make good' provisions of Chapter 3 of the Water Act.
- Is unlikely to impact aquatic GDEs, terrestrial GDEs or stygofauna

It is therefore concluded that the Project will not have a significant impact on the water resources.

Table 24. Summary of potential impacts against the significant impact criteria 1.3 – changes to hydrological characteristics

Parameter	Discussion
Flow regime (volume, timing, duration and frequency of surface water flows)	The Project will not extract water from or discharge water to surface watercourses. The production of CSG must necessarily result in the reduction of the formation pressure within the target reservoir, which may induce leakage from overlying and underlying formations. The Project will target coal seams of the Bandanna Formation. The production wells will be drilled and constructed in accordance with the DNRME Code of Practice, which will limit the potential for fluid extraction from overlying formations. An assessment of potential water level drawdown from the Project on surficial was assessed with the Surat CMA UWIR model (OGIA 2023) and a Project-specific model to assess uncertainties. Neither model predicted drawdown in excess of 0.2 m to the water table. There is therefore unlikely to be a reduction in baseflow associated with CSG production by the Project, and hence the Project would not change the flow regime of surface water flows.
Recharge rates to groundwater	The Project is located in an area where alluvium, Tertiary sediments, and basalts, as well as a number of Bowen Basin units outcrop. These outcrop areas are considered to be the location where diffuse rainfall recharge occurs. It is unlikely that recharge rates will be modified as a result of Project activities.
Aquifer pressure or pressure relationship between aquifers.	The Project will target coal seams of the Bandanna Formation. The production of CSG must necessarily result in the reduction of the formation pressure within the target reservoir. As the Bandanna Formation is overlain and underlain by low permeability aquitards, there will be a greater reduction in the reservoir formation as compared with overlying and underlying aquifers,

Parameter	Discussion
Groundwater table and potentiometric surface levels Inter-aquifer connectivity	hence there will be changes to the pressure relationships between aquifers, specifically the coal seams will be at a significantly lower pressure than the overlying and underlying formations, inducing potential groundwater movement vertically towards the depressurised coal seams. The Surat CMA UWIR model (OGIA 2023), used to assess potential drawdown, with predicted water level drawdown associated with the Project limited to the Bandanna Formation and Rewan Formation. This will change potentiometric surface levels, resulting in localised groundwater flow towards the production area. The predicted drawdown in the surficial model layer was less than 0.2 m, with seasonal or cyclic water levels observed at magnitudes greater than 2 m in the surficial formation(s), therefore the predicted drawdown will not affect the groundwater table. The production wells will be drilled and constructed in accordance with the DNRME Code of Practice, which will limit the potential for fluid extraction from overlying formations. No hydraulic fracture stimulation will be undertaken by the Project that could potentially result in anthropogenic connection of formations.
Groundwater/surface water interactions	Water level and groundwater chemistry data indicate hydraulic connection between surface watercourses and alluvial aquifers, and variable connection with the underlying Tertiary aquifers. CSG water production for the Project is limited to the coal seams of the Bandanna Formation. The Surat CMA UWIR model (OGIA 2023), used to assess potential drawdown, with predicted water level drawdown associated with the Project limited to the Bandanna Formation and Rewan Formation. The predicted drawdown in the surficial model layer, representing the alluvium and the Tertiary Strata was less than 0.2 m, with seasonal or cyclic water levels observed at magnitudes greater than 2 m in the surficial formation(s). The small magnitude of predicted groundwater level drawdown will not affect groundwater/surface water interactions. The Project will not extract water from or discharge water to surface water courses.
Coastal processes	The Project is located in central Queensland, nearly 300 km from the nearest coastline. Given the distance to the coast, no predicted impacts in terms of groundwater-surface water interactions, or changes to coastal processes will occur.

Table 25. Summary of potential impacts against the significant impact criteria 1.4 – changes to water quality

Parameter	Discussion
Create risks to human or animal health or to the condition of the natural environment as a result of the change in water quality	No changes to groundwater quality are anticipated as a result of the Project. The production wells will be drilled and constructed in accordance with the DNRME Code of Practice. The DNRME Code of Practice identifies mandatory requirements and good practice to reduce the potential for causing environmental harm during well drilling and construction. Produced and treated water will be stored in engineered above ground tanks. Water will be managed in accordance with the CSG Water Management Plan, EA conditions and the relevant End of Waste Code(s). It is unlikely that the Project would result in a risk to human or animal health or to the condition of the natural environment as a result of the change in water quality. Regular monitoring of groundwaters during the Project operations will provide early identification of any impact on groundwater as a result of the Project. Details of the monitoring program, including management and mitigation measures are provided in a WMMP prepared for the Project (**Appendix L**).
Substantially reduce the amount of water available for human consumptive uses or for other uses, including environmental uses which are dependent on water of the appropriate quality	Groundwater use from bores within the Proposed action area and immediate surrounds is primarily for stock watering purposes and from bores accessing the Tertiary Strata. The primary use is for stock watering purposes. One bore is predicted to experience drawdown in exceedance of the Water Act trigger threshold as a result of the Project alone, and two bores when the petroleum industry is considered in a cumulative sense. As per the requirements of the Water Act, bore baseline assessments will be performed prior to the commencement of production and any impacts will be managed in accordance with the Project's obligations under the most recent UWIR. The GIA (**Appendix G**) and RCP (**Appendix M**)provides lines of evidence that the Comet River is temporally hydraulically disconnected from the regional water table, with further investigation sanctioned to demonstrate this with confidence, these works are described in **Appendix M**.. While drawdown of the water table may occur, this will not influence baseflow to Comet River or to the water available to GDEs due to the hydraulic disconnection.

Parameter	Discussion
	The Project will utilise irrigation as the primary means of managing produced water. As surface water discharge or injection will not be utilised, there is negligible potential to impact on the natural water qualities of the shallow aquifers. Regular monitoring of groundwaters during the Project operations will provide early identification of any drawdown potentially experienced at nearby receptors. Details of the monitoring program are provided in **Appendix L**.
Causes persistent organic chemical, heavy metals, salts or other potentially harmful substances to accumulate in the environment	Produced and treated water will be stored in structures design and constructed in accordance with *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (DES 2016a). Water will be managed in accordance with the CSG Water Management Plan, EA conditions and the relevant End of Waste Code(s). The production wells will be drilled and constructed in accordance with the DNRME Code of Practice. The DNRME Code of Practice identifies mandatory requirements and good practice to reduce the potential for causing environmental harm during well drilling and construction. Hydraulic fracture stimulation will not be undertaken by the Project.
Seriously affects the habitat or lifestyle of a native species dependent on a water resource	The GIA (**Appendix G**) and RCP (**Appendix M**) provides lines of evidence that the Comet River is temporally hydraulically disconnected from the regional water table. While drawdown of the water table may occur, this will not influence baseflow to Comet River or to the water available to GDEs due to the hydraulic disconnection. The Project will utilise irrigation as the primary means of managing produced water. As surface water discharge or injection will not be utilised, there is negligible potential to impact on the natural water qualities of the shallow aquifers.
Causes the establishment of an invasive species (or the spread of an existing invasive species) that is harmful to the ecosystem function of the water resource	No changes to surface water or groundwater availability or quality have been identified that may cause the establishment or spread of invasive species. The GIA (**Appendix G**) and RCP (**Appendix M**) provides lines of evidence that the Comet River is temporally hydraulically disconnected from the regional water table. While drawdown of the water table may occur, this will not influence baseflow to Comet River or to the water available to GDEs due to the hydraulic disconnection. Produced and treated water will be stored in structures design and constructed in accordance with *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (DES, 2016). Water will be managed in accordance with the CSG Water Management Plan (**Appendix F**), EA conditions and the relevant End of Waste Code(s).
There is a significant worsening of local water quality (where current local water quality is superior to local or regional water quality objectives)	The Project will utilise irrigation as the primary means of managing produced water. As surface water discharge or injection will not be utilised, there is negligible potential to impact on the natural water qualities of the shallow aquifers. The production wells will be drilled and constructed in accordance with the DNRME Code of Practice. Thes DNRME Code of Practice identifies mandatory requirements and good practice to reduce the potential for causing environmental harm during well drilling and construction. Hydraulic fracture stimulation will not be undertaken by the Project.
High quality water is released into an ecosystem which is adapted to a lower quality of water	The Project will utilise irrigation as the primary means of managing produced water. Beneficial use activities such as irrigation will be undertaken in accordance with operational procedures to ensure compliance with the End of Waste Code(s) and EA conditions. Surface water discharge or water injection are not proposed for management of produced water.

6.7 IESC Guideline Checklist

The independent expert scientific committee (IESC) is a statutory committee established under the EPBC Act. The IESC's key function is to advise regulators regarding potential impacts to water resources from unconventional gas or large coal mining development proposals.

The IESC prepared an information guideline (IESC 2024) outlining the relevant information necessary for the IESC to undertake. **Table 26** includes a checklist based on the guideline and the conformance of this assessment to that checklist by identifying the relevant sections of the GIA (**Appendix G**) or other reports against each item. It is noted that some items in the guideline and checklist are not relevant this Project (e.g. final landforms).

Table 26. IESC Checklist

Checklist item	Where Addressed
Description of the Proposal	
Provide a regional overview of the Proposed action area including a description of the geological basin; coal resource; surface water catchments; groundwater systems; water-dependent assets (including terrestrial and aquatic GDEs); and past, present and reasonably foreseeable coal mining and CSG developments.	**Appendix G**: Section 1.1 Section 4.1, Section 3.2 Section 4, Section 3 **Appendix L**: Section 2, Section 3
Describe the proposal's location, purpose, scale, duration, disturbance area, and the means by which it is likely to have a significant impact on water resources and water-dependent assets.	**Appendix G**: Section 1.1 **Appendix L**: Section 2, Section 4, Section 5.2
Assess the frequency (and time lags, if any), location, volume and direction of interactions between water resources, including surface water/groundwater connectivity, inter-aquifer connectivity and connectivity with sea water.	**Appendix G**: Section 4 **Appendix M**, Section 1.2, Section 4 **Appendix L**: Section 8.5, Section 8.6
Regulatory context	
Describe the statutory context, including information on the proposal's status within the regulatory assessment process and any applicable water management policies or regulations	**Appendix G**: Section 2 **Appendix L**: Section 3
Describe how potentially impacted water resources are currently being regulated under state or Commonwealth law, including whether there are any applicable standard conditions.	**Appendix G**: Section 2.1.1, Section 2.2.3, Section 2.1.4 **Appendix L**: Section 3
Describe existing water quality guidelines, environmental flow objectives and other requirements (e.g., water planning rules) for the surface water catchments and groundwater basins within which the development proposal is based.	**Appendix G**:Section 2.2.4 **Appendix L**: Section 6
Describe public health, recreation, amenity, Indigenous, tourism and/or agricultural values for each water resource, and the plans relevant to their management and protection.	**Appendix G**:Section 2.2.4 **Appendix L**: Section 6.1, Section 6.2, Section 8.3.2
Drilling and hydraulic stimulation	
Describe the scale of fracturing (number of wells, number of fracturing events per well), types of wells to be stimulated (vertical versus horizontal), and other forms of well stimulation (e.g., cavitation, acid flushing).	**Appendix G**:Section 1.1 **Appendix M**: Section 2
Describe proposed measurement and monitoring of fracture propagation, and specify associated uncertainties and challenges.	Not relevant
Identify water source(s) for drilling and hydraulic stimulation, and specify the volumes of fluid and mass balance (quantities/volumes).	**Appendix G**: Section 1.1
Describe the rules (e.g., water sharing plans) covering access to each water source to be used for drilling and hydraulic stimulation, and how the project proposes to comply with them	**Appendix G**: Section 1.1

Checklist item	Where Addressed
Quantify and describe the quality and toxicity of flowback and produced water and how it will be treated and managed.	CSG Water Management Plan (RDM Hydro, 2023) (**Appendix F**)
Assess the potential for inter-aquifer leakage or contamination, and describe the risks to water-dependent assets if such leakage or contamination occurs.	Chemical Risk Assessment (Epic Environmental, 2023) (**Appendix H**) **Appendix L**: Section 5.2.2, Section 5.3 **Appendix M**: Section 4

Checklist item		Where Addressed
Groundwater		
Context and Conceptualisation	Describe and map geology at an appropriate level of horizontal and vertical resolution including: - definition of the geological sequence(s) in the area, with names and descriptions of the formations and accompanying surface geology, cross-sections and any relevant field data. - identification of hydrogeological sequences and characteristics.	**Appendix G**: Section 4.1, Section 4.2, Section 4.3, Table 4, Figure 11, Figure 12, Figure 15 **Appendix L**: Section 4.3 **Appendix M**: Section 1.2, Section 3.1, Section 3.2, Figure 1, Figure 3
	Define and describe or characterise significant geological structures (e.g., faults, folds, intrusives) and associated fracturing in the area and their influence on groundwater – particularly groundwater flow, discharge or recharge.	**Appendix G**: Section 4.2 **Appendix L**: Section 5.3.2 **Appendix M**: Section 1.2, Section 3.1, Section 4,
	Describe the likely recharge, discharge and flow pathways for all hydrogeological units likely to be impacted by the proposed development	**Appendix G**: Section 4.5 Section 4.6.2, Figure 26, Figure 27, Figure 28 **Appendix L**: Section 5.3.2 **Appendix M**: Section 1.2, Section 3.1, Section 3.2
	Describe the existing water quality of all aquifers in the project area.	**Appendix G**: Section 4.7, Section 4.7.2, Figure 31 Figure 32, Figure 33, Figure 34 **Appendix L**: Section 6.3
	For groundwaters, surface waters and ecological water-dependent assets that have been identified in the risk-based assessment, present data that are sufficient to establish pre-development (baseline) conditions and that have been collected at an appropriate sampling frequency and spatial coverage of monitoring sites, ideally over a period sufficiently long to characterise the impacts of climatic variability.	Groundwater Dependent Ecosystems Assessment (WaterMark 2024) (**Appendix E)** **Appendix L**: Section 8.1, Section 8.4

Checklist item		Where Addressed
	Provide data from surveyed boreholes to demonstrate the varying depths of the hydrogeological units and associated standing water levels or potentiometric heads, including directions of groundwater flow, contour maps and hydrographs.	**Appendix G**: Figure 26, Figure 27, Figure 28, Figure 29 Figure 30, Figure 22, Figure 23 Figure 24, Appendix C **Appendix M**: Section 5.2, Figure 10 **Appendix L**: Section 8.5.8, Figure 12, Figure 13, Figure 14, Figure 15, Figure 16
	Present information from site-specific studies (e.g., geophysical, coring/wireline logging) to characterise the local stress regime and fault structure (e.g., damage zone size, open/closed along fault plane, presence of clay/shale smear, fault jogs or splays).	**Appendix G**: Section 4.3.1
	Provide site-specific values for hydraulic parameters (e.g., vertical and horizontal hydraulic conductivity and specific yield or specific storage characteristics, including the data from which these parameters were derived) for each relevant hydrogeological unit. In situ observations of these parameters should be sufficient to characterise the heterogeneity of these properties for modelling.	**Appendix G**: Appendix B
	Provide hydrochemical characterisation (e.g., acidity/alkalinity, electrical conductivity, metals and major ions) and a suitable suite of environmental tracers (e.g., heat; stable isotopes of water; tritium, helium, strontium isotopes) (e.g., Kurukulasuriya et al. 2022; OWS 2020) commensurate with the risks of the proposed development to water resources and water-dependent assets.	**Appendix G**: Section 4.7
	Provide sufficient data on physical aquifer parameters and hydrogeochemistry to establish pre-development conditions, including fluctuations in groundwater levels at time intervals relevant to aquifer processes. This should include time-series data for water levels and water quality that represent seasonal and climatic cycles.	**Appendix G**: Section 8.1
	Provide long-term groundwater monitoring data, including a comprehensive assessment of all relevant chemical parameters to inform changes in groundwater quality and detect potential contamination events.	**Appendix G**: Section 8.1 **Appendix L**: Section 6.2, Section 8
Surface water context	Provide data for the hydrological regime of all watercourses, standing waters and springs across the site, including: • spatial, temporal and seasonal trends in streamflow and/or standing water levels • spatial, temporal and seasonal trends in water quality data (such as turbidity, acidity, salinity, relevant organic chemicals, metals, metalloids and radionuclides).	**Appendix G**: Section 3.2, Section 4.7.1, Figure 31
Ecological context	Provide clear statements of the goals of the baseline data, specifying how the information will address knowledge gaps (e.g., current ecological condition of water-dependent assets in the project area, potential impact pathways) and justifying the choice of parameters and measures.	Groundwater Dependent Ecosystems Assessment (WaterMark 2024) (**Appendix E)**

Checklist item		Where Addressed
	Describe and justify the sampling program (e.g., sampling frequency, locations of impact and control sites) and collection methods for gathering appropriate baseline data on all ecological water-dependent assets that have been identified in the risk-based assessment.	Groundwater Dependent Ecosystems Assessment (WaterMark 2024) (**Appendix E)**
	Ensure ecological sampling methods reflect best practice, are quantitative if needed, and comply with relevant state or national monitoring guidelines	Groundwater Dependent Ecosystems Assessment (WaterMark 2024) (**Appendix E)**
	Identify potential aquatic and terrestrial GDEs, using the method outlined by Eamus et al. (2006) and information from the GDE Toolbox (Richardson et al. 2011), the GDE Atlas (CoA 2023) and the GDE Explanatory Note (Doody et al. 2019).	**Appendix G**: Section 5.2, Appendix E
	Present information on the distribution of potential aquatic and terrestrial GDEs within and near the project area, and explain how their groundwater dependence has been ground-truthed and on which hydrogeological units they are likely to depend (see Doody et al. 2019).	Groundwater Dependent Ecosystems Assessment (WaterMark 2024) (**Appendix E**) Ecohydrological Model (Comet Ridge 2025b) **(Appendix O)**
Modelling of water storage and movement	Undertake groundwater modelling in accordance with the Australian groundwater modelling guidelines (Barnett et al. 2012), including independent peer review.	**Appendix G**: Section 7.1, Appendix G, Section 7.2.1 Section 7.2.2, OGIA (2021b) OGIA (2021c), Section 7.2 RCP (Anderson 2025) **(Appendix M)**
	Describe each hydrogeological unit as incorporated in the groundwater model, including the thickness, storage and hydraulic characteristics, and linkages between units, if any.	
	Undertaken groundwater modelling in accordance with the Australian Groundwater Modelling Guidelines (Barnett et al. 2012), including independent peer review.	
	Describe the existing recharge/discharge pathways of the units and the changes that are predicted to occur upon commencement, throughout, and after completion of the proposed project.	
	Select and justify appropriate boundary conditions across the model domain to enable a comparison of groundwater model outputs to seasonal field observations.	
	Where possible, calibration should incorporate measurements of both potentiometric head (or pressure) and flux, such as measured mine inflows or measured discharges to streams or springs.	
	Undertake sensitivity analysis of boundary conditions and hydraulic and storage parameters, and justify the conditions applied in the final groundwater model. Where the interaction between surface water and groundwater is important, parameters describing their connectivity, such as riverbed conductance, should be assessed.	
	Assess the potential impacts of the proposal, including how impacts are predicted to change over time and any residual long-term impacts	
	Undertake an uncertainty analysis of key predictive outputs (i.e., quantities of interest as per Peeters and Middlemis 2023).	

Checklist item		Where Addressed
	Provide an assessment of the quality of, and risks and uncertainty inherent in, the data used to establish baseline conditions and in modelling, particularly with respect to predicted potential impact scenarios.	
	For each relevant hydrogeological unit, describe the proportional increase in groundwater use and impacts as a consequence of the proposed project, including an assessment of any consequential increase in demand for groundwater from towns or other industries resulting from associated population or economic growth due to the proposal.	
Subsidence	Provide predictions of subsidence impacts on surface topography, water-dependent assets, groundwater (including enhanced connectivity between aquifers) and the movement of water across the landscape (see CoA 2014b; CoA 2014c).	**Appendix G**: Section 7.4
Environmental Impact Assessment		
Risk-based assessment	Describe the intensity, duration, magnitude, timing and geographic extent of each potential impact, specifying the impact's significance and consequences, especially on the environmental condition and human values of each water resource.	**Appendix G**: Section 7.3
	Identify and assess all potential environmental risks to water resources and water-related assets, and their possible impacts. In selecting a risk-assessment approach, consideration should be given to the complexity of the project and the probability and potential consequences of the project's impacts.	**Appendix G**: Section 9
	Include a systematic and evidence-based assessment of: • the sources of environmental impacts in the project area • the exposure pathways by which impacts may be transferred from these sources to water resources (receptors), presented as one or more IPDs based on ecohydrological conceptualisation • the likely response of each receptor, especially when the impact(s) may be severe and likely to cause irreversible damage (posing a high risk) • 'hot spots', or areas in the project area (e.g., where vulnerable receptors occur close to impact sources) where risks are especially high • 'hot moments', or periods during and after the project (e.g., when activities are likely to generate major impact) when risks are especially high.	**Appendix G**: Section 6, Section 7.3.2, Section 7.3.3 Section 7.3.4, Section 7.3.5 Ecohydrological Model (Comet Ridge 2025b) **(Appendix O)**
	Specify where and how each risk can be avoided or mitigated (or, as a last resort, requires appropriate offsets and/or a conservation payment), and: • provide evidence (preferably from equivalent activities and regions) for the feasibility and effectiveness of mitigation or offset methods • describe how monitoring will be able to demonstrate the effectiveness of the mitigation measures.	**Appendix G**: Section 8
	Specify all sources of uncertainty in the assessments of each risk and describe how information has been and will be collected to reduce this uncertainty.	**Appendix G**: Section 9
	Investigate relevant context for the risk assessment, such as bioregional assessments, Commonwealth and state water resource plans (e.g., Murray–Darling Basin Plan, Hunter River Salinity Trading Scheme) and state processes such as those that apply in the Surat Cumulative Management Area and the Commonwealth's Joint Industry Framework on Coal Seam Gas.	**Appendix G**: Section 8.4

Checklist item		Where Addressed
	Assess residual risks remaining after the implementation of the proposed mitigation and management options, to determine whether these effectively reduce risks to an acceptable level based on the identified environmental objectives	**Appendix G**: Table 14
Cumulative impacts	Describe the risks of potential cumulative impacts of all past, present and reasonably foreseeable actions and activities that are likely to impact on water resources, including from multiple stressors arising from the proposed action.	**Appendix G**: Section 7.2 **Appendix L:** Section 9
	Assess the cumulative impacts on potentially affected water-dependent assets and water resources, considering: • the full extent of potential impacts from the proposed project (including whether there are alternative options for infrastructure and mine configurations which could reduce impacts) • all stages of the development, including exploration, operations and post-closure/rehabilitation • the likely spatial magnitude and timeframe over which cumulative impacts will occur (ensuring that the analysis has sufficiently broad geographic and temporal boundaries to include all potentially significant impacts) • opportunities to work with other water users to avoid or mitigate potential cumulative impacts to meet specified environmental objectives.	**Appendix G**: Section 7.3 **Appendix L:** Section 9
Monitoring and Management		
Describe proposed mitigation and management actions, and their adequacy, for each significant impact identified, including any proposed mitigation or offset measures for long-term impacts post mining.		-
Propose adaptive management measures and management responses, giving details of trigger action response plans (TARPs) for valued assets and water resources that are at greater risk of impacts from the proposed development.		**Appendix G**: Section 8.4 **Appendix L:** Section 7
Describe a robust groundwater monitoring program using dedicated groundwater monitoring bores – including nested arrays where there may be connectivity between hydrogeological units – and targeting specific aquifers, providing information on the groundwater regime and on recharge and discharge processes and identifying changes in quantities and quality of groundwater over time.		**Appendix G**: Section 8.1 **Appendix L:** Section 8
Identify and justify dedicated sites to monitor hydrology, water quality, and channel and floodplain geomorphology before, during and for a suitable period after the proposed development.		Not proposed (no surface water releases)
Water and Salt Balances		
Describe the proposed development's water requirements and on-site water management infrastructure, including modelling to demonstrate the infrastructure's adequacy under a range of potential climatic conditions, including extremes associated with predicted climate change.		CSG Water Management Plan (RDM Hydro, 2023) (**Appendix F**)
Provide salt balance modelling that includes stores and the movement of salt between stores, and takes into account seasonal and long-term variation.		
Indicate the vulnerability to contamination (e.g., from salt production and salinity) of, and the likely impacts of contamination on, the identified water-dependent ecological assets.		
Identify how produced water, brine and waste from water treatment plants that are stored on site during operations will be managed and disposed of after operations cease, where applicable		
Provide estimates of the quality and quantities of operational discharges under dry, median and wet conditions, potential emergency discharges due to unusual events, and the likely impacts on water-dependent ecological assets		

7 CHEMICAL RISK

This section is informed primarily by the Chemical Risk Assessment (CRA), prepared by Epic Environmental (Epic 2024b) (**Appendix H**).

Key information from this technical assessment has been extracted and incorporated to address the specific requirements outlined in RFI. The purpose of the risk assessment is to assess potential impacts to MNES protected under the EPBC Act from the use of chemicals during the Project's CSG operations.

The CRA has been carried out in accordance with the following guidelines:

- DCCEEW (formerly the Department of Environment (DoE): Significant Impact Criteria provided in *'Significant Impact Guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources* (DCCEEW 2022b)
- DoE (2013) *Significant Impact Guidelines 1.1 – Matters of National Environment Significance*
- The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (the IESC): *Information guidelines for proponents preparing coal seam gas and large coal mining development proposals* (IESC 2018)

7.1 Risk Assessment Method

7.1.1 Method Overview

A four-stage risk assessment has been adopted for this investigation, generally in accordance with the guidelines provided in the Organisation for Economic Co-Operation and Development (OECD) *Risk Assessment Toolkit* (OECD 2014). The four stages of the chemical risk assessment framework have been shown in **Figure 31** and explained in **Sections 7.1.2** to **7.1.5**.

In addition to the above the risk assessment method was developed with reference to the:

- *AS/NZS 4360:2004: Risk Management* and *AS/NZS ISO 31000:2009 Risk Management – Principals and Guidelines*
- *Risk Assessment Guidance Manual: for chemicals associated with coal seam gas extraction* (DoE 2017a)
- *Environmental Risk Assessment of Chemicals used in WA Petroleum Activities Guideline* (Department of Mines and Petroleum 2013)
- *National Assessment of Chemicals Associated with Coal Seam Extraction in Australia,* Commonwealth of Australia, Canberra, Technical Reports (DoE 2017b, 2017c; NICNAS 2017)

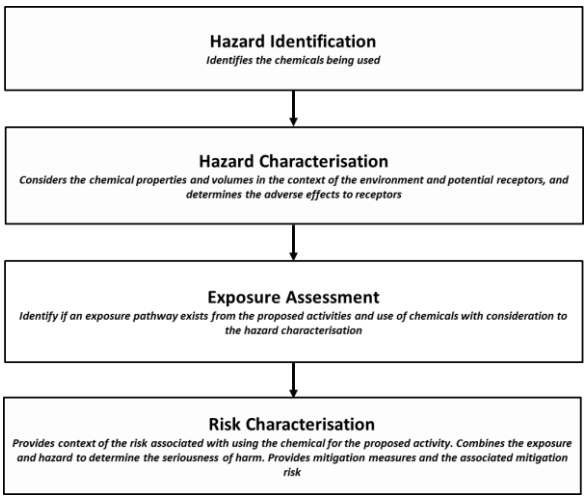


Figure 31. Chemical risk assessment framework

Source: Based on OECD Toolbox; OECD 2014 and the Chemical Assessment Guidance Manual Department of the Environment and Energy (DoEE) 2017a

To appropriately assess the environmental impacts due to the use of chemicals, the following stages of the chemical lifecycle were considered:

- Transport and storage to and on the site
- Processing on site at the CSG production well head prior to use
- During use down-hole at the CSG production well
- Processing on site at the water treatment plant
- Disposal of the waste fluid

7.1.2 Hazard Identification

The identification of products and chemicals used in the drilling process and water treatment is an important process of hazard identification. It details how products will be used and assesses their hazardous nature and the chemicals within them.

An initial review has been carried out to clarify whether products proposed to be used could be determined a 'hazard'. A product or chemical is deemed hazardous (Department of Mines and Petroleum 2013) if it:

- Meets health hazard criteria
- Meets environmental health hazard criteria
- Identifies as a pollutant, contaminant or hazardous good on its Safety Data Sheet (SDS)

Products or the chemicals within the products that were identified as hazardous were then assessed further under this method. It is important to note that the scope of the risk assessment only applies to potential harm to MNES, and the risk of harm to human health is beyond the scope of this risk assessment.

7.1.2.1 Products and Chemicals not Requiring a Detailed Risk Assessment

Products or chemicals not considered to require a detailed risk assessment as part of this assessment included:

- Inert, man-made products
- Products not meeting the criteria of being harmful, toxic, or very toxic to human health and / or the environment

7.1.3 Hazard Characterisation

Where a product or chemical is considered to be potentially hazardous in accordance with the criteria described in **Section 7.1.2**, further hazard characterisation was undertaken. This characterisation further assessed the chemical constituents to consider (as per DoE 2017a):

- The nature and state of the chemicals at surface and their solubility, to determine the potential for chemicals to enter the environment
- The fate and transport of the chemical in the environment including an assessment of the mobility, potential for bioaccumulation and degradation
- An assessment of chemical volumes proposed to be used in the context of the environment, with a comparison against relevant environmental hazard criteria

The fate of a chemical depends on its chemical and physical properties including its persistence, solubility, binding ability, volatility and how it reacts in the environment that it is released into. Relevant information of the chemicals was obtained from the SDS provided by the drilling fluid supplier for the products proposed to be used in the drilling activities.

7.1.4 Exposure Assessment

An exposure assessment identified the potential chemical sources and 'risk events' where a release to the environment had the potential to occur. The consideration of the likely fate and transport of the chemical, the likely exposure pathways and resulting potential impacts on MNES were assessed.

7.1.4.1 Exposure Pathways

Exposure pathways can include:

- Overland flow into nearby surface water systems
- Infiltration / leaching through soil into shallow groundwater systems
- Groundwater flow as a result of a loss of chemicals in the well
- Direct contact between chemical and receptor

7.1.5 Risk Characterisation

A tiered approach is recommended by DCCEEW (formerly DoEE) (DoEE 2017); based on this guidance chemicals are classified into three tiers. This approach entails increasing level of complexity, commensurate refinement of assumptions, and the inclusion of additional, more site-specific data. Based on the classification category of the chemical (and its potential toxicity, persistence and bioaccumulation potential) different levels of assessment will be undertaken. The following are reviewed within the screening assessment to determine the appropriate chemical tier level:

- **Persistence:** Persistence refers to whether, and how fast, a chemical degrades in the environment over time. Chemicals that are persistent in the environment may cause chronic health problems in humans and animals that are high in the food chain. The Stockholm Convention provides scientifically based criteria for identifying persistent organic pollutants and is used in this assessment to define a chemical's persistence in water, soil and air and has been adopted in the Environmental Risk Assessment Guidance Manual: for industrial chemicals (EPHC 2009)
- **Bioaccumulation:** Bioaccumulation is the general term describing a process by which chemicals are taken up by a plant or animal either directly through exposure to a contaminated medium (soil, sediment, water) or by eating food containing the chemical (DoEE 2017). The criteria for bioaccumulation used in this assessment has been taken from the Exposure draft: *Chemical risk assessment guidance manual: for chemicals associated with coal seam gas dextraction* (DoEE 2017), which adopts the criteria from the *Environmental Risk Assessment Guidance Manuals* (EPHC 2009)
- **Toxicity:** Ecotoxicity data are used to determine the toxic hazards posed by a chemical to terrestrial and aquatic organisms. The assessment process involves collecting all available acute and chronic data and considering how this data can inform the assessment (DoEE 2017). The minimum data set for quantitative CSG chemical risk assessments comprises acute toxicity tests for fish and invertebrates, and a chronic test for algae, however chronic data for fish and invertebrates are preferable if they are available. Acute and chronic toxicity are assessed against criteria from the Exposure draft: Chemical risk assessment guidance manual: for chemicals associated with coal seam gas extraction (DoEE 2017)

The overall tier level is determined by the highest tier value assigned for each criterion (for example, a chemical which is determined to be Tier 1 for toxicity but Tier 2 for persistence is assigned as a Tier 2 chemical). A general description of the chemical tiers, category and the assessment required is summarised in **Table 27**.

Table 27. Description of chemical tiers

Tier	General Description	Category	Risk Assessment Required	Management Measures
1	• Not persistent • No potential concerns with bioaccumulation on flora and fauna, and • No/low Toxicity	Chemicals of low concern	No further assessment required	Standard management measures suitable

Tier	General Description	Category	Risk Assessment Required	Management Measures
2	• Persistent • Low / no bioaccumulate, and • Acute toxicity, toxic with long lasting effects	Chemicals of potential concern	Toxicological profile Qualitative Risk Assessment	Site specific management Measures
3	• Persistent • Does bioaccumulate, and • Very acutely toxic, long term toxicity – very toxic with long lasting effects	Chemicals of potentially High concern	Toxicological Profile Qualitative and quantitative risk assessment	Site specific management Measures

7.1.5.1 Tier 1: Chemical of low concern

Tier 1 are chemicals that are categorised as of low concern which require a basic toxicological assessment and screening that will have no impacts on flora and fauna. Tier 1 chemicals are also chemicals not listed as a chemical of concern on relevant databases.

7.1.5.2 Tier 2: Chemicals of potential concern

Tier 2 chemicals are chemicals that will undergo a qualitative assessment in addition to a basic toxicological assessment and screening. The qualitative risk assessment includes:

- Further hazard characterisation
- Determination of pathways to identified receptors
- A risk assessment which examines the likelihood, consequence, and subsequent magnitude to MNES from the chemical. This is undertaken both with and without management and mitigation measures in place

7.1.5.3 Tier 3: Chemical of potentially high concern

Tier 3 chemicals will undergo a quantitative risk assessment in addition to the qualitative risk assessment as outlined above. The assessment will be more site-specific and is tailored towards specific locations including distance to a watercourse. Tier 3 chemical will also require additional mitigation and management controls to ensure the potential risk to MNES has been reduced as much as is reasonably practicable.

7.1.6 Risk Assessment

The risk assessment is a qualitive evaluation of **Tier 2** and **Tier 3** chemicals (refer **Section 7.1.5**), which takes into consideration the likelihood of exposure and allocated a rating of the consequence of the exposure. The likelihood of exposure was assessed by examining the likelihood that a chemical used in CSG extraction could reach a MNES receptor, based on known pathways and following the application of the management and mitigation measures. The likelihood of exposure ranking is provided in **Table 28.**

Table 28. Likelihood of exposure

Rank	Description	Example
1	Highly unlikely	No known connection between the source and receptor – there is no pathway i.e. source is solid and not soluble – highly unlikely pathway to surface water and groundwater systems
2	Unlikely	Unlikely connection between the source and the receiving environment. Unlikely for a surface spill and underground use to reach a receptor
3	Possible	Possible connection between the source and the receptor (i.e. connection of coal seams with an aquifer being used for extraction). Possible that surface and groundwater spills could reach the receiving environment
4	Likely	Likely connection between the source and the receiving environment. Likely that surface and groundwater spills could reach receiving environment, or direct contact occurs

Rank	Description	Example
5	Very likely	Confirmed connection between the source and the receiving environment, with the receiving environment (aquifer) being used for drinking water or discharging to an ecosystem. Very likely that a surface and groundwater spills will reach receiving environment

The consequence of Tier 2 and Tier 3 chemical used was then assessed using the consequence levels outlined in **Table 29**. The consequence level of a chemical to MNES is based on the hazard characterisation identified for each chemical.

Table 29. Consequence levels

Magnitude	Description	Example
Negligible	Negligible potential for adverse effects	• Low severity and short-term, impacts restricted to the immediate area of an activity or footprint • Very minor chemical incident (<20 litres [L]) • Minimal environmental impacts • Insignificant departure from Commonwealth or State policy or guidance
Low	Results in some measurable changes in attributes quality of vulnerability	• Chemical incident (20 L to 100 L) • Impacts likely to persist for short duration only, with rapid recovery when the activity is completed • Impact is restricted to the Bandanna Formation/Bandanna Coal Measures only and other aquifers or users are not affected • Impact causes minor departure from Commonwealth or State policy or guidance
Moderate	Results in impact on the integrity of attribute at a localised scale	• Significant chemical event (100 L to 1,000 L) • Minor, but manageable, environmental impacts • Rapid recovery upon activity completion • Potential health impacts • Impact may occur across aquifers and groundwater features, or users may be affected • Moderate potential for adverse effects on aquatic ecosystems
High	Results in impact on the integrity of attribute or loss of part of attribute at a regional scale	• Chemical pollution or contamination is likely (1,000 L to 10,000 L) • Significant environmental impacts • Significant health impacts • High potential for adverse effects on the aquatic ecosystems
Severe	Results in loss of attribute	• Irreversible or persistent high-severity impact likely (>10,000 L) • No recovery within the foreseeable future • Impacts are at a regional, national or international scale • Impacts to groundwater may include impacts across aquifers regionally • Groundwater discharge features and users are affected

A final risk rating was determined for each particular risk by combining the consequence level with the likelihood level (refer **Table 30**). The risk to MNES from chemical use was considered using the *Significant Impact Guidelines* (DCCEEW 2022), where a 'significant impact' is described as an impact which is important, notable or of consequence, having regard to its context or intensity. The following risk rating was determined:

- **Significant**: Significant impact with high likelihood of impact to MNES. Level of impacts are considered as unacceptable. Impacts may be irreversible or have a persistently high severity impact on the quality or availability to surface water or groundwater
- **Medium**: Moderate severity with MNES impacts persisting over time. Level of impacts are considered as unacceptable. Impacts may be tolerable, but risk treatment and mitigation should apply where possible
- **Minor**: Impacts to MNES will be impacted at a low severity. Level of impacts are considered as acceptable with risk treatments applied. Impacts will be of a short duration and the receptor will have a rapid recovery when the activity is complete

- **Insignificant**: An insignificant impact exists to MNES. Level of impacts are considered to be acceptable with no risk treatment necessary. The impact is of low severity and restricted to a localised area of activity. There are no medium or long-term impacts and recovery is rapid

Table 30. Risk rating assessment

		Likelihood				
		Highly Unlikely (1)	**Unlikely (2)**	**Possible (3)**	**Likely (4)**	**Highly Likely (5)**
Consequence	**Severe (E)**	Minor	Medium	Significant	Significant	Significant
	High (D)	Insignificant	Minor	Medium	Significant	Significant
	Moderate (C)	Insignificant	Minor	Medium	Medium	Medium
	Low (B)	Insignificant	Minor	Minor	Minor	Minor
	Negligible (A)	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant

7.1.7 Predicted Impact on MNES

The consequence of a chemical impacting on a MNES is based on the hazard characterisation of each chemical. The significance of impact on a MNES has been assessed and is typically based on the following:

- The likelihood of an impact reaching a MNES receptor
- The environmental consequence on the MNES receptor

The significance of the inherent risk is assessed prior to the consideration of mitigating factors. With the significance of the residual risk assessed following consideration of mitigating factors.

The full risk assessment is provided in **Table 37**, **Table 38** and **Table 39.** This is based on the criteria provided in **Section 2.4.4** which outlines the risk assessment method utilised by the Project and provides the Likelihood (**Table 28**), Consequence Levels (**Table 29**) and Risk Rating (**Table 30)**.

7.2 Hazard Identification and Characterisation

7.2.1 Chemical List

Different chemicals will be used throughout the drilling and water treatment process during various aspect of the Project lifecycle. Drilling fluids will be required to facilitate the drilling of the production bores. Each phase of drilling incorporates different drilling fluids, and hence produce different risk profiles. The phases of drilling include:

- Phase 1 – Drilling CSG Production wells
- Phase 2 – Completion and work over of CSG production wells
- Phase 3 – Production
- Phase 4 – Decommissioning

The proposed drilling fluids are listed in **Table 31** and the proposed water treatment chemicals are listed in **Table** 32. The tables provide the following information:

- Chemical name
- CAS registry number
- Approximate quantities and/or concentrations
- Chemical's general purpose and function

All chemicals have been identified to be approved for import, manufacture or use in Australia. The volumes are based on the maximum amounts being stored on site at any one time.

Table 31. Proposed drilling fluids

Chemical Name	CAS Registry Number[4]	Type of Container	Weight/Volume of each Container	Number of Containers [5]					Purpose and Function
				Drilling Phase		Completion/ workover Phase	Production Phase	Decommissioning Phase	
				Vertical	Lateral				
Quickseal Medium	N/A	Sack	18 kg	7	39	0	0	0	Reduces loss of drilling fluid into the formation
Defoamer S	NA	Cube	20 L	1	1	0	0	0	Anti-foamer for water-based drilling fluids
Citric Acid	77-92-9	Sack	25 kg	10	10	0	0	0	pH control
Biocide G	55566-30-6	Cube	20 L	2	5	0.5	0.0015[6]	0.5	Reduce and prevent bacterial and fungal activity
Aus Dex	9005-25-8	Sack	25 kg	17	40	0	0	0	Provides filtration control
Potassium chloride (KCl)	7447-40-7	Sack	25 kg	120	266	17	0	0	Clay control and weight agent
Soda Ash	497-19-8	Sack	25 kg	1	2	0	0	0	pH control
Xan Bore	11138-66-2	Sack	25 kg	12	25	0.5	0	0.5	Provide maximum solids suspension and hole cleaning

[4] Where CAS registry number is not given, or the drilling fluid is not deemed hazardous in the CAS registry number column, this information has been taken directly from the SDS
[5] Quantity of chemicals to be stored on site at any one time
[6] For Production, one biocide treatment per well annually

Table 32. Proposed water treatment chemicals

Chemical Name	CAS Registry Number	Type of Container	Volume of each Container (L)	Number of Containers (Operations only) (#)	Total Volume Stored / Month (L)	Purpose and Function
Betzdearborn DCL30	7681-57-4	Pail	15	1.3	19	Dechlorination agent
Biomate MBC2881	10222-01-2; 3252-43-5; 7647-15-6	Pail	15	4.8	71	Biocide, disinfectant and cleaner
Caustic soda	1310-73-2; 7732-18-5	Pail	13	0.5	7	Cleaner, unblocker, disinfectant
Gengard GN7004	NA	Pail	13	4	53	Dispersant
Hypersperse MDC776	38820-59-6	Pail	12	9.3	108	Membrane deposit control agent
Klaraid IC1172	12042-91-0	Pail	15	4.5	67	Waste treatment additive
Kleen MCT103	79-14-1; 139-89-9; 2836-32-0	Pail	15	1.5	22	Reverse osmosis membrane cleaner
KLEEN MCT515	139-89-9; 584-08-7; 497-19-8; 119435-04-9; 1310-58-3; 1310-73-2	Pail	20	3.5	70	Membrane cleaner
Hydrochloric ACID 32% Aquapac	7647-01-0	Pail	15	0.5	7	Removal of scale, lime, calcium, oxides, efflorescence, bore stains, concrete dust and hard water deposits

7.2.2 Hazardous Chemical Database

An initial review of each chemical and its contents was carried out to determine the hazardous nature of each chemical (refer **Table 33**). As detailed in **Section 7.1**, a product or chemical is considered hazardous based on its environmental hazard criteria and if it is identified as a pollutant, contaminant or a hazardous good under Australian legislation or regulations.

Table 33. Hazardous chemical database

Chemical Name	Mixture	Hazardous Chemical [7]	Aquatic toxicity (environment)	Persistence	Bioaccumulative	Mobility in soil	Comments
Drilling Fluids							
Biocide G	Tetrakis (hydroxymethyl) phosphonium Sulfate, CAS 55566-30-8	Yes	Yes	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients	The product is classified as environmentally hazardous and spills can have a harmful or damaging effect on the environment [8]. Very toxic to fish, crustacea, algae or other aquatic plants.
Soda Ash	Sodium carbonate, CAS 497-19-8	Yes	Yes	Low in water/soil and air	Low (LogKOW = -0.4605)	High (KOC = 1)	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that spills can have a harmful or damaging effect on the environment [8]. The hazard of sodium carbonate for the environment is mainly caused by the pH effect of the carbonate ion. For this reason, the effect of sodium carbonate on the organisms depends on the buffer capacity of the aquatic or terrestrial ecosystem. Toxic to fish, crustacea, algae or other aquatic plants.
Potassium Chloride (KCl)	>95% Potassium chloride	No	Yes	High in water/soil and air	Low (LogKOW = -0.4608)	Low (KOC = 14.3)	Toxic to crustacea, fish and algea and other aquatic plants.
Xanbore	100% gum xanthan, CAS 1138-66-2	No	Yes	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients	Toxic to fish. Acute (rainbow trout) LC50: 320-560 ppm/96hr [Australian Mud].

[7] Based on the definition of 'hazard' identified in **Section 7.1.2**

[8] Effect on the environment measured based on the predicted no-effect concentration (PNEC) values for individual aquatic values listed in the SDS

Chemical Name	Mixture	Hazardous Chemical [7]	Aquatic toxicity (environment)	Persistence	Bioaccumulative	Mobility in soil	Comments
Citric Acid	Citric Acid (C6H8O7), CAS 77-92-9	Yes	No observed effects	Low in water/soil and air	Low (LogKOW = -1.64)	Low (KOC = 10)	Due to its physio-chemical characteristics citric acid is highly mobile in the environment and will partition to the aquatic compartment. Citric acid is rapidly degraded in both sewage works and surface waters and in soil.
Ausdex	>60% Starch	No	Not available	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients	No data available to assess toxicity to the environment. Comply with SDS disposal considerations to mitigate potential environmental impact.
Defoamer S	3-5% Silicone based emulsion neutralised polyacrylic based stabiliser	No	Not available	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients	No data available to assess toxicity to the environment. Comply with SDS disposal considerations to mitigate potential environmental impact.
Quickseal medium	100% of ingredients determined not to be hazardous	No	Not available	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients	No data available to assess toxicity to the environment. Comply with SDS disposal considerations to mitigate potential environmental impact.
Water Treatment Chemicals							
Betzdearborn DCL30	20-40% Sodium bisulphite (CAS 7681-57-4)	Yes	Yes	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that spills can have a harmful or damaging effect on the environment[8]. Toxic to fish and crustacea.
Biomate MBC2881	20-40% DBNPA (CAS 10222-01-2), 2.5-10% Sodium Bromide (CAS 7647-15-6), 0.1-1% Dibromoacetonitrile (CAS 3252-43-5)	Yes	Yes	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that spills can have a harmful or damaging effect on the environment [8]. Toxic to fish, algae, crustacea.
Caustic soda	Sodium hydroxide	Yes	Yes	Water/soil: low	Low	High - may leach to groundwater	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that spills can have a harmful or damaging effect on the environment [8]. Toxic to fish.

Chemical Name	Mixture	Hazardous Chemical [7]	Aquatic toxicity (environment)	Persistence	Bioaccumulative	Mobility in soil	Comments
Gengard GN7004	N/A	No	Yes	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that spills can have a harmful or damaging effect on the environment [8]. Toxic to crustacea and fish.
Hypersperse MDC776	30-60% [Hexane-1, 6-diylbis[nitrilobis(methylene)]] tetrakisphosphonic acid, potassium salt (CAS 38820-59-6)	Yes	Yes	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that spills can have a harmful or damaging effect on the environment [8]. Toxic to crustacea and fish.
Klaraid IC1172	30-60% Aluminium Chlorhydroxide (CAS 12042-91-0)	Yes	Yes	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that spills can have a harmful or damaging effect on the environment[8]. Toxic to crustacea and fish
Kleen MCT103	10-20% Glycolic acid (hydroxyacetic acid) (CAS 79-14-1), 10-20% N-Hydroxyethylenediamine triacetic acid trisodium salt (CAS 139-89-9), 1-2.5% Sodium glycolate (CAS 2836-32-0)	Yes	Yes	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that spills can have a harmful or damaging effect on the environment [8]. Toxic to crustacea.

Chemical Name	Mixture	Hazardous Chemical [7]	Aquatic toxicity (environment)	Persistence	Bioaccumulative	Mobility in soil	Comments
Kleen MCT515	2.5-10% N-hydroxyethylenediamine triacetic acid trisodium salt (CAS 139-89-9), 2.5-10& Potassium carbonate (CAS 584-08-7), 2.5-10% Sodium carbonate (CAS 497-19-8), 1-25% Benzene, 1,1'-oxybis-, Tetrapropylene Derivs., Sulfonated, 0-1%Potassium hydroxide (CAS1310-58-3), 0-1% Sodium hydroxide (CAS 1310-73-2)	Yes	Yes	Not biodegradable	Not bioaccumulating	No data available for all ingredients	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that spills can have a harmful or damaging effect on the environment [8]. Toxic to crustacea and fish.
Hydrochloric ACID 32% Aquapac	Hydrochloric acid (CAS 7647-01-0)	Yes	No	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients	Comply with SDS disposal considerations to mitigate potential environmental impact.

7.2.3 Hazard Characterisation

Drilling fluids and water treatment chemicals that are proposed to be used for the Project that have been identified as potentially harmful to the environment in **Table 33** are further characterised in the below sections.

7.2.3.1 Nature of Chemicals

The potential for chemicals to enter the environment have been assessed based on their nature and state at the surface as well as their solubility in water, as summarised in **Table 34**. If a chemical is a solid at the surface and is insoluble in water, it is assumed the chemical is unlikely to be mobilised. In addition, if a solid, insoluble chemical is present down a well it is assumed it is unlikely to be mobilised through the aquifer. It is also assumed there is little to no risk the chemical will migrate offsite and therefore these chemicals are not deemed to pose a risk to MNES.

Table 34. Chemical surface state and pathway

Chemical Name	Physical State at Surface (as manufactured and pre-mixing)	Water Solubility	Comment
Biocide G	Liquid	Miscible	Poses some risk where it has the potential to move offsite
Soda Ash	Divided Solid	Miscible	Poses some risk where it has the potential to move offsite
Potassium Chloride (KCl)	Divided Solid	Miscible	Poses some risk where it has the potential to move offsite
Xanbore	Divided Solid	Partly miscible	Poses some risk where it has the potential to move offsite
Betzdearborn DCL30	Liquid	Soluble	Poses some risk where it has the potential to move offsite
Biomate MBC2881	Liquid	Soluble	Poses some risk where it has the potential to move offsite
Caustic soda	Liquid	Miscible	Poses some risk where it has the potential to move offsite
Gengard GN7004	Liquid	Soluble	Poses some risk where it has the potential to move offsite
Hypersperse MDC776	Liquid	Soluble	Poses some risk where it has the potential to move offsite
Klaraid IC1172	Liquid	Soluble	Poses some risk where it has the potential to move offsite
Kleen MCT103	Liquid	Soluble	Poses some risk where it has the potential to move offsite
Kleen MCT515	Liquid	Soluble	Poses some risk where it has the potential to move offsite

7.2.3.2 Chemical Fate and Transport

The behaviour of chemicals at the surface and subsurface has been assessed to understand how chemicals may behave if released to the environment. The chemical fate and transport informed the potential consequence of a release of the chemicals to surface water or groundwater. The mobility, potential for bioaccumulation and degradation of chemicals were assessed with findings outlined in **Table 35.**

Table 35. Chemical fate and transport summary

Chemical Name	Persistence / Degradation	Potential for Bioaccumulation	Mobility in Soil
Biocide G	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients
Soda Ash	Low in water/soil and air	Low (LogKOW = -0.4605)	High (KOC = 1)

Chemical Name	Persistence / Degradation	Potential for Bioaccumulation	Mobility in Soil
Potassium Chloride (KCl)	High in water/soil and air	Low (LogKOW = -0.4608)	Low (KOC = 14.3)
Xanbore	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients
Betzdearborn DCL30	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients
Biomate MBC2881	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients
Caustic soda	Water/soil: low	Low	High - may leach to groundwater
Gengard GN7004	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients
Hypersperse MDC776	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients
Klaraid IC1172	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients
Kleen MCT103	No data available for all ingredients	No data available for all ingredients	No data available for all ingredients
Kleen MCT515	Not biodegradable	Not bioaccumulating	No data available for all ingredients

7.3 Risk Characterisation

A risk characterisation was undertaken with consideration to persistence, bioaccumulation and toxicity of the chemicals being used. The risk characterisation was undertaken to determine where the chemical should be categorised as Tier 1, Tier 2 or Tier 3 chemical. Tier 2 and Tier 2 chemicals will be assessed within the qualitative and quantitative risk assessment.

Table 36. Risk characterisation

Chemical	Persistence[1]	Bioaccumulation[1]	Aquatic Toxicity[1]	Tier / Risk Category
Biocide G	No data available for all ingredients	No data available for all ingredients	Acute toxicity	2 - Chemicals of potential concern
Soda Ash	Low in water/soil and air	Low (Log KOW = -0.4605)	Acute toxicity	2 - Chemicals of potential concern
Potassium Chloride (KCl)	High in water/soil and air	Low (LogKOW = -0.4608)	Short term toxicity	2 - Chemicals of potential concern
Xanbore	No data available for all ingredients	No data available for all ingredients	Acute toxicity	2 - Chemicals of potential concern
Citric Acid	Low in water/soil and air	Low (LogKOW = -1.64)	No observed effects	1 - Chemicals of low concern
Ausdex	Not persistent	Does not bioaccumulate	No observed effects	1 - Chemicals of low concern
Defoamer S	Not persistent	Does not bioaccumulate	No observed effects	1 - Chemicals of low concern
Quickseal medium	No data available for all ingredients	No data available for all ingredients	Toxic to aquatic life	2 - Chemicals of potential concern
Betzdearborn DCL30	No data available for all ingredients	Product contains only inorganics that are not subject to typical biological degradation.	Acute toxicity	2 - Chemicals of potential concern
Biomate MBC2881	Persistent	Low	Acute toxicity	2 - Chemicals of potential concern
Caustic soda	Water/soil: low	Low	Acute toxicity	2 - Chemicals of potential concern
Gengard GN7004	Low persistence	None	Low observed effect	1 - Chemicals of low concern

Chemical	Persistence[1]	Bioaccumulation[1]	Aquatic Toxicity[1]	Tier / Risk Category
Hypersperse MDC776	No data available for all ingredients	No data available for all ingredients	Low observed effect	2 - Chemicals of potential concern
Klaraid IC1172	No data available for all ingredients	No data available for all ingredients	Acute toxicity	2 - Chemicals of potential concern
Kleen MCT103	No data available for all ingredients	No data available for all ingredients	Acute toxicity	2 - Chemicals of potential concern
Kleen MCT515	Not biodegradable	Not bioaccumulating	Acute toxicity	2 - Chemicals of potential concern
Hydrochloric ACID 32% Aquapac	No data available for all ingredients	No data available for all ingredients	Low observed effect	2 - Chemicals of potential concern

[1] Where no data is available, the chemical will automatically be categorised as a Tier 2

7.4 Risk Assessment

Chemicals categorised as Tier 2 and Tier 3 may impacts to environmental values due to the chemical risk. A risk assessment of potential chemical spills and leaks of each environmental value and mitigation factors relevant to the Project has been detailed in **Table 37**, **Table 38**, and **Table 39**.

Table 37. Risk assessment – Above ground chemical spills and leaks

Environmental Value	MNES	Inherent Risk Rating			Mitigating Factors	Residual Risk Rating		
		Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
Wetlands	There is a large area mapped as a Wetland Protection Area and listed as high ecological significance (HES) under the *Environmental Protection Regulation 2019* located in the northern extent of the Proposed action area	2	B	Minor	All infrastructure and any plant or equipment is at least 200 m away from HES wetland, which is consistent with the *Streamlined Model Conditions for Petroleum Activities (ESR/2016/1989, V2 05 May 2016).* This distance indicates any impact would be naturally attenuated and therefore unlikely to impact the wetlands.	1	B	Insignificant
Threatened Ecological Communities (TECs)	Brigalow (*Acacia harpophylla* and co-dominant)	2	B	Minor	All areas of TECs have been avoided by the proposed disturbance footprint. Unlikely to be impacted. Small quantities of product will be utilised and if surface chemical spills occur these are likely to be localised.	1	B	Insignificant
	Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	2	B	Minor		1	B	Insignificant
Threatened Species (fauna)	Ornamental Snake (*Denisonia maculata*)	2	B	Minor	Identified habitat will be avoided where possible in the Disturbance footprint design. Unlikely to be impacted. Small quantities of product will be utilised and if surface chemical spills occur these are likely to be localised.	1	B	Insignificant
	Koala (*Phascolarctos cinereus*)	2	B	Minor		1	B	Insignificant
Threatened Species (flora)	Annual Wine Grass (*Aristida annua*)	2	B	Minor	Unlikely to be impacted. Small quantities of product will be utilised and if surface chemical spills occur these are likely to be localised. Identified habitat will be avoided where possible in the Disturbance footprint design.	1	B	Insignificant
Listed Migratory Species	No Listed Migratory species were listed as known or likely to occur within the Proposed action area	1	B	Insignificant	Not applicable	1	B	Insignificant

Environmental Value	MNES	Inherent Risk Rating			Mitigating Factors	Residual Risk Rating		
		Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
Surface Water	Comet River	2	C	Minor	Product volumes to be used on site are likely to be small with the majority of products stored as dry ingredients and mixed on site. Creek systems identified within the Proposed action area are temporary / ephemeral. Unlikely to be impacted. Small quantities of product will be utilised and if surface chemical spills occur these are likely to be localised.	1	C	Insignificant
	Humboldt Creek	3	C	Medium		2	C	Minor
	Three Mile Creek	3	C	Medium		2	C	Minor
	Rockland Creek	3	C	Medium		2	C	Minor
Groundwater	Quaternary Alluvium	3	C	Medium	Production well intersecting these aquifers is sealed off from these units. Unlikely a surface spill will reach depths of these formations.	2	C	Minor
	Tertiary Sediments	3	C	Medium		2	C	Minor
	Tertiary Basalt	3	C	Medium		2	C	Minor
	Clematis Sandstone	3	C	Medium		2	C	Minor
	Rewan Formation	3	C	Medium		2	C	Minor
	Bandanna Formation	3	C	Medium		2	C	Minor
	Rangal Coal Measure	2	C	Minor	Connectivity of WCM to surface spills is via the production well. Unlikely to have significant impact reach this depth.	1	C	Insignificant

Table 38. Risk assessment – Below ground chemical spills and leaks

Environmental Value	MNES	Inherent Risk Rating			Mitigating Factors	Residual Risk Rating		
		Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
Wetlands	There is a large area mapped as a Wetland Protection Area and listed as high ecological significance under the Environmental Protection Regulation 2019 located in the northern extent of the Proposed action area.	2	B	Minor	All infrastructure and any plant or equipment is at least 200 m away from HES wetland, which is consistent with the *Streamlined Model Conditions for Petroleum Activities* (ESR/2016/1989, V2 05 May 2016). This distance indicates any impact would be naturally attenuated and therefore unlikely to impact the wetlands.	1	B	Insignificant
Threatened Ecological Communities	Brigalow (*Acacia harpophylla* and co-dominant)	3	B	Minor	Below ground spills or leaks unlikely to impact TEC.	2	B	Minor
	Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	3	B	Minor		2	B	Minor
Threatened Species (fauna)	Ornamental Snake (*Denisonia maculata*)	3	B	Minor	Below ground spills or leaks unlikely to impact threatened fauna.	2	B	Minor
	Koala (*Phascolarctos cinereus*)	3	B	Minor		2	B	Minor
Threatened Species (flora)	Annual Wine Grass (*Aristida annua*)	3	B	Minor	Below ground spills or leaks unlikely to impact threatened flora.	2	B	Minor
Listed Migratory Species	No Listed Migratory species were listed as known or likely to occur within the Proposed action area	1	B	Insignificant	Below ground spills or leaks unlikely to impact migratory birds.	1	B	Insignificant
Surface Water	Comet River	1	C	Insignificant	Below ground spills or leaks unlikely to impact surface water systems.	1	C	Insignificant
	Humboldt Creek	2	C	Minor		1	C	Insignificant
	Three Mile Creek	2	C	Minor		1	C	Insignificant
	Rockland Creek	2	C	Minor		1	C	Insignificant
Groundwater	Quaternary Alluvium	2	C	Minor	Production wells intersecting these aquifers are sealed.	1	C	Insignificant
	Tertiary Sediments	2	C	Minor		1	C	Insignificant

Environmental Value	MNES	Inherent Risk Rating			Mitigating Factors	Residual Risk Rating		
		Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
	Tertiary Basalt	2	C	Minor		1	C	Insignificant
	Clematis Sandstone	2	C	Minor		1	C	Insignificant
	Rewan Formation	2	C	Minor		1	C	Insignificant
	Bandanna Formation	2	C	Minor		1	C	Insignificant
	Rangal Coal Measure	1	C	Insignificant	Connectivity of WCM to surface spills is via the production well. Unlikely to have significant impact reach this depth.	1	C	Insignificant

Table 39. Risk assessment – Inappropriate reuse / disposal of drill cutting and fluids

Environmental Value	MNES	Inherent Risk Rating			Mitigating Factors	Residual Risk Rating		
		Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
Wetlands	There is a large area mapped as a Wetland Protection Area and listed as high ecological significance under the Environmental Protection Regulation 2019 located in the northern extent of the Proposed action area	2	B	Minor	All infrastructure and any plant or equipment is at least 200 m away from HES wetland, which is consistent with the *Streamlined Model Conditions for Petroleum Activities* (ESR/2016/1989, V2 05 May 2016). This distance indicates any impact would be naturally attenuated and therefore unlikely to impact the wetlands.	1	B	Insignificant
Threatened Ecological Communities	Brigalow (*Acacia harpophylla* and co-dominant)	2	B	Minor	All areas of TECs have been avoided by the proposed disturbance footprint. Small quantities of product will be utilised and if surface chemical spills occur these are likely to be localised.	1	B	Insignificant
	Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	2	B	Minor		1	B	Insignificant
Threatened Species (fauna)	Ornamental Snake (*Denisonia maculata*)	2	B	Minor	Areas of the disturbance footprint within threatened fauna habitat have been reduced to the greatest extent possible.	1	B	Insignificant
	Koala (*Phascolarctos cinereus*)	2	B	Minor		1	B	Insignificant

Environmental Value	MNES	Inherent Risk Rating			Mitigating Factors	Residual Risk Rating		
		Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
Threatened Species (flora)	Annual Wine Grass (*Aristida annua*)	2	B	Minor	Areas of the disturbance footprint within threatened flora habitat have been reduced to the greatest extent possible.	1	B	Insignificant
Listed Migratory Species	No Listed Migratory species were listed as known or likely to occur within the Proposed action area	1	B	Insignificant	Not applicable, no suitable habitat for migratory species was identified.	1	B	Insignificant
Surface Water	Comet River	2	C	Minor	Well sites are located away from watercourses. Product volumes to be used on site are likely to be small with the majority of products stored as dry ingredients and mixed on site. Creek systems identified within the Proposed action area are temporary / ephemeral.	1	C	Insignificant
	Humboldt Creek	3	C	Medium		2	C	Minor
	Three Mile Creek	3	C	Medium		2	C	Minor
	Rockland Creek	3	C	Medium		2	C	Minor
Groundwater	Quaternary Alluvium	2	B	Minor	Production well intersecting these aquifers is sealed.	1	B	Insignificant
	Tertiary Sediments	2	B	Minor		1	B	Insignificant
	Tertiary Basalt	2	B	Minor		1	B	Insignificant
	Clematis Sandstone	2	B	Minor		1	B	Insignificant
	Rewan Formation	2	B	Minor		1	B	Insignificant
	Bandanna Formation	2	B	Minor		1	B	Insignificant
	Rangal Coal Measure	1	B	Insignificant	Connectivity of WCM to surface spills is via the production well. Unlikely to have significant impact reach this depth.	1	B	Insignificant

7.5 Management Measures

Several management and mitigation measures will be adopted as part of construction and operational activities associated with the Project to address the potential chemical risk as outlined in **Table 40**. Refer to Section 8.8 of the WMMP (**Appendix L**) and the site-specific stormwater and water balance assessment report (**Appendix N**).

Table 40. Management and mitigation measures

Risk	Mitigation or Management Measure
Above-ground chemical spills and leaks	**Chemical and Fuel Storage** • All fuel, oil and chemicals are to be stored, transported, and handled in accordance with appropriate standards including *AS1940:2004 - The storage and handling of flammable and combustible liquids*, *AS 3780:2008 – The storage and handling of corrosive substances*, *AS 3833:2007 – Storage and handling of mixed classes of dangerous goods* in packaged and intermediate bulk containers • Chemical and fuel storage areas must be bunded, and adequately ventilated • Refuelling must only be carried out in dedicated refuelling areas, and in line with the relevant standard operating procedures that will be prepared for the Project • All locations storing hazardous chemicals will be located at a minimum of 200 m away from wetlands or watercourses • Containment bunds will be inspected monthly, and immediately following a rain event; all rainwater will be removed from the bunded area as soon as reasonably practical
	Tank Storage • All tanks will be constructed on hardstand and will be double lined with a leak detection system • CSG water storage structures classified as 'low hazard', such as tanks, will be designed in accordance with accepted engineering standards and will be constructed to an Australian Standard that ensures its integrity • All regulated structures are to be designed, constructed and operated in accordance with the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (DES 2016) • Tanks have been located in accordance with the Queensland requirements for buffers around watercourses and MNES

	Emergency and Incident Response
	• All chemical or fuel spills will be managed in accordance with the Project's Spill Response Management Plan that will be developed and implemented prior to the commencement of construction
	• All contractors undertaking works, including the drilling contractor, must have suitable spill response procedures in place prior to commencing works. As a minimum, spill response procedures must document:
	  - How spills are to be prevented from occurring
	  - Communication plans outlining contact details and order of communication in the event of a spill or chemical release
	  - Details on storage and location of chemicals and fuels
	  - Location of spill kits and details on how they are to be used
	  - Clean-up procedures, including testing and/or disposal of contaminated material
	• Required remediation and clean-up procedures will be determined by the Project's environmental manager, with works completed under the supervision of them or the site supervisor
	• All fuel or chemical spills are to be recorded in the Project's internal reporting system and include details on nature of fuel/chemical spilled, what clean-up was undertaken and any incident investigation reports
	• Emergency drills will be undertaken regularly in line with Comet Ridge's emergency response procedure
	• Personnel who observe an environmental incident or emergency must immediately notify the Project's environmental management within 24 hrs of incident identification

Risk	Mitigation or Management Measure
	Well Locations Well locations will be determined through the implementation of Comet Ridge's *Environmental Protocol for Constraints Planning and Field Development* (the protocol) for all cases where construction involves significant disturbance to land. The protocol aims to avoid or limit (where avoidance is not possible) impacts such that infrastructure siting: • Considers biodiversity values and environmental constraints • Is compliant with EA conditions and State and Commonwealth regulatory requirements • Identifies any external environmental approvals required With respect to environmental values, the protocol addresses avoiding or minimising and managing potential impacts to: • Biodiversity values contributing to MNES • Habitat for wildlife, including MNES threatened ecological communities, flora and fauna • Wetlands, watercourses, springs, and groundwater dependent ecosystems The protocol also recognises that, in addition to environmental constraints, landholder, engineering and cultural heritage constraints must be considered during infrastructure siting
Below ground chemical spills and leaks	**Well Construction & Decommissioning** All CSG production wells will be designed, constructed, and decommissioned in accordance with the Code (DNRME 2019).
	Prevention of Drilling Fluid Losses • Drilling fluids are selected and managed to ensure all products are used in accordance with the manufacturer's recommendations and relevant SDS. The name, type and quantity of each drilling fluid additive used on each well is recorded • A suitably licenced, and experienced drilling contractors will be engaged to undertake the drilling program and will adopt currently accepted best industry practice throughout the engagement • A review of available geological information will be undertaken prior to drilling commencing to aid in informing method and materials to be used
	Well Siting Well siting will be determined through adoption of Comet Ridge's protocol for all cases where activities for the Project involves significant disturbance to land. Engineering constraints are addressed within the protocol, and include (but aren't limited to): • Presence of any known or potential faults • Location of coal seam gas reservoirs and / or groundwater aquifers • Interconnectivity of coal seam gas reservoirs and / or groundwater aquifers
Inappropriate reuse / disposal of drill cuttings and fluids and brine	**Appropriate Disposal of Drilling Fluids** • If drilling muds are found to meet the approved quality criteria, they may be disposed of onsite, via land spraying or land spreading. • Initial discussions with landholders expressed interest in the land spraying/spreading methodologies (Leucaena), if the residual drilling material meets the approved quality criteria. Otherwise, the drilling muds will be disposed of offsite to a licensed facility • Do not discharge into sewer or waterways • Do not allow wash water from cleaning or process equipment to enter drains
	Appropriate Disposal of Drill Cuttings • Drill cuttings that meet the approved quality criteria may be disposed of onsite through burial or via land spraying or land spreading activities • Otherwise cuttings will be disposed of at an offsite facility licenced to receive materials • Manage in accordance with the DES *End of waste code Coal Seam Gas Drilling Mud* (ENEW07543018) • Drill cuttings will not be used as backfill for the production well
	Appropriate Disposal of Brine • Concentrated waste product will be disposed of at a licensed Waste Facility.

7.6 Inspections, Monitoring and Auditing

7.6.1 Environmental Monitoring

Monitoring will be undertaken to demonstrate conformance with the Project's environmental requirements (e.g. EMP) and compliance with statutory requirements (e.g. Commonwealth or State legislation). This monitoring will be directed by the Environmental Manager and or the Environmental Representative. Environmental reporting and monitoring will include the following as relevant:

- Inspections / monitoring reports
- Photograph records
- Incidents reports
- Remedial actions taken following incident reports
- Records of waste removal including waste tracking certificates

If monitoring indicates a breach of a condition or the contaminant level has caused, or has potential to cause, environmental harm, Comet Ridge will take the necessary actions to rectify the condition or contaminant level so as to avoid or minimise environmental harm. All required monitoring records and reports will be:

- Kept for a period of at least five (5) years
- Provided to a new holder of the EA on transfer of the EA
- Provided to the administering authority within a timeframe nominated by the administering authority or in annual reports
- Provided to the administering authority in the format requested

7.6.2 Environmental Auditing

Auditing and reporting of on-site activities provide a direct measure of environmental compliance in accordance with regulations and EA conditions, together with an indication of the effectiveness of the Health Safety and Environment Management System, EMP and supporting procedures and plans.

Environmental auditing will be undertaken by suitably qualified environmental representatives on a periodic basis to assess whether activities are in compliance with the requirements of these systems and documents.

7.6.3 Review Process

Chemicals determined to be low-risk chemicals (Tier 1) will be peer reviewed by an independent chemical risk assessment expert to review the toxicological profile. The review process will include the following assessment:

- Have the physical/chemical properties been documented?
- Was the chemical listed on any databases indicating chemical of concern?
- Has the toxicity been assessed?
- Has the environment fate (persistence, biodegradation, and bioaccumulation) been assessed?
- Is the categorisation correct?

A signed statement detailing the findings of the low-risk assessment, including evidence and findings that the chemical has been correctly categorised and will be reviewed every 5 years if the low-risk chemical are still in use.

7.6.4 Review of Listed Chemicals

Comet Ridge will review the chemical risk assessment:

- Prior to the use of new drilling fluids and chemicals at the site
- Receipt of advice from drilling contractors or the regulatory authority indicating the toxicology and hazardous nature of the chemicals being used has change

7.6.5 Risk Assessment Reporting

A Risk Assessment Report of chemicals is to be published and maintained on Comet Ridge website.

The Register of each assessed chemical will provide a summary of outcomes of the screening assessment, including risk level categorisation, the activities the chemical has been assessed for (i.e drilling) and the assessed end use/fate of the chemical.

An example of the register is proved in Appendix B of the CRA (Epic 2024b).

7.6.6 Adaptive Risk Management

In a scenario where accidental release or spill of chemical occurs, an emergency response plan will be implemented to provide standard protocols for Comet Ridge to respond in an appropriate and timely manner. The emergency response plan will be used to preserve life, ensure the safety of people and minimise the impact on the environment. The steps involved in an emergency response to accidental spills or releases is shown in the flow chart in **Figure 32**. In all scenarios, the green cells in the flow chart are actioned which includes raising an alarm, assessing the spill, containing the spill, monitoring the response activities and co-ordinating clean up. Depending on the severity of the spill/release, the orange, white and red cells in the flow chart will also be actioned.

To improve the effectiveness of any future incident, plans and procedures will be updated following the incident to ensure the response process is adaptive and responds appropriately to the Project's risks.

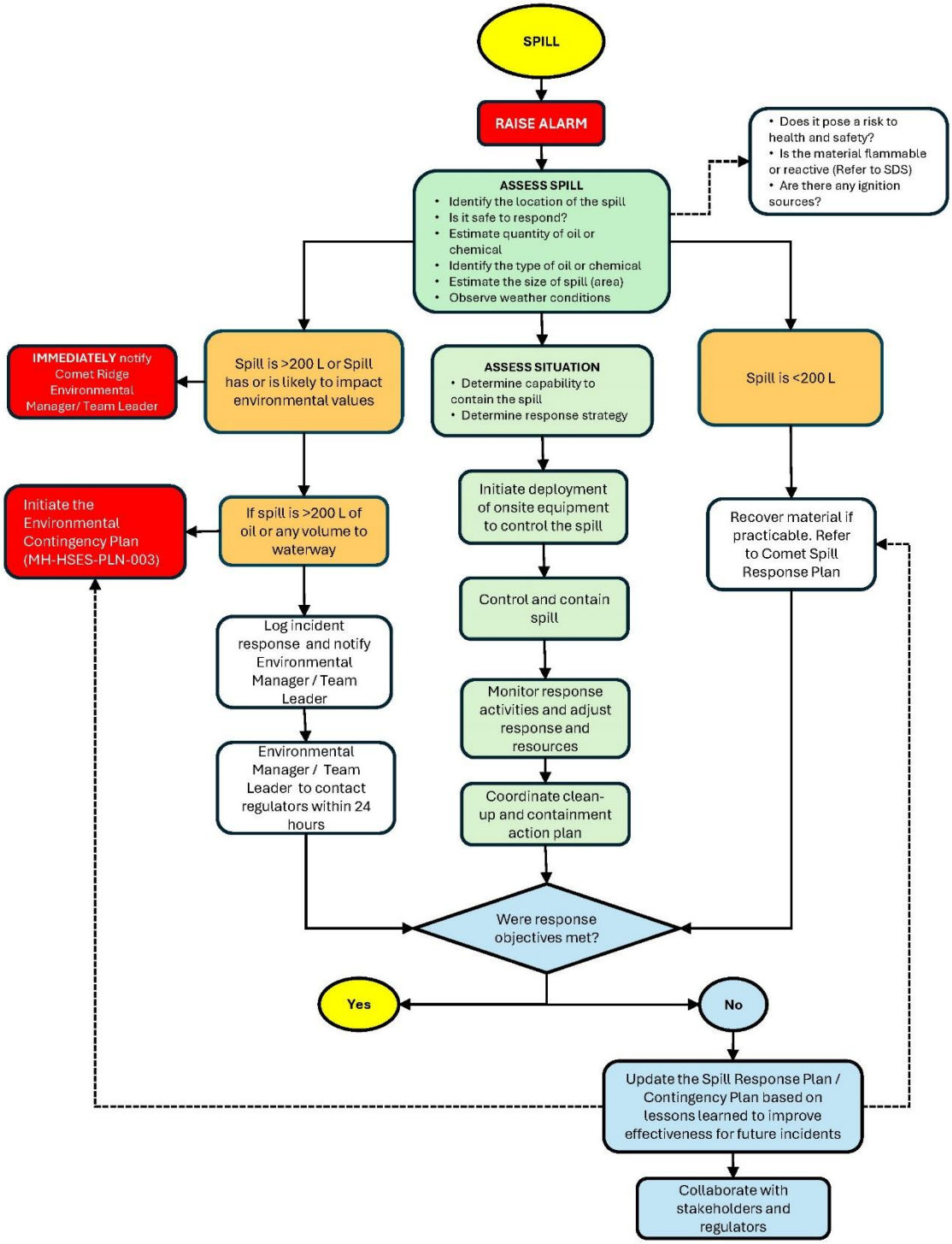


Figure 32. Spill management and adaptive response flow chart

8 AVOIDING, MONITORING, MITIGATING AND MANAGING IMPACTS

Avoidance and mitigation measures are the primary methods of eliminating and reducing significant impacts on protected matters. Where possible, it is best to avoid impacts. Where impacts cannot be avoided, then they must be minimised or mitigated as much as possible. This section details the proposed avoidance, monitoring, mitigation and management measures for the Project and where applicable, outlines the supporting evidence relied upon for each measure.

8.1 Environmental Management Plan

An Environmental Management Plan (EMP) has been prepared to minimise the potential for environmental harm from the Project **(Appendix I)**. The EMP has been prepared with consideration to Comet Ridge's likely approval obligations and relevant legislative requirements. The scope of the EMP includes Project construction, operation, and rehabilitation activities undertaken by (or on behalf of) Comet Ridge for the Project. Within the EMP, the following management plans have been developed:

- Management Plan 1: Induction and Training Plan
- Management Plan 2: Environmental Incident Management
- Management Plan 3: Complaints Register and Management
- Management Plan 4: Monitoring and Reporting
- Management Plan 5: Air Quality Management Plan
- Management Plan 6: Noise and Vibration Management Plan
- Management Plan 7: Vegetation Clearing Management Plan
- Management Plan 8: Fauna and Pest Management Plan
- Management Plan 9: Weed Management Plan
- Management Plan 10: Soil and Erosion Management Plan
- Management Plan 11: Land Use Management Plan
- Management Plan 12: Waste Management Plan
- Management Plan 13: Coal Seam Gas Water Management Plan
- Management Plan 14: Surface Water Management Plan
- Management Plan 15: Groundwater Management Plan
- Management Plan 16: Cultural Heritage Management Strategy
- Management Plan 17: Rehabilitation Management Plan

Each management plan and the proposed measures to avoid, mitigate and/or manage relevant impacts of the proposed action has been provided in the following sections.

8.1.1 S.M.A.R.T Principle

The development of all management plans and rehabilitation requirements were produced in accordance with the 'S.M.A.R.T' principle:

- S – Specific (what and how)
- M – Measurable (baseline information, number/value, auditable)
- A – Achievable (timeframe, money, personnel)
- R – Relevant (conservation advice, recovery plans, threat abatement plans)
- T – Time-bound (specific timeframe to complete)

By utilising the 'S.M.A.R.T' principle parameters, Comet Ridge are ensuring all objectives are attainable within designated timeframes and are eliminating risks associated with potential guesswork. Using this method has also ensured control strategies are easier to measure and track, creating a more accountable and robust system of on-site management.

8.1.2 Effectiveness Assessment Method

For each management plan, the potential effectiveness of the mitigation measures being adopted was assessed using a risk-based assessment with (inherent risk) and without (residual risk) mitigation measures

being implemented. This method was based on examining the likelihood and consequence of an environmental risk event occurring. The qualitative values for assessing the likelihood of an environmental risk event are provided in **Table 41**. The qualitative values for assessing the consequence of an environmental risk event are provided in **Table 42**. Based on the likelihood and consequence values, an inherent and residual risk rating has been applied using the score sheets in **Table 43.**

Table 41. Likelihood levels

Description	Example
Highly unlikely	Will only occur in exceptional circumstances
Unlikely	Not likely to occur within the project lifecycle
Possible	May occur within the project lifecycle (or once every ten years)
Likely	Likely to occur within the project lifecycle (or once every five years)
Very likely	Almost certain to occur within the project lifecycle (at least once every year)

Table 42. Consequence levels

Magnitude	Description
Negligible	No environmental harm or environmental nuisance
Low	Environmental nuisance or minor environmental harm. Unreasonable interference or, likely interference with an environmental value (Noise complaints, odour complaints, complaints about visual amenity etc) and/or < $5,000 actual or potential loss or damage to property.
Moderate	Material Environmental Harm. Causes or threatens harm not trivial or negligible in nature, extent or context and/or >$5,000 actual or potential loss or damage to property but < $50,000
High	Serious Environmental Harm. Causes or threatens harm that high impact or widespread and/or >$50,000 actual or potential loss or damage to property
Severe	Irreversible impact on an environmental value and/or MNES.

Table 43. Risk rating assessment

		Likelihood				
		Highly Unlikely	**Unlikely**	**Possible**	**Likely**	**Highly Likely**
Consequence	**Severe**	Minor	Medium	Significant	Significant	Significant
	High	Insignificant	Minor	Medium	Significant	Significant
	Moderate	Insignificant	Minor	Medium	Medium	Medium
	Low	Insignificant	Minor	Minor	Minor	Minor
	Negligible	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant

8.1.3 Management Plan 1: Induction and Training Plan

A process for inducting new personnel, including contractors, onto the site will be implemented. The objective will be to ensure the entire workforce is aware of the environmental obligations of the Project. All visitors will be required to sign into the site visitor register prior to gaining access to the site and will be inducted as appropriate. Refer **Table 44** for Management Plan 1 – Induction and Training Plan.

Table 44. Management plan 1 - Induction and training plan

Environmental Protection Objective	Ensure all staff and contractors are aware of their environmental obligations and comply with all requirements		
Measurable Environmental Outcome	All staff, contractors and visitors have undergone site induction and relevant training.		
Environmental Risk Event	Minor environmental harm (e.g. unauthorised impact to flora and fauna, proliferation of weeds and pests, spill of fuel or chemicals etc.) caused a as result of a personnel or contractors not being aware of the compliance requirements on-site.		
Avoidance Measures	N/A - No avoidance measures apply to this management plan		
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Possible	Low	Minor
Mitigation/Management Measures		**Timing**	**Responsibility**
A site induction program will be developed that addresses key site environmental requirements • The induction program will be flexible and regularly updated to reflect changes in environmental requirements. • The induction program will include (but will not be limited to): - Overview of environmental risks - Overview of legislative requirements - General environmental duty of care - Key environmentally sensitive areas - Waste removal - Incident notification, investigation, and reporting - Mitigation measures for environmental elements (e.g. erosion and sediment control, flora and fauna, air, noise, vibration, cultural heritage, species of significance) - Storage, handling, and disposal of hazardous materials - Spill response requirements • Additional training will be targeted to staff with specific responsibilities. • A training and induction register will be maintained and records kept for a minimum of five years.		Whenever an employee or contractor Starts at the Site	Project Manager
Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Unlikely	Low	Minor
On-Going Monitoring	Monthly comparison of site induction records with the on-site attendance records, to be undertaken by the Environmental Representative		
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**	
	Personnel or contractor entered site without adequate training and inductions.	• Personnel must immediately Stop Work • Personnel not allowed to restart work until inductions have been completed • Identify how a person was able to start work on-site without adequate inductions • Design and implement a process that mitigates how the person was able to start without adequate training and inductions	
Relevant EA conditions	None		

8.1.4 Management Plan 2: Environmental Incident Management

Comet Ridge has developed a management process for environmental incidents, particularly those involving hazardous substances including fire, explosion, spillage, leakage or other escape into the environment. The management system is available as a separate document. **Table 45** provides a summary of control measures for potential environmental incidents.

Table 45. Management plan 2 - Environmental incident management

Environmental Protection Objective	Minimise environmental harm from fire, explosion, spillage, leakage or other escape of harmful substances.		
Measurable Environmental Outcome	• The response to and reporting of environmental incidents is appropriate to the environmental risk of the incident. • An emergency response capability and a suitable number of spill kits or a suitably stocked area in a proximate container are maintained.		
Environmental Risk Event	Insufficient response planning and preparation to an environmental incident results in an increased level of environmental harm.		
Avoidance Measures	N/A - No avoidance measures apply to this management plan		
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Possible	High	Medium

Mitigation/Management Measures	Timing	Responsibility
Implement the Environmental Contingency Plan (MH-HSES-PLN-003.3)	At all times	All Personnel
In the event of an incident, a person should take immediate action to reduce any risk associated with unauthorised discharges to air, land and water (where it safe to do so)	In the event of an incident	All Personnel
The person identifying the incident should notify the Project manager immediately after becoming aware of the incident	Within 1 hours of the incident identification	All Personnel
Investigate the incident to determine the likely cause, record the outcome of the investigation (keep these records for the life of the Project)	Within 7 days of the incident identification	Environmental Representative
Implement appropriate preventative action that will address the cause of the incident (as identified during the investigation). A preventative action should be a single action or a series of actions that is designed to minimise the likelihood of an environmental incident reoccurring.	Within 28 days of the incident investigation	Environmental Representative
Excavate or remove contaminated ground (spills up to five litres or less) in a sensitive area, or remedy through an approved process.	Within 7 days of the incident identification	Environmental Representative
Notify relevant landowners in the event of an unauthorised release likely to impact on landowner activities and/or safety.	Within 24 hours of the incident identification	Project Manager
Conduct soil, surface water and/or groundwater sampling and monitoring of the clean-up area if/as required.	Until the impact have been remediated	Environmental Representative
Notify the appropriate authorities in accordance within 24 hours if there is actual or potential for environmental harm as a result of the incident.	Within 24 hours of the incident identification	Project Manager

Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Unlikely	High	Minor
On-Going Monitoring	• Spill kits will be inspected on a weekly basis • Post-incident review to determine the suitability of the incident response		

Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**
	• Incident response was not appropriate to minimise the environmental harm	• Undertake additional training in incident response with all personnel • Review the available response equipment and source additional equipment that would be suitable to respond to a similar incident • Review, update and implement this EMP to ensure all management/mitigation measures are suitable to minimise the likelihood and consequence of an environmental incident
Relevant EA conditions	Refer to Schedule G (conditions G11 to G16) of the EA conditions (**Appendix A**)	

8.1.5 Management Plan 3: Complaints Register and Management

Enquiries/complaints will be dealt with in a responsive manner so that stakeholders feel their concerns are being seriously dealt with and not dismissed. This will assist in building a relationship of trust and reliability between the community and Project team. Complaints will be handled in accordance with the relevant condition/s of the EA and the Complaints Register and Management Plan provided in **Table 46**.

Table 46. Management plan 3 - Complaints register and management

Environmental Protection Objective	Deal with enquiries and complaints in a timely manner			
Measurable Environmental Outcome	All complaints and responses recorded in the complaints register. The response to and reporting of complaints is appropriate and resolves the concern of the compliant.			
Environmental Risk Event	Insufficient response to an environmental compliant, resulting in further complaints being received or complaints remaining unresolved.			
Avoidance Measures	The layout of the activity has considered the location of sensitive receptors and potential for air and noise impacts.			
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**	
	Possible	Low	Minor	
Mitigation/Management Measures			**Timing**	**Responsibility**
A central point of contact will be maintained for enquiries and complaints, to enable the content and distribution of information to the community to be appropriately managed and monitored.			At all times	Project Manager
Each complaint will be assessed for its validity and potential risk and investigated as soon as practicable.			Within 7 days of complaint receipt	Environmental Representative
Corrective action will be implemented where appropriate to address the cause of the complaint and to minimise reoccurrence of similar complaints.			Within 28 days of investigating the complaint	Environmental Representative
The following details will be recorded in the complaints register for all complaints received: • Name, address and contact number for complainant • Time and date of complaint • Reasons for the complaint as stated by the complainant • Investigations undertaken in response to the complaint • Conclusions formed • Actions taken to resolve complaint • Any abatement measures implemented to mitigate the cause of the complaint Name and contact details of person responsible for resolving the complaint			Upon receipt of a complaint	Project Manager
Records will be kept for a minimum of five years.			For five years following a complaint	Project Manager
The administering authority will be notified of valid complaints and any actions proposed or undertaken in relation to the complaint.			Within 7 days of complaint receipt	Environmental Representative

Any monitoring or actions requested by the administering authority will be undertaken.		Following response receipt from the administering authority	Environmental Representative
Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Unlikely	Possible	Minor
On-Going Monitoring	Annual review of complaints and response actions to ensure timing and investigations occurred in accordance with this management plan.		
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**	
	Complaint has not been resolved in accordance with this management plan	• Investigate the reason for non-conformance • Retrospectively update the complaint register (if information was missing) • Train the Project Team on required complaint response requirements	
Relevant EA conditions	Refer to Schedule G (conditions G20 to G23) of the EA conditions (**Appendix A**)		

8.1.6 Management Plan 4: Monitoring and Reporting

Environmental monitoring and reporting are key measures to demonstrate compliance with the EA and EPBC approval. This management plan ensures the sampling, monitoring, analysis and reporting measures are undertaken in compliance with the legislative requirements, refer **Table 47**.

Table 47. Management plan 4 - Monitoring and reporting

Environmental Protection Objective	Compliance with the requirements of the EA		
Measurable Environmental Outcome	Meet all reporting and record keeping requirements. Adopted monitoring standards will be conformant with industry best practice.		
Environmental Risk Event	• Monitoring data is not suitable to identify the potential for environmental harm • Monitoring is not compliant with conditions of approval		
Avoidance Measures	N/A - No avoidance measures apply to this management plan		
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Likely	Moderate	Medium
Mitigation/Management Measures		**Timing**	**Responsibility**
All monitoring required will be compliant with the standards set in the EA		At all times	Environmental Representative
If no specific standards are set, then appropriate Australian Standards, Codes or industry best practice guidelines will be followed		At all times	Environmental Representative
All environmental sampling and in-field monitoring will be undertaken by person/s that are appropriately qualified to undertake the sampling and monitoring		At all times	Environmental Representative
Monitoring systems and processes shall be put in place by a appropriately qualified person to ensure compliance with the EA		At all times	Environmental Representative
Any monitoring equipment utilised to undertake the monitoring will be calibrated in accordance with manufacturers specifications		At all times	Environmental Representative
All samples will be collected and transported in accordance with the required sample preservation requirements (as prescribed by the laboratory) and transferred to the laboratory for analysis under a chain of custody (COC)		At all times	Environmental Representative
All laboratory analyses and tests will be undertaken by a laboratory that has appropriate NATA accreditation		At all times	Environmental Representative
Where there is no NATA accredited laboratory, duplicate samples will be sent to at least two separate laboratories for independent testing		At all times	Environmental Representative

Sampling and monitoring results will be kept in readily accessible files, labelled appropriately, and collated if necessary	At all times	Environmental Representative
The following monitoring records will be maintained for a period of 5 years and provided to the administering authority on request: • Calibration records • Field sheets and records • COC • Laboratory certificate of analysis Summary results.	At all times	Environmental Representative
A certification is required by an appropriately qualified person for each plan, procedure, program and report required to be developed under the EA • That relevant material and published guidelines have been considered in the written document • The content of the written document is accurate and true • The document meets the requirements of the relevant conditions of the EA	At all times	Environmental Representative

Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Possible	Low	Minor
On-Going Monitoring	N/A - No additional monitoring apply to this management plan		
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**	
	Non-conformance with the requirements of this management or environmental authority	• Notify the department • Undertake an additional round of monitoring to verify no environmental harm in the receiving environment • Review, update and implement this management	
Relevant EA conditions	Refer to Schedule G (conditions G10 to G16), of the EA conditions (**Appendix A**)		

8.1.7 Management Plan 5: Air Quality Management Plan

The Project is located in a rural area; however, the area is more broadly located between a number of operating coal mines, including Blackwater Mine, Cook Colliery, Curragh Mine, and Jellinbah Mine to the north; Minerva Mine to the west; and Rolleston Coal Mine to the south. These mines are anticipated to affect the air quality due to coal dust particles, depending on the prevailing wind. Other than coal particulates the majority of the existing sources of emissions would be derived from:

- Products of combustion from fuel burning vehicles and equipment;
- Smoke from low-temperature scrub and agricultural burning;
- Wind erosion;
- Mining and extractive industry;
- Vehicle movements across dirt roads; and
- Livestock movements.

Sensitive receptors have been identified on the Meroo Downs property (the occupiers homestead) and on Struan Station (the ringers quarters and the owners homestead).

The Air Quality Management Plan is provided in **Table 48**. This plan provides the environmental protection commitments and control strategies that will be implemented to minimise impacts on air quality and other air environmental values relevant to the Proposed action area.

Table 48. Management plan 5 - Air quality management plan

Environmental Protection Objective	• To avoid impacts on human health and amenity arising from particulate emissions • To minimise dust emissions beyond 100 m of construction activities • To minimise gas emissions from flaring, venting or fugitive emissions causing a nuisance

Measurable Environmental Outcome	• Consultation undertaken with any potentially affected landowners/occupiers (sensitive receptors) • Limited or no air quality complaints from sensitive receptors		
Environmental Risk Event	Air emissions from the Project cause an environmental nuisance at a nuisance-sensitive place		
Avoidance Measures	• Project layout (particularly the GCF) has been positioned to avoid air quality impacts on the sensitive receptors. • The closest sensitive receptor to the GCF is located >2.3 km east.		
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Unlikely	Moderate	Minor

Mitigation/Management Measures	**Timing**	**Responsibility**
Where possible, soil stockpiles will be placed in areas protected from the wind and away from public places	During earthworks	Supervisor
Soil stockpiles will be aligned with prevailing winds to minimise cross sectional area exposed to the prevailing wind direction	During earthworks	Supervisor
Soil stockpiles will be lightly compacted after placement and covered (with vegetation) if intended to remain in place for longer than 28 days	During earthworks	Supervisor
Soil stockpiles heights will be less than 3 m	During earthworks	Supervisor
Existing vegetation will be retained where possible within cleared areas	During earthworks	Supervisor
Construction traffic will be controlled by using specific routes for haulage and access. Vehicle speeds on unsealed roads will be limited to 50 km/hr, or less if significant dust plumes occur	At all times	All personnel
All trucks hauling dirt, sand, soil or other loose materials to and from project sites will be covered	At all times	Supervisor
All construction vehicles, mobile plant and machinery will be maintained and operated in accordance with the manufacturers' specification to minimise exhaust emissions	At all times	Project Manager
Water spraying will be undertaken for dust suppression on unsealed roads	At all times	Supervisor
Any complaints in relation to dust emissions will be recorded, and if any variation to the control strategies is indicated, this will be implemented.	At all times	Supervisor
During drilling and well operations, flaring and venting will be minimised in accordance with section 72 of the P&G Act	At all times	Project Manager
Regular testing for well-head leaks in accordance with the Queensland Government's *Code of practice for coal seam gas well head emissions detection and reporting*.	At all times	Project Manager

Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Highly Unlikely	Low	Insignificant
On-Going Monitoring	• Number of complaints received • Visual observations of dust plumes • Wind direction		
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**	
	An air quality complaint is received	• Review the watering regime and increase if necessary to minimise dust emissions • Reduce the speed limits on access tracks within 500m of the complainant to 30 km per hour • Apply cover material (e.g. vegetation, soil binder etc.) on any stockpile that is proposed to remain in place for longer than 28 days	
Relevant EA conditions	Refer to Schedule A of the EA conditions (**Appendix A**)		

8.1.8 Management Plan 6: Noise and Vibration Management Plan

The predominant land use within the Proposed action area is rural in nature, and accordingly, background noise levels are low. Major noise sources include existing mining activities, cattle truck movements and helicopter mustering activities.

Sensitive receptors have been identified on the Meroo Downs property (the occupiers homestead) and on Struan Station (the ringers quarters and the owners homestead).

The Noise and Vibration Management Plan is provided in **Table 49**. This plan provides the environmental protection commitments and control strategies that will be implemented to minimise impacts of noise and vibration within the Proposed action area.

Table 49. Management plan 6 - Noise and vibration management plan

Environmental Protection Objective	• Noise from activities associated with construction and operation will not cause an environmental nuisance at a sensitive receptor • Minimise noise and vibration impacts to fauna where possible.			
Measurable Environmental Outcome	• Consultation undertaken with any potentially affected landowners/occupiers (sensitive receptors), especially if atypical noise events are anticipated • Limited or no noise related complaints from sensitive receptors • Noise condition limits in the EA are not exceeded in the event of a complaint			
Environmental Risk Event	Noise and vibration emissions from the Project cause an environmental nuisance at a nuisance-sensitive place			
Avoidance Measures	• Project layout (particularly the GCF) has been positioned to avoid impacts on the sensitive receptors. • The closest sensitive receptor to the GCF is located >2.3 km east.			
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**	
	Possible	Low	Minor	
Mitigation/Management Measures			**Timing**	**Responsibility**
Consider potential for noise nuisance when planning activities			Prior to works commencing	Environmental Representative
Avoid night time constructions within 1 km of a sensitive receptor between works between the hours 6PM and 6AM.			During construction	Project Manager
Notify landholders of construction works in advance of commencement of works. Provide information on likely timing and duration of works and contact details in the event of questions or complaints			During construction	Project Manager
Notify impacted landholders of any proposed nighttime construction works			During construction	Project Manager
Liaise with landholder about how to minimise potential impacts and implement “alternative arrangements” if necessary.			During construction	Project Manager
Apply noise mitigation measures to permanent noise sources where necessary (e.g. in the event that valid noise complaints are received)			At all times	Project Manager
Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**	
	Possible	Very Low	Insignificant	
On-Going Monitoring	Number of complaints received			
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**		
	A noise or vibration complaint is received	• Review, update and implement this management plan		
Relevant EA conditions	Refer to Schedule N of the EA conditions (**Appendix A**)			

8.1.9 Management Plan 7: Vegetation Clearing Management Plan

The primary land use within the Proposed action area is agricultural land, including grazing and cropping. The majority of the Proposed action area is freehold tenure, with the exception of road parcels, a railway corridor

and easement parcel. There is a stock route located within the road corridor of Comet-Rolleston Road that is mapped within the eastern section of the Proposed action area.

The Vegetation Clearing Management Plan is provided in **Table 50**. This plan provides the environmental protection commitments and control strategies that will be implemented to minimise impacts on terrestrial flora values, fauna habitat values and sensitive environmental areas and communities.

Table 50. Management plan 7 - Vegetation clearing management plan

Environmental Protection Objective	Minimise vegetation clearing to the extent practicable for the safe operation of petroleum activities		
Measurable Environmental Outcome	• No unauthorised clearing of native vegetation. • No unauthorised disturbance to flora species or habitats of flora species listed as endangered, vulnerable or rare under State or Commonwealth legislation		
Environmental Risk Event	Unauthorised disturbance to flora species or habitats of flora species listed as endangered, vulnerable or rare under State or Commonwealth legislation		
Avoidance Measures	• Project layout optimised based on the ground-truthed ecological assessments to avoid any areas of ecological significance (e.g. TEC, GDEs, threatened species habitat, etc.) • No vegetation clearing adjacent to water courses • Project layout has considered and utilised existing access tracks • Project footprint minimised through the use of lateral and vertical production wells		
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Likely	High	Significant

Mitigation/Management Measures	**Timing**	**Responsibility**
Clearing limits to be survey marked prior to any clearing commencing	Prior to vegetation clearing	Project Manager
Assess sites for vegetation prior to undertaking clearing activities, by a suitably qualified and experienced person	Prior to vegetation clearing	Environmental Representative
Cleared paddocks and access tracks will be preferentially utilised for locating assets and tracks to minimise the extent of clearing	Prior to vegetation clearing	Project Manager
Where site assessment results in identification of sensitive ecological values such as threatened flora and fauna species, or threatened ecological communities, in order of preference: adjust location to avoid ecological values adjust the activity to prevent impact (e.g. change design or layout) if there is no viable alternative, seek additional authorisation where that is appropriate, which may include offset conditions	Prior to vegetation clearing	Project Manager
Any clearing beyond the approved clearing areas boundaries will be reported as an incident	During vegetation clearing	Environmental Representative
Pipeline crossings of defined watercourses will be via horizontal directional drilling to minimise the disturbance to riparian vegetation and aquatic habitat	Prior to vegetation clearing	Project Manager
The following records must be maintained for clearing: • Pre-clearance ecological inspection • Survey data of clearing extents	For a minimum of 5 years following clearing	Environmental Representative
Regular weed inspections will be carried out in areas subject to clearing	During construction	Environmental Representative
All plant and equipment moving mobilising to and demobilising from the site will be inspected for weed and seeds. If required plant and equipment will be cleared prior to mobilisation or demobilisation	During construction	Environmental Representative
Any cleared vegetation will be stockpiled in windrows adjacent to the area of clearing	During construction	Environmental Representative

Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Unlikely	High	Minor
On-Going Monitoring	Clearing extents will be visually inspected and verified by the Environmental Representative.		
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**	
	Clearing extents are exceeded in an area identified as containing significant ecological values (i.e. MNES, MSES or habitat for a threatened species)	• Train personnel on this management plan via a toolbox. • Notify the relevant authority and engage an ecologists to undertake an impact assessment and provide further recommendations	
Relevant EA conditions	Refer to Schedule B of the EA conditions (**Appendix A**)		

8.1.10 Management Plan 8: Fauna and Pest Management Plan

The Fauna and Pest Management Plan is provided in **Table 51.** This plan provides the environmental protection commitments and control strategies that will be implemented to minimise direct and indirect impacts on terrestrial fauna values including the following threatened MNES fauna species considered as likely or possibly occurring on the site:

- Koala (*Phascolarctos cinereus*)
- Australian Painted Snipe (*Rostratula australis*)
- Squatter Pigeon (*Geophaps scripta scripta*)
- Painted Honeyeater (*Grantiella picta*)
- Ornamental Snake (*Denisonia maculata*)
- Grey Snake (*Hemiaspis damelii*).

In terms of management of listed species that may occur on-site, including Koala, the plan provides specific and measurable outcomes, including reporting requirements and actions to be taken in the (unlikely) event of injury or mortality to one of the identified species. In compiling these measures, review of the following sources was used:

- Species Profile and Threats Database (SPRAT)
- Approved Conservation Advice for the relevant species including:
  - Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (DAWE 2022a)
  - Approved conservation advice for Rostratula australis (Australian Painted Snipe) (DSEWPC 2013)
  - Conservation advice Geophaps scripta scripta Squatter pigeon (southern) (TSSC 2015)
  - Conservation advice Grantiella picta Painted Honeyeater (DE 2015)
  - Approved conservation advice for Denisonia maculata (Ornamental Snake) (DE 2014)
  - Conservation advice for *Hemiaspis damelii* (Grey Snake) (DCCEEW 2022)
- National Recovery Plans for the relevant species including: for the Koala (2022)
  - National Recovery Plan for the Koala *Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory) (DAWE 2022b)
  - National recovery plan for the Australian Painted Snipe (*Rostratula australis*) (DCCEEW 2022)
  - National recovery plan for the Painted Honeyeater (*Grantiella picta*) (DAWE 2021)
- Adopted threat abatement plans relevant for the species including:
  - Threat abatement plan for predation by feral cats 2024 (DCCEEW 2024)
  - Threat abatement plan for competition and land degradation by rabbits (DEE 2016)
  - Threat abatement plan for predation by the European red fox (DEWHA 2008)

It is acknowledged that the SPRAT database notes that no threat abatement plan has been identified as being relevant for this species (Koala). As identified in the EPBC Act referral, the Project's extent of impact to potential Koala habitat for the identified species is very minor (<1.2 ha for any species), given the extent of

identical habitat present elsewhere within the Proposed action area (1,470 ha of wooded habitat and 1,513 ha of wetland/gilgai habitat). Although not identified above, several wetland bird species listed as Migratory under the EPBC Act may also possibly occur within the Proposed Action area. While not specifically addressed it is considered that management measures considered applicable to Australian Painted Snipe are also suitable to mange any possible impact on Migratory wetland bird species.

It is considered highly unlikely a significant impact to an MNES species. Koala will occur as a result of the Project. Nevertheless, the proposed measures are anticipated to be effective in avoiding, mitigating, and/or managing potential impacts.

Table 51. Management plan 8 - Fauna and pest management plan

Environmental Protection Objective	Minimise impacts on listed fauna species as a result of exploration, development and decommissioning activities		
Measurable Environmental Outcome	• No unauthorised disturbance to fauna species or habitats of fauna species listed as endangered, vulnerable, rare or near threatened under State or Commonwealth legislation • No introduction or spread of introduced pest animals.		
Environmental Risk Event	• Project activities result in the loss of habitat for a significant fauna species • Project activities result in the death or injury to a significant fauna species		
Avoidance Measures	• Project layout optimised based on the ground-truthed ecological assessments to avoid any areas of ecological significance (e.g. TEC, GDEs, threatened species habitat, etc.) • No vegetation clearing adjacent to water courses • Project layout has considered and utilised existing access tracks • Project footprint minimised through the use of lateral and vertical production wells		
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Likely	High	Significant

Mitigation/Management Measures	**Timing**	**Responsibility**
Cleared paddocks and access tracks will be preferentially utilised for locating assets and tracks to minimise impact to fauna habitat	Prior to vegetation clearing	Project Manager
Assess sites for fauna habitat prior to undertaking clearing activities, by a suitably qualified and experienced person	Prior to vegetation clearing	Environmental Representative
Where site assessment results in identification of sensitive ecological values such as threatened fauna species, or threatened ecological communities, in order of preference: • Adjust location to avoid ecological values • Adjust the activity to prevent impact (e.g. change design or layout) • If there is no viable alternative, seek additional authorisation where that is appropriate, which may include offset conditions	Prior to vegetation clearing	Project Manager
For any clearing of potential habitat (including vegetation or stockpiles of vegetation), the following will be implemented: • The potential habitat will be inspected by a suitably qualified and experienced person (i.e. licensed fauna spotter) to identify any fauna residing in the area • Clearing activities will only commence with verbal authorisation from the licensed fauna spotter • If fauna is present, the licensed fauna spotter will provide instructions to the Project Manager on appropriate action that may encourage the fauna to move of its own volition • In the event that fauna does not move, only the licensed fauna spotter will be authorised to collect the animal, in accordance with the Queensland code of practice for the welfare of wild animals affected by land-clearing and other habitat impacts and wildlife spotter/catchers (2009). The licensed fauna spotter must relocate the animal to the nearest available habitat (ideally adjacent to the area of clearing and outside the development footprint)	Prior to and during vegetation clearing	Environmental Representative

Establish partnerships with local wildlife carer	Prior to vegetation clearing	Project Manager
Any identified injured fauna must either be euthanised or transported to a local wildlife carer (if safe to do so) by a suitably qualified and experienced person (i.e. licensed fauna spotter). Liaise with local wildlife carers or veterinarians for appropriate treatment of injured animals	During construction	Environmental Representative
Any listed fauna injuries or mortalities caused as a result of vegetation clearing will be communicated to the administering authority within 24 hours of discovery	During construction	Environmental Representative
Any occurrence of listed species, including Koala (*Phascolarctos cinereus*) recorded during vegetation clearing will be immediately reported to the Environmental Representative	During construction	All Personnel
The following records must be maintained for clearing: • Pre-clearance ecological inspection • Fauna spotter records of any fauna interactions	For minimum of 5 years following clearing	Environmental Representative
Install appropriate fencing or cover of areas where fauna may be entrapped such as well infrastructure, dams or trenches	During construction	Environmental Representative
Inspect any trenches or excavations for trapped fauna on a daily basis	During construction	Environmental Representative
Fauna ramps must be installed in trenches a minimum of every 10 m apart, where trenches are required to remain open over night	During construction	Environmental Representative
Take prompt action to control any introduced species of pest animals, actions may include: • No domestic animals belonging to project personnel or subcontractors will be permitted on site • Covering and securing scrap kitchen • Direct pest control baiting and trapping (only if the specific species can be targeted) • Weekly inspections of onsite project buildings/infrastructure (e.g. offices and workers accommodation) for sheltering feral predators (focused on cats)	At all times	Environmental Representative
A fauna register to record all fauna encountered during clearing works (as per fauna spotter-catchers) including fauna incidents (injuries and mortality) will be maintained during construction	At all times	Environmental Representative
Onsite speed limits (<50 km/h) will be established throughout Proposed action area to limit the potential for road collisions. This speed limit is considered suitable as the Proposed action area is flat with good visibility; the Proponent is utilising existing farm tracks; driving will only be in 4WD mode.	At all times	All Personnel

Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Unlikely	High	Minor
On-Going Monitoring	Number of fauna interactions		
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**	
	Death or injury to a significant fauna species	Review, update and implement this management plan based on the cause of the death or injury.	
	Unauthorised disturbance to fauna habitat	• Train personnel on this management plan via a toolbox. • Notify the relevant authority and engage an ecologists to undertake an impact assessment and provide further recommendations	
Relevant EA conditions	Refer to Schedule B, conditions B1 and B2 of the EA conditions (**Appendix A**)		

8.1.11 Management Plan 9: Weed Management Plan

The Weed Management Plan is provided in **Table 52**. This plan provides the environmental protection commitments and control strategies that will be implemented to minimise impacts from weeds on terrestrial flora values and land use.

Table 52. Management plan 9 - Weed management plan

Environmental Protection Objective	Prevent or minimise the introduction or spread of pests through movement of people, vehicles, machinery or soil and vegetation disturbance			
Measurable Environmental Outcome	• No introduction of new weed species on the Proposed action area as a result of the petroleum activities • No increase on the Proposed action area in abundance or distribution of weed species as a result of the petroleum activities			
Environmental Risk Event	Proliferation of weed species as a result of Project activities.			
Avoidance Measures	No avoidance measures apply to this management plan.			
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**	
	Possible	Moderate	Medium	
Mitigation/Management Measures			**Timing**	**Responsibility**
Identify and record areas currently subject to weed infestations			Prior to vegetation clearing	Environmental Representative
Regular weed inspections will be carried out in areas of vegetation clearing			During Construction	Environmental Representative
Control and manage pest infestations and outbreaks resulting from petroleum activities in consultation with the relevant landowner/s			At all times	Environmental Representative
Weed washdown procedures will be implemented where necessary when moving between properties			At all times	Project Manager
Periodic monitoring of petroleum sites and access tracks for weeds			At all times	Environmental Representative
Weed awareness including in induction and tool box talks for all personnel			At all times	Environmental Representative
A vehicle and plant movement protocol will be established for movement between properties			At all times	Project manager
If a new weed infestation is reported or found, appropriate action to contain and eradicate will be implemented (in consultation with an ecologist). This will include (at a minimum) review of the Qld Department of Agriculture and Fisheries weed factsheets which provide advice on control methods including recommended herbicides and application rates. Available at: https://www.dpi.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/fact-sheets			At all times	Project manager
Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**	
	Possible	Low	Minor	
On-Going Monitoring	Weed inspections identifying weed outbreak			
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**		
	Weed outbreak identified adjacent to the Project activities	• Train personnel on this management plan via a toolbox. • Review all weed washdowns related to the Project had been completed in the last 90 days • Notify the land holder and take appropriate action to rectify (https://www.dpi.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/fact-sheets)		
Relevant EA conditions	No specific conditions applicable to weed management in the EA conditions.			

8.1.12 Management Plan 10: Soil and Erosion Management Plan

The Soil and Erosion Management Plan is provided in **Table 53**. This plan provides the environmental protection commitments and control strategies that will be implemented to minimise impacts on land and soil quality values.

Table 53. Management plan 10 - Soil and erosion management plan

Environmental Protection Objective	Minimise soil erosion and sedimentation that may result from exploration, development, or decommissioning activities.		
Measurable Environmental Outcome	• No failure of erosion and sediment control measures that result in the release of sediment • No release of stormwater runoff from active construction sites that has a greater turbidity than background water quality • No degradation of top soil quality as a result of project activities		
Environmental Risk Event	Project activities result in a release of sediment-laden waters to surface waters, resulting in an increase in downstream turbidity.		
Avoidance Measures	• No vegetation clearing adjacent to water courses • Project layout has considered and utilised existing access tracks • Project footprint minimised through the use of lateral and vertical production wells		
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Likely	High	**Significant**

Mitigation/Management Measures	**Timing**	**Responsibility**
Avoid working during the wet season or heavy erosive rainfall as much as practicable. Where this is not possible, erosion and sediment controls will be implemented prior to any disturbance being commenced	During construction	Project Manager
Use existing access roads where practicable. Where this is not practicable, new access tracks will be formed with erosion controls such as whoa boys and berms to minimise flows across the disturbance	At all times	All personnel
Soil sampling will be undertaken to identify reactive/erosive/dispersive soils	Prior to vegetation clearing	Environmental Representative
Every stage of the Project will have a site-specific erosion and sediment control plan (ESCP) developed and implemented in accordance with the *Best Practice Erosion and Sediment Control* (International Erosion Control Association Australia, 2008 or later versions). Each ESCP will outline erosion and sediment controls with consideration to: • Quantification of potential soil loss • Catchment and sub-catchments • Slope lengths and gradients • Nearest waterway and drainage lines • Soil properties • Stage duration • Disturbance areas	Prior to vegetation clearing	Environmental Representative
Reactive/erosive and dispersive soils will be managed with drainage and sediment controls in accordance with best practice guidance material	Prior to vegetation clearing	Environmental Representative
Vegetation clearing will be limited to the minimum disturbance required for the construction phase. Rootstocks will remain in situ where no earthworks are required.	During vegetation clearing	Supervisor
Reuse stripped top soil in areas to be rehabilitated with similar top soil characteristics if possible. If top soil cannot be effectively reused immediately, stockpile ensuring the height of the stockpile is no more than 2 m. Long-term stockpiles will be re-vegetated with appropriate cover crops to minimise loss of top soil	During vegetation clearing	Supervisor
Top soils and subsoils will not be mixed. Replace subsoils at depth and cover with top soil	During construction	Supervisor

Where practicable, mulch cleared vegetation and spread as protective layer over exposed soil	During construction	Supervisor
Stabilise problem area/s that have the potential for erosion or soil movement with surface stabilisers, crushed rock or scour protection as necessary	During construction	Supervisor
Slow the overland flow of water and floodwaters by installing frequent contour banks, whoa boys or similar in appropriate areas	During construction	Supervisor
Direct discharges to multiple locations to decrease volumes. Discharges will be stable drainage lines. Implement engineering controls in drainage line where necessary	During construction	Supervisor
Any erosion and sediment control devices installed will remain in place until the relevant area is stabilised by rehabilitation	During construction	Supervisor
Subsoil stockpiles will be less than 3 m in height and located away from drainage lines	During construction	Supervisor
Re-establish the bed and banks profile of any waterways or creeks disturbed by Project activities	During construction	Supervisor
Erosion and sediment control devices will be inspected following every rainfall event. Where maintenance to devices are required, this will be completed immediately	Following rainfall event	Environmental Representative

Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Possible	Low	**Minor**
On-Going Monitoring Program	Implement the surface water monitoring detailed in Section 8.7 of **Appendix L** (Water Monitoring and Management Plan 2025)		
Corrective Actions if Environmental Outcome is not achieved	**Identified Cause**	**Corrective Action**	
	This management plan or ESCP has not been implemented	• Rectify the non-conformances • Train personnel and contractors on the appropriate implementation of measures • Weekly surface water monitoring until results demonstrate the Project causes no residual sedimentation	
	This management plan or ESCP is not suitable to minimise the potential for erosion	• Review and update the management plan / ESCP • Train personnel and contractors on the updated measures adopted in the management plan / ESCP • Weekly surface water monitoring until results demonstrate the Project causes no residual sedimentation • Implement the mitigation response detailed in section 7.3 of the water monitoring and management plan (2025)	
Relevant EA conditions	Refer to Schedule L of the EA conditions (**Appendix A**)		

8.1.13 Management Plan 11: Land Use Management Plan

A Land Use Management Plan is provided in

Table 54. This plan provides the environmental protection commitments and control strategies that will be implemented to minimise impacts on land use, landholders and other land tenure holders.

Table 54. Management plan 11 - Land use management plan

Environmental Protection Objective	• Minimise impacts on existing land uses and surrounding landholders/tenure holders as a result of exploration, development, production and decommissioning activities • Avoid accidental damage to existing infrastructure and services • Avoid environmental harm and reduced soil productivity arising from the release of sediments, salinisation of soil, disturbance of contaminated soils and contamination of soils		
Measurable Environmental Outcome	• Any impacted landholder is consulted with prior to impact to their land • No complaints from landowners or tenure holders		
Environmental Risk Event	• Project activities result in damage to existing infrastructure and services • Release of contaminants results in reduced soil productivity and biodiversity		
Avoidance Measures	• Project layout optimised based on the ground-truthed assessments and consultation with landholders to: - Avoid any areas of ecological significance (e.g. TEC, GDEs, threatened species habitat, etc.) - Minimise impacts to agricultural activities and productive land • Project layout has considered and utilised existing access tracks • Project footprint minimised through the use of lateral and vertical production wells		
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Likely	Moderate	Medium

Mitigation/Management Measures	**Timing**	**Responsibility**
Co-ordinate clearing and disturbance activities with landowners to minimise disruption to property operations	Prior to vegetation clearing	Project Manager
Use existing access roads where practicable	At all times	All personnel
Flow lines will follow existing fence lines or roads where practicable to minimise disturbance to property activities	During construction	Project Manager
Consult with land/tenure holders on locations of field infrastructure to minimise impacts on property activities	Prior to works commencing	Project Manager
Maintain a complaints register and handling system.	At all times	Environmental Representative
Conduct pre-clearing checks for potential soil contamination	Prior to vegetation clearing	Environmental Representative
If contaminated soil is identified, further investigate and in consultation with the landowner develop appropriate remediation strategies and disposal requirements	During earthworks	Environmental Representative
Dispose of significant quantities of contaminated soils to authorised facilities. Small quantities can be maintained on-site where appropriate	At all stages	Supervisor
Design fuel, oil and chemical storage and handling areas in accordance with Australian Standards	Prior to works commencing	Project Manager
Inspect and maintain all vehicles, plant and machinery to ensure they are not at risk of leaking or spilling contaminants	At all stages	All personnel
Ensure that appropriate handling and use of fuels, oils and chemicals is enforced on-site	At all stages	Project Manager
Include handling procedures and clean up protocols in induction training and tool box talks	At all stages	Environmental Representative
Clean up spills promptly	At all stages	All personnel
Keep a spill kit on-site for each relevant infrastructure	At all stages	Environmental Representative
Ensure that each well, tank and sewage treatment is adequately signposted for easy identification with a unique name or number	At all stages	Project Manager

Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Possible	Moderate	Medium
On-Going Monitoring	Implement the monitoring detailed in Section 9 of the Chemical Risk Assessment (2023)		
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**	
	Contaminant releases from the Project result in loss of biodiversity or land productivity	• Engage a contaminated land specialist / soil scientist to undertake an investigation and determine appropriate remediation action plan • Implement the remediation action plan • Review this management plan, update as necessary and implement the revised plan	
Relevant EA conditions	Refer to Schedule L of the EA conditions (**Appendix A**)		

8.1.14 Management Plan 12: Waste Management Plan

The primary waste generation for the construction and operation is expected to include the following:

- Vegetation
- Typical drilling wastes including packaging, surplus drilling materials such as timber, concrete, gravel, metals and plastics
- Returned drill cuttings and muds
- Surplus soil from earthworks
- Typical domestic waste generated from camps
- Sewage from camps
- CSG water

Where possible the waste will be reused, recycled or removed to a facility that can lawfully accept the waste under the EP Act.

All regulated waste will be removed from site and transported by a person who holds a current authority to transport such wastes to a facility that is lawfully able to accept the waste under the EP Act. Trackable waste records will be kept in accordance with EA conditions and the EP Act.

The following potential impacts from waste have been identified:

- Release of hazardous waste to land or waters either through inappropriate waste disposal protocols or accidental release(s)
- Inadequate waste management leading to inappropriate disposal, or inadequate re-use or recycling
- Compromised land use, ecosystems or well-being of people resulting from inappropriate waste disposal
- Beneficial re-use of coal seam gas water may result in improved conditions for agriculture by providing an additional water source.

Objectives for waste management are based on the waste and resource management hierarchy outlined in Section 9 of the WRR Act. Management Plan 12 (refer **Table 55**) deals with all solid and sewage waste that may be generated by the petroleum activities, including drilling materials, packaging materials, green waste and sewage.

Table 55. Management plan 12 - Waste management plan

Environmental Protection Objective	• Minimise waste generation to the extent practicable in accordance with the waste management hierarchy of avoid, re-use and recycle • Or dispose of waste in the most appropriate manner
Measurable Environmental Outcome	• No on-site environmental impacts from the management of waste • No waste is disposed of at a facility that is not licensed to accept the waste • No contamination of soil, air or water as a result of waste handling

Environmental Risk Event	• Solid waste material is not disposed of at an appropriately licensed facility • Sewage waste material is released to the environment • Loss of available landfill airspace as a result of the inappropriate segregation of solid waste		
Avoidance Measures	N/A - No avoidance measures apply to this management plan		
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Likely	Low	Minor
Mitigation/Management Measures		**Timing**	**Responsibility**
Set up designated waste disposal areas at each production well construction area. Include bins or nominated areas for the following solid waste streams: • General waste • Regulated waste (i.e. oils, oily rags, solvents, lubricants and fuel). • Drill cuttings • Cleared vegetation The designated area can be moved once the production well construction has been completed.		At all stages	Project Manager
Maintain a designated waste disposal areas at the gas compression facility construction area. Include bins, tanks or nominated areas for the following solid waste streams: • General waste • Regulated waste (i.e. clean-up material, oily waste etc • Sewage effluent • Recyclable steel and copper		At all stages	Project Manager
Surplus soil will be reused across the Project to shape land and create erosion and sediment controls		At all stages	Project Manager
Store recyclable waste separately from residual/non-recyclable waste		At all stages	Project Manager
All fuel, oil and chemicals are to be stored, transported, and handled in accordance with appropriate standards including AS1940:2004 - The storage and handling of flammable and combustible liquids, AS 3780:2008 – The storage and handling of corrosive substances, AS 3833:2007 – Storage and handling of mixed classes of dangerous goods in packaged and intermediate bulk containers		At all stages	All personnel
Use pre-painted products to minimise use of paints and solvents		At all stages	All personnel
Ensure waste is removed by an appropriately licensed contractor		At all stages	Supervisor
Ensure appropriate records are kept for trackable wastes		At all stages	Environmental Representative
Used oils, oily rags, solvents, lubricants and fuel in covered and bunded areas and disposed of as regulated waste		At all stages	All personnel
Ensure drilling wastes will be disposed of as general waste		At all stages	Supervisor
Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Possible	Low	Minor
On-Going Monitoring	Volumes and type of waste being generated on the Project		
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**	
	Unauthorised disposal or release of Project generated waste material	• Undertake toolbox training with all personnel on appropriate waste handling • Increase the frequency of waste servicing • Review, update and implement this management plan	
Relevant EA conditions	Refer to Schedule W of the EA conditions (**Appendix A**)		

8.1.15 Management Plan 13: Coal Seam Gas Water Management Strategy

The Coal Seam Gas Water Management Plan is provided in **Table 56**. This plan provides the environmental protection commitments and control strategies that will be implemented to minimise impacts on environmental values from the storage and handling of produced water.

Table 56. Management plan 13 - Coal seam gas water management strategy

Environmental Protection Objective	• Manage coal seam gas produced water in a way that optimises its beneficial use and minimises adverse impacts on environmental values • Contain coal seam gas produced water in appropriate structures until it can be re-used			
Measurable Environmental Outcome	• Beneficial use of coal seam gas produced water will be in accordance with the appropriate end of waste code • The initial consequence category of structures will be certified by a suitably qualified and experienced person in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933)* and the Guideline *Structures which are dams or levees constructed as part of environmentally relevant activities* (ESR/2016/1934)			
Environmental Risk Event	Unauthorised release of coal seam gas produced water to the environment.			
Avoidance Measures	Produced water is stored greater than 2km from the nearest mapped watercourses			
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**	
	Possible	Moderate	Medium	
Mitigation/Management Measures			**Timing**	**Responsibility**
Coal seam gas produced water will be contained in appropriately designed and constructed dams or tanks. [Note the EA only authorises low consequence category dams]			During Operations	Project Manager
Dams will be monitored regularly to ensure that the dam remains a low consequence category structure			At all stages	Environmental Representative
Testing of coal seam gas produced water will occur prior to any beneficial use to establish that the water meets the criteria required for that use (e.g. stock and domestic)			At all stages	Environmental Representative
Any beneficial use of water will be in accordance with the latest version of the *End of Waste Code Associated Water (including coal seam gas water) (ENEW07547018)*			At all stages	Environmental Representative
Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**	
	Unlikely	Moderate	Minor	
On-Going Monitoring	• Permanent leak detection on any tanks or dams that are storing coal seam gas produced water • Implement the surface water monitoring detailed in Section 8.7 of the Water Monitoring and Management Plan 2025			
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**		
	Unauthorised release of coal seam gas produced water	Implement the mitigation response detailed in Section 7.3 of the Water Monitoring and Management Plan (2025)		
Relevant EA conditions	Refer to Schedule W (conditions W5 to W8) of the EA conditions (**Appendix A**)			

8.1.16 Management Plan 14: Surface Water Management Plan

The Project is contained within the Fitzroy River catchment area, and the Comet River sub-basin. The Fitzroy River drains to the sea at Rockhampton.

The *Environmental Protection Policy (Water and Wetland Biodiversity) 2019* provides a framework for managing water, including identification values associated with water and setting of water quality objectives. Environmental values identified for water in the Proposed action area are:

- Farm water supply
- Stock watering and irrigation
- Suitability for raw drinking water supply
- Cultural and spiritual values

The following potential impacts to surface water were identified for the construction and operation phases:

- Increased sediment load in runoff and at stream crossings
- Water quality impacts associated with herbicides for weed control
- Water quality impacts from improper containment of chemicals, fuels, wastes and CSG water
- Stormwater discharge and flow redirection
- Impacts to natural flood flows

A Surface Water Management Plan is provided in **Table 57**. This plan provides the environmental protection commitments and control strategies that will be implemented to minimise impacts on surface waters. Surface water encompasses watercourses, wetlands and springs and overland flow as well as the management of stormwater runoff.

Table 57. Management plan 14 - Surface water management plan

Environmental Protection Objective	• Undertake petroleum activities in a manner that has negligible impact on surface water environmental values • Undertake petroleum activities in a manner that has negligible impact of stormwater runoff to surface water geomorphology, hydrology, quality and dependent ecosystems		
Measurable Environmental Outcome	• The natural flow of a watercourse has not been interfered with through placing fill, excavation, impoundment or diversion • Time of disturbance to the bed and banks of a watercourse is not undertaken between the months of 01 November and 31 March each year • No unauthorised discharge to surface waters of contaminants, including through stormwater runoff		
Environmental Risk Event	• Project activities result in a reduction in the water quality in the receiving environment • Project activities alter the natural hydrologic flow regime resulting in changes in water availability in the receiving environment		
Avoidance Measures	• Only minor earthworks proposed on the Project resulting in minimal changes to hydrologic regimes • The GCF is located more than 2km from a mapped watercourse • Disturbance activities have preferentially been chosen to be located in previously disturbed land to minimise the potential for new impacts to be caused		
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Possible	High	Medium
Mitigation/Management Measures		**Timing**	**Responsibility**
Infrastructure and activities will be designed to occur outside watercourses and drainage lines where practicable		Prior to works commencing	Project Manager
Vegetation will not be cleared, nor fill placed in or within: • 200 m from any wetland, lake or spring; or • 100 m of the high bank of any other watercourse		During Construction	Supervisor
Activities for construction of pipelines or access tracks or any other linear infrastructure in watercourses, will be undertaken in no or low flow conditions		During Construction	Supervisor
Routine, regular and frequent visual monitoring will be undertaken while construction work is carried out in a watercourse		During Construction	Supervisor
Petroleum activities that do occur in a watercourse, lake or spring will be designed and undertaken by a suitably qualified person		During Construction	Supervisor
Refuelling of plant and equipment will occur at least 30 m from a watercourse or other drainage feature		During Construction	Supervisor
Hazardous and dangerous goods will be stored in bunded facilities located at least 100 m from a watercourse or other drainage feature		During Construction	Supervisor
Fuels and other flammable liquids will be stored and handled in accordance with *AS 1940:2004 - The storage and handling of flammable and combustible liquids*.		During Construction	All personnel

Every stage of the Project will have a site-specific erosion and sediment control plan (ESCP) developed and implemented in accordance with the *Best Practice Erosion and Sediment Control* (International Erosion Control Association Australia, 2008 or later versions). Each ESCP will outline erosion and sediment controls with consideration to: • Quantification of potential soil loss • Catchment and sub-catchments • Slope lengths and gradients • Nearest waterway and drainage lines • Soil properties • Stage duration • Disturbance areas	During Construction	Supervisor
Where hardstand areas are installed, appropriate measures to reduce the possible effects of stormwater runoff will be implemented.	During Construction	Supervisor

Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Unlikely	High	Minor
On-Going Monitoring	Implement the surface water monitoring detailed in Section 8.7 of the Water Monitoring and Management Plan 2025		
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**	
	Project activities result in a change in water quality or flow in the receiving environment	Implement the mitigation response detailed in Section 7.3 of the Water Monitoring and Management Plan (2025)	
Relevant EA conditions	Refer to Schedule WT of the EA conditions (**Appendix A**)		

8.1.17 Management Plan 15: Groundwater Management Plan

There are a number of requirements under the *Water Act 2000* designed to protect groundwater resources from the impacts of resource activities. A Baseline Assessment Plan is required to be submitted and approved prior to commencement of testing or production activities.

The *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* provides a framework for managing water, including identification values associated with water and setting of water quality objectives. Environmental values identified for water in the Proposed action area are:

- Farm water supply
- Stock watering and irrigation
- Suitability for raw drinking water supply
- Cultural and spiritual values

The following potential impacts to groundwater were identified for the construction and operating phases:

- Potential drawdown of aquifers as a result of depressurisation activities for coal seam gas production
- Potential loss of functional use of water bores as a result of that drawdown
- Impact on aquifers as a result of drilling activities, including connectivity of gas producing horizons with water producing horizons
- Contamination of aquifers due to poor drilling practises or improper isolation of zones by casing or cement
- Potential impact on GDEs

A Groundwater Management Plan is provided in

Table 58. This plan provides the environmental protection commitments and control strategies that will be implemented to minimise impacts on groundwater values as a result of petroleum activities. Note that the existing EA does not authorise well stimulation activities; so there are no such management measures outlined here.

Table 58. Management plan 15 - Groundwater management plan

Environmental Protection Objective	Manage petroleum activities in a manner that minimises impacts to groundwater quality and levels			
Measurable Environmental Outcome	• Well construction and operation in accordance with the relevant Codes • Oil-based or synthetic-based drilling muds will not be used • Drilling activities do not cause the connection of a target gas production horizon with other aquifers			
Environmental Risk Event	Drawdown of groundwater levels resulting in impacts to groundwater users			
Avoidance Measures	N/A – no avoidance measures are applicable to this management plan			
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**	
	Unlikely	High	Minor	
Mitigation/Management Measures			**Timing**	**Responsibility**
Procure and use only approved water based and biodegradable drilling fluids			During drilling activities	Project Manager
During development of production wells, hydraulic isolation will be maintained between aquifers			Throughout the well development phase	Supervisor
Baseline assessment of any identified water bores in the area completed prior to testing			Prior to works commencing	Project Manager
Annual modelling will be undertaken to determine connectivity or otherwise of coals seams with groundwater resources in the area			Annual	Project Manager
Undertake collation of historical water level data for bores in the area to establish natural seasonal variation in aquifer levels			Prior to drilling works commencing	Environmental Representative
Develop and implement a groundwater monitoring program to identify potential impacts on groundwater user			Prior to drilling works commencing and on-going thereafter	Environmental Representative
Develop a trigger action response plan in accordance with the *Coal Seam Gas - Joint industry framework Managing impacts to groundwater resources in the Surat Cumulative Management Area under EPBC Act approvals*			Prior to drilling works commencing and on-going thereafter	Environmental Representative
Monitor trigger levels of the implementation of the trigger action response plans			At all times	Environmental Representative
Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**	
	Highly Unlikely	High	Insignificant	
On-Going Monitoring	Implement the ground water monitoring detailed in Section 8.7 of the Water Monitoring and Management Plan 2025			
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**		**Corrective Action**	
	Project activities result in a change in water quality or flow in the receiving environment		Implement the mitigation response detailed in Section 7.3 of the Water Monitoring and Management Plan (2025)	
Relevant EA conditions	Refer to Schedule WT and WS of the EA conditions (**Appendix A**)			

8.1.18 Management Plan 16 Cultural Heritage Management Strategy

There is potential for activities undertaken in the Proposed action area to disturb unrecorded items of cultural heritage (CH). The management of accidental finds of cultural heritage items is therefore important, along with the Duty of Care requirements under the *Aboriginal Cultural Heritage Act 2003*.

The CH group for the Proposed action area are the Gaangalu Nations People (GNP). Prior to land disturbance, a CH ground survey will be conducted, utilising advisors from the GNP.

The Cultural Heritage Management Strategy is provided in

Table 59. This provides the environmental protection commitments and control strategies that will be implemented to minimise impacts to both unknown and undiscovered items and places of cultural heritage relevant to the Proposed action area.

Table 59. Management plan 16 - Cultural heritage management strategy

Environmental Protection Objective	• To avoid damage, destruction or degradation of cultural artefacts during construction or operation; • To avoid impacts on other existing group rights seeking access to cultural artefacts and places			
Measurable Environmental Outcome	Compliance with the Duty of Care obligations under the *Aboriginal Cultural Heritage Act 2003*			
Environmental Risk Event	Loss of Aboriginal cultural heritage values from Project disturbance activities.			
Avoidance Measures	Avoidance of all known cultural heritage sites in the Project layout.			
Inherent Risk Rating (before mitigation measures applied)	**Likelihood**	**Consequence**	**Risk Rating**	
	Possible	Moderate	Minor	
Mitigation/Management Measures			**Timing**	**Responsibility**
Identify and map all known cultural heritage sites			Prior to ground disturbance	Environmental Representative
Conduct cultural heritage surveys prior to commencing activities that could result in ground disturbance			Prior to ground disturbance	Environmental Representative
Catalogue any discovered artefacts			At all stages	Environmental Representative
In the event of accidental finds, stop work to exercise Duty of Care			At all stages	Project Manager
Create buffer zones around fixed known cultural heritage locations (such as scar trees or sacred places)			At all stages	Supervisor
Where appropriate and in consultation with the CH advisors, log location details, and relocated artefacts for the duration of Project activities (such as isolated finds)			At all stages	Environmental Representative
Record results of any cultural heritage surveys in the register (if agreed by traditional owners)			At all stages	Environmental Representative
Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**	
	Unlikely	Moderate	Minor	
On-Going Monitoring	Pre-disturbance cultural surveys with traditional owners			
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**		
	Cultural heritage artefact is found during the Project	In the event of accidental finds, stop work to exercise Duty of Care		
Relevant EA conditions	No specific conditions applicable to cultural heritage management in the EA conditions.			

8.2 Cumulative Impacts

The Project occurs in a region with existing mining projects in the wider area including Whitehaven's Blackwater Coal Mine (10 km to the east at its closest point) and Glencore's Rolleston Open Cut mine 38 km to the south. Cumulative impacts associated with these projects may be associated with impacts to ecological and groundwater values. Assessment of these potential cumulative impacts have been included in **Sections 5.4.12** and **Section 6.6**. No potential or likely cumulative impacts associated with the Project and surrounding projects are predicted.

In response to the IESC advice (Item 20), a cumulative impact assessment has been undertaken and is provided in Section 9 of the WMMP (**Appendix L**).

8.2.1 Associated Proponent Projects

The Project, although not inextricably linked to other actions, is part of the Mahalo CSG Hub involving existing and potentially future developments by the proponent and other developers, these include the following:

- **Domestic Gas Export Pipeline:** A new domestic gas export pipeline to connect the Proposed action area to the domestic gas network
- **Existing Production Leases (PL 1082 and 1083):** These leases are part of the Mahalo Gas Project, but there is currently no production activity, and development may not occur for several years
- **Future Tenement:** Gas interests north of the Proposed action area

8.2.1.1 Domestic Export Pipeline

Comet Ridge is working with Jemena (pipeline development company) to develop a domestic gas export pipeline route located south of the Proposed action area. A document developed by Comet Ridge, titled '*Comet Ridge Progressing Mahalo Gas Hub Development – Capital Raising Presentation'* is publicly available and presents this option.

A secondary option of the domestic gas export pipeline running west of the Proposed action area towards PPL 10 (which is owned by Denison Gas) may also be explored. This option will only be employed if there are delays to the development of the southern Jemena domestic export pipeline.

Either pipeline route would be subject to separate State and Commonwealth approvals (where applicable). Prior to the approval pathway being determined route optimisation will be undertaken to identify the preferential route that avoids impacts to MNES. The avoidance of MNES will be achieved by:

- Utilising existing disturbed routes (e.g. road corridors, fence lines, agricultural land etc.)
- Utilising HDD methods under watercourses to avoid clearing any fringing vegetation

By ensuring the domestic gas export pipeline route is chosen to avoid impacts on MNES, the Project will not contribute to a cumulative impact to a MNES that is listed threatened species and/or communities.

From the perspective of water resources, the domestic gas export pipeline will not impact on any groundwater resources and therefore will not contribute to cumulative impacts on groundwater resources from the Project. In terms surface water resources, there will not be a cumulative impact as a result of the pipeline and the Project, as the combined actions will not:

- Change any existing hydrological regimes in the surrounding area
- Result in additional sediment loads in stormwater runoff as compared with existing sediment loads. This is because best practice erosion and sediment control will be adopted during the construction phase
- Result in the release of any contaminated water (e.g. produced water) to receiving waters
- Impact on the bed and banks of watercourses, as a result of HDD methods being employed

8.2.1.2 Existing Production Leases

The Mahalo Gas Project (PL 1082 and 1083) is a joint venture between Comet Ridge (57%) and Santos (43%) and is located directly south of the Proposed action area. This Project is a standalone project, has not processed to Financial Investment Decision (FID) or Front End Engineering Design (FEED) and is considered a completely separate action to this Proposed action. Accordingly, the Mahalo Gas Project has undergone a separate approval pathway under the EPBC Act.

In terms of cumulative impacts on water resources the Proposed action area is located within the northern extent of the Surat Cumulative Management Area (CMA), which also incorporates the Mahalo Gas Project. The Surat CMA Underground Water Impact Report (UWIR) numerical groundwater flow model was used to predict cumulative impacts on water resources with inclusion of the Proposed action. To further validate the outcomes of the Surat CMA UWIR, a site-specific conceptual groundwater model was prepared, this modelling also considered the Mahalo Gas Project. The findings of the groundwater modelling undertaken for the Project and the cumulative impacts have been described in **Appendix G.** Overall, the modelling has demonstrated there is unlikely to be a cumulative impact on water resources with the addition of the Project.

From the perspective of ecological impacts the Project will have minimal impact on remnant vegetation (1.28 ha) or gilgai habitat (0.89 ha) that may provide value for MNES. Land within and surrounding the Proposed action area has been highly disturbed as a result of on-going and historical agricultural activities. This has

resulted in ecological values being highly fragmented. As such, the Project is not considered to contribute to a cumulative impact to when considered with the existing impacts from the Mahalo Gas Project.

The WMMP (Section 9) (**Appendix L**) provides an adaptive assessment framework and methodology for identifying and managing cumulative water-related impacts. The methodology is in line with the principles outlined in Chapter 5 of the IESC Information Guidelines (2024)

8.2.1.3 Future Tenement

The Proponent, Comet Ridge, has another tenement interest directly to the north of the Project (identified as PLA 1132). This tenement is currently under reserve appraisal by Comet Ridge prior to further development and therefore is not confirmed as a proven and possible Project. Further appraisal and development work will require:

- Further drilling works
- Landholder negotiations
- Environmental assessments
- Environmental approval applications (including EA and EPBC approval)

The work required to complete the above will take a number of years to progress and refine. For this reason tenement PLA 1132 has been excluded as a relevant to cumulative impacts for this Project. However should a project within PLA 1132 be confirmed, the approval pathway for that project will consider this Project as part of the cumulative impact assessment for a Proposed action within PLA 1132.

9 REHABILITATION REQUIREMENTS

9.1 EA Conditions for Rehabilitation Requirements

Section 560 of the P&G Act and Condition R9 to R11 of the EA requires the tenure holder to remove all equipment and infrastructure from the land prior to relinquishment of the tenure, unless the landowner agrees otherwise. A written agreement for any permanent infrastructure left to the landowner is required to be included in a Final Rehabilitation Report triggered under the EP Act. Schedule R of the EA Conditions (**Appendix A**) lists the rehabilitation requirements for the Project. A summary of these conditions is provided below:

- Condition R1: Develop a rehabilitation plan
- Condition R2: Backfill and reinstate pipeline trenches
- Condition R3: Progressive rehabilitation acceptance criteria:
  - Within 12 months of works associated with the activity ceasing over an area of land, disturbance on the land caused by the activity must be rehabilitated to meet the following acceptance criteria and be maintained until the final acceptance criteria in conditions R4 or R5 is met:
    a) contaminated land resulting from the activity is remediated and rehabilitated;
    b) the areas are:
       i. non-polluting;
       ii. a stable landform; and
       iii. re-profiled to contours consistent with the surrounding landform; and
    c) surface drainage lines are re-established;
    d) top soil is reinstated; and
    e) either:
       i. groundcover, that is not a declared pest species, is growing; or
       ii. an alternative soil stabilisation methodology that achieves effective stabilisation is implemented and maintained.
- Condition R4: Final rehabilitation acceptance criteria (areas that do not have biodiversity values):
  - Disturbance caused by the activity to areas that do not have biodiversity values, which are not being or intended to be utilised by the landholder or overlapping tenure holder, must be rehabilitated to meet the following final rehabilitation acceptance criteria measured against either the highest ecological value of the adjacent land use or the pre-disturbed land use:
    a) greater than or equal to 70% of native ground cover species richness;
    b) greater than or equal to the total per cent of ground cover;
    c) less than or equal to the per cent species richness of declared plant pest species; and
    d) where the adjacent land use contains, or the pre-disturbed land use contained, one or more regional ecosystem, then the disturbed land must be rehabilitated to have at least one regional ecosystem from the same broad vegetation group and with the equivalent biodiversity status or a biodiversity status with a higher conservation value.
- Condition R5 and R6: Final rehabilitation acceptance criteria (areas that have biodiversity values):
  - Disturbance caused by the activity to areas with biodiversity values must be rehabilitated to meet the following final rehabilitation acceptance criteria as measured against the pre-disturbance biodiversity values assessment for that area required by condition B2:
    a) greater than or equal to 70% of native ground cover species richness;
    b) greater than or equal to the total per cent ground cover;
    c) less than or equal to the per cent species richness of declared plant pest species;
    d) greater than or equal to 50% of organic litter cover;
    e) greater than or equal to 50% of total density of coarse woody material; and
    f) all predominant species in the ecologically dominant layer, that define the pre-disturbance regional ecosystems are present
  - Conditions R3, R4 and R5 continue to apply after this environmental authority has ended or ceased to have effect.
- Condition R7 and R8: Rehabilitation reporting for relinquishment
- Condition R9, R10 and R11: Transfer of infrastructure

In accordance with Condition R1 of the EA, a Rehabilitation Management Plan is provided in the EMP (**Appendix I**) and in **Table 60**. This plan provides the environmental protection commitments and control strategies that will be implemented to maximise the effectiveness of rehabilitation activities.

In accordance with Condition R3 to R6 of the EA, Rehabilitation Objectives and Criteria is provided in **Table 61.** Rehabilitation activities and measures have been provided to ensure a safe, stable, non-polluting, and self-sustaining landform, including restoration of habitat for listed threatened species, including Koala, and avoidance of sedimentation/erosion within the site generally.

Details of rehabilitation activities proposed to be undertaken as required by any Commonwealth or State approvals, which are not already shown here, will be added once the requisite approvals and conditions are granted.

Table 60. Rehabilitation management plan

<table>
<tr><td>Environmental Protection Objective</td><td colspan="4">• Final landform that is safe, non-polluting, stable and self-sustaining
• Significantly disturbed land reinstated to pre-disturbance land use; except where otherwise agreed between the landholder, administering authority and the tenure holder
• Significantly disturbed land is rehabilitated to a stable landform requiring no on-going management greater than that required pre-disturbance</td></tr>
<tr><td>Measurable Environmental Outcome</td><td colspan="4">• Dams to be rehabilitated to become a stable landform similar to surrounding undisturbed areas OR with agreement maintained for use by the landowner.
• Decommissioning of all infrastructure no longer required at cessation of activities.
• No ongoing contamination of surface or groundwater.
• Achieve stable landform with no subsidence or erosion gullies
• Achieve 70% native ground cover species richness after rehabilitation compared to pre-disturbed or adjacent land use
• Achieve greater than or equal to the total percent of ground cover compared to pre-disturbed or adjacent land use
• Achieve less than or equal to the percent species of declared plant pest species compared to pre-disturbed or adjacent land use
• Rehabilitated land to contain at least one regional ecosystem from the broad vegetation group in either the adjacent land or pre-disturbed land, with equal or higher biodiversity conservation value
• Where the rehabilitated land was in an environmentally sensitive area, additionally achieve greater than or equal to 50% organic litter cover, and greater than or equal to 50% of total density of woody material
• Where the rehabilitated land was in an environmentally sensitive area, additionally, all predominant species in the ecologically dominant layer defining the pre-disturbance regional ecosystem (RE) are to be present</td></tr>
<tr><td>Environmental Risk Event</td><td colspan="4">Residual environmental harm is occurring post operations as a result of ineffective rehabilitation</td></tr>
<tr><td>Avoidance Measures</td><td colspan="4">• Project layout optimised based on the ground-truthed ecological assessments to avoid any areas of ecological significance (e.g. TEC, GDEs, threatened species habitat, etc.)
• Project layout has considered and utilised existing access tracks
• Project footprint minimised through the use of lateral and vertical production wells</td></tr>
<tr><td rowspan="2">Inherent Risk Rating (before mitigation measures applied)</td><td>Likelihood</td><td colspan="2">Consequence</td><td>Risk Rating</td></tr>
<tr><td>Likely</td><td colspan="2">High</td><td>Significant</td></tr>
<tr><td colspan="3">Mitigation/Management Measures</td><td>Timing</td><td>Responsibility</td></tr>
<tr><td colspan="3">Progressive rehabilitation of disturbed areas as practicable, including reshaping significantly disturbed land to a stable profile and remediation of contaminated land.</td><td>At all stages</td><td>Environmental Representative</td></tr>
</table>

Re-establish surface drainage lines to prevent erosion and manage sedimentation, and restore natural hydrological function	During construction	Supervisor
Reinstate top layer of soil profile to promote vegetation growth and prevent erosion	During construction	Supervisor
Continue weed management protocols (refer to Management Plan 8 (**Table 51)** until a minimum of 70% native ground cover is achieved. Note where the land disturbed was previously used for cropping, the land must be returned to a suitable state to allow the landholder to continue cropping.	During construction	Supervisor
Promote establishment of vegetation to stabilise soil and prevent erosion	During construction	Supervisor
Regular maintenance of rehabilitated areas until performance standards are met.	At all stages	Environmental Representative
Monitoring at least annually, or as appropriate, to measure progress of rehabilitation until performance standards are met.	Annually	Environmental Representative
Written agreements with landowners for acceptance of rehabilitation works	At all stages	Project Manager
Written agreements with landowners for any infrastructure remaining on the property for their us	At all stages	Project Manager
Prepare Final Rehabilitation Report once rehabilitation has been completed across all stages	Prior to surrender of PL	Environmental Representative

Residual Risk Rating (after mitigation measures have been applied)	**Likelihood**	**Consequence**	**Risk Rating**
	Possible	High	Medium
On-Going Monitoring	• Groundcover achieved following rehabilitation • Verified completion of progressive rehabilitation		
Corrective Actions if Environmental Outcome is not achieved	**Identified Issue**	**Corrective Action**	
	Rehabilitation is not successful in achieving a stable, safe, non-polluting and self-sustaining landform	Rehabilitation obligations continue until the land can be proven to be stable, safe, non-polluting and self-sustaining.	
Relevant EA conditions	Refer to Schedule R of the EA conditions (**Appendix A**)		

9.2 Revegetation

The vegetation community that is being rehabilitated is described as remnant Poplar Box woodland analogous to Regional Ecosystem 11.5.3 - *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces. Dominant species that will be included in the rehabilitation site are listed below:

Trees

- Poplar Box (Eucalyptus populnea)
- Silver-leaved Ironbark (Eucalyptus melanophloia)
- Long-fruited Bloodwood (Corymbia clarksoniana)
- White Cypress Pine (Callitris glaucophylla)
- Quinine Tree (Petalostigma pubescens)

Shrubs

- Leichardt Bean (*Cassia brewsteri*)
- Curracabah (*Acacia crassa*)
- Small-leaf Wax-flower (*Philotheca difformis*)
- Wilga (*Geijera parviflora*)

- Cocaine Tree (*Erythroxylum australe*)
- False Sandalwood (*Eremophila mitchelli*)
- Sandalwood (*Santalum lanceolatum*)
- Currant Bush (*Carissa ovata*)
- Wild Orange (*Capparis canescens*)
- Dysentery Plant (*Grewia latifolia*)

Grasses

- Kangaroo Grass (*Themeda triandra*)
- Black Spear Grass (*Heteropogon contortus*)
- Hairy Panic (*Panicum effusum*)
- Dark Wiregrass (*Aristida calycina*)
- Leafy Nineawn (*Enneapogon polyphyllus*)
- High Sida (*Sida trichopoda*)
- Pin Sida (*Sida fibulifera*)
- Australian Millet (*Panicum decompositum*)

9.3 Proposed Final Land Use

In the absence of specific landowner agreements, the proposed final land use will be consistent with the current pre-disturbed land use (agricultural or native ecosystem). Any land that is contaminated as a result of the Project activities will be remediated in accordance with accepted industry practice at the time and the relevant current regulatory and administrative requirements.

Final land use will be determined by a number of factors including:

- Regulatory and legislative requirements current at the time of decommissioning and rehabilitation
- Stakeholder views including those of landowners, particularly where continued use of infrastructure such as access roads, dams, water bores, fences and gates, may be required
- Land use of surrounding areas and local community needs, for example land may be used for future community development rather than return to agricultural use
- The nature of the receiving environment and the environmental values of the area

9.4 Assessment of Rehabilitation Effectiveness

Conditions R3 to R5 of the EA (as listed in **Section 9.1**), must be achieved in order for Comet Ridge to relinquish their tenure rights at the end of the Project's life.

Based on current regulatory requirements on progressive rehabilitation and closure reforms in Queensland, the proposed rehabilitation measures are expected to allow effective and appropriate rehabilitation at the Proposed action area. Assessment of the effectiveness of the proposed rehabilitation activities will be undertaken progressively via rehabilitation monitoring in accordance with the indicators, timing, and completion criteria outlined in **Table 61**. Should any issues be identified throughout the rehabilitation monitoring, alternative corrective actions will be implemented immediately as outlined in **Table 61**.

Table 61. Rehabilitation objectives and criteria

Petroleum activity feature	Rehabilitation goal	Rehabilitation objectives	Indicators	Timing	Completion criteria	Corrective actions
Wells	1. safe	Site safe for humans and animals.	Reported accidents, incidents and injuries.	Ongoing for life of Project	• Plugged with cement to isolate aquifers • Surface facilities removed • Re-contoured to condition consistent with surrounding area or proposed land use • Visual inspection following decommissioning • No reported accidents, incidents or injuries as a result of petroleum activities	• Review any incident and establish appropriate actions to ensure safety of site is maintained
	2. non-polluting	Stormwater runoff does not pollute nearby watercourses.	All equipment and chemicals from site are removed. No leakage.	Ongoing for life of Project	• No erosion occurring on the former well sites • No contaminated land	• Design and implement and erosion and sediment control plan
	3. stable	Stormwater runoff does not cause erosion. Surface contours re-established.	Subsidence. Erosion gully formation.	Ongoing for life of Project	• Landform re-established • No active rill, gully or sheet erosion visible five years after rehabilitation activities commenced • Drainage follows appropriate drainage paths • Certification from a suitably qualified engineer that the final landform is geotechnically stable	• Rework site to suitable landform

Petroleum activity feature	Rehabilitation goal	Rehabilitation objectives	Indicators	Timing	Completion criteria	Corrective actions
	4. self-sustaining	Land use returned to pre-disturbance use.	Foliage cover. Species diversity. Weed survey.	Either progressively where able or upon decommissioning of wells	• Either land is returned to cropping land in agreement with the landholder OR • Foliage cover established at 70% of the surrounding area. • No ongoing management beyond that required for surrounding areas with similar land use • Vegetation successfully self-propagating and reseeding using seed mix consistent with RE 11.5.3 • Key species present (vegetation community of RE 11.5.3). • No weed species introduced	• If the site is not progressing or likely not to reach acceptance criteria for final rehabilitation, undertake an investigation into the cause (i.e. soil condition, weed infestation), including: - Review of monitoring results from previous site assessments to identify any issues - If necessary, undertake targeted surveys to identify the magnitude of the issue - Review the current management measures - If required, amend the management measures to ensure consistency with the acceptance criteria for final rehabilitation • Actions may include soil amelioration, reseeding, control of weeds/pests or stock fencing.

Petroleum activity feature	Rehabilitation goal	Rehabilitation objectives	Indicators	Timing	Completion criteria	Corrective actions
Flow lines	1. safe	Site safe for humans and animals.	Reported accidents, incidents and injuries.	Ongoing for life of Project	• Lines isolated, drained, purged and vented • Lines flushed and cleaned • Capped and left in situ • Visual inspection following decommissioning • No reported accidents, incidents or injuries as a result of the petroleum activities	• Review any incident and establish appropriate actions to ensure safety of site is maintained
	2. non-polluting	Stormwater runoff does not pollute nearby watercourses.	Surface water quality.	Ongoing for life of Project	• No erosion occurring on the right of way	• Design and implement and erosion and sediment control plan
	3. stable	Stormwater runoff does not cause erosion. Surface contours re-established.	Subsidence. Erosion gully formation.	Ongoing for life of Project	• Landform re-established • No active rill, gully or sheet erosion visible five years after rehabilitation activities commenced • Drainage follows appropriate drainage paths • Certification from a suitably qualified engineer that the final landform is geotechnically stable	• Rework site to suitable landform

Petroleum activity feature	Rehabilitation goal	Rehabilitation objectives	Indicators	Timing	Completion criteria	Corrective actions
	4. self-sustaining	Land use returned to pre-disturbance use.	Foliage cover. Species diversity. Weed survey.	Either progressively where able or upon decommissioning of flow lines	• Either land is returned to cropping land in agreement with the landholder OR • Foliage cover established at 70% of the surrounding area. • No ongoing management beyond that required for surrounding areas with similar land use. • Vegetation successfully self-propagating and reseeding using seed mix consistent with RE 11.5.3. • Key species present (vegetation community of RE 11.5.3). • No weed species introduced	• If the site is not progressing or likely not to reach acceptance criteria for final rehabilitation, undertake an investigation into the cause (i.e. soil condition, weed infestation), including: - Review of monitoring results from previous site assessments to identify any issues - If necessary, undertake targeted surveys to identify the magnitude of the issue - Review the current management measures - If required, amend the management measures to ensure consistency with the acceptance criteria for final rehabilitation • Actions may include soil amelioration, reseeding, control of weeds/pests or stock fencing.

Petroleum activity feature	Rehabilitation goal	Rehabilitation objectives	Indicators	Timing	Completion criteria	Corrective actions
Access tracks	1. safe	Site safe for humans and animals.	Reported accidents, incidents and injuries.	Ongoing for life of Project	• Fences removed • Road closed • Visual inspection following decommissioning • Condition of land similar to surrounding landscape • No reported accidents, incidents or injuries as a result of the petroleum activities	• Review any incident and establish appropriate actions to ensure safety of site is maintained
	2. non-polluting	Stormwater runoff does not pollute nearby watercourses.	Surface water quality.	Ongoing for life of Project	• No erosion occurring on the access track	• Design and implement and erosion and sediment control plan
	3. stable	Stormwater runoff does not cause erosion. Surface contours re-established.	Subsidence. Erosion gully formation.	Ongoing for life of Project	• No significant erosion events. • Landform re-established. • No active rill, gully or sheet erosion visible five years after rehabilitation activities commenced • Drainage follows appropriate drainage paths • Certification from a suitably qualified engineer that the final landform is geotechnically stable	• Rework site to suitable landform

Petroleum activity feature	Rehabilitation goal	Rehabilitation objectives	Indicators	Timing	Completion criteria	Corrective actions
	4. self-sustaining	Land use returned to pre-disturbance use OR Tracks maintained for use by landowner with agreement.	Foliage cover. Species diversity. Weed survey.	Upon decommissioning of Project or in accordance with landowner agreement/s	• Either land is returned to cropping land in agreement with the landholder OR • Foliage cover established at 70% of the surrounding area. • No ongoing management beyond that required for surrounding areas with similar land use. • Vegetation successfully self-propagating and reseeding using seed mix consistent with RE 11.5.3. • Key species present (vegetation community of RE 11.5.3). • No weed species introduced.	• If the site is not progressing or likely not to reach acceptance criteria for final rehabilitation, undertake an investigation into the cause (i.e. soil condition, weed infestation), including: - Review of monitoring results from previous site assessments to identify any issues - If necessary, undertake targeted surveys to identify the magnitude of the issue - Review the current management measures - If required, amend the management measures to ensure consistency with the acceptance criteria for final rehabilitation • Actions may include soil amelioration, reseeding, control of weeds/pests or stock fencing.
Dams	1. safe	Site safe for humans and animals.	Reported accidents, incidents and injuries.	Ongoing for life of Project	• Fences removed. • Condition of land similar to surrounding landscape. • Visual inspection following decommissioning • No reported accidents, incidents or injuries as a result of the petroleum activities.	• Review any incident and establish appropriate actions to ensure safety of site is maintained

Petroleum activity feature	Rehabilitation goal	Rehabilitation objectives	Indicators	Timing	Completion criteria	Corrective actions
	2. non-polluting	No land contamination from contents of dam. Stormwater runoff does not pollute nearby watercourses.	Contaminated land assessment. Ongoing surface water quality sampling.	Ongoing for life of Project	• Salts removed and disposed at registered waste facility • Above ground structures removed. • All reinstated soil is classified as clean	• Design and implement and erosion and sediment control plan
	3. stable	Stormwater runoff does not cause erosion. Surface contours re-established.	Subsidence. Erosion gully formation.	Ongoing for life of Project	• No subsidence or major erosion gullies. • Landform re-established. • No active rill, gully or sheet erosion visible five years after rehabilitation activities commenced • Drainage follows appropriate drainage paths • Certification from a suitably qualified engineer that the final landform is geotechnically stable	• Rework site to suitable landform

Petroleum activity feature	Rehabilitation goal	Rehabilitation objectives	Indicators	Timing	Completion criteria	Corrective actions
	4. self-sustaining	Land use returned to pre-disturbance use. OR Dams maintained for use by landowner with agreement.	Foliage cover. Species diversity. Weed survey.	Upon decommissioning of dams or in accordance with landowner agreement/s	• Either land is returned to cropping land in agreement with the landholder OR • Foliage cover established at 70% of the surrounding area. • No ongoing management beyond that required for surrounding areas with similar land use. • Vegetation successfully self-propagating and reseeding using seed mix consistent with RE 11.5.3. • Key species present (vegetation community of RE 11.5.3). • No weed species introduced.	• If the site is not progressing or likely not to reach acceptance criteria for final rehabilitation, undertake an investigation into the cause (i.e. soil condition, weed infestation), including: - Review of monitoring results from previous site assessments to identify any issues - If necessary, undertake targeted surveys to identify the magnitude of the issue - Review the current management measures - If required, amend the management measures to ensure consistency with the acceptance criteria for final rehabilitation • Actions may include soil amelioration, reseeding, control of weeds/pests or stock fencing.

10 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

10.1 Principles of ESD

The Ecologically Sustainable Development (ESD) principle is a framework for integrating environmental, economic, social, and equity considerations into decision-making processes to achieve sustainable outcomes. It seeks to meet the needs of the present generation without compromising the ability of future generations to meet their own needs.

Under Section 3A of the EPBC Act, ESD is guided by the following core principles as listed in the RFI item:

- **Integration principle:** Decision-making processes should effectively balance short-term and long-term economic, environmental, social, and equity considerations.
- **Precautionary principle:** Where there are threats of serious or irreversible environmental damage, a lack of full scientific certainty should not delay measures to prevent environmental degradation.
- **Inter-generational equity principle:** The present generation has a responsibility to ensure that the environment's health, diversity, and productivity are maintained or enhanced for the benefit of future generations.
- **Biodiversity diversity and ecological integrity principle:** The conservation of biological diversity and ecological integrity should be a fundamental consideration in all decision-making processes.
- Improved valuation, pricing and incentive mechanisms should be promoted.

10.2 Integration Principle

Comet Ridge demonstrate the integration principle through its governance frameworks, cultural heritage protections, environmental risk mitigations, and focus on economic and social benefit. This approach ensures decision-making integrates long-term and short-term considerations.

Social and cultural values

Comet Ridge recognise the interests of the Gaangalu Nations People (GNP), who maintain a cultural connection to the Proposed action area, and has implemented a Cultural Heritage Management Strategy. This strategy ensures that cultural heritage ground surveys are conducted prior to any land disturbance, with the active involvement of the GNP as advisors. This process safeguards cultural artefacts and prevents damage or degradation to cultural heritage sites. Furthermore, by aligning with the requirements of the EP Act, the Project incorporates consultation with Aboriginal and Torres Strait Islander peoples, local communities, and other stakeholders to ensure a respectful and collaborative approach (refer **Section 11.2** and **Section 11.3** and for detailed information).

Environmental risk mitigation

The Project has been designed as a low-risk activity with a strong emphasis on avoiding and minimising environmental impacts. The Project incorporates iterative design revisions to avoid high-value ecological areas, minimise habitat fragmentation, with the majority of the Disturbance footprint occurring in non-remnant vegetation. The remaining environmental risks are effectively managed through conditions specified in the EA and the implementation of an Environmental Management Plan.

Economic and social contributions

The Project evaluates competing economic and environmental factors to achieve a balance that benefits both the present and future generations. The Project prioritises supplying natural gas to the Australian domestic market for the next 30 years, addressing an anticipated shortfall in the East Coast gas market. This supports Queensland's manufacturing, agriculture, and industrial sectors while ensuring energy security (refer **Section 11.1** for detailed information). The Project supports regional Queensland through job creation, investment, and economic growth. The Project is expected to generate employment opportunities during both the construction and operational phases, benefiting local and regional communities.

10.3 Precautionary Principle

Comet Ridge has demonstrated a commitment to aligning the Project with the precautionary principle, as defined under the Intergovernmental Agreement on the Environment (IGA) and the EPBC Act. This principle asserts that where there are threats of serious or irreversible environmental damage, a lack of full scientific certainty should not be used as a reason to delay measures to prevent environmental degradation. Public and private decision-making should be guided by (1) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and (2) an assessment of the risk-weighted consequences of various options.

Careful evaluation and avoidance of environmental damage

To ensure the Project avoids, minimises, and mitigates environmental damage, Comet Ridge has undertaken detailed scientific assessments across multiple domains. These assessments provide a thorough understanding of the environmental values within the Proposed action area and inform decision making to avoid serious or irreversible harm to ecological features, including TECs and water resource. Key scientific studies include:

- **Terrestrial ecology surveys –** the surveys informed the design of the Project's Disturbance footprint, ensuring placement of infrastructure in cleared or degraded areas to minimise impacts on TECs and high-value habitats. The Disturbance footprint was revised several times to avoid significant ecological areas, reflecting the Project's commitment to the precautionary principle. Comet Ridge has prioritised the locating infrastructure, such as well pads and gathering pipelines, in areas that have already been cleared of vegetation wherever possible. As a result, only 1.17 hectares of remnant vegetation will be impacted. The majority of the Project's Disturbance footprint (178.27 ha) will occur in non-remnant vegetation areas, avoiding significant habitat fragmentation and maintaining landscape connectivity
- **Groundwater assessments -** detailed groundwater studies confirmed that the Project will not impact groundwater levels or groundwater dependent ecosystems, including TECs. These assessments utilised monitoring data and hydrological models to evaluate groundwater reliance and ensure that Project activities will not adversely affect aquifers or connected ecological systems.
- **Terrestrial GDE assessments -** investigations into the potential reliance of Brigalow TEC and eucalypt species on groundwater concluded that neither vegetation type within the Proposed action area is groundwater-dependent. The results of these studies confirm that the TECs within and near the Proposed action area, including Brigalow-dominated communities, are not at risk of groundwater impact from the Project.

Mitigation of known risks

Comet Ridge has applied extensive knowledge to implement proven avoidance and mitigation measures that effectively minimise potential environmental harm. Key measures include:

- **Avoidance:** Prioritising previously cleared areas for infrastructure placement and reducing direct impacts on remnant vegetation.
- **Mitigation:** Implementing rigorous environmental management practices to reduce indirect impacts on nearby environmental values and ensure that the Disturbance footprint remains within acceptable limits.
- **Rehabilitation:** Restoring disturbed areas to their original or improved condition wherever practicable, supporting long-term environmental health.

Risk-weighted assessment and responsible decision-making

Comet Ridge has conducted thorough environmental assessments to evaluate the risk-weighted consequences of various Project design and implementation options. These assessments informed decisions to strategically avoid high-value habitats and reduce the likelihood of serious or irreversible environmental damage. For example:

- Infrastructure design has been guided by ecological surveys to minimise interaction with sensitive areas

- Disturbance to remnant vegetation has been kept to a minimum to preserve critical environmental values

The implementation of these measures ensures that the Project is consistent with the precautionary principle, balancing the need for resource development with environmental protection.

10.4 Inter-generational Equity Principle

The Project aligns with the principle of intergenerational equity by ensuring that its activities maintain and enhance the health, diversity, and productivity of the environment for the benefit of future generations. This is achieved through a combination of environmental management practices, regulatory compliance, and efforts to reduce greenhouse gas emissions.

The Project has been designed with robust environmental controls to minimise its Disturbance footprint. EA conditions regulate key aspects of the Project, including strict limits on disturbance to sensitive ecological areas, noise, air emissions, and the release of contaminants into waters. These conditions ensure that the impacts of the Project are carefully managed to preserve environmental values over the long term.

The Project's greenhouse gas emissions have been assessed as negligible in the broader context of national and state inventories. The Greenhouse Gas Assessment Report (Katestone 2023) indicates that Scope 1 and 2 emissions will consistently remain well below the reporting threshold of 25,000 tCO_2-e under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act). The average annual Scope 1 emissions are projected to be 5,931 tCO_2-e, peaking at 13,628 tCO_2-e in 2030 during the construction phase. Scope 3 emissions, although accounted for in the Project assessment, are primarily attributed to downstream users and are significantly lower than those of coal-fired power generation. The Project's low-carbon natural gas output, with an emissions intensity of 0.42 to 0.62 tCO_2-e/MWh, provides a cleaner alternative to coal-fired electricity production, which typically produces 0.86 to 0.99 tCO_2-e/MWh.

In addition to its operational measures, Comet Ridge has prioritised rehabilitation and land restoration efforts to ensure that areas disturbed by the Project are returned to productive use. These efforts not only safeguard the land for future generations but also support the ecological integrity of the region.

With stringent regulatory compliance and sustainable energy production, the Project demonstrates a strong commitment to preserving environmental resources and supporting a sustainable future for the next generation. This integrated approach ensures that the Project contributes positively to economic growth while maintaining environmental and ecological health, embodying the principle of intergenerational equity.

10.5 Biodiversity Diversity and Ecological Integrity Principle

Comet Ridge has taken a proactive approach to avoid and minimise environmental impacts on biodiversity. The Project's disturbance footprint was designed following extensive ecological surveys and iterative planning to avoid high-value ecological areas and minimise habitat fragmentation. A significant majority of the disturbance footprint occurs within non-remnant vegetation, with only 1.17 ha of remnant vegetation impacted. This strategic siting of infrastructure preserves critical habitats and maintains landscape connectivity, thereby supporting the ecological integrity of the Proposed action area.

The Project's biodiversity considerations are informed by science-based assessments, including terrestrial ecology surveys, GDE assessments, groundwater impact studies, and aquatic ecology surveys. These studies confirm that key ecological values, such as threatened species, GDEs and TECs, will not be adversely affected. For example, detailed investigations have demonstrated that Brigalow and eucalypt species in the Proposed action area rely on shallow soil moisture and are not dependent on groundwater. This finding ensures that groundwater extraction activities associated with the Project will not negatively impact TECs or associated ecosystems.

The Project employed a hierarchy of controls to mitigate environmental risks to biodiversity. Measures include avoiding direct impacts to TECs, minimising disturbance through careful infrastructure placement, and remediating disturbed areas. Comet Ridge has committed to progressive rehabilitation, restoring disturbed

land to its original or improved ecological state. This ensures that the health, diversity, and productivity of the environment are preserved throughout the life of the Project.

Comet Ridge has implemented an EMP to guide the Project's biodiversity conservation efforts. Conditions outlined in the EA further regulate activities to minimise risks to biodiversity, including restrictions on clearing sensitive habitats and requirements for rehabilitation in areas with biodiversity value.

The Project aligns with broader conservation objectives by contributing to a sustainable energy transition that supports ecological integrity. The use of natural gas as a lower-emission energy source complements the shift away from coal-fired power, helping to reduce the overall environmental footprint of energy production in Australia. This balance between energy production and environmental stewardship supports both biodiversity conservation and ecological integrity.

11 ECONOMIC AND SOCIAL MATTERS

11.1 Economic and Social Impact

The value of the Project to the state of Queensland and to the nation, is significant at a number of levels. The East Coast gas market is currently under strain with both the Australian Competition and Consumer Commission (ACCC) and Australian Energy Market Operator (AEMO) predicting a structural shortfall in domestic gas production to occur by 2027 (ACCC 2024; AEMO 2024).

Inter-day demand spikes in Victoria and New South Wales (NSW) may see shortages of gas supply (and hence power brown-outs or black-outs) as early as summer 2024-2025 or mid 2025 given the transmission capacity of the pipeline network from Queensland to the southern states is finite.

Potential Liquefied natural gas (LNG) import terminals (which both ACCC and AEMO forecast are required by 2026) are being led by Viva Energy Australia in Victoria and Squadron Energy in NSW. These have been delayed by a combination of environmental activism, Federal Government price caps and intervention in the gas market (December 2022) and also by commercial concerns from customers over imported gas pricing and contract conditions (AEP 2024). Due to delays, Squadron Energy has sub-leased its floating storage and re-gasification unit (FSRU), the vessel Hoegh Galleon, to Egypt and expects it back in Australia only in 2026. Superimposed over the top of this is the formal moratorium on onshore gas development in Victoria and the informal moratorium in NSW, leaving Queensland to assume the primary responsibility of gas production in the East Coast Gas Market.

The Federal Government has now given the Minister for Resources more power to intervene via the Australian Domestic Gas Security Mechanism (ADGSM) and reduce LNG cargoes to Asian customers out of Gladstone in favour of the southern domestic market, despite a limit on how much gas can be transported via current infrastructure to the southern states. These policies have damaged Australia's reputation as a reliable LNG supplier in Asia and is prompting customers to seek alternative sources in other northern hemisphere markets, such as Qatar and the west coast of North America.

All of these factors make the development of Queensland gas critical to the domestic market, Australia's reputation as a reliable supplier, and to the Australian economy, where approximately 70% of domestic natural gas consumed is used for manufacturing of key commodities such as fertilisers, plastics, glass, bricks, critical medical supplies, and many other key products required for a functioning economy to maintain our standard of living.

As nearly a decade has passed since the LNG schemes commenced production at Gladstone, it is critical to continue to bring more low carbon (lower emissions) natural gas into the market to support both East Coast manufacturing and power generation, particularly dovetailing with renewables when solar and wind is not available. Three of the four 100% Comet Ridge blocks over the northern part of the Mahalo Gas Hub (ATPs 2048, 2061 and 2063 including the Project (PL 1128)) have domestic market obligations. These blocks, similar to Senex's Atlas project, are expected to be a key contributor to the domestic market.

Comet Ridge announced it had executed a Gas Sales Agreement (GSA) with CleanCo Queensland Limited (CleanCo) on 18 September 2023 for supply of gas from the Mahalo Gas Hub (this includes Mahalo North PL 1128). The seven-year GSA comprises a total contract volume of up to 25 petajoule (PJ) which will be supplied to CleanCo's low-emission Swanbank E power station, providing firming capacity in partnership with renewable energy. Gas supplied from the Mahalo Gas Hub area will contribute towards low-emission energy and renewable projects across Queensland. CleanCo projects and activities will contribute towards Queensland's 70% renewable energy target in 2032.

The Project is expected to generate both positive and negative social impacts. Potential positive social impacts associated with the Project may include:

- Increased demand for construction and operations workforce, creating job opportunities, and stimulate service and supply industries
- Generation of income in the regional economy over the Project's duration
- Increased funding opportunities for community facilities and activities

Potential negative social impacts associated with the Project may include:

- Increased road use and traffic
- Properties and families directly impacted by operations
- We would note, that there were no local objections to the Project during the public notification stage for the Environmental Approval (EA) assessment, and Comet Ridge has negotiated and signed a Conduct and Compensation Agreement (CCA) with the key property in the Proposed action area, with negotiations well underway with the second key property owner.

The potential negative impacts outlined above are likely to be higher during the construction phase. The construction phase is likely to last approximately 18 months and then the production phase, although possibly lasting 20 or more years, will have a much smaller workforce and is likely to result in fewer social impacts.

Comet Ridge pledges to continue to participate and contribute to projects and partnerships across the local and regional community and environment over the duration of the gas development project.

Comet Ridge is committed to further developing a trusted and valued reputation locally through its ongoing actions and activity, contributing to local well-being and liveability and long-term social cohesion. Comet Ridge will continue seeking direct input from local government, business, stakeholders, and service providers whilst also considering the various research conducted across the region, such as the Gas Industry Social and Environmental Research Alliance (GISERA) longitudinal study.

11.2 Public Consultation

Comet Ridge was founded specifically to develop gas opportunities in the Comet region and as such has a deep existing relationship with the local stakeholders and community groups across the greater Mahalo Gas Hub area. The Company's name reflects this connection, derived from a regional geological structure centred around the Project.

Comet Ridge has over 19 years' experience and has maintained continuous engagement with Local Government and landholders, and is devoted to acting with the utmost respect toward the owners and occupiers of the lands and communities in which it seeks to conduct petroleum activities. This commitment applies to all stakeholders, including landholders, traditional owners, relevant local government authorities and the wider local community.

Engagement with the wider local community has been undertaken by a number of forms, as described below:

- There have been regular briefings to the local Council (to the Mayor and Chief Executive Officer, both to the prior Council and the newly elected Council in March 2024), by both the Comet Ridge Land Access Manager and the Managing Director
- There have been briefings to the Central Highlands Development Corporation (CHDC) (Home - Central Highlands Development Corporation)
- Comet Ridge regularly provides sponsorship to local events, most recently the Wild Horse Cutting Event held annually in Rolleston , with competitors attending from across eastern Australia and the wider local community (Comet Ridge has been a gold sponsor of this event from 2021-2025) and previously have sponsored the Rolleston rugby team weekend as well as a Fun Flight, that provided a flying experience for disabled and disadvantaged children
- During the Queensland State EA application process, there was a public notification stage (April 2024), with an advertisement in the local Emerald Today newspaper, and on the Comet Ridge website. Comet Ridge was informed by a number of landholders that we knew (from properties within the PLA and further around the district) that they had seen the advertisement in the paper
- Comet Ridge also regularly brief the local Native Title claimant and Cultural Heritage group, the Gaangalu Nations People (GNP), and have subsequently engaged the GNP to provide cultural heritage surveys prior to any ground disturbance activities. The first meeting with the GNP was in Dec 2019, and latest meeting was June 2024
- Comet Ridge has also met with and discussed our activities with Coexistence Queensland (the latest meeting was in June 2025)

A summary of the outcomes from engagement is provided below:

- Both prior and current Councils appreciative of our efforts to keep them informed of proposed Comet Ridge activities, and extended an offer to provide whatever assistance would be appropriate if and as required. They did not have any issues with the proposed gas field development
- The CHDC were interested in the proposed development, asked to be kept informed of status of the project, and extended an offer to provide assistance if and as required. They did not raise any issues with the proposed gas field development
- The local groups indicated sponsorship was appreciated, and neither groups raised any issues with the proposed gas field development
- The only respondents to the public notification was Lock the Gate. No local community members raised any issues or concerns with the proposed gas field development
    - Lock the Gate subsequently appealed the awarding of the EA, which triggered an internal review of the decision by DETSI
    - DETSI subsequently upheld their decision to award the EA, and published a Statement of Reasons
    - Lock the Gate did not object further, and DETSI subsequently confirmed to Comet Ridge that the EA was awarded (in August 2024)
- The GNP appreciated the early engagement in regards briefing them on proposed activities. They were happy to be involved in the cultural heritage surveys. They expressed no major concerns with proposed gas field development
- Coexistence Qld were appreciative of being informed of Comet Ridge activities, and our wiliness to exchange information with them

Comet Ridge has assembled a management and Project team whose legacy includes deep knowledge and understanding of the early development and production phases of all the CSG and conventional fields adjacent to the Project. The Comet Ridge team have longstanding valuable relationships with local individuals, business and communities built over many years, from the very early days of CSG activity and development in the 1980's and 1990's.

Comet Ridge has established strong relationships with the key landholders within the Proposed action area, having drilled the Mahalo North Pilot (two wells) on Meroo property, and having an existing conduct and compensation agreement (CCA) in place to drill an exploration well on Togara property. Most recently Comet Ridge has executed a development CCA with the landholders of Meroo, and has advanced negotiations for a CCA with Togara property, for activities under the proposed development plan of the Project. A pre-existing relationship exists between Comet Ridge and the remaining two landholders within the Proposed action area. Due to Comet Ridge being Agent for the Operator (Santos QNT Pty Ltd) from 2017-2018 in ATP 1191 (Mahalo JV Area - now comprises PL 1082, PL 1083, PCA 302, PCA 303 & PCA 304) immediately to the south, Comet Ridge successfully negotiated CCA's with both landholders to undertake drilling and production testing on behalf of the joint venture.

In December 2022, Comet Ridge's Land, Environment and Cultural Heritage Manager and Managing Director met with two of the key landholders where initial development will occur within the Proposed action area to discuss future development plans. Information shared with the landholders included proposed number and locations of wells, proposed drilling schedules, nature of activities and potential impacts to the landholders' activities. Both landholders indicated support for the Project.

Comet Ridge prioritise understanding what is important to each landholder and the specific concerns of the community, utilising corporate systems and procedures to ensure a standard and comprehensive approach, is always applied.

Comet Ridge's engagement extends beyond landholders with development earmarked within the Proposed action area, encompassing the overlapping and neighbouring coal exploration and mining companies. Comet Ridge has established a positive working relationship with Whitehaven Coal with respect to legislative requirements relating to overlapping tenure. Comet Ridge will continue to work with Whitehaven and all overlapping and neighbouring coal tenement holders to ensure co-development of coal seam gas resources

and coal resources are managed in a sustainable, efficient, and safe manner for the benefit of the state of Queensland.

11.3 Indigenous Engagement

Comet Ridge first engaged with the GNP in 2019, when Comet Ridge was awarded ATP 2048 (Proposed action area is within ATP 2048), and have been engaging with them annually ever since. That engagement includes detailed discussion on exploration and potential development activities, and included engaging the GNP for cultural heritage field surveys, prior to any ground disturbance in ATP 2048.

Comet Ridge also successfully negotiated native title agreements (Section 31 Deeds and Ancillary Agreements) with the GNP and for Native Title land within ATP 2048 and ATP 2063 (Mahalo Far East) in 2020 and 2021, when the GNP were Native Title claimants (this claim was rejected in 2024).

Comet Ridge have a Company Policy document on Cultural Heritage and a Cultural Heritage Management Procedure which will be followed and implemented throughout the Project. Comet Ridge ensures Native Title compliance through a compliance framework that adheres to both Commonwealth and State legislation comprising (but not limited to):

- *Native Title Act 1993 (Cth)*
- *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*
- *Native Title (Queensland) Act 1993*
- *Native Title (Queensland) State Provisions Act 1998*
- *Native Title Resolution Act 2000 (Qld)*
- *Aboriginal Cultural Heritage Act 2003 (Qld)*

Comet Ridge has confirmed that Native Title does not exist in the Proposed action area, therefore there is no requirement for any Native Title approvals. However, Comet Ridge has engaged (since 2019) with the GNP, who were Native Title claimants are Cultural Heritage claimants for the majority of the Proposed action area. Noting the four properties located within the Proposed action area are freehold, cattle grazing properties.

Comet Ridge has a close working relationship with the GNP with respect to Native Title and in relation to cultural heritage field surveys prior to commencement of operational activities undertaken within ATP 2048 to date and will continue to work closely with the GNP and any other Native Title party in regards cultural heritage field surveys, prior to any ground disturbance for the Project.

Comet Ridge will regularly check with the Queensland State government if there are any new or existing Native Title claimants for the Proposed action area, and commit to early and frequent engagement.

11.4 Economic Costs and Benefits

The Project is a 68 gas well development, of which 34 are proposed to be gas production wells (the other 34 wells are lateral wells that connect to the production well, where only the production well produces gas). Current verifiable estimates of the value of CSG within the Proposed action area amount to over $840M given a gas price of $12/gigajoule (GJ).

It is assumed that some gas produced from the Project may be sold at spot prices which may be higher than $12/GJ. The total current verifiable value of CSG within the Proposed action area may well exceed $1.0 billion over the 30-year term of the Project.

Royalty payable to the State is estimated to be $83 million (M) over the 30-year term of the Project on the basis that all gas produced and sold from Project is supplied to the Australian domestic gas market.

Most of the costs (estimated at over $650 M) associated with the CSG development will contribute to the economy of Queensland over the 30-year term of the Project including:

- Drilling and completion
- Development appraisal activities
- Water and gas facilities and network construction

- Operational expenditure including jobs for Queenslanders

An example of annual fees payable over the 30-year term to State agencies and Local Government that will provide a financial return to the Local and State economy include (note: fees are estimated only and based on 2023-24 costs):

- Rent for the area of the Proposed action area, payable to the State, Is approximately $0.7 M
- Petroleum safety and health fee - $0.12M
- Local council rates - $0.26M
- Office of Groundwater Impact Assessment fee - $0.03M
  Environmental Authority fee - $0.1M

It is also estimated, that total royalties payable, for the 30 year life of the field, in todays dollars, would be $43M.

11.5 Employment Opportunities

The Project is a relatively small-scale gas development, with 68 gas wells in total, which will be drilled progressively over a period of up to ten years. Comet Ridge will engage a drilling company to provide a drill rig and associated camp to undertake this work. A drill rig generally employs up to 35 onsite personnel for short durations. As these are highly specialised roles, it is assumed these personnel will come from outside the local district.

A large portion of services required during the Project will be managed by Comet Ridge via third-party services companies, including but not limited to, InGauge Energy (drilling, engineering, and management), Jemena Qld Pty Ltd (pipeline construction and operation) and Upstream Production Services (field operations). Workforce requirements of third-party service companies may comprise local, regional, State, or interstate residents.

Some of the operations and services that will be required during the Project are listed below:

- Construction of well pads (e.g. construction equipment drivers and handlers)
- Drilling and completion of wells (e.g. drillers and engineers, geologists, equipment supply)
- Surface facility and incidental facility construction (e.g. electricians, plumbers, engineers, builders)
- Food, water, fuel and equipment supply as required to support operational requirements
- Cleaning services and garbage disposal
- Field operations (e.g. water and gas monitoring personnel, electricians, engineers)
- Transport (delivery and transportation of equipment)

It is anticipated that these operations and services may generate new employment opportunities and support local, regional, and statewide businesses and jobs. Once operational, as this is a small gas field, of up to 34 gas production wells, will require a field workforce of four to six personnel, working on a two weeks on, two weeks off roster (two to three personnel per roster), on a drive in – drive out (DIDO) basis. These roles are expected to be employed and trained locally.

12 ENVIRONMENTAL RECORD OF THE PERSON PROPOSING TO TAKE THE ACTION

COI is an ASX listed Company that was founded in 2003, and its headquarters are in Brisbane, Queensland. Comet Ridge has operated permits and licences in Queensland, New South Wales as well as New Zealand, and is currently operating in Queensland.

COI (through its wholly subsidiaries;

- Comet Ridge Mahalo North Pty Ltd,
- Comet Ridge Mahalo East Pty Ltd,
- Comet Ridge Far East Pty Ltd,
- Comet Ridge Galilee Pty Ltd; and
- Comet Ridge Mahalo Pty Ltd)

COI currently hold seven ATP, two PL's and one Petroleum Survey License (PSL), with the corresponding associated EA's in Queensland. COI has through its subsidiaries has undertaken and had responsibility for the drilling of petroleum gas wells including coreholes, pilot production wells, 2D seismic acquisition programs and operating pilot production testing, over the last 20 years and during that time has not had any reportable environmental incidents. A record which COI is proud of.

There are no past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against or naming COI, any of its subsidiary company's listed, or any of the executive officers (details of which are listed below) of the body corporate and its subsidiaries. Nether is COI, its subsidiaries or the executive officers of those entities are of any pending or proposed action to be taken for the protection of the environment or conservation and sustainable use of natural resources in any of the permits or licences held or previously held by them.

Details of the executive officers of the entity that is taking the proposed action and those of COI, and who are also the executive officers for the purposes of the other subsidiaries of COI are:

- **James McKay** (Non-executive chairman)
  - James McKay has been the chairman of COI since 2011.
  - James has been involved in the Coal Seam Gas industry for over 20 years having also been a director of Sunshine Gas Limited up to 2009 until it was acquired by QGC Limited.
  - James McKay is also a non-executive director of Comet Ridge Mahalo North Pty Ltd the party proposing to take the action.
- **Tor McCaul** (Managing Director)
  - Tor McCaul has been a director of COI since 2009. He over 30 years' experience in the oil and gas industry. He graduated in Petroleum Engineering from UNSW in 1987 and spent the next 9 years in Brisbane working with operating companies in technical roles on projects in Queensland, New Zealand and PNG, which included a secondment to Chevron Niugini. In Queensland he has worked across Surat and Eromanga Basins and over the past 14 years in the Galilee and Southern Bowen Basins.
  - He spent 11 years in Asia (Karachi, Jakarta, Chennai and Delhi) in technical, finance, commercial and management roles. At VICO Indonesia (a BP-ENI JV) he was their LNG Contract Manager on the 23 million-tonne-per-annum Botang LNG project. In India, he was Cairn plc's Head of Commercial for the Indian business.
  - He has previously been the Chairman for the Queensland Section of the Society of Petroleum Engineers and was the 2013 Queensland Petroleum Exploration Association (QUPEX) President. In late 2018, he was elected to the board of the Australian Exploration Producers (AEP).
  - Tor McCaul is also a director of Comet Ridge Mahalo North Pty Ltd, the party proposing to take the action.
- **Phil Hicks** (Chief Financial Officer & Commercial)
  - Phil Hicks has been the Chief Financial Officer of COI since 1 July 2020. Mr Hicks commenced his professional career as a Chartered Accountant spending 8 years with KPMG and Ernst & Young. For the past 21 years, he has been working with small cap

companies in commercial, advisory and broking roles, particularly in the resources sector in Queensland.
  - He spent 13 years at Wilson HTM Limited, a national stockbroking and corporate finance firm, including as Head of the Corporate Finance business. During his time at Wilson HTM Phil Hicks acted for numerous coal seam gas companies, assisting with M&A and equity raisings transactions.
  - He is a Fellow of FINSIA and a member of the Chartered Accountants Australia and New Zealand.
  - Phil Hicks is not an officeholder of Comet Ridge Mahalo North Pty Ltd, the party proposing to take the action but is an executive officer of COI.
- **Dale Aaskow** (Chief Operating Officer)
  - Dale Aaskow joined COI in May 2010 and has over 36 years' experience in the upstream oil and gas sector. Originally from Canada, he graduated from the British Columbia Institute of Technology with a Diploma in Natural Gas and Petroleum Engineering Technology. He has over 35 years of oil and gas industry experience in a variety of roles from field operations to country management positions. This includes 10 years of experience in Asia (Malaysia, China and Thailand).
  - Prior to joining COI, he worked for a major international service company in a region managerial role focused on unconventional gas developments in the Asia-Pacific, with significant involvement in the Australian CSG sector. Dale is a member of the Society of Petroleum Engineers and has served on the committee of the Queensland section.
  - Dale Aaskow is not an officeholder of Comet Ridge Mahalo North Pty Ltd, the party proposing to take the action but is an executive officer of COI.
- **Stephen Rodgers** (Company Secretary)
  - Stephen Rodgers is a lawyer with over 30 years' experience.
  - Stephen Rodgers was the in-house Legal and Commercial Counsel at Sunshine Gas Limited.
  - Stephen Rodgers has been the Company Secretary of COI since April 2009 and is also the Company Secretary of all of COI's wholly owned subsidiaries.
  - Stephen Rodgers is also the Company Secretary of Comet Ridge Mahalo North Pty Ltd, the party proposing to take the action.

13 REFERENCES

Anderson Consulting 2025, Stormwater and Water Balance Assessment. Prepared for Comet Ridge, June 2025

APLNG 2018: *2017-2018 Groundwater Assessment Report. Origin Energy Report QLD 1000 E75 RPT CDN/ID 20305638*. 20 November 2018. https://www.aplng.com.au/content/dam/aplng/compliance/management-plans/2017-2018%20Groundwater%20Assessment%20report.pdf

APPEA 2021 Coal Seam Gas - *Joint industry framework Managing impacts to groundwater resources in the Surat Cumulative Management Area* under EPBC Act approvals. 17 March 2021

Atlas of Living Australia (ALA) 2023, Atlas of Living Australia spatial portal. Accessed at: https://spatial.ala.org.au/.

Australian Competition and Consumer Commission (ACCC) 2024, *East Coast gas supply sufficient for 2025, but concerns remain for longer term*. *Media Release.* Available at: https://www.accc.gov.au/media-release/east-coast-gas-supply-sufficient-for-2025-but-concerns-remain-for-longer-term

Australian Energy Market Operator (AEMO) 2024, *2024 Gas Statement of Opportunities*. Available at: https://aemo.com.au/-/media/files/gas/national_planning_and_forecasting/gsoo/2024/aemo-2024-gas-statement-of-opportunities-gsoo-report.pdf

Australian Energy Producers (AEP) 2024, *No future made in Australia without gas*. *Media Release.* Available at: https://energyproducers.au/all_news/media-release-no-future-made-in-australia-without-gas/

Australian Koala Foundation (AKF) 2015, National Koala tree planting list. Report prepared for the Australian Koala Foundation.

Black, R, Houston, W & Jaensch, R 2010, 'Evidence of regular seasonal migration by Australian painted snipe Rostratula australis to the Queensland tropics in autumn and winter', Stilt, vol. 58, pp. 1-9.

Bureau of Meteorology (BoM) 2024. Australian Government. Climate data for Arcturus Downs Recording Station (BOM station 035002) available at: Daily Rainfall - 035002 - Bureau of Meteorology

Buchanan B. W. 1993, Effects of enhanced lighting on the behaviour of nocturnal frogs. Animal Behaviour, Vol 45, pp. 893–899.

Comet Ridge 2025a, *DCCEEW IESC Advice Response*

Comet Ridge 2025b, DCCEEW IESC Ecohydrological Model, Revision 0, 23 July 2025

Covacevich, J & Wilson, S 1995, 'Land Snakes', in M Ryan (ed), Wildlife of Greater Brisbane, Queensland Museum, Brisbane, pp 275-295

Costelloe, J., Payne, E., Woodrow, I., Irvine, E., Western, A., & Leaney, F. (2008). Water sources accessed by arid zone riparian trees in highly saline environments, Australia. Oecologia, 156(1), 43-52

DAF 2018, *Accepted Development Requirements for Operational Work that is Constructing or Raising Waterway Barrier Works*. Department of Agriculture and Fisheries, Queensland Government, Brisbane.

DES 2016, *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures*. Department of Environment and Science, Queensland Government, Brisbane.

DAWE 2022a, National Recovery Plan for the Koala Phascolarctos cinereus (combined populations of Queensland, New South Wales and the Australian Capital Territory). Department of Agriculture, Water and the Environment, Australian Government, Canberra. Available at: http://www.awe.gov.au/environment/biodiversity/threatened/publications/recovery/koala-2022.

DAWE 2022b, Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory, Department of Agriculture, Water and the Environment, Australian Government, Canberra. Available online:

http://www.environment.gov.au/biodiversity/threatened/species/pubs/85104-conservation-advice-12022022.pdf

DCCEEW 2017, *Draft Conservation Advice (incorporating listing advice) for the Poplar Box Grassy Woodlands on Alluvial Plains*. Department of Climate Change, Energy, the Environment and Water, Accessed at: https://www.dcceew.gov.au/environment/biodiversity/threatened/nominations/comment/poplar-box-grassy-woodland-alluvial-plains

DCCEEW 2022a, *Conservation Advice for* Hemiaspis damelii *(grey snake)*. Department of Climate Change, Energy, the Environment and Water, Australian Government, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1179-conservation-advice-05102022.pdf.

DCCEEW 2022b, *Significant Impact Guidelines 1.3: Coal seam gas and large coal mining developments—impacts on water resources*, Department of Climate Change, Energy, the Environment and Water, Canberra. CC BY 4.0. Retrieved 3 March 2023 from: https://www.dcceew.gov.au/sites/default/files/documents/significant-impact-guidelines-1-3.pdf

DCCEEW 2024, Species Profile and Threats Database. Department of Climate Change, Energy, Environment and Water, Australian Government, Canberra. Available at: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=17906

DE 2012, *The EPBC Act Referral Guidelines for the Vulnerable Koala*. The Department of the Environment, Accessed at: https://www.agriculture.gov.au/sites/default/files/documents/koala-referral-guidelines.pdf

DE 2013, Approved Conservation Advice for the Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community. Department of the Environment, Australian Government, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/028-conservation-advice.pdf

DE 2014a, Approved Conservation Advice for Aristida annua (a tufted grass). Department of the Environment, Australian Government, Canberra. Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/17906-conservation-advice.pdf.

DE 2014b, Approved Conservation Advice for Denisonia maculata (Ornamental Snake). Canberra: Department of the Environment, Australian Government, Canberra. Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1193-conservation-advice.pdf.

DEE 2020, *Draft National recovery plan for the Australian Painted Snipe*. Department of the Environment and Energy, Australian Government, Canberra, Available at: https://www.dcceew.gov.au/sites/default/files/env/consultations/5e6b3fbf-ef4d-4d0a-b9c8-c8e29bb11afc/files/draft-recovery-plan-australian-painted-snipe.pdf

DES 2016, *Manual for assessing consequence categories and hydraulic performance of structures,* Department of Environment and Science, Queensland. Retrieved 3 March 2023 from: https://environment.des.qld.gov.au/__data/assets/pdf_file/0023/90266/era-mn-assessing-consequence-hydraulic-performance.pdf

DEWHA 2008, *Approved Conservation Advice for Cadellia pentastylis (Ooline)*. Canberra: Department of the Environment, Water, Heritage and the Arts, Australian Government, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/9828-conservation-advice.pdf. In effect under the EPBC Act from 01-Oct-2008.

DEWHA 2010, *Survey Guidelines for Australia's Threatened Birds*. April 2017. Accessed at: https://www.dcceew.gov.au/sites/default/files/documents/survey-guidelines-birds-april-2017.pdf

DoE 2013, *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance,* Commonwealth of Australia, Canberra. Retrieved 3 March 2023 from: https://www.dcceew.gov.au/environment/epbc/publications

DoE 2017a, *Chemical Risk Assessment Guidance Manual: for chemicals associated with coal seam gas extraction*, Guidance manual prepared by Hydrobiology and ToxConsult Pty Ltd for the Department of the Environment and Energy, Commonwealth of Australia, Canberra. Retrieved 3 March 2023 from: https://www.dcceew.gov.au/water/coal-and-coal-seam-gas/national-assessment-chemicals/consultation-risk-assessment-guidance-manual

DoE 2017b, *Literature review: Environmental risks posed by chemicals used in coal seam gas operations*, Project report prepared by the Chemicals and Biotechnology Assessments Section (CBAS), in the Chemicals and Waste Branch of the Department of the Environment and Energy as part of the National Assessment of Chemicals Associated with Coal Seam Gas Extraction in Australia, Commonwealth of Australia, Canberra. Retrieved 3 March 2023 from: https://www.dcceew.gov.au/water/coal-and-coal-seam-gas/publications/literature-review-environmental-risks-posed-by-chemicals-used-in-csg-operations

Dique, DS, Preece, HJ, Thompson, J & de Villiers, DL 2004, 'Determining the distribution and abundance of a regional koala population in south-east Queensland for conservation management', Wildlife Research, vol. 31, pp. 109-117.

DoEE 2017, *Risk Assessment Guidance Manual: For Chemicals Associated with Coal Seam Gas Extraction – Exposure Draft*. Department of the Environment and Energy Australian Government. Retrieved from: https://www.nepc.gov.au/sites/default/files/2022-09/cmgt-nchem-eragm-industrial-chemicals-200902.pdf

Doody TM, Hancock PJ, Pritchard JL 2019. *Information Guidelines Explanatory Note: Assessing groundwater-dependent ecosystems. Report* prepared for the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development through the Department of the Environment and Energy, Commonwealth of Australia 2019

DNRME 2019, *Code of Practice for the construction and abandonment of coal seam gas and petroleum wells and associated bores in Queensland,* Version 2. Department of Natural Resources, Mines and Energy, Queensland Government, viewed 01 August 2023 from: https://www.resources.qld.gov.au/__data/assets/pdf_file/0006/1461093/code-of-practice-petroleum-wells-bores.pdf

DPM Environmental 2023, *Aquatic Ecology Assessment*, prepared for Comet Ridge Mahalo North Pty Ltd, Brisbane, Queensland.

DRDMW 2023a, *Riverine protection permit exemption requirements,* WSS/2013/726, Version 2.02. Department of Regional Development, Manufacturing and Water, Queensland Government, Brisbane.

DSEWPC 2011, *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles*. Department of Sustainability, Environment, Water, Populations and Communities. Australian Government, Canberra

Dupuy L, Fourcaud T, Stokes A (2005). A numerical investigation into the influence of soil type and root architecture on tree anchorage. Plant Soil 278(1):119–134

Ehmann, H 1992, Encyclopedia of Australian animals: reptiles, Angus & Robertson, Sydney.EMM 2022, Blackwater terrestrial ecology survey report, flora and fauna seasonal surveys - Blackwater South Report prepared for BHP BMA (February 2022).

EMM 2022, Blackwater terrestrial ecology survey report, flora and fauna seasonal surveys - Blackwater South Report prepared for BHP BMA (February 2022).

ERM 2017, Spring Gully North-West and North East – Drilling Mud and Cement Additive Chemical Risk Assessment. Prepared for Origin Energy. November 2017.

EPHC 2009, *Environmental Risk Assessment Guidance Manual for Industrial Chemicals*. Environment Protection and Heritage Council. Retrieved from: https://www.nepc.gov.au/sites/default/files/2022-09/cmgt-nchem-eragm-industrial-chemicals-200902.pdf

Epic Environmental 2024a, *Matters of National Environmental Significance: Ecological Assessment Report*, prepared for Comet Ridge Mahalo North Pty Ltd, Brisbane, Queensland.

Epic Environmental 2024b, *Chemical Risk Assessment*, prepared for Comet Ridge Mahalo North Pty Ltd, Brisbane, Queensland.

Eyre, T.J., Kelly, A.L, Neldner, V.J., Wilson, B.A., Ferguson, D.J., Laidlaw, M.J. and Franks, A.J. 2015, *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.2*. Queensland Herbarium, Department of Science, Information Technology, Innovation and Arts, Brisbane.

Eyre, TJ, Smith, GC, Venz, MF, Mathieson, MT, Hogan, LD, Starr, C, Winter, J & McDonald, K 2022, *Guide to greater glider habitat in Queensland*, report prepared for the Department of Agriculture, Water and the Environment, Canberra. Department of Environment and Science, Queensland Government, Brisbane.

Farmer, AM, 1993, The effects of dust on vegetation – a review, Environmental Pollution, vo. 79, pp. 63-75.

Feikema, P., Morris, J., & Connell, L. 2010. The water balance and water sources of a Eucalyptus plantation over shallow saline groundwater. Plant and Soil, 332(1), 429-449

Fielding, C.R., Sliwa, R., Holcombe, R.J., and Kassan, J. 2000, *A New Palaeogeographic Synthesis of the Bowen Basin of Central Queensland. In Bowen Basin Symposium*, 287–302. Geological Society of Australia Brisbane

Fensham R.J and Holman J.E 1999, Temporal and spatial patterns in drought-related tree dieback in Australian savanna. Journal of Applied Ecology, 36 1035 – 1050

Field, JP, Belnap, J, Breshears, DD, Neff, JC, Okin, GS, Whicker, JJ, Painter, TH, Ravi, S, Reheis, MC & Reynolds, RL 2010, 'The ecology of dust', Frontiers in Ecology and the Environment, vol. 8, pp. 423-430.

Garnett, ST, Szabo, JK & Dutson, G 2011, The action plan for Australian birds 2010, CSIRO Publishing, Collingwood.

Garnet, ST & Baker, GB 2021, The action plan for Australian birds 2020, CSIRO Publishing, Collingwood.

Geering, A, Agnew, L & Harding, S 2007, Shorebirds of Australia, CSIRO Publishing, Collingwood.

Golder 2018, Mahalo Gas Project: ecology technical report. Report prepared for Comet Ridge Limited (August 2018).

Hair, I.D. 1987, *Hydrogeology of Coal Seams at Curragh, Central Queensland*. Queensland Department of Mines Record 1987/20. Ref E205. May, 1987

Higgins, PJ (ed) 1999, Handbook of Australian, New Zealand and Antarctic birds, Vol 4: parrots to dollarbird, Oxford University Press, Melbourne.

Hobson, R 2012. Grey snake, Hemiaspis damelii. In 'Queensland's Threatened Animals' (Eds L. K. Curtis, A. J. Dennis, K. R. McDonald, P. M. Kyne and S. J. S. Debus) pp. 245-246. CSIRO Publishing: Collingwood.

Holland K, Tyreman S, Mensforth L, Walker G. 2006. Tree water sources over shallow, saline groundwater in the lower River Murray, south eastern Australia: implications for groundwater recharge mechanisms. Australian Journal of Botany 54: 193–205

Hose, G.C., Sreekanth, J., Barron, O. and Pollino, C. 2015,. *Stygofauna in Australian groundwater systems: Extent of knowledge*, Report to the Australian Coal Association Research Program (ACARP), CSIRO, Australia

Humphreys WF 2006, *Aquifers: the ultimate groundwater dependent ecosystem*. Australian Journal Botany, 54, 115-132

Hume, ID & Esson, C 1993, 'Nutrients, antinutrients and leaf selection by captive koalas (Phascolarctos cinereus).' Australian Journal of Zoology, vol. 41, pp. 379–392

IESC 2018, *Information guidelines for proponents preparing coal seam gas and large coal mining development proposals*, Commonwealth of Australia 2018. Retrieved 3 March 2023 from: https://www.iesc.gov.au/sites/default/files/2022-07/iesc-information-guidelines-may-2018.pdf

Johnson, RW, McDonald, WJ, Fensham, RJ, McAlpine, CA & Lawes, MJ 2016, 'Changes over 46 years in plant community structure in a cleared brigalow (*Acacia harpophylla*) forest, *Austral Ecology*, vol. 41, pp. 644-656

Katestone 2023, *Greenhouse Gas Assessment Report*, prepared for Comet Ridge Mahalo North Pty Ltd, Brisbane, Queensland

KCB 2018, Project Atlas EPBC Referral – Water Report Final. Prepared for Senex Energy Ltd

Korsch, RJ, and Totterdell, J.M. 2009, *Subsidence History and Basin Phases of the Bowen, Gunnedah and Surat Basins, Eastern Australia*. Australian Journal of Earth Sciences 56 (3): 335–353

Lamontagne, S., Leaney, F., & Herczeg, A. 2005. Groundwater–surface water interactions in a large semi-arid floodplain: implications for salinity management. Hydrological Processes, 19(16), 3063-3080

OECD 2014, *Environmental Risk Assessment Toolkit*. Retrieved 3 March 2023 from: https://envriskassessmenttoolkit.oecd.org/default.aspx?idExec=bddf1e29-391f-49ee-ba5b-9a620162b74f

Richardson, R 2008, Queensland Brigalow Belt reptile recovery plan 2008 – 2012, Report to the Department of the Environment, Water, Heritage and the Arts, Canberra, WWF-Australia, Brisbane

RDM Hydro 2024, *Groundwater Impact Assessment*, prepared for Comet Ridge Mahalo North Pty Ltd, Brisbane, Queensland

Marchant, S & Higgins, PJ (eds) 1993, Handbook of Australian, New Zealand and Antarctic birds. Vol. 2: raptors to lapwings, Oxford University Press, Melbourne

Martin, RW, Handasyde, KA & Krockenberger, A 2008, 'Koala Phascolarctos cinereus', in S Van Dyck & R Strahan (eds), The mammals of Australia, Third edition, Reed New Holland, Sydney, pp. 198-201

Melzer, A 2012, 'Ornamental Snake Denisonia maculata (Steindachner, 1867)', in LK Curtis, AJ Dennis, KR McDonald, PM Kyne & SJS Debus (eds), Queensland's threatened animals, CSIRO Publishing, Collingwood, pp. 241-242

Mensforth, L., Thorburn, P., Tyerman, S., & Walker, G. 1994. Sources of water used by riparian Eucalyptus camaldulensis overlying highly saline groundwater. Oecologia, 100(1), 21-28

Moore, BD & Foley, WJ 2000, 'A review of feeding and diet selection in koalas (Phascolarctos cinereus)', Australian Journal of Zoology, vol. 48, pp. 317-333

NICNAS 2017, Literature review: Summary report, Project report prepared by the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) as part of the National Assessment of Chemicals Associated with Coal Seam Gas Extraction in Australia, Commonwealth of Australia, Canberra. Retrieved 3 March 2023 from: https://www.dcceew.gov.au/water/coal-and-coal-seam-gas/publications/literature-review-summary-report

Neldner, VJ, Wilson, BA, Thompson, EJ, Dillewaard, HA, Ryan TS, Butler DW, McDonald WJF, Richter D, Addicott EP & Appelman CN 2022. Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland, Version 6.0. Queensland Herbarium, Queensland Environmental Protection Agency, Brisbane

OGIA 2016 *Hydrogeological conceptualisation report for the Surat Cumulative Management Area. Office of Groundwater Impact Assessment*. Department of Natural Resources, Mines and Energy. August 2016

OGIA 2021a, Underground Water Impact Report 2021 for the Surat Cumulative Management Area. Office of Groundwater Impact Assessment. Queensland Government. December 2021

OGIA 2021b, *Geology and 3D geological models for Queensland's Surat and southern Bowen basins Stratigraphic framework, data, methods and results*. Version 1.0. (OGIA/21/CD03/V1). Office of Groundwater Impact Assessment. Department of Natural Resources, Mines and Energy. December 2021

OGIA 2021c, *Modelling of cumulative groundwater impacts in the Surat CMA: approach and methods. Version 1.0. (OGIA/21/CD15/V1)*. Office of Groundwater Impact Assessment. Department of Natural Resources, Mines and Energy. December 2021

OGIA 2019, *Groundwater Modelling Report Surat Cumulative Management Area*. October 2019. Office of Groundwater Impact Assessment. Department of Natural Resources, Mines and Energy

OGIA 2023, Surat CMA UWIR groundwater model data provision to Comet Ridge for the Mahalo North Project

Pahl, LI & Hume, ID 1990, 'Preferences for Eucalyptus species of the New England Tablelands and initial development of an artificial diet for Koalas.' In: AK Lee, KA Handasyde and GD Sanson (eds.), Biology of the Koala. Surrey Beatty and Sons, Sydney. pp. 123–128

Pearce, B. and Hansen, J. 2006, Hydrogeological Investigations of the Comet River Sub-Catchment, Central Queensland, Australia

Perry, G, Buchanan, BW, Fisher, RN, Salmon, M & Wise, SE 2008, 'Effects of artificial night lighting on amphibians and reptiles in urban environments.' In: JC Mitchell, RE Jung Brown & B Bartholomew (eds.), Herpetological Conservation, Society for the Study of Amphibians and Reptiles.

Radle, AL 2007, Effects of noise on wildlife: a literature review, Available at: http://wfae.proscenia.net/library/articles

Ransley, T.R. and Smerdon, B.D. (Eds) 2012, *Hydrostratigraphy, hydrogeology and system conceptualisation of the Great Artesian Basin*. A technical report to the Australian Government from the CSIRO Great Artesian Basin Water Resource Assessment. CSIRO Water for a Healthy Country Flagship, Australia

Richardson, R 2008, Queensland Brigalow Belt reptile recovery plan 2008 – 2012, Report to the Department of the Environment, Water, Heritage and the Arts, Canberra, WWF-Australia, Brisbane

Rogers, D, Hance, I, Paton, S, Tzaros, C, Griffioen, P, Herring, M, Jaensch, R, Oring, L, Silcocks, A & Weston, M 2005, 'The breeding bottleneck: breeding habitat and population decline in the Australian painted snipe', in P Straw, (ed), Status and conservation of seabirds in the East Asian-Australasian Flyway: proceedings of the Australasian Shorebirds Conference, 13-15 Dec 2003, Canberra, Wetlands International Global Series 18, International Wader Studies 17, Sydaney, pp. 15-23

Rowland 2012, *Grey snake,* Hemiaspis damelii. Targeted species survey guidelines. Queensland Herbarium, Department of Environment and Science, Brisbane

Sliwa, R., Babaahmadi, A. and Esterle, J. 2017, *ACARP Project C24032: Structure Supermodel 2017 – Fault Characterisation in Permian to Jurassic Coal Measures*. 1 February 2018

Specht & Specht 2000, Australian Plant Communities, Oxford University Press, USA

State of Queensland 2023, Water Quality Data. Department of Environment and Science. Accessed via http://qldspatial.information.qld.gov.au/catalogue// on 15 June 2023

Swan, G & Wilson, S 2012, 'The results of fauna recovery from a gas pipeline trench, and a comparison with previously published reports', Australian Zoologist, vol. 36, pp. 129-136

Terra Sana 2021a, *Baseline Assessment 2021 Meroo Downs*. Prepared for Comet Ridge. 23 December 2021.

Terra Sana 2021b, *Baseline Assessment 2021 Togara Station*. Prepared for Comet Ridge, 23 December 2021

Terra Sana 2025a, *Water Monitoring and Management Plan, 2025.* Prepared for Comet Ridge, 11 June 2025

Terra Sana 2025b, *Rewan Connectivity Plan, 2025.* Prepared for Comet Ridge, 9 July 2025

Threlfall, CG, Law, B, & Banks, PB 2013, 'The urban matrix and artificial light restricts the nightly ranging behaviour of Gould's long-eared bat (Nyctophilus gouldi).' Austral Ecology, vol. 38, pp. 921–930.

TSSC 2009, A Conservation Advice for Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin. Department of Agriculture, Water and the Environment, Canberra. Accessed at: https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=99

Watermark Eco 2024, *Groundwater Dependent Ecosystems Assessment*, prepared for Comet Ridge Mahalo North Pty Ltd, Brisbane, Queensland

Wilson, S & Swan, G 2017, A complete guide to reptiles of Australia, Third edition, New Holland Publishers, Sydney

Youngentob, K. N., Marsh, K. J., & Skewes, J. 2021. *A Review of Koala Habitat Assessment Criteria and Methods*. The Australian National University, prepared for the Department of Agriculture, Water and the Environment, Canberra. Accessed at: https:/www.dcceew.gov.au/sites/default/files/documents/review-koala-habitat-assessment-criteria-and-methods-2021.pdf

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APPENDIX A DETSI ENVIRONMENTAL AUTHORITY CONDITIONS

APPENDIX B DETSI INTERNAL REVIEW DECISION AND STATEMENT OF REASONS

APPENDIX C MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE: ECOLOGICAL ASSESSMENT REPORT (EPIC 2024)

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APPENDIX I ENVIRONMENTAL MANAGEMENT PLAN (COMET RIDGE 2024)

APPENDIX J IESC ADVICE

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APPENDIX L WATER MONITORING AND MANAGEMENT PLAN 2025 (TERRA SANA 2025A)

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APPENDIX N STORMWATER AND WATER BALANCE ASSESSMENT (ANDERSON CONSULTING, 2025)

APPENDIX O DCCEEW IESC ECOHYDROLOGICAL MODEL (COMET RIDGE 2025B)

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