

*DRAFT*  
ORNAMENTAL SNAKE  
MANAGEMENT PLAN  
LAKE VERMONT  
MEADOWBROOK PROJECT

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PREPARED FOR  
BOWEN BASIN COAL PTY LTD

28 September 2023

## Document Control

<b>Project Name:</b>	Lake Vermont Meadowbrook Project
<b>Report Title:</b>	Ornamental Snake Management Plan
<b>Client:</b>	Bowen Basin Coal Pty Ltd
<b>Project Manager:</b>	Rod Hailstone

Version	Comments	Author	Reviewer	Date
Draft issued for client review		IG	RH	28 Sep 2023
Final issued to client		IG	BA	29 Sep 2023

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# 1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) was commissioned by Bowen Basin Coal Pty Ltd to develop an Ornamental Snake (*Denisonia maculata*) management plan (OSMP) for the Lake Vermont Meadowbrook Project.

## 1.1 Project Location

The Project is located approximately 25 km north-east of Dysart and approximately 160 km south-west of Mackay, within the Isaac Regional Council Local Government Area. The Project is within the Brigalow Belt North Bioregion. The location of the Project area is shown in Figure 1-1.

## 1.2 Project description

The objective of the Project is to develop the metallurgical coal resource located to the north and directly adjoining the existing Lake Vermont Mine, to secure the long-term future of the operation.

The Project addresses the forecast reduction in coal production that will occur at the existing Lake Vermont Mine by combining output from the existing open-cut operations and the Project extension. The Project extension proposes underground mining development, as well as a new satellite open-cut pit. The Project will enable total coal production to be maintained at the currently approved output for an extended period of approximately 20 years, with the overall Project life spanning approximately 53 years (inclusive of final rehabilitation). The Project layout including the location of infrastructure is shown in Figure 1-2.

## 1.3 Background

An Environmental Impact Statement (EIS) has been prepared for the Project in accordance with the Environmental Protection Act 1994 (EP Act). The Project was determined to be a controlled action (EPBC Referral 2019/8485) under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) on 22 November 2019. The Project has been identified as potentially impacting a number of Matters of National Environmental Significance (MNES) listed under the EPBC Act, including the Ornamental Snake. A species management plan for the Ornamental Snake was requested in support of the EIS.

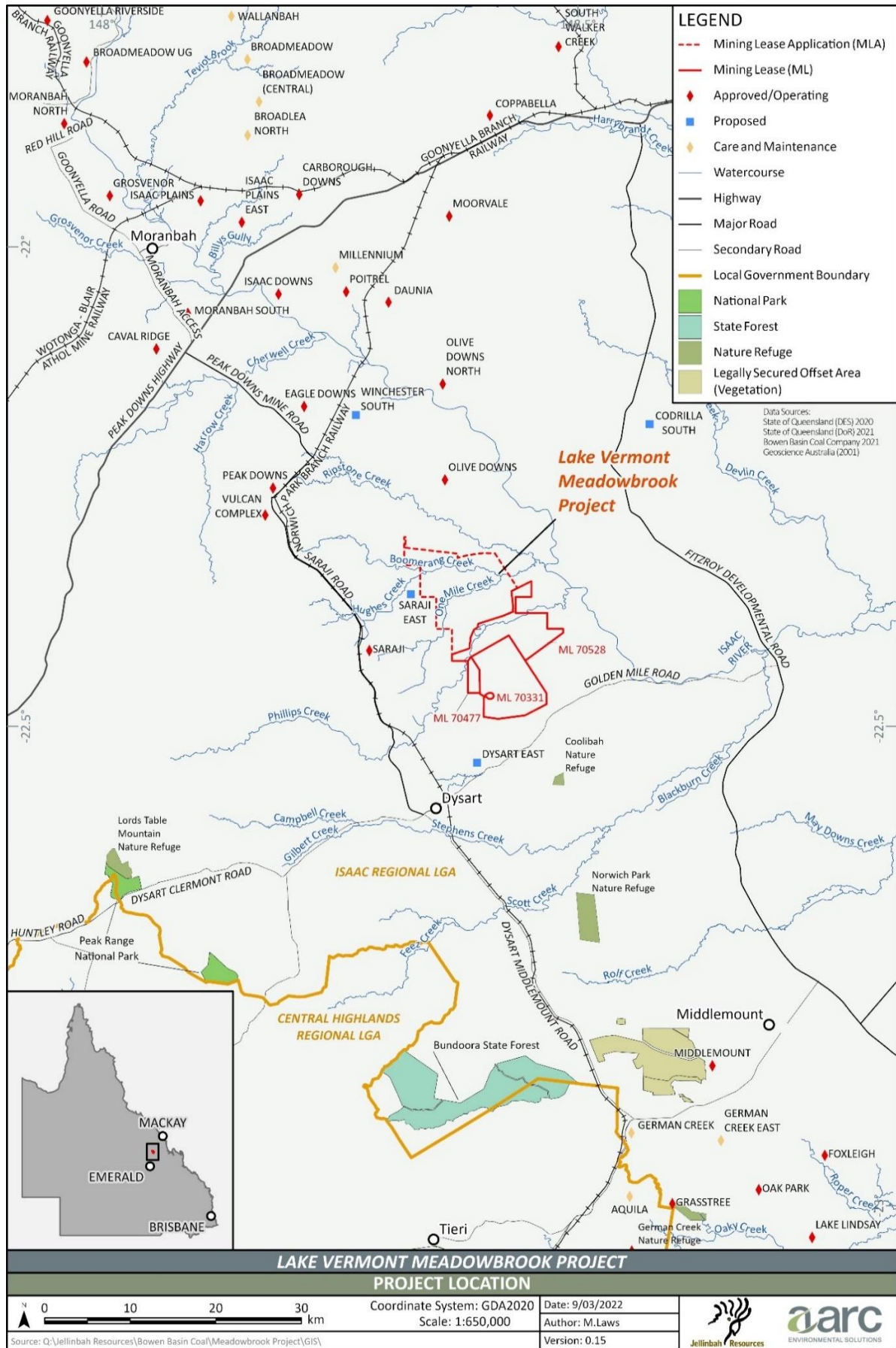


Figure 1-1 Project location

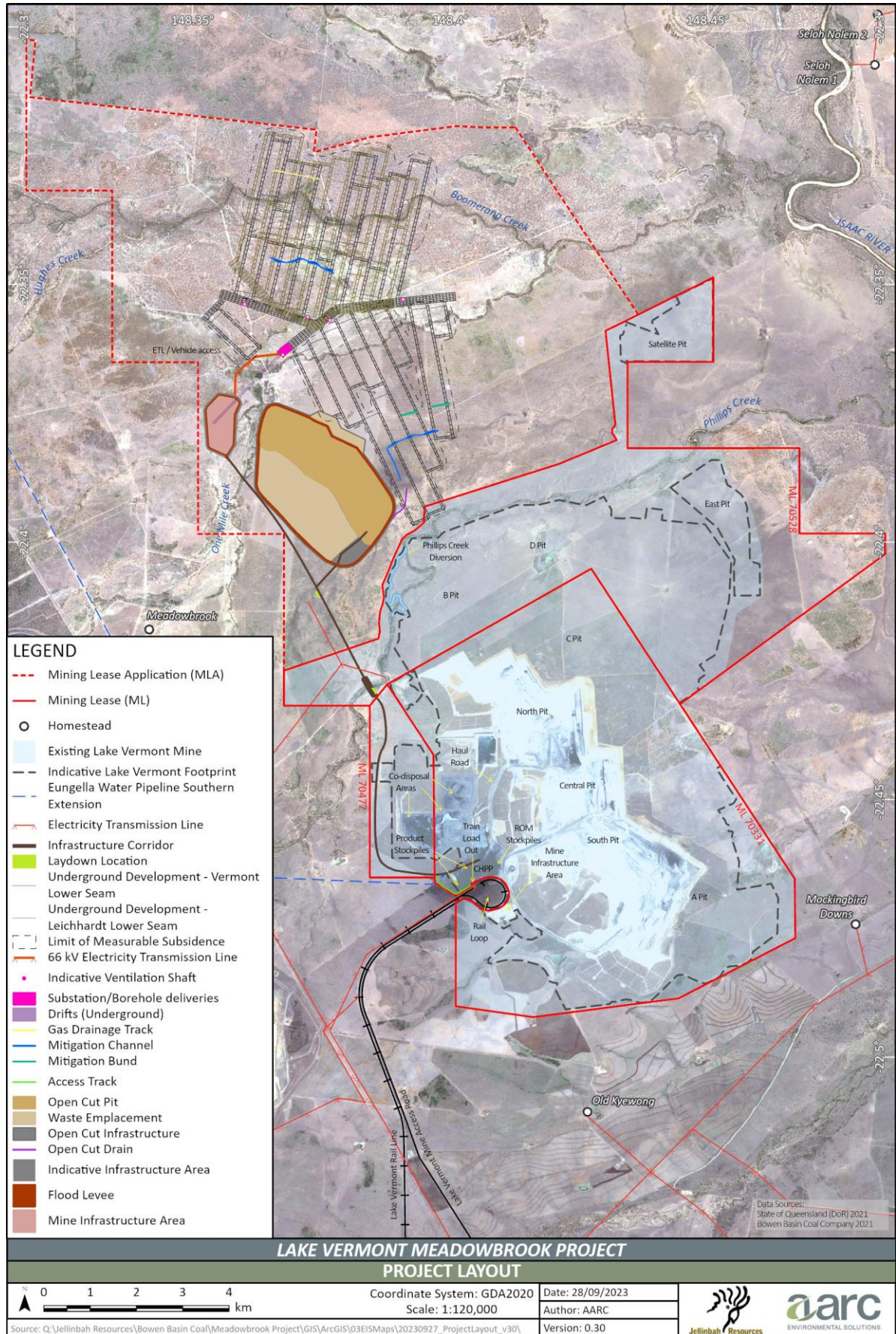


Figure 1-2 Project layout

## 1.4 Purpose and scope

This OSMP has been developed to provide for the requirements of the EIS in relation to Ornamental Snake, including:

- Assessment of potential impacts to the Ornamental Snake as a result of Project activities.
- Detail of the proposed mitigation measures to be implemented to manage potential impacts to the Ornamental Snake.
- For the purposes of monitoring for potential impacts to Ornamental Snake habitat in the Project subsidence footprint, this document should be read in conjunction with the Subsidence Management Plan (SMP)(AARC 2023).

### 1.4.1 Relevant legislation and guidelines

This document has been prepared in accordance with the following relevant guidelines:

- Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (DOE 2013).
- Conservation Advice *Denisonia maculata* (Ornamental Snake) (DOE 2014).
- Ornamental Snake Species Profile and Threat Database (SPRAT) (DAWE 2021a).
- Threat abatement plan for predation by feral cats (DoE 2015a).
- Threat abatement plan for predation by the European red fox (DEWHA 2008).
- Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads (DSEWPaC 2011a).
- Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (DoEE 2017).
- Survey Guidelines for Australia's Threatened Reptiles. EPBC Act survey guidelines 6.6 (DSEWPaC 2011b).
- Draft Referral guidelines for the nationally listed Brigalow Belt reptiles (DSEWPaC 2011c).
- DoE Environmental Management Plan Guidelines (DOE 2014).

### 1.4.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act identifies and provides for the protection of Matters of National Environmental Significance (MNES). The EPBC Act protects Australian biodiversity values and integrates management of important natural and cultural places.

Any action which may have a significant impact on a MNES must be referred to the relevant Commonwealth Minister to decide whether or not the action is a 'controlled action' requiring approval under the EPBC Act.

### 1.4.3 Environmental Offsets Policy

The 'Queensland Environmental Offsets Policy (Version 1.13)' provides a single, consistent, whole-of-government policy to enable administering agencies to assess offset proposals and satisfy offset conditions in accordance with the EO Act. The Offsets Policy requires that all environmental offsets must meet the following set of principles:

- offsets will not replace or undermine existing environmental standards or regulatory requirements, or be used to allow development in areas otherwise prohibited through legislation or policy;
- impacts must first be avoided, then mitigated, before considering the use of offsets for any remaining impact;



- offsets must achieve a conservation outcome that counterbalances the significant residual impact for which the offset was required;
- offsets must provide environmental values as similar as possible to those being lost;
- offset provision must minimise the time lag between the impact and delivery of the offset;
- offsets must provide additional protection to environmental values at risk, or additional management actions to improve environmental values; and
- where legal security is required, offsets must be legally secured for the duration of the impact on the prescribed environmental matter.

## 2 Species profile and biology

### 2.1 Conservation status

The Ornamental Snake (*Denisonia maculata*) is listed as Vulnerable under the EPBC Act and NC Act.

### 2.2 Description

The Ornamental Snake occurs within woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions in Queensland Regional Ecosystem Land Zone 4 and also lake margins and wetlands (DAWE 2021a). These habitats are favoured by frogs (the Ornamental Snake's prey) and provide suitable microhabitat features for the species, such as deep cracking clay soils, logs and vegetation debris/litter, in which the species shelters.

The Ornamental Snake has most commonly been recorded in Queensland Regional Ecosystem (RE) 11.4.3, has commonly been recorded in RE 11.4.6, RE 11.4.8 and RE 11.4.9 and has less commonly been recorded in RE 11.3.3 and RE 11.5.6 (DAWE 2021a, DSEWPaC 2011c).

The Ornamental Snake also occurs in cleared areas where the above-mentioned RE's formerly occurred, which comprise adequate ground cover to provide shelter (such as gilgai formations, logs, rocks and other debris) for the species. Gilgai formations are found where deep cracking alluvial soils with high clay contents occur.

The Ornamental Snake is nocturnally active. The diet of this species consists predominantly of frogs, and the species forages in areas where frogs are abundant (DAWE 2021a). The Ornamental Snake has been observed consuming a variety of species (DAWE 2021a). The Ornamental Snake shelters during the day in logs and under coarse, woody debris; ground litter and in deep soil cracks (DAWE 2021a). The species is thought to be active year-round, with the exception of cooler months. Peak activity occurs in early summer and through the wet season. During dry periods, *D. maculata* can remain inactive in suitable shelter sites (DAWE 2021a). The Ornamental Snake is viviparous (i.e. gives birth to young that have developed within the mother's body), and typically, a litter size ranges from three to 11 (DAWE 2021a).

### 2.3 Threats

Threats to the Ornamental Snake include (DAWE 2021a):

- habitat loss through clearing;
- habitat fragmentation;
- habitat degradation by overgrazing by stock, especially cattle or grazing of gulgais during the wet season leading to soil compaction and compromised soil structure;
- alteration of landscape hydrology in and around gilgai environments;
- alteration of water quality through chemical and sediment pollution of wet areas;
- contact with the Cane Toad;
- predation by feral species; and
- invasive weeds.

### 2.4 Habitat assessment

Habitat mapping for the Ornamental Snake within the study area is shown in Figure 2-1 and is informed by in-field observations and transect data, aerial photography, soils mapping and information contained in

DAWEs Species Profiles and Threats (SPRAT) database, including the relevant statutory documents and published research.

Habitat amenity for the Ornamental Snake within the study area has been mapped against the criteria outlined in Table 2-1.

Areas of habitat amenity have been determined based on in-field observations and aerial photography by EcoSmart Ecology and AARC. Dark clay soils, which are more likely to retain water and support abundant frog populations, have been assessed using the following hierarchy of confidence:

- direct in-field observations;
- the presence of dark shrub vegetation (Brigalow) on aerial photography and the absence of light green shrub vegetation (*Carissa ovata*); and
- soil mapping of the study area (AARC 2023).

Aerial photography of the study area (1 m resolution) was captured in May 2019 following above average rainfall (approximately 45% greater than average for June and April combined). At the provided resolution, larger, more substantial microrelief (i.e. gilgai) were visible, and the recent rainfall allowed the extent and/or likely presence of surface water to be assessed.

While the above habitats are relatively easy to define, assigning these criteria to areas within the site is problematic due to:

- gradual transitions in gilgai formations (mapping of distinct boundaries oversimplifies in-field values);
- complex patchwork of soils that can occur in some areas (e.g. to the north and west of One Mile Creek); and the
- history of ploughing to remove woody regrowth, which incrementally alters microrelief in areas that may otherwise show deep gilgai formations.

On the site, *Acacia harpophylla* is generally associated with darker clays, while *Carissa* sp. is generally associated with red soils. These two plant species can be differentiated using high-resolution aerial imagery.

However, in many areas there is a mix of the two. While the soil mapping for the Project area is suitable for its intended purpose, it does not provide a sufficient level of detail at the scale suitable for mapping Ornamental Snake habitat. As such, it has only been used to predict soil type when required.

The Ornamental Snake has been recorded at three locations within and adjacent to the Project area. All three records were recorded within Brigalow regrowth vegetation containing well-developed gilgai Figure 2-1.

Table 2-1 Ornamental Snake habitat amenity assessment criteria

Habitat amenity	Description
High	High amenity habitat is defined as areas of deep gilgai microrelief (60+ cm depth) or ephemeral creek lines (including older systems) on dark clays. Evidence of pooling surface water is common on aerial imagery. In these areas, Ornamental Snakes are known to occur (previous records) or are considered highly likely, and the area is expected to support comparatively higher densities.
Moderate	Moderate amenity habitat is areas with less pronounced gilgai microrelief (20–60 cm depth) that occurs on either dark (predominantly) or loam (uncommonly) soils. There is reduced evidence of surface water pooling on aerial imagery. On balance, these areas are more likely to be inhabited by Ornamental Snakes than not, though the species may be absent from some areas or in low abundance. These habitats may not hold water in poor rainfall conditions (i.e. droughts).

Habitat amenity	Description
Low	<p>Low amenity habitat are areas with slight microrelief (&lt;20 cm) or low possibility of pooling water—often associated with sand/loam soils. Ornamental Snakes, if present, are likely to be at comparatively low density, though on balance, it is anticipated that most areas will be uninhabited. These habitats are anticipated to contain water only in high rainfall conditions (i.e. well above average) and, even then, may not hold water for lengthy periods.</p> <p>Despite containing water, large dams or permanent waters are not typically frequented by abundant frogs. Considering the extent of more suitable habitat, these waterbodies are generally not mapped as suitable (with some exceptions).</p>
Unsuitable	<p>Unsuitable habitat for the Ornamental Snake includes areas that contain less appropriate soil types (sands and sandy loams), lack suitable microhabitat features, have been subject to historic blade-ploughing that has adversely affected microrelief (unless otherwise indicated by aerial photography or in-field observations) and are characterised by dense non-native grass species. These habitats are typically not attractive to Ornamental Snakes or large aggregations of their prey (frogs).</p>

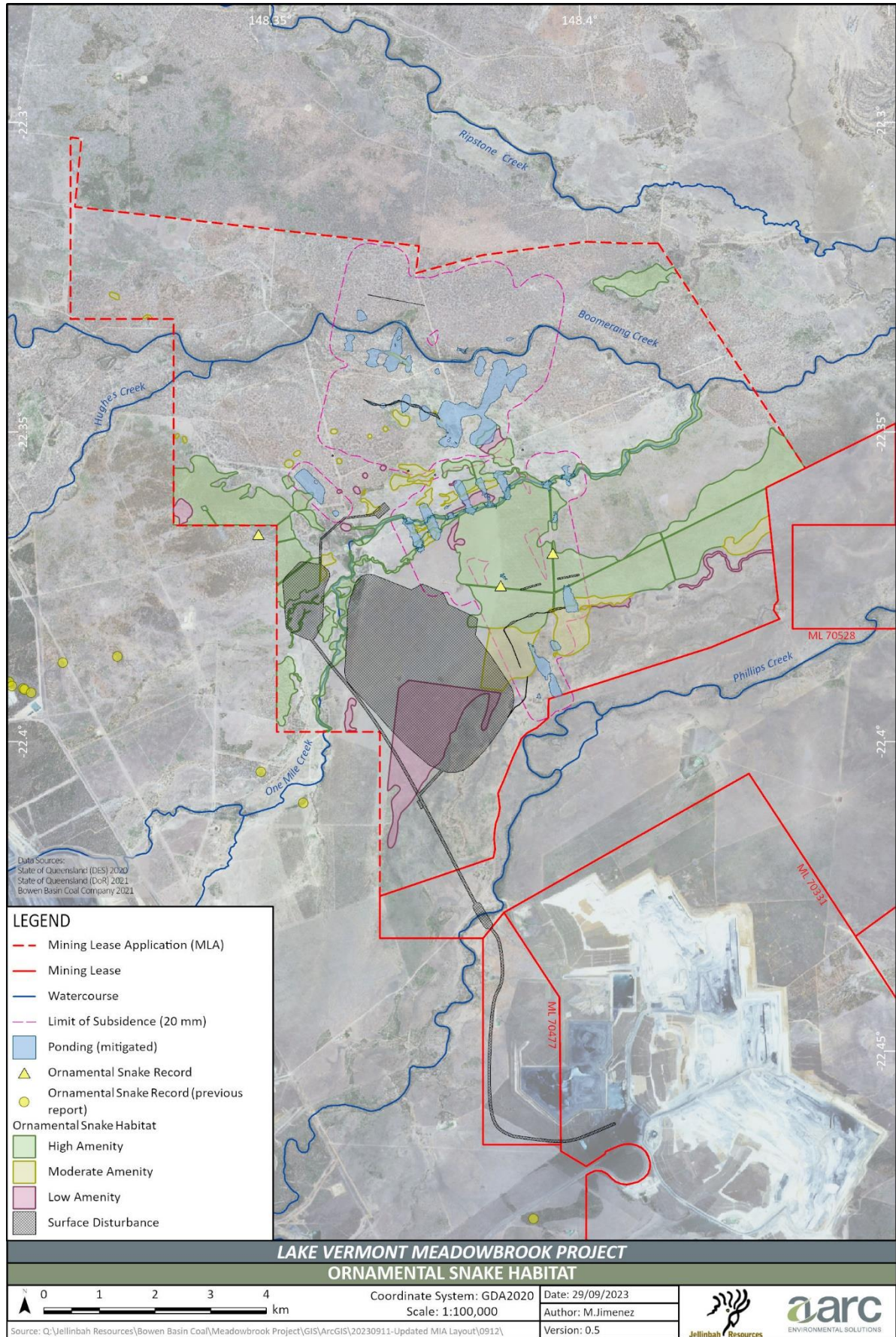


Figure 2-1 Ornamental Snake habitat mapping

### 3 Potential impacts and impact assessment

The potential threats to Ornamental Snake have been identified in the Terrestrial Ecology Assessment (AARC 2023). The assessment identified a total of 1,672.0 ha of Ornamental Snake habitat within the study area, including 1,192.5 ha of high amenity, 213.5 ha of moderate amenity and 266.0 ha of low amenity habitat (Figure 2-1). A total of 211.1 ha of Ornamental Snake habitat is proposed to be cleared for the Project, including 41.7 ha of high amenity, 21.9 ha of moderate amenity and 147.5 ha of low amenity habitat (Table 3-1).

Table 3-1 Proposed Project footprint within Ornamental Snake habitat

Habitat amenity	Extent within study area (ha)	Extent of direct disturbance (ha)		Extent of subsidence impact (ha) <sup>a</sup>	Extent of predicted ponding impact (ha)
		Stages 1,2,3 clearing (ha)	Stage 4 clearing (ha)		
Low	266.0	4.1	143.4	19.9	4.2
Moderate	213.5	3.6	18.3	100.8	10.9
High	1192.5	38.1	3.6	393.8	27.7
<b>Total</b>	<b>1672.0</b>	<b>45.9</b>	<b>165.3</b>	<b>514.5</b>	<b>42.8</b>

<sup>a</sup> Excludes predicted ponding areas

Potential impacts were identified to include:

- direct clearing of habitat;
- surface subsidence and intermittent ponding of subsided areas;
- flooding regime changes;
- erosion; and
- weed and pest population increase.

Potential impacts are considered in detailed in the Project EIS, terrestrial ecology assessment (AARC 2023). The Project was designed to avoid and mitigate these impacts on the Ornamental Snake and proposed avoidance and mitigation measures were described including their timing, predicted effectiveness, monitoring and adaptive management.

An assessment of the likelihood of significant impacts on the Ornamental Snake in accordance with the Commonwealth 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' was conducted for the Terrestrial Ecology Assessment (AARC 2023). The assessment concluded that the Project will result in the removal of 207.1 ha of Ornamental Snake habitat. This clearing is identified as likely to reduce the area of habitat availability within the study area and may be critical to the survival of the species in the local area. Therefore, the Project is likely to have a significant impact to the Ornamental Snake.

The approved disturbance areas of Ornamental Snake habitat are shown in Figure 3-1.

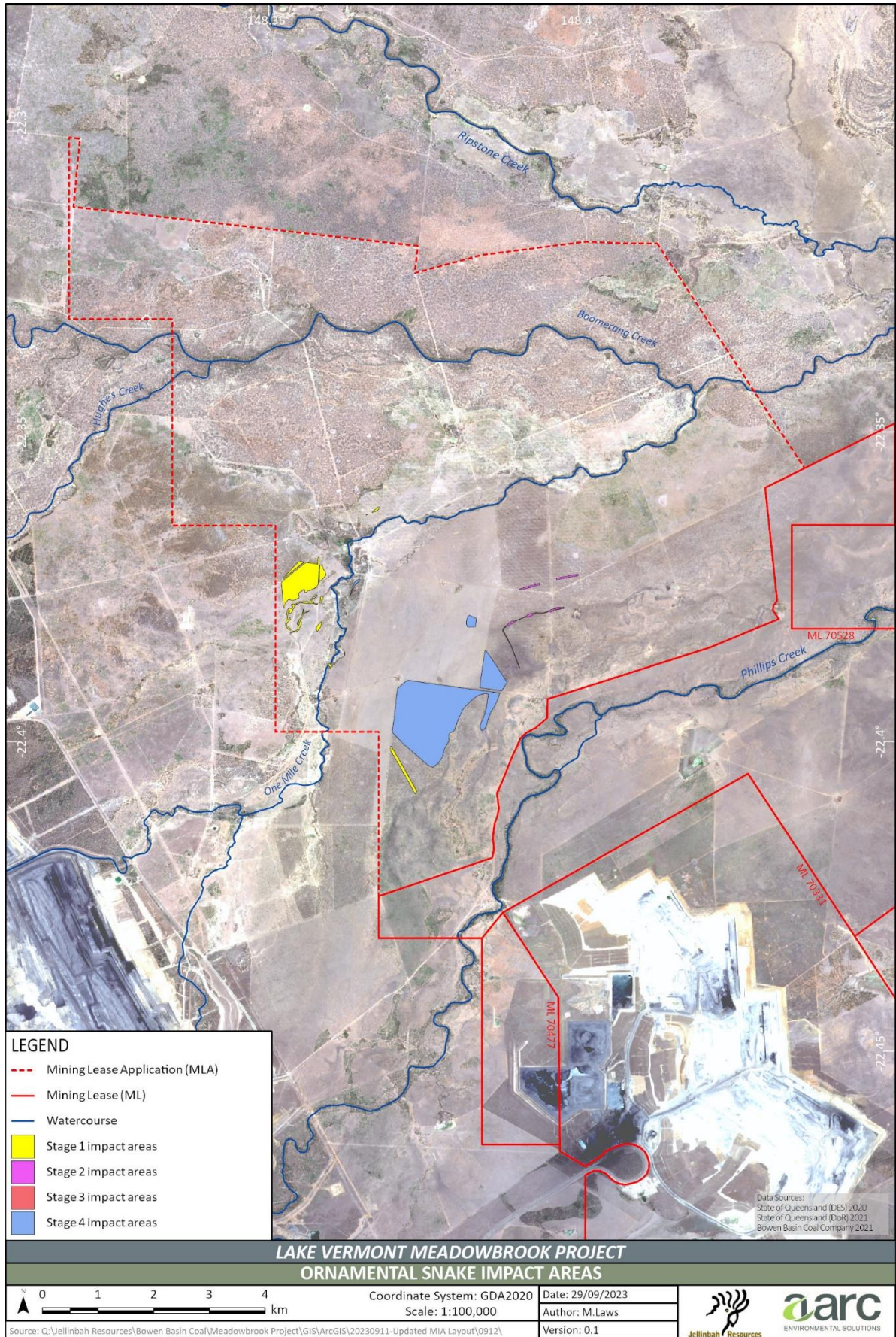


Figure 3-1 Ornamental Snake impact areas

## 4 Mitigation and management measures

The Project has been designed to avoid and mitigate impacts to the Ornamental Snake where practicable. The proposed avoidance and mitigation measures for the Ornamental Snake, including timing, predicted effectiveness, monitoring, adaptive management and statutory or policy basis are described in Table 4-1. These measures will be subject to monitoring to assess the effectiveness and inform adaptive management, as proposed in Table 4-1.

Additional mitigation measures proposed to avoid and mitigate impacts to terrestrial ecology matters in general. These potential impacts have been assessed as unlikely to impact Ornamental Snake, however the management and monitoring of these impacts are considered necessary to ensure the prevention of impacts to the Ornamental Snake. These mitigation measures, with detail of timing, monitoring and adaptive management are presented in Table 4-2.



Table 4-1 Ornamental Snake impact avoidance and mitigation measures

Avoidance/mitigation measures	Timing	Predicted effectiveness	Monitoring and adaptive management	Statutory or policy basis
Project infrastructure has been located to minimise direct disturbance to Ornamental Snake habitat.	Mine planning/ construction/ operations	Highly effective—minimises the extent of impacts to Ornamental Snake habitat.	Monitor disturbance/vegetation clearance areas against approved disturbance limits.	DoE (2014), DSEWPaC (2011c), Ponce Reyes <i>et al.</i> (2016)
Disturbance areas will be delineated to prevent accidental damage to adjacent Ornamental Snake habitat.	Construction/ operations	Highly effective management technique to manage Project disturbance activities.	Monitor/audit implementation of vegetation clearance protocol to confirm it is appropriately implemented (e.g. areas have been clearly delineated, prior inspections have been conducted and habitat features have been assessed for potential salvage).  Should clearing exceed approved limits, incident reporting would be initiated with a corrective action plan will be proposed (including proposed timing) and implemented.	
Fauna spotter/catcher will be on-site when clearing activities occur within Ornamental Snake habitat. Fauna spotter/catcher will monitor clearance activities for Ornamental Snakes and any incidence of fauna mortality or injury will be recorded. Injured fauna will be taken to a wildlife carer or veterinarian.	Construction/ operations	Effectiveness is likely to be variable and dependent on whether individual(s) move from their shelter and whether individual(s) can be caught during the clearing activities.	Adaptive measures will be implemented, as necessary. Potential adaptive measures include pre-clearance surveys/trapping of target fauna.	DoE (2014)
Fauna spotter/catcher will monitor the fauna encountered and the occurrence of Ornamental Snakes within trenches.	Construction	Highly effective method to ensure trapped animals do not perish.	Adaptive measures include increased frequency of inspection or limiting the duration or extent of the disturbance at any one time.	DSEWPaC (2011c)
Select habitat features (e.g. hollows, logs) will be salvaged during clearance activities for habitat enhancement in Ornamental Snake habitat that will not be disturbed by the Project.	Construction/ operations	Effective if salvaged carefully and placed strategically to enhance existing habitat.	Implementation of the vegetation clearance protocol will be monitored/audited. Corrective measures will be implemented as required.	DoE (2014)

Avoidance/mitigation measures	Timing	Predicted effectiveness	Monitoring and adaptive management	Statutory or policy basis
Design and undertake subsidence ponding drainage management works to minimise hydrological changes to Ornamental Snake gilgai habitats.	Mine planning/ operations	The hydrological modelling (WRM 2022) indicates the subsidence ponding mitigation works will be effective in minimising the hydrological changes that will occur as a result of mine subsidence.	Subsidence effects and implemented mitigation and rehabilitation measures will be monitored in accordance with the Subsidence Management Plan.  Audit(s) will be conducted against the Subsidence Management Plan. Corrective measures may include additional works to reduce ponding.	DoE (2015b), DoE (2014), DSEWPaC (2011c), Ponce Reyes <i>et al.</i> (2016)
Implement erosion and sediment control measures.	Construction/ operations/ rehabilitation and decommissioning	Highly effective management measure to minimise the potential for erosion and sedimentation.	Monitoring of the integrity and effectiveness of implemented erosion and sediment controls will be conducted in accordance with the Erosion and Sediment Control Plan that will be prepared for the Project. Adaptive management measures (such as installation of additional erosion controls or increase in frequency of inspections) will be implemented, as required.	DoE (2014), DSEWPaC (2011c), Ponce Reyes <i>et al.</i> (2016)
Implement measures to reduce the risk of the introduction of pollutants (e.g. bunding or containment of hydrocarbon storages, provision of spill kits).	Construction/ operations/ rehabilitation and decommissioning	Highly effective management measure to minimise the potential for leaks and spills or other pollutants being introduced to Ornamental Snake habitat.	Visual inspections will be conducted of containment measures at MIA.  Maintenance or implementation of additional controls will be carried out, as required, to maintain integrity and effectiveness.  Auditing of management measures and identification of potential system improvements will be conducted.	DoE (2014), DSEWPaC (2011c), Ponce Reyes <i>et al.</i> (2016)

Avoidance/mitigation measures	Timing	Predicted effectiveness	Monitoring and adaptive management	Statutory or policy basis
<p>Monitor and manage pest animal populations and implement pest control measures in accordance with the Weed and Pest Management Plan to be updated for the Project.</p>	<p>Construction/ operations/ rehabilitation and decommissioning</p>	<p>Effective management measure to manage the occurrence and abundance of feral pests.</p>	<p>Corrective actions (such as increasing the frequency or extent of control efforts or alternative control strategies) will be implemented, as necessary.</p>	<p>DoE (2014), DSEWPaC (2011c), Ponce Reyes <i>et al.</i> (2016), Commonwealth of Australia (2017), Qld Department of Agriculture and Fisheries pest control strategies (<a href="https://www.daf.qld.gov.au">https://www.daf.qld.gov.au</a>), Isaac Regional Council (2020), DoEE (2017)</p>

Table 4-2 General impact avoidance and mitigation measures

Potential impact	Mitigation measure	Timing	Monitoring and adaptive management
Noise and vibration	Noise and blasting pressure generated by Project activities must not exceed EA criteria for noise limits and Blasting noise limits.	Construction/ operations/ rehabilitation and decommissioning	Noise monitoring will be undertaken in compliance with the Project EA and Environmental Management Plan.
Dust	All reasonable and feasible avoidance and mitigation measures will be employed so that dust emissions do not cause exceedances of the EA condition levels.	Construction/ operations/ rehabilitation and decommissioning	Dust monitoring will be undertaken in compliance with the Project EA and Environmental Management Plan.
Artificial lighting	To minimise potential impacts of artificial lighting, the placement, configuration, shielding of and direction of lighting for the Project will be implemented in consideration of AS 4282:2019 'Control of the obtrusive effects of outdoor lighting' (Standards Australia 2019).	Construction and operations	Project general maintenance inspections will include lighting equipment such that configuration continues to meet standard.
Vehicle strike mortality	Site speed limits (will be set on all access roads / tracks throughout the site to minimise potential collisions.	Construction/ operations/ rehabilitation and decommissioning	Any injured individuals will be taken to a predetermined veterinarian for immediate attention.  Any injuries or mortalities will be reported and recorded in a register including date, location and other important details.
Bushfire	Fire management will measures will include: <ul style="list-style-type: none"> <li>• Management of high risk activities;</li> <li>• Vegetation management strategies (e.g. fire breaks, grazing, or controlled burns);</li> <li>• Vehicle and machinery pre-start checks;</li> <li>• Waste management strategies.</li> </ul>	Construction/ operations/ rehabilitation and decommissioning	Monitoring and adaptive management for bushfire risks will be conducted as required under the Project Bushfire Management Plan which will be maintained under the Emergency Response Plan.

## 5 Monitoring

### 5.1 Impact monitoring

As detailed in Section 4 subsidence, noise, dust, fire weed and pest monitoring will be undertaken in compliance with the Project management plans and or compliance with EA conditions.

### 5.2 Ecological monitoring surveys and species sightings

Ongoing monitoring of Ornamental Snake will be undertaken to identify the species use of habitat to be cleared and the presence of individuals during pre-clearing surveys. In regard to the Project subsidence footprint, the monitoring program will be a component of broader ecology monitoring under the SMP (AARC 2023). The monitoring in relation to subsidence areas is described in Section 5.2.1.

#### 5.2.1 Monitoring

Pre activity ecological condition assessment will be undertaken in the proposed subsidence areas, prior to commencement of underground longwall mining. This work will be in the form of an **'Initial Assessment Report'**, which is required as part of EA conditions for the Project. Monitoring transects and photographic monitoring points will be established as part of the Initial Assessment Report. Monitoring will also include establishment of depth gauges to measure pond water depth in key locations (determined as part of the on-ground initial assessment work). A Baseline Lidar Survey will also be undertaken prior to underground longwall mining commencement, to determine pre-subsidence topographic conditions of the proposed subsidence area.

Following the Initial Assessment Report, **'Annual Monitoring Inspections'** will be undertaken to identify any areas of observable or measurable impact that may be associated with subsidence or associated surface disturbance. Annual Monitoring Inspections will progressively observe and analyse changes in surface topography through available Lidar (which will be updated at maximum 2 yearly intervals). Annual monitoring will continue until subsidence movement in the northern subsidence area is considered to have finalised. An **'Annual Subsidence Monitoring Report'** will also be prepared to provide the results and analysis from the annual monitoring inspections, as well as detail any required repair/rehabilitation activities.

Vegetation and Ornamental Snake habitat monitoring transects will be established in subsidence areas in accordance with the monitoring assessment methods defined in the SMP (AARC 2023) during the initial assessment. Annual monitoring for subsidence-induced impacts to vegetation communities (with relevance to Ornamental Snake habitat suitability) will then include the following:

- for each strata (emergent, canopy, sub-canopy and understory) the dominant species, their height class and lifeform will be identified;
- foliage projective cover for each strata;
- cover of coarse woody debris;
- groundcover composition; and
- vegetation health including foliar discolouration, defoliation, signs of pathogenic attack and death.

Additional habitat suitability assessment will include:

- Ornamental Snake utilisation, detected through active searching;
- presence and abundance of habitat soil cracks;
- quality and availability of food habitat required for foraging through:
  - assessment of gilgai or wetland habitat;
  - ponding depth and duration;

- presence of dry season soil cracks for refugial habitat; and
- presence of aquatic or gilgai vegetation suitable for Ornamental Snake prey;

Results and outcomes of annual monitoring events and any resulting restoration activities will be reported in the Annual Subsidence Monitoring Report. Reporting will be conducted under the reporting program described in the SMP (AARC 2023). Reporting will include assessment of whether Ornamental Snake habitat or occupancy has undergone subsidence related reduction.

### **5.2.2 Species sightings**

The site environmental officer will keep a register of confirmed and suspected sightings of individuals observed in the Project area, including the following:

- date of sighting;
- number or abundance of individuals present;
- details of recorder of sighting;
- co-ordinates of sighting; and
- any other relevant detail.

## **5.3 Management objectives, targets, performance indicators and corrective actions**

This section provides clear objectives on what the OSMP aims to achieve, as well as targets and performance indicators against which achievement of these objectives will be measured, as well as corrective actions to be implemented if the performance indicators or objectives are not being met (Table 5-1).

- Objectives are statements about what the OSMP aims to achieve.
- Targets provide a quantifiable target in relation to the identified objectives.
- Performance indicators are quantitative or qualitative measures against which achievement of the identified objectives and targets will be measured.
- Corrective actions are actions taken to eliminate or minimise the causes of non-conformances to prevent recurrence and improve achievement against the identified objectives and targets.

Table 5-1 Objectives, target, performance indicators and corrective actions

Aspect	Outcome	Target	Performance indicator	Prompt	Contingency measures/corrective actions
Clearing of disturbance areas and Project construction	Minimise disturbance and clearing of Ornamental Snake habitat	No ground disturbance or clearance of vegetation outside authorised areas	Area (ha) of Ornamental Snake habitat clearance or disturbance outside authorised area	Incident / non-conformance reported involving habitat clearance outside authorised area	<ul style="list-style-type: none"> <li>• Notify, investigate and report incident / nonconformance in accordance with the operation of the 'Annual Subsidence Monitoring Report'.</li> <li>• Identify cause of incident, and develop and implement appropriate corrective actions to prevent recurrence.</li> <li>• Review efficacy of relevant procedures (e.g. vegetation clearing procedure, permit to disturb, habitat delineation/identification, fauna spotter, clearing methodology) and mitigation measures.</li> <li>• Review training materials regarding vegetation clearing.</li> <li>• Update management plans, procedures and training materials as required.</li> <li>• Rehabilitate disturbed areas in accordance with the site 'Progressive Rehabilitation and Closure Plan'</li> </ul>
Mortality and injury	Minimise mortality and injury of the Ornamental Snake	No mortality or injuries	Number of Ornamental Snake mortalities/injuries during clearing activities	Incident report involving avoidable mortality or injury	<ul style="list-style-type: none"> <li>• Notify, investigate and report incident / non-conformance in accordance with the</li> </ul>

Aspect	Outcome	Target	Performance indicator	Prompt	Contingency measures/corrective actions
Vehicle strike	Reduce potential interaction of to the Ornamental Snake with vehicles	No reported incidents of fauna-vehicle interactions	Number of vehicle strikes causing Ornamental Snake fatality or injury	Incident report involving vehicle strike	<p>operation of the 'Annual Subsidence Monitoring Report'.</p> <ul style="list-style-type: none"> <li>• Identify cause of incident, and develop and implement appropriate corrective actions to prevent recurrence.</li> <li>• Review efficacy of relevant procedures (e.g. transport routes, speed limits) and mitigation measures.</li> <li>• Investigate other possible ecological or behavioural reasons behind any increases mortalities or injuries (e.g. seasonality).</li> <li>• Continued or enhanced staff training and awareness in relation to species identification.</li> <li>• Update management plans, procedures and training materials as required.</li> </ul>
Subsidence impact management	No loss of Ornamental Snake habitat to subsidence impacts	No observable reduction in occupancy of Ornamental Snake in subsidence areas	Observations of the reduced Ornamental Snake occupancy	Observed impact as a result of surface subsidence	<ul style="list-style-type: none"> <li>• Notify, investigate and report incident/non-conformance in accordance with the operation of the 'Annual Subsidence Monitoring Report'</li> <li>• Review efficacy of subsidence management plan, including erosion and crack control and management</li> <li>• Instigate rehabilitation through operation of the 'Annual Subsidence Monitoring Report' and 'Progressive Rehabilitation and Closure Plan'</li> <li>• Update management plan, procedures and training materials as required</li> </ul>



Aspect	Outcome	Target	Performance indicator	Prompt	Contingency measures/corrective actions
Erosion and sediment control	Minimise impacts to Ornamental Snake as a result of Project impacts from erosion and sedimentation	No degradation of Ornamental Snake habitat by erosion	Observations of degradation of habitat quality for Ornamental Snake	Observed erosion in habitat areas	<ul style="list-style-type: none"> <li>If in subsidence areas, contingency measures to be determined through adaptive management under the Subsidence Management Plan</li> <li>For areas outside the subsidence footprint the erosion and sediment control measures under the Water Management Plan will be assessed for non-conformance</li> <li>Relevant management plans will be reviewed for efficacy</li> <li>Identify and instigate erosion repairs/rehabilitation through operation of the 'Annual Subsidence Monitoring Report'</li> </ul>
Water or soil pollutant	Minimise water or soil pollution within Ornamental Snake habitat areas	No release of water or soil pollution to Ornamental Snake habitat	Water or soil pollution incidents	Observation of water or soil pollution release event	<ul style="list-style-type: none"> <li>Notify, investigate and report incident / non-conformance in accordance with the EA and the operation of the 'Annual Subsidence Monitoring Report'</li> <li>For spills resulting in pollution of Ornamental Snake habitat, implement spill management and clean up works as soon as practicable</li> <li>Rehabilitation will be implemented as part of managing and reporting on any pollution incidents</li> </ul>
Weed and pest species	Minimise impacts from weed and pest species to the Ornamental Snake as a result of Project activities.	No introduction of new or increase of weed or pest species	Number of new introduced weed or pest species or change in abundance or extent of weed or pest species in Ornamental Snake habitat	<p>New/increased introduced fauna species (which are a known threat to the species) observed in or near the Project area.</p> <p>Actual or potential impact observed as a result of an increase in introduced fauna species (which are a known threat to the species).</p>	<ul style="list-style-type: none"> <li>Identify potential pest and weed species outbreaks through the operation of the 'Annual Subsidence Monitoring Report' and 'Pest and Weed Management Plan'</li> <li>Implement actions to manage pest and weed outbreaks through the operation of the 'Annual Subsidence Monitoring Report' and/or 'Pest and Weed Management Plan'</li> <li>Update management plans, procedures and training materials as required.</li> </ul>

## 5.4 Incident and non-conformance reporting

For the purpose of the OSMP an incident may include an unauthorised or avoidable impact, or a failure to comply with a key OSMP requirement or procedure, which could result in an unauthorised or avoidable impact occurring, including for example:

- clearing outside the authorised disturbance area;
- destruction of habitat through subsidence related processes;
- avoidable mortalities and injuries; and
- failure to implement key management measures and procedures, such as clearing without a permit to disturb, failure to delineate MNES habitat areas, failure to implement the required Fauna Spotter/Catcher monitoring activities, failure to implement the vegetation clearing procedure.

For the purpose of the OSMP a non-conformance may include a failure to meet the requirements of the OSMP or an exceedance of the relevant trigger values, including for example:

- failure to meet Project monitoring requirements (Section 5.1);
- failure to complete auditing, training and management plan review requirements (Section 6); or
- exceedance of site-specific trigger values (e.g. in relation to noise, dust, water).

Any incidents or non-conformances will be reported under the operation of the EA, as well as being recorded through the 'Annual Subsidence Monitoring Report' processes.

Reported incidents are to be investigated by the Site Environmental Officer in accordance with EA requirements. The 'Annual Subsidence Monitoring Report' will also report on incidents and non-conformances, while providing a function for ongoing monitoring of such works.

Where an incident involves a technical matter, (i.e., reduction in Ornamental Snake populations) a suitability qualified individual or individuals will undertake an investigation to identify potential causes and provide recommendations.

## 6 Auditing, review and training

### 6.1 Management Plan review

This OSMP will be reviewed and updated every four years (in conjunction with the review of the SMP) or as required, including for example:

- following a significant incident;
- as a result of changes to the Project, for example expansions or new activities;
- following changes to the SMP;
- if it has been identified that there is a need to improve performance; and
- if there are changes to business conditions, legislative requirements and knowledge on the species.

Review of the OSMP is to be undertaken by the Site Environmental Officer, taking into consideration the following:

- the results of monitoring activities (Section 5);
- the effectiveness of the OSMP in meeting the plans objectives, targets and performance indicators (Section 5.3);
- the results of incident / non-compliance investigations;
- project changes, such as expansions or new activities; and
- changes to business conditions, legislative requirements and knowledge on the species.

### 6.2 Environmental training

Training and awareness is an essential part of the Project environmental management approach. Suitable training will be undertaken ensure the Site Environmental Officer and other environmental personnel, including outside contractors, are sufficiently experienced and/or trained in their field, to carry out the management measures described within this Management Plan.

Meadowbrook Project staff will carry out general environmental training and awareness programs for all personnel/contractors working on the site as part of its Project specific site induction and ongoing refresher training and toolbox talks.

#### 6.2.1 Inductions

Prior to commencing work within areas of Ornamental Snake habitat, personnel will be required to undertake a Project induction. The induction will include the following information:

- how to identify the Ornamental Snake;
- areas of Ornamental Snake habitat in relation to Project activities;
- key risks to the Ornamental Snake associated with Project activities;
- key mitigation measures and procedures;
- incident reporting procedures;
- emergency response procedures;
- roles and responsibilities in relation to implementation of the OSMP; and
- penalties that apply for breach of legislation.

## **6.2.2 Toolbox training**

Regular 'toolbox training' will be undertaken to enhance and maintain knowledge, and on a risk management basis, for example:

- prior to commencement of clearing activities;
- following any incidents or non conformances; and
- to advise on corrective actions or changes to procedures.

## 7 Roles And Responsibilities

The roles and responsibilities for the implementation and compliance with this OSMP are provided in this section.

### 7.1 General Manager

The General Manager is responsible for:

- implementing mitigation and management measures during the design, planning and scheduling phase of the Project, as detailed in Section 4;
- enforcing mitigation measure relating to traffic (Section 4);
- ensuring corrective actions are completed (Section 5.3); and
- providing the necessary resources for implementation of the OSMP.

### 7.2 Site Environmental Officer

The Site Environmental Officer is responsible for:

- implementing the majority of the OSMP mitigation and management measures, as detailed in Section 4;
- engaging and liaising with the Fauna Spotter-Catcher;
- ensuring that OSMP monitoring auditing activities are completed (Section 5.2, 5.3 and 6);
- keeping a register of confirmed and suspected sightings of individuals observed in the Project area (Section 5.2);
- overseeing implementation of corrective actions (Section 5.3);
- identifying the need for, and completing review of, the OSMP (Section 6.1);
- completing incident and non-compliance investigations (Section 5.4);
- reporting incidents to DCCEEW where required (Section 5.4);
- developing and updating training materials (Section 6.2); and
- reporting mortalities and injuries to the 1300 ANIMAL hotline (1300 264 625).

### 7.3 Fauna Spotter-Catcher

As detailed in Section 4 an experienced and licensed Fauna Spotter-Catcher will be engaged during clearing activities to:

- conduct pre-clearance surveys;
- capture and relocate any at risk individuals; and
- record sightings of observed individuals and provide a copy to the Site Environmental Officer, including: the date, coordinates, number of individuals, Fauna Spotter-Catcher name, any management actions taken, and any other relevant details.

## 8 References

AARC Environmental Solutions Pty Ltd 2021, Lake Vermont Meadowbrook Project: Terrestrial Ecology Assessment, prepared for Bowen Basin Coal Pty Ltd, AARC Environmental Solutions Pty Ltd, Brisbane.

AARC Environmental Solutions Pty Ltd 2023, Lake Vermont Meadowbrook Project: Subsidence Management Plan, prepared for Bowen Basin Coal Pty Ltd, AARC Environmental Solutions Pty Ltd, Brisbane

Commonwealth of Australia 2017, Australian Pest Animal Strategy 2017-2021, Department of Agriculture and Water Resources, Canberra.

Department of Agriculture, Water and the Environment (DAWE) 2021a, Species Profile and Threats Database, Commonwealth of Australia, Department of Agricultural Water and the Environment, Canberra. <  
<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>>

Department of the Environment, Water, Heritage and the Arts (DEWHA) 2008, Threat abatement plan for predation by the European red fox, Commonwealth of Australia, Canberra.

Department of the Environment (DoE) 2013, Matters of National Environmental Significance: Significant Impact Guidelines 1.1, Environment Protection and Biodiversity Conservation Act 1999, Commonwealth of Australia, Canberra.

Department of the Environment (DoE) 2014, Approved Conservation Advice for *Denisonia maculata* (Ornamental Snake), Commonwealth of Australia, Canberra.

Department of the Environment (DoE) 2015a, Threat abatement plan for predation by feral cats, Department of the Environment, Commonwealth of Australia.

Department of the Environment (DoE) 2015b, Monitoring and management of subsidence induced by longwall coal mining activity, Department of the Environment.

Department of the Environment and Energy (DoEE) 2017, 'Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) (2017)', Commonwealth of Australia, 2017.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2011a. Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the EPBC Act. Australian Government, Canberra.

Department of the Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2011b. Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads. Canberra, ACT: Commonwealth of Australia.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2011c, Draft Referral guidelines for the nationally listed Brigalow Belt reptiles, Commonwealth of Australia, Canberra

Isaac Regional Council 2020, Isaac Region Biosecurity Plan 2020-2023, Isaac Regional Council.

Ponce Reyes, R, Firn, J, Nicol, S, Chadès, I, Stratford, DS, Martin, TG, Whitten, S, Carwardine, J 2016, Priority Threat Management for Imperilled Species of the Queensland Brigalow Belt , CSIRO, Brisbane.