Clearing Assessment Report – CPS 818

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Bow River Quarry Extension 2023
Great Northern Highway (H006)
Kimberley, WA
EOS No. 3060

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1 PROPOSAL

1.1 Purpose and Justification

The Bow River quarry in the Kimberley Region is an existing quarry that has been used to provide road building materials to the Kimberley roads over the past decade. Main Roads is now required to Crush Rock and Supply Aggregates, Road Base Gravel and Rock Armour from the Quarry for the improvement of roads and bridges within the region to enhance safety and to improve sight distances. The quarry has been and is today the main source of Road Building material for the roads within this area. As natural materials become more and more difficult to provide, product from the Bow River quarry is more and more in demand.

1.1.1 Main Roads Approach to Road Safety and the Environment

Main Roads is committed to minimising the environmental impacts of all of its activities and manages the State Road network to achieve balanced economic, social, safety and environmental benefits for the community. Main Roads recognises that Western Australia's environment is significant from a global perspective and the unique conservation values that are contained within its road reserve. Main Roads road-network often adjoins natural areas and, in some locations, the reserve itself hosts remnant vegetation with high environmental values. Although the reserves were not established for this purpose, Main Roads recognises that it has a responsibility to conserve the environmental values that occur within the State's Road network and minimise the impact its proposals have on the environment. In addition to providing a safe and efficient road network for all people using the roads under its control, Main Roads is also committed to protecting and enhancing the natural environment.

In accordance with National and State Government road safety policies, Main Roads is also committed to substantially reducing road trauma on the road network through Safe System principles. The Safe System approach acknowledges that more than two thirds of all serious crashes are due to human error rather than deliberate risk taking (e.g., speeding or drink driving) and seeks to improve behaviour through education and enforcement while managing the safety of vehicles, speeds and the road and road infrastructure. It is shown that improving sub-optimal road formation will substantially reduce the likelihood and severity of road crashes. For example, according to the Road Safety Management Guideline, increasing the sealed shoulder from 0.5 m to 2 m will reduce Killed and Seriously Injured numbers by more than 50%.

As the statutory authority responsible for providing and managing a safe and efficient main road network in Western Australia, Main Roads focuses on improving road safety by thoroughly considering all environmental, economic and community benefits and impacts. It operates on a hierarchy of avoiding, minimising, reducing and then, if required, offsetting our environmental impacts. This has been achieved through changes in proposal scope and design. Main Roads regularly reduces its clearing footprint by restricting earthworks limits for proposals, steepening batters, installing barriers, establishing borrow pits in cleared paddocks and avoiding temporary clearing for storage, stockpiles and turn around bays to avoid and minimise its impacts.

Further details on measures to avoid, minimise and reduce are provided in Section 1.5.

1.2 Proposal Scope

Approximately 460,000 tonnes of material is proposed to be processed in the Bow River Quarry. The project will require clearing a total of 3.6 ha in a 67 ha Project Development Envelope. The clearing will be undertaken using CPS 818. The proposed works will involve:

- Vegetation clearing within the blast zone.
- Extraction of rock material from blast zone.
- Cartage of rock to crushing plant and stockpiling of processed materials.

The Bow River Quarry is a well-established quarry with existing materials sources, water sources, side tracks, turnaround locations, aggregate/mulch/material stockpile areas, site office and accommodation areas within the boundary of the reserve. No services are within the quarry area. Services outside of works area will not be impacted in any way.

1.3 Proposal Location

The project is located on Great Northern Highway (H006) at SLK 3009.9, approximately 30km north of Warmun in the Shire of Wyndham-East Kimberley as shown in Figure 1.

1.4 Clearing Details

Proposed Clearing to be undertaken using CPS 818: 3.6 ha in a 67 ha Project Development Envelope

Areas of Native Vegetation Clearing:
The areas of native vegetation to be cleared are shown in Figure 2.

Type of Native Vegetation:
The type of vegetation to be cleared under this Proposal is mapped by Ecologia, (2021) as "W10-*Bauhinia* low open woodland' described as "*Bauhinia cunninghamii*, *Corymbia confertifolia*, *Eucalyptus pruinosa* subsp. *pruinosa* low open woodland; *Carissa lanceolata*, *Flueggea virosa* subsp. *melanthesoides* mid sparse shrubland; *Sorghum timorense*, *Aristida hygrometrica*, *Eriachne obtusa* mid/low tussock grassland" and shown in Figure 3.

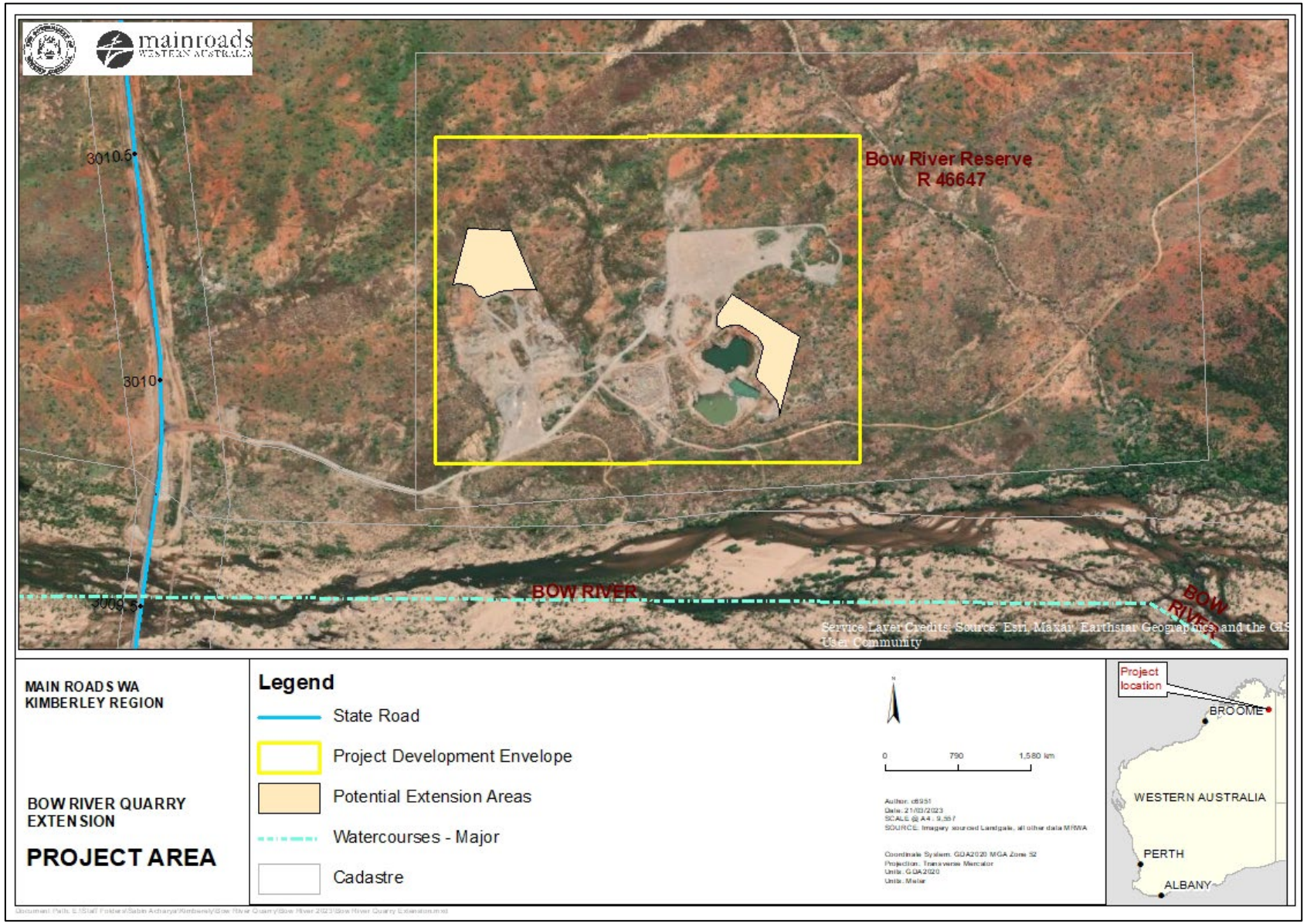

Figure 1. Project Area

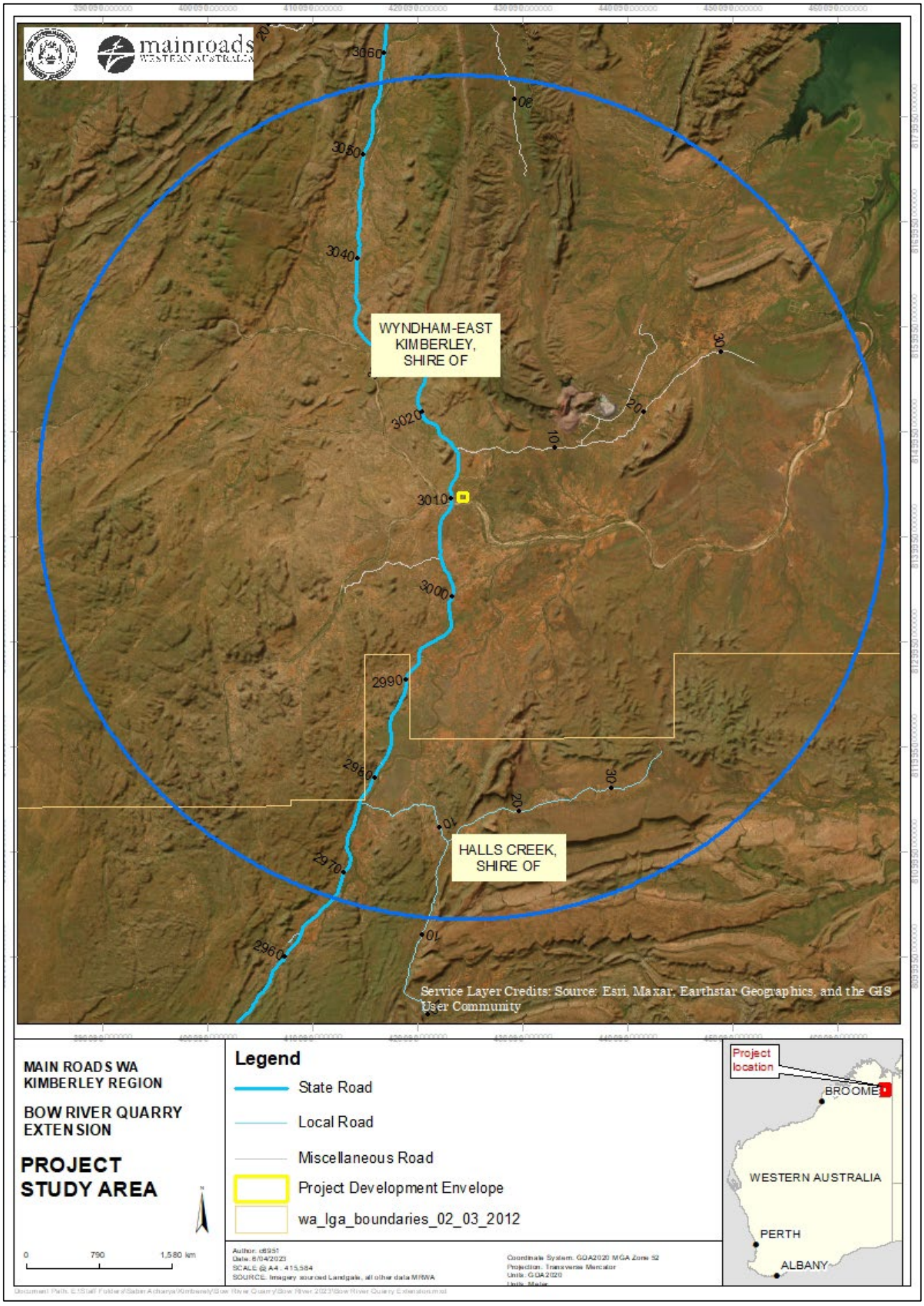

Figure 2. Project Location and Study Area

1.5 Alternatives to Native Vegetation Clearing Considered During Proposal Development

The following alternatives to clearing were considered during the development of the proposal:

- The Bow River Quarry is a well-established quarry with existing materials sources, water sources, side tracks, turnaround locations, aggregate/mulch/material stockpile areas, site office and accommodation areas within the boundary of the reserve. As natural materials become more and more difficult to provide, this quarry has been and is today the main source of Road Building material for the roads within this area. Any alternatives to the existing Bow River Quarry would require more vegetation clearing in the area.
- Main Roads retains frangible vegetation where a clear zone is to be established for road projects. For this project, however, clearing is related to a materials pit located greater than 40m from the road and as such no clear zone will be established. Accordingly, the retention of frangible vegetation does not apply to this proposal.
- Reducing the speed limit to minimise clearing requirements, while still balancing safety (driver fatigue) and freight efficiency. Speed Limits are an essential mechanism to ensure the safe and efficient operation of road networks. The application of appropriate speed limits and other traffic management measures is a key mechanism in managing vehicle speeds to achieve desired safety, mobility, traffic management, local amenity, and road user expectations. There are several factors involved in road safety, including road conditions, driver behaviour and overall road design. Except in special situations, reducing speed limits below national standards on state and national roads is not typically supported as it has the potential to contribute to driver frustration, impatience, tiredness and recklessness. The environmental values protected by reducing the speed limit, do not justify the impacts on freight efficiencies nor road user safety. Accordingly, the reduction of the speed limits to avoid clearing of native vegetation for this proposal is not proposed.

1.6 Measures to Avoid, Minimise, Reduce and Manage Proposal Clearing Impacts

The design and management measures implemented to avoid and minimise the potential clearing impacts of the Proposal are provided in Table 1.

Table 1. Measures Undertaken to Avoid, Minimise, Reduce and Manage the Proposal Clearing Impacts

Design or Management Measure	Discussion and Justification
Alignment to one side of existing road	Existing tracks will be utilised to access the quarry avoiding the need to clear vegetation for access purposes. Clearing required is associated with the extraction of materials, therefore this measure is not applicable.
Alternative alignment located within pasture or degraded areas	Existing tracks will be utilised to access the quarry avoiding the need to clear vegetation for access purposes. Clearing required is associated with the extraction of materials, therefore this measure is not applicable.
Simplification of design to reduce number of lanes and/or complexity of intersections	Existing tracks will be utilised to access the quarry avoiding the need to clear vegetation for access purposes. Clearing required is associated with the extraction of materials, therefore this measure is not applicable.
Steepen batter slopes	Existing tracks will be utilised to access the quarry avoiding the need to clear vegetation for access purposes. Clearing required is associated with the extraction of materials, therefore this measure is not applicable.
Installation of barriers	Existing tracks will be utilised to access the quarry avoiding the need to clear vegetation for access purposes. Clearing required is associated with the extraction of materials, therefore this measure is not applicable.
Installation of kerbing	Existing tracks will be utilised to access the quarry avoiding the need to clear vegetation for access purposes. Clearing required is associated with the extraction of materials, therefore this measure is not applicable.
Use of existing cleared areas for access tracks, construction storage and stockpiling	Existing tracks will be utilised to access the quarry avoiding the need to clear vegetation for access purposes. Clearing associated with the extraction of materials will utilise cleared areas where possible to limit clearing. Expansion of the existing quarry will require less clearing than establishing a new quarry in this area.
Drainage modification	No drainage modifications are proposed. Existing drainage lines will be utilised with no clearing proposed for this purpose.

1.7 Approved Policies and Planning Instruments

The clearing of native vegetation in Western Australia is regulated under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations).

In addition to the matters considered in accordance with section 51O of the EP Act, Main Roads has also had regard to the below instruments where relevant.

Other Legislation potentially relevant for assessment of clearing and planning/other matters:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Conservation and Land Management Act 1984* (WA) (CALM Act)
- *Country Areas Water Supply Act 1947* (WA) (CAWS Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Planning and Development Act 2005* (WA) (P&D Act)
- *Soil and Land Conservation Act 1945* (WA)
- *Rights in Water and Irrigation Act 1914*
- *Aboriginal Heritage Act 1972* (WA).

Environmental Protection Policies:

- Environmental Protection (Peel Inlet - Harvey Estuary) Policy 1992
- Environmental Protection (Western Swamp Tortoise Habitat) Policy 2011.

Other relevant policies and guidance documents:

- Environmental Offsets Policy (Government of Western Australia, 2011)
- A guide to the assessment of applications to clear native vegetation (Government of WA, December 2014)
- Procedure: Native vegetation clearing permits (Government of WA, October 2019)
- Environmental Offsets Guidelines (Government of Western Australia, 2014)
- Technical guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016)
- Technical guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2020)
- Approved conservation advice under section 266B of the EPBC Act for threatened flora/fauna/vegetation communities.

2 SCOPE AND METHODOLOGY OF CLEARING ASSESSMENT

Native vegetation will be cleared to accommodate this Proposal. This clearing will be undertaken using the Main Roads Statewide Clearing Permit CPS 818.

To comply with CPS 818, Main Roads must prepare a Clearing Assessment Report (CAR).

The CAR outlines the key activities associated with the Proposal, the existing environment and an assessment of native vegetation clearing. This assessment provides an evaluation of the vegetation clearing impacts associated with the Proposal using the ten Clearing Principles listed under s51 of the *Environmental Protection Act 1986* (EP Act) and strategies used to manage vegetation clearing.

2.1 Report Terminology and Sources

The following terms are used in this Clearing Assessment Report:

- **Project Development Envelope (PDE)** – The maximum extent within which the clearing is located. This envelope includes both cleared and uncleared areas and is larger than the clearing footprint to allow for unexpected changes such as avoiding large trees or encountering buried boulders or services. This flexibility allows the site personnel to make modifications to the proposal to avoid areas that may contain better environmental values. The CAR has assessed all environmental values within the PDE as though all of these values will be impacted, up to the amount specified within the clearing footprint.

- **Study Area** – Area covered by the Desktop Assessment. The Study Area for the Proposal is confined to a local area of a 40 km radius.

- **Survey Area** – Area covered by the Biological Survey, which is typically larger than the Project Clearing Envelope.

2.2 Desktop Assessment

A desktop assessment of the Development Envelope was undertaken by viewing internal datasets and other government agency managed databases, and consulting with relevant stakeholders where necessary. Results from searches can be found in Appendix 2.

GIS layer viewing and mapping is done using ArcMap and/or Main Roads corporate mapping system known as iMaps. Referencing of the GIS layers accessed is done under the relevant methodology section of each clearing principle. Government managed databases were searched to locate additional information, which are found under References in Section 9.

2.3 Surveys and Assessments

The following survey was undertaken to inform this CAR:

- Biological Survey, Ecologia Environment, (2021)

The biological survey conducted for the proposal is outlined in Table 2 and a summary of the findings in these reports are presented in Sections 3.1.

Table 2. Summary of the Biological Survey Relevant to the Proposal

Consultant & Survey Name	Survey Details
Ecologia Environment, (2021). Main Roads, Western Australia Bow River Quarry Biological Survey. June 2021.	**Survey Area:** The Bow River Quarry survey area is located east of the GNH SLK 3009.9 approximately north of Warmun in the Shire of Wyndham-East Kimberley, with an approximate area of 167 ha. **Type:** The biological survey included a single-phase detailed flora and vegetation survey, a targeted survey for significant plant species identified in the desktop assessment and a basic fauna and fauna habitat assessment. **Timing:** The survey was conducted by two botanists on 30th March 2021, as a part of a larger survey of the adjacent Warmun South to Bow River survey area, which was conducted over nine days between the 23rd – 31st March 2021. **Survey Results Shapefile TRIM Ref:** D21#904523 **Document TRIM Ref:** D21#904553

3 SURVEY RESULTS

In accordance with CPS 818/16 condition 8 (e) (iii), a copy of the relevant sections of the executive summary and report conclusions from the biological survey and/or field assessments are provided in Appendix 1.

3.1 Summary of the Biological Survey

Flora and Vegetation Assessment

A total of 171 vascular plant taxa were recorded from eight quadrats sampled along with additional opportunistic records. No EPBC Act (1999) or BC Act (2016) listed Threatened species were recorded. Two DBCA listed Priority species were recorded within the survey area: *Ipomoea racemigera* (P2) and *Rothia indica* subsp. *australis* (P3). Four vegetation types were characterised and mapped from the survey area:

- W02 **-** *Eucalyptus* mid open woodland
- W10 - *Bauhinia* low open woodland
- W11 - *Corymbia* low open woodland
- W12 - *Eucalyptus* low open woodland.

The survey area consisted mainly of W10 *Bauhinia* low open woodland described as "*Bauhinia cunninghamii*; *Corymbia confertifolia*, *Eucalyptus pruinose* subsp. *pruinosa* low open woodland; *Carissa lanceolata*, *Flueggea virosa* subsp. *melanthesoides* mid sparse shrubland; *Sorghum timorense*, *Aristida hygrometrica*, *Eriachne obtusa* mid/low tussock grassland". No state (DBCA) or Commonwealth (EPBC Act) listed (Threatened Ecological Communities (TECs) have been recorded within or in the vicinity of the survey area. All of the vegetation types from the survey area were mostly in 'Excellent' condition and coincided with a Vegetation Association of Beard (1979) that is a Priority 3 Priority Ecological Community (PEC), 'Vegetation Association 833 as defined by John Beard's vegetation mapping for the Kimberley (Beard 1979)', which accounts for 95.3% (159.42 ha) of the survey area.

Thirteen introduced plant species were recorded, two (**Calotropis procera* and **Jatropha gossypifolia*), of which are listed as Declared Pests, and one (**J. gossypifolia*) is classified as a Weed of National Significance (WONS).

Fauna and Fauna Habitat Assessment

Four habitat types were identified from the survey area: Undulating Grassy Plains, Rocky Hills, Creekline, and Man-made Wetland. With the exception of the Man-made Wetland habitat, all habitat types are generally common at a local and regional level and were not restricted to the survey area. Habitat condition ranged from 'Very Good' to 'Good' with evidence of European cattle, weed infestation, and clearing contributing to lower condition ratings. Seventeen vertebrate fauna species were recorded during the survey including two mammals (one introduced), twelve birds and three reptiles. Fauna recorded during the survey were generally common and are not restricted to survey areas. No fauna taxa listed as 'Threatened fauna' under the EPBC Act, 'Threatened fauna' under the BC Act or DBCA-classified 'Priority' fauna taxa were recorded during the field survey.

No Threatened or Priority fauna species listed under the EPBC Act or BC Act were identified during the field survey. The Gouldian Finch (*Chloebia gouldiae* [EN EPBC Act, P4 BC Act]) has previously been recorded within the Bow River Quarry survey area and suitable habitat for this species is present within the Undulating Grassy Plains; however, the species was not recorded during the current survey. The post-survey likelihood of occurrence assessment identified two birds (Glossy Ibis [*Plegadis*

falcinellus] and Peregrine Falcon [*Falco peregrinus*]) and one mammal (Northern Short-tailed Mouse [*Leggadine lakedownensis*]) considered 'Likely' to occur and one bird (Fork-tailed Swift [*Apus pacificus*]) considered 'Possible' to occur within the survey area.

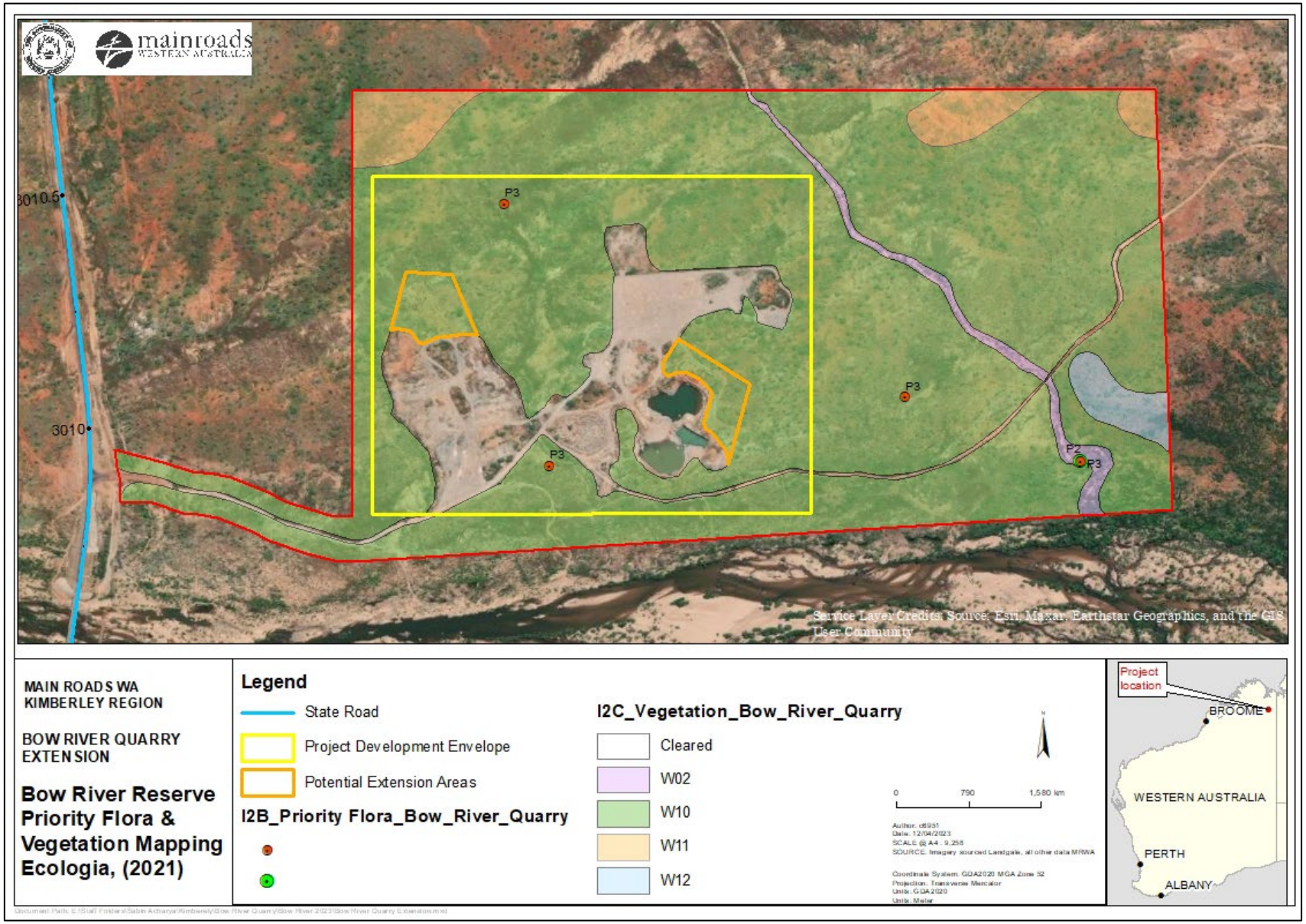

Figure 3. Bow River Reserve Priority Flora and Vegetation Assessment Mapping. Ecologia, (2021)

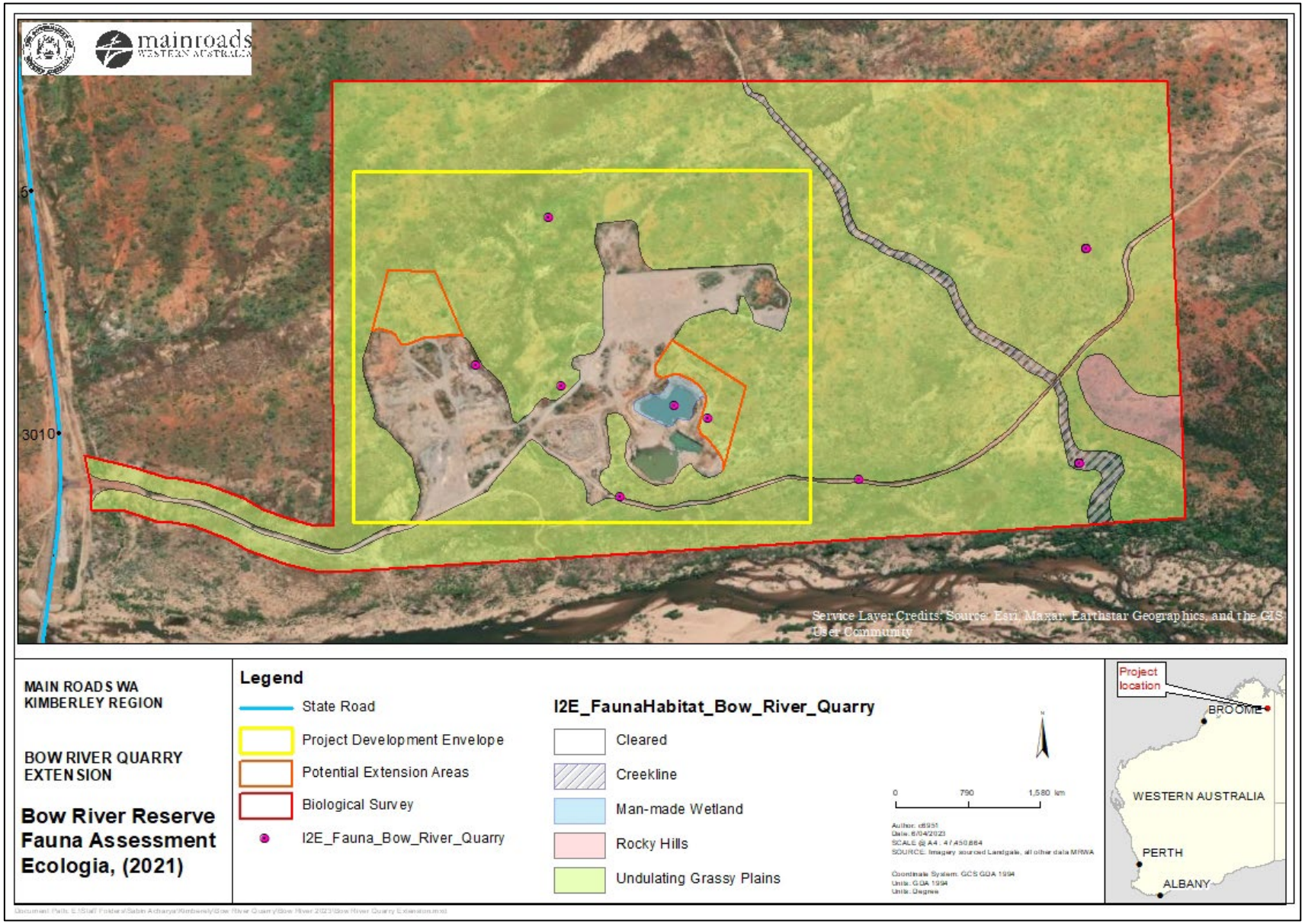

Figure 4. Bow River Reserve Fauna Assessment Mapping. Ecologia, (2021)

4 VEGETATION DETAILS

4.1 Proposal Site Vegetation Description

The PDE consists of W10 - *Bauhinia* low open woodland vegetation type which was the most widespread vegetation within the survey area. The W10 - *Bauhinia* low open woodland vegetation type was mapped as 'Excellent' in condition and coincided with a vegetation association of Beard (1979) that is a Priority 3 PEC, 'Vegetation Association 833 as defined by John Beard's vegetation mapping for the Kimberley (Beard 1979)'. Table 3 and Table 4 provide details of the vegetation types and their condition within the Project Development Envelope and the remaining extents of these associations.

Table 3. Summary of Vegetation Types within PDE

Vegetation Type	Proposed Clearing (ha)	Total Extent Mapped (ha) within Survey Area
W10 - *Bauhinia* low open woodland described as "*Bauhinia cunninghamii*, *Corymbia confertifolia*, *Eucalyptus pruinosa* subsp. *pruinosa* low open woodland; *Carissa lanceolata*, *Flueggea virosa* subsp. *melanthesoides* mid sparse shrubland; *Sorghum timorense*, *Aristida hygrometrica*, *Eriachne obtusa* mid/low tussock grassland". Ecologia Environment, (2021).	3.6 ha	133.73 ha

Table 4. Pre-European Vegetation Representation

Pre-European Vegetation Association	Scale	Pre–European Extent (ha)	Current Extent (ha)	% Remaining	% Current Extent in DBCA Managed Land (proportion of pre-European Extent)
Veg Assoc No. 825	**Statewide**	64,206.40	64,160.99	99.93	-
	IBRA Bioregion Ord Victoria Plain	22,590.30	22,555.36	99.85	-
	IBRA Sub-region Purnululu	22,590.30	22,555.36	99.85	-
	Local Government Authority Shire of Wyndham-East Kimberley	64,195.42	64,160.47	99.95	-
Veg Assoc No. 833	**Statewide**	38,674.88	37,916.18	98.04	-
	IBRA Bio region Ord Victoria Plain	38,497.64	37,738.94	98.03	-
	IBRA Sub-region Purnululu	38,497.64	37,738.94	98.03	-
	Local Government Authority Shire of Wyndham-East Kimberley	37,861.85	37,103.15	98.00	-

5 ASSESSMENT AGAINST THE TEN CLEARING PRINCIPLES

In assessing whether the Proposal's proposed clearing is likely to have a significant impact on the environment, the Proposal was assessed against the ten Clearing Principles (EP Act, Schedule 5).

Each principle has been assessed in accordance with the former Department of Environment Regulation (now Department of Water and Environmental Regulation (DWER) '*A Guide to the Assessment of Applications to Clear Native Vegetation*' (Department of Environment Regulation, 2014) and other relevant clearing permit application decision reports prepared by DWER.

The proposed clearing is at variance with Principle (a), and not likely to be or not at variance with the remaining Clearing Principles.

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Proposed clearing is at variance to this Principle.

Vegetation

The broad scale pre-European vegetation within the PDE is mapped as Vegetation Associations 825 and 833. Both the Vegetation Associations are widespread and very well represented locally and regionally, with more than 98% of their pre-European extents remaining intact at all levels (State IBRA Bioregion, IBRA Subregion, LGA).

No Threatened Ecological Communities (TECs) listed under the EPBC Act or BC Act were recorded within the PDE or within the project 40 km radius desktop area. The project is more than 30 km from a Ramsar Site - Lake Argyle, and a buffer of Purnululu Conservation Reserve, both of which are listed as Environmentally Sensitive Areas (ESAs) under Clearing Regulations.

Ecologia, (2021) recorded only one vegetation type in Excellent condition from the proposed PDE as listed below:

- *Bauhinia* low open woodland (W10) described as "*Bauhinia cunninghamii*, *Corymbia confertifolia*, *Eucalyptus pruinosa* subsp. *pruinosa* low open woodland; *Carissa lanceolata*, *Flueggea virosa* subsp. *melanthesoides* mid sparse shrubland; *Sorghum timorense*, *Aristida hygrometrica*, *Eriachne obtusa* mid/low tussock grassland".

The Vegetation Type W10 was identified by Ecologia (2021) as partly coinciding with a Priority 3 Ecological Community – "Vegetation Association 833 as defined by Beard's vegetation mapping for the Kimberley". Ecologia (2021) mapped a total of 133.7 ha of Vegetation Type W10 associated with this PEC from within the survey area. The proposed clearing of 3.6 ha of W10 represents the removal of only 2.7% vegetation associated with PEC from the survey area. The extent of "Vegetation Association 833" within the survey area is 144.5 ha which represents less than 0.4% of its current extent in the Ord Victoria Plain IBRA Bioregion. As such "Priority 3 Vegetation Association 833" extends well outside the survey area and the relatively small scale clearing of vegetation type W10 is unlikely to result in a significant residual impact to this PEC at a local or regional level.

Flora

Ecologia, (2021) did not record any EPBC Act or BC Act listed Threatened flora taxa from the Bow River Reserve. The Desktop Database Searches (PMST report and Government GIS Shapefiles) also identified no known records of listed Threatened flora taxa from the Project 40km radius Study Area.

A total of 171 vascular plant taxa from 43 families and 115 genera were recorded during the survey. While no Threatened species were recorded, two DBCA listed Priority species were recorded in the survey area:

- *Ipomoea racemigera* (P2)
- *Rothia indica* subsp. *australis* (P3).

Ipomoea racemigera (P2) occurs outside of the proposed PDE and will not be impacted. There are two records of *Rothia indica* subsp. *australis* (P3) within the PDE. However, they occur outside the proposed clearing areas and will not be impacted.

Ecologia, (2021) undertook a pre- and post-survey likelihood of occurrence assessment of all the significant flora species identified in the desktop assessment based on previous records and habitat suitability within the survey area. The assessment considered the species identified in the desktop assessment as unlikely to occur within the survey area as representative areas of all major landforms and plant communities were surveyed and they were not recorded.

Fauna Habitat

Two fauna habitat types were identified from the PDE:

- **Undulating Grassy Plains** - This habitat type comprises low, undulating hills and plains with varying degrees of tussock grass cover. Tussock grasslands provide refugia for reptiles and small mammals, including the Northern Short-tailed Mouse. Eucalypts and shrubs within this habitat type provide habitat for many species of bird, including the Gouldian Finch.
- **Man-made Wetland** - Man-made wetland may provide intermittent habitat for waterfowl and migratory birds.

Summary of Fauna Habitat Types within the PDE

Fauna Habitat Type	Total Extent within Survey Area (ha)	Clearing Required (ha)
Undulating Grassy Plains	139.6	3.6 (2.58%)
Man-made Wetland	0.868828	-

The habitat type - Undulating Grassy Plains is not restricted to within the PDE. Rather it is well represented outside the survey area and is common at a local and regional scale (Ecologia, 2021). Any impact to this habitat type is unlikely to have any significant effects on the availability of suitable habitat for fauna at a local and regional level.

Fauna

Seventeen vertebrate fauna species were recorded during the survey including two mammals (one introduced), twelve birds and three reptiles. Fauna recorded during the survey were generally common and are not restricted to survey areas. No fauna taxa listed as 'Threatened fauna' under the EPBC Act, 'Threatened fauna' under the BC Act, or DBCA-classified 'Priority' fauna taxa were recorded during the field survey.

A pre- and post-survey assessment of likelihood of occurrence of all the significant fauna species identified in the desktop assessment was undertaken by Ecologia (2021). The assessment identified four species as 'Likely' and two species as 'Possible' to occur in the survey area based on proximity and recency of records and the presence of suitable habitat within the survey area.

The following species were identified as 'Likely' to occur based on proximity and recency of records and the presence of suitable habitat within the survey area:

- Glossy Ibis — *Plegadis falcinellus* (MI)
- Peregrine Falcon — *Falco peregrinus* (OS)
- Northern Short-tailed Mouse — *Leggadina lakedownensis* (P4)
- Gouldian Finch — *Chloebia gouldiae* (EN, P4)

The following species were assessed as 'Possible' to occur based on proximity and recency of records and the presence of suitable habitat within the survey area:

- Fork-tailed Swift - *Apus pacificus* (MI)
- Spectacled Hare-wallaby (mainland) *Lagorchestes conspicillatus leichardti* (P4)

The preferred habitat for these species occurs throughout the local and regional area and the relatively small extent of habitat clearing for the project activities adjoining existing cleared and disturbed areas is unlikely to significantly impact the habitat availability for these species.

Ecological Linkages

There are no known Conservation Areas, DBCA managed lands, Ramsar Sites or Important Wetlands within the immediate vicinity of the PDE. No watercourse occurs in the PDE. A major non-perennial watercourse Bow River runs adjacent to the PDE but it will not be impacted by the project activities with clearing restricted to within the PDE. The relatively small scale clearing for the project adjoining existing cleared and disturbed areas in a region where remnant native vegetation is widespread, is unlikely to fragment the landscape. Due to the proximity of the project to the watercourse, several fauna species may use the area in a fly over nature. However, habitat critical for these species does not occur in the PDE.

Based on the clearing of vegetation considered to represent the PEC, the proposed clearing is at variance to this Principle.

Methodology

- Ecologia Environment, (2021)
- EPBC Act Protected Matters Search Report (Accessed 01/03/2023)
- Government GIS Shapefiles:
  - DBCA Threatened and Priority Ecological Community database search (Accessed 13/04/2023)
  - DBCA Threatened and Priority flora database search (Accessed 13/04/2023)
  - DBCA Threatened and Priority fauna database search (Accessed 21/03/2023)
  - DBCA Legislated Lands and Waters (Accessed 13/04/2023)
  - Ramsar Sites (Accessed 1/03/2023)
  - Nationally Important Wetlands (Accessed 13/04/2023)
  - Pre-European vegetation (Accessed 28/02/2023)
- Statewide Vegetation Statistics (Government of Western Australia, 2019)
- WA Florabase (Accessed 13/04/2023)
- Species Profile and Threats Database (Accessed 13/04/2023)

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Proposed clearing is not likely to be at variance to this Principle.

Fauna Habitat

Based on vegetation types, soil units, and landforms, only two fauna habitat types were identified from the PDE:

- **Undulating Grassy Plains** - This habitat type comprises low, undulating hills and plains with varying degrees of tussock grass cover. Tussock grasslands provide refugia for reptiles and small mammals, including the Northern Short-tailed Mouse. Eucalypts and shrubs within this habitat type provide habitat for many species of bird, including the Gouldian Finch.
- **Man-made Wetland** - Man-made wetland may provide intermittent habitat for waterfowl and migratory birds.

Summary of Fauna Habitat Types within the PDE

Fauna Habitat Type	Total Extent within Survey Area (ha)	Clearing Required (ha)
Undulating Grassy Plains	139.6	3.6 (2.58%)
Man-made Wetland	0.868828	-

The habitat type - Undulating Grassy Plains is not restricted to within the PDE. Rather it is well represented outside the survey area and is considered common at a local and regional scale (Ecologia, 2021). The relatively small extent of habitat clearing for the project activities adjoining existing cleared and disturbed areas is unlikely to significantly impact the habitat availability for these species at a local and regional level.

Fauna

Ecologia, (2021) did not record any EPBC Act or BC Act listed Threatened or Priority fauna species from the survey area.

A pre- and post-survey assessment of likelihood of occurrence of all the significant fauna species identified in the desktop assessment was undertaken by Ecologia (2021). The assessment identified the following species as 'Likely' to occur based on proximity and recency of records and the presence of suitable habitat within the survey area:

- Glossy Ibis — *Plegadis falcinellus* (MI)
- Peregrine Falcon — *Falco peregrinus* (OS)
- Northern Short-tailed Mouse — *Leggadina lakedownensis* (P4)
- Gouldian Finch — *Chloebia gouldiae* (EN, P4)

Glossy Ibis is a non-breeding migrant to Western Australia and prefers shallows and adjacent flats of freshwater lakes and swamps, but is also found in river pools, flooded samphire and sewage ponds. With a recent record (2008) within 2 kms of the PDE, this species is considered likely to overfly the survey area and may intermittently utilise the Man-made Wetland habitat. The proposed clearing is unlikely to impact the species or their preferred habitat with no clearing of the Man-made wetland habitat proposed.

Peregrine Falcon is widespread in Australia and requires specific nesting sites such as cliffs, rocky outcrops, or large tree hollows. Suitable breeding habitat doesn't occur in the PDE. As such the species may only overfly the study area intermittently and is highly unlikely to be a regular visitor or a permanent resident. No impact to this species is expected as a result of the proposed clearing.

Northern Short-tailed Mouse occupies a diverse range of habitats from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, *Acacia* shrublands, tropical eucalypt and *Melaleuca* woodlands and stony ranges. However, the species is usually found in habitats which are seasonally inundated with red or white sandy-clay soils. The species is both nocturnal and solitary, spending the day in simple, single-chambered burrows. With 34 records within the project 40 km radius (most recently in 2012), the species may utilise Undulating Grassy Plains habitat. This habitat is widespread on a regional level and clearing of a relatively small extent (3.6 ha) is unlikely to significantly impact this species or the habitat critical to them given the availability of habitat outside of the PDE.

Gouldian finch - *Chloebia gouldiae* (EN, P4)
The species inhabits open woodlands dominated by Eucalyptus trees, annual and perennial grasses (especially Sorghum), a nearby source of surface water and in the breeding season, unburnt hollow-bearing Eucalyptus trees particularly *Eucalyptus brevifolia* (Species Profile and Threats Database, 2023). This is a very common environment in the top end of Australia. There are 22 known records of the species within the Project 40 km radius area, most recently in 2015 approximately 6.5 km from the PDE. However, no individuals were recorded during the current survey. The Undulating Grassy Plains habitat type may provide suitable habitat for this species. The impact to the species as a result of small scale clearing of this habitat type is unlikely to be significant due to the availability of significant habitat for the species outside of the PDE.

The following species were assessed as 'Possible' to occur based on proximity and recency of records and the presence of suitable habitat within the survey area:

Fork-tailed Swift -	*Apus pacificus* (MI)
Spectacled Hare-wallaby (mainland)	*Lagorchestes conspicillatus leichardti* (P4)

Fork-tailed Swift is a non-breeding migrant to Australia and almost exclusively aerial in nature. There are three known records of Fork-tailed Swift in the proximity of the Argyle Mine within the project 40 km radius area. With the known records in the vicinity, it has the potential to occur in the area in a fly over nature but is unlikely to permanently utilise the habitat within the survey area due to the aerial preferences of the species.

Spectacled Hare-wallaby (mainland) usually occurs in open woodlands, shrublands and hummock grassland. It shelters during the day in dense tussocks, and forages at night on shrubs, grasses and herbs, usually within close proximity to shelter sites (Broome Bird Observatory, 2017). The species has no known records within the project 40 km radius area. Suitable habitat for this species is found extensively throughout the region. As such, the relatively small amount of vegetation removal for the project is unlikely to significantly impact the habitat availability for the species given the availability of habitat outside of the PDE.

Based on the above, the proposed clearing is not likely to be at variance to this principle.

Methodology

- Broome Bird Observatory, (2017)
- Ecologia Environment, (2021)
- EPBC Act Protected Matters Search Report (Accessed 01/03/2023)
- Species Profile and Threats Database (Accessed 13/04/2023)
- Government GIS Shapefiles:
  - DBCA Threatened and Priority fauna database search (Accessed 13/04/2023)

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora.

Proposal is not at variance to this Principle.

Ecologia, (2021) did not record any EPBC Act or BC Act listed Threatened flora taxa from the Bow River Reserve.

The Desktop Database Searches (PMST report and Government GIS Shapefiles) also identified no known records of listed Threatened flora taxa from the Project 40km radius Study Area.

Given the above, the proposed clearing is not at variance to this Principle.

Methodology

- Ecologia Environment, (2021)
- EPBC Act Protected Matters Search Report (Accessed 01/03/2023)
- Government GIS shapefiles:
  - DBCA Threatened Flora database search (Accessed 06/04/2023)

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

Proposed clearing is not at variance to this Principle.

The Desktop database searches (PMST report and DBCA Shapefiles) show no known records of State or Federally listed Threatened Ecological Communities (TECs) within 40 km of the PDE.

No vegetation community representative of TECs were recorded within or in the vicinity of the survey area during the biological Survey carried out by Ecologia, (2021).

Based on the above, the proposed clearing is not at variance to this Principle.

Methodology

- Ecologia Environment, (2021)
- EPBC Act Protected Matters Search Report (Accessed 01/03/2023)
- Government GIS shapefiles:
  - DBCA Threatened Ecological Community database search (Accessed 12/04/2023)

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Proposed clearing is not at variance to this Principle.

The pre-European vegetation from the PDE is mapped as:

- Vegetation Association 825 described as Grasslands, high grass savanna woodland; cabbage gum & *Eucalyptus foelscheana* over upland tall grass & curly spinifex on basalt.
- Vegetation Association 833 described as Grasslands, short bunch grass savanna sparse low tree; scattered snappy gum over arid short grass on plains.

As evident from Table 4 above, both the vegetation associations have more than 98% of their pre-European extent remaining intact at all levels (Statewide, IBRA Bioregion and LGA). As such, the project is not located in an area with a regionally significant remnant vegetation. Given that the vegetation associations are widespread throughout the area and are well-represented locally and regionally, impacts due to project clearing is not likely to be significant.

Based on the above, the project is not at variance to this Principle.

Methodology

- Ecologia Environment, (2021)
- Government GIS shapefiles:
  - Pre-European vegetation (Accessed 28/02/2023)
- Statewide Vegetation Statistics (Government of Western Australia, 2019)

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Proposed clearing is not at variance to this Principle.

No vegetation growing in, or in association with a water course or wetland will be cleared for the proposed activities. No watercourses or creek lines runs through the PDE.

Vegetation associated with the adjacent Bow River is not connected to the vegetation proposed to be cleared, with previous disturbance and clearing and existing roads separating these areas.

Based on the above, the proposed clearing is not at variance to this Principle.

Methodology

- Ecologia Environment, (2021)
- Government GIS shapefiles:
  - Hydrology (Accessed 1/03/2023)

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Proposed clearing is not likely to be at variance to this Principle.

The project is in an area prone to severe rainfall events, which could contribute to land degradation via flooding and heavy runoff.

The soil landscape mapping system identified the PDE within a MacPhee System described as gently undulating plains below low granite hills supporting eucalypt woodlands over upland tall grasses. The MacPhee System is considered to have some susceptibility to gully erosion if vegetation cover is removed (Schoknecht, N, and Payne, A L., 2011).

The area is also identified as having a very high to extreme risk of water erosion & wind erosion and moderate to high risk of flooding and waterlogging from soil land quality analyses (DPIRD, 2023).

The project is located within an area mapped as cq(p4) and cn(p4)- extremely low probability of occurrence of Acid Sulphate Soils. As such, ASS is unlikely to be an issue.

The project occurs within a region where pre-European levels of native vegetation is widespread. Clearing will be conducted in dry conditions and in accordance with the Main Roads Standard Construction Environment Management Plan (CEMP). The quarry will be managed in accordance with Main Roads Pit Management Plan to ensure any land degradation issues are appropriately managed. Given the relatively small amount of vegetation in a pre-existing project setting is being removed adjoining existing cleared and disturbed areas, the project works are unlikely to cause appreciable land degradation.

Based on the above, the project is not likely to be at variance to this Principle.

Methodology

- NRInfo Map Application. DPIRD, (2023)
- Schoknecht, N, and Payne, A L., (2011)
- Government GIS Shapefiles:
  - Acid Sulphate Soil Risk Map (Accessed 12/04/2023)

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Proposed clearing is not at variance to this Principle.

There are no known Conservation Areas or DBCA managed lands within the 40 km radius of the PDE.

The nearest Ramsar Site or Wetland of National Importance is Lake Argyle, occurring more than 33 km to the northeast of the project location. The proposed clearing will not impact any drainage lines or associated vegetation and given the distance, there will be no impacts to the conservation values of Lake Argyle.

As such, the project is not at variance to this Principle.

Methodology

- Government GIS Shapefiles:
  - DBCA Legislated Lands and Waters (Accessed 1/03/2023)
  - Ramsar Sites (Accessed 1/03/2023)
  - Nationally Important Wetlands (Accessed 1/03/2023)

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Proposed clearing is not likely to be at variance to this Principle.

The project is located within the Ord River and Tributaries and Ord Irrigation District Surface Water Areas and Canning-Kimberley Groundwater Area, both of which are Proclaimed Water Areas. A major non-perennial watercourse – Bow River, flows adjacent to the Bow River reserve (approximately 200m from PDE). No dewatering, no changes to surface water flows, no disturbance to groundwater and no clearing of vegetation associated with a wetland or watercourse is proposed. Water requirements for the project will be sourced from Main Roads approved licensed bores and no changes to the currently approved groundwater allocations is proposed. The existing quarry itself has a source of water which can be utilised for project requirements such dust suppression. The clearing will take place in dry conditions with Main Roads standard measures for environmental management in place during on ground works to avoid and/or reduce localised erosion and sedimentation.

The project will adhere to Main Roads Standard CEMP and Pit Management Plan to ensure the proposed works will not disturb the watercourse, interrupt the natural surface water flows and appropriately manage the site drainage and the quarry pit. The CEMP will also have appropriate provisions to manage possible contamination risk such as spill incidents due to fuel leakage during on-ground works and refuelling and maintenance will occur in a designated areas where there is no surface water retention. As such the deterioration of quality of surface and groundwater from sedimentation, erosion, or spill contamination because of project activities is unlikely.

Based on the above, the project is not likely to be at variance to this Principle.

Methodology

- Government GIS Shapefiles:
  - RIWI Act, Surface Water Areas and Irrigation Districts (Accessed 12/04/2023)
  - RIWI Act, Groundwater Areas (Accessed 12/04/2023)
  - Watercourses (Accessed 12/04/2023)

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Proposed clearing is not likely to be at variance to this Principle.

The subregional climate is described as dry winter and hot semi-arid summer with an average annual rainfall of 720.7 mm (Warmun, Site ID- 2032) (BoM, 2023). Extreme weather events are a significant component of the Kimberley climate. Tropical cyclones and tropical storms can bring heavy and sustained rainfall, particularly in the months leading up to and during the wet season. It is common for a large proportion of the Region's rainfall to be recorded in one single event, leading to extensive flooding of rivers, creeks and roadways. The proposal area is also within the area identified as a high risk of flooding, waterlogging or erosion from soil land quality analyses (DPIRD, 2023). A major non-perennial watercourse Bow River runs adjacent to the Bow River reserve within which the PDE is located.

The proposed clearing will take place in the dry season with the Main Roads standard measures for environmental management in place during on ground works to avoid or escalate flooding, waterlogging or erosion. The clearing is in a region where the pre-European level of native vegetation is widespread. No changes to the existing levels of flooding are anticipated as the proposal is an extension of existing quarry. As such, the project is unlikely to cause or exacerbate the incidence or intensity of flooding. As noted above, climatic conditions are the main factor influencing flooding and the removal of a relatively small amount of vegetation in the pre-existing project setting will have no measurable influence on flood regimes in the area.

Given the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology

- Monthly Climate Data. BoM, (2023)
- NRInfo Map Application. DPIRD, (2023)

6 VEGETATION MANAGEMENT

Main Roads will avoid clearing native vegetation where possible. Where clearing cannot be avoided then this clearing is kept to a minimum. Clearing of Vegetation will be managed in accordance with the Main Roads standard management measures.

7 REHABILITATION, REVEGETATION & OFFSETS

7.1 Revegetation and Rehabilitation

No temporary clearing will be undertaken as part of the Proposal activities.

7.2 Offset Proposal

In accordance with CPS 818/16 condition 11(a), Main Roads is seeking an exemption from submitting an offset proposal.

8 STAKEHOLDER CONSULTATION

Main Roads will undertake stakeholder consultation in accordance with CPS 818 Condition 8.

9 COMPLIANCE WITH CPS 818

Table 7 summarises what further pre-clearing impact assessment is required in accordance with CPS 818.

Table 5. Summary of Additional Management Actions Required by CPS 818

Impact of Clearing	Yes/No or NA	Further Action Required
1. The CAR indicates that the clearing is 'At Variance' or 'May be at Variance' with one or more of the Clearing Principles.	**Yes**	**1.** Clearing Report to be published on website and submissions sought for 21 days. **2.** Submissions invited from relevant parties, including the LGA, the owner or occupier of the land and other stakeholders in accordance with Condition 8 of CPS 818. **3.** VMP has been completed, refer to Appendix 2. **4.** A request for exemption from an offset proposal will be sought from DWER based on the *WA Environmental Offsets Guidelines 2014*. **5.** Summary of submissions and a statement addressing each of those submissions to be published on website.
2. Clearing is at variance or may be at variance with Clearing Principle (g) land degradation, (i) surface or underground water quality **or** (j) the incidence of flooding.	**No**	No further action required.
3. Clearing is at variance with Clearing Principle (g) land degradation, (i) surface or underground water quality **and** (j) the incidence of flooding.	**No**	No further action required.
4. The Proposal involves clearing for temporary works (as defined by CPS 818).	**No**	No further action required.
5a. Proposal is within a Region that: • has rainfall greater than 400mm; and, • is South of the 26th parallel; and, • works are necessary in 'Other than dry conditions'; and, • works have potential for **uninfested** areas to be impacted.	**No**	Standard Vehicle and Plant management actions from Principal Environmental Management Requirements (PEMRs) and Hygiene Checklists will be applied.
5b. Do the proposed works require clearing within or adjacent to DBCA managed lands in non-dry conditions?	**No**	No further action required.
6. Main Roads has been notified by DWER or an environmental specialist that the area to be cleared is susceptible to a pathogen other than dieback.	**No**	No further action required.

Impact of Clearing	Yes/No or NA	Further Action Required
7. Weeds are likely to spread to and result in environmental harm to adjacent areas of native vegetation that are in good or better condition.	**No**	No further action required.
8. Did an environmental specialist conduct the survey or field assessment?	**Yes**	The Environmental Specialist undertaking the biological assessments was suitably qualified and had more than three years' experience.
9. Did an environmental specialist prepare the Assessment Report and any other associated documentation including the VMP, Dieback Management Plan or Offset Proposal?	**Yes**	The Environmental Specialist preparing the Assessment Report and any other associated documentation including the VMP, Dieback Management Plan or Offset Proposal was suitably qualified and had more than three years' experience.

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11 APPENDICES

Appendix 1: Bow River Biological Survey – Ecologia 2021 – Executive Summary and Report Conclusions

EXECUTIVE SUMMARY

Main Roads Western Australia (Main Roads) proposes to undertake progressive upgrade works on the Great Northern Highway (GNH), specifically two adjacent projects: 'Warmun South to Bow River Upgrade' and 'Bow River Quarry'. Ecologia Environment (*ecologia*) was engaged by Main Roads to undertake a biological survey of the Bow River Quarry survey area, located east of the GNH SLK 3009.9 north of Warmun in the Shire of Wyndham-East Kimberley, with an approximate area of 167 ha. E*cologia* completed a detailed flora and vegetation survey, a targeted survey for significant plant species and communities, and a basic fauna and fauna habitat assessment of the survey area on the 30th March 2021, as part of a larger survey of the adjacent Warmun South to Bow River survey area, which was conducted over nine days between the 23rd and 31st March 2021.

Flora and Vegetation Assessment

A total of 171 vascular plant taxa representing 43 families and 115 genera were recorded from eight quadrats sampled along with additional opportunistic records. No EPBC Act (1999) or BC Act (2016) listed Threatened species were recorded. Two DBCA listed Priority species were recorded within the survey area: *Ipomoea racemigera* (P2) and *Rothia indica* subsp. *australis* (P3). The record of *Ipomoea racemigera* is a range extension of approximately 200 km south, and the record of *Rothia indica* subsp. *australis* is a range extension of approximately 600 km east. Thirteen introduced plant species were recorded, two of which (**Calotropis procera* and **Jatropha gossypifolia*) are listed as Declared Pests, and one (**J. gossypifolia*) is classified as a Weed of National Significance (WONS).

Hierarchical agglomerative clustering was conducted using floristic data from eight quadrats within the survey area and 49 sites within the adjacent Warmun South to Bow River survey area. Based on this classification, four vegetation types were characterised and mapped within the survey area, with vegetation consisting mainly of *Bauhinia cunninghamii*; *Corymbia confertifolia*, *Eucalyptus pruinose* subsp. *pruinosa* low open woodland; *Carissa lanceolata*, *Flueggea virosa* subsp. *melanthesoides* mid sparse shrubland; *Sorghum timorense*, *Aristida hygrometrica*, *Eriachne obtusa* mid/low tussock grassland. Vegetation within the survey area was mostly in 'Excellent' condition. None of the recorded vegetation types were considered significant based on available data, although all of them coincide with a vegetation association of Beard (1979) that is a Priority 3 PEC, 'Vegetation Association 833 as defined by John Beard's vegetation mapping for the Kimberley (Beard 1979)', which accounts for 95.3% (159.42 ha) of the survey area.

Fauna and Fauna Habitat Assessment

Habitat assessments were undertaken at three sites to describe representative habitat types present within the survey area. Four habitat types were identified within the survey area: Undulating Grassy Plains, Rocky Hills, Creekline, and Man-made Wetland. With the exception of the Man-made Wetland habitat, all habitat types are generally common at a local and regional level and were not restricted to the survey area. Habitat condition ranged from 'Very Good' to 'Good'

with evidence of European cattle, weed infestation, and clearing contributing to lower condition ratings.

Seventeen vertebrate fauna species were recorded during the survey including two mammals (one introduced), 12 birds and three reptiles. Fauna recorded during the survey were generally common and are not restricted to survey areas. No fauna taxa listed as 'Threatened fauna' under the EPBC Act, 'Threatened fauna' under the BC Act or DBCA-classified 'Priority' fauna taxa were recorded during the field survey.

No Threatened or Priority fauna species listed under the EPBC Act or BC Act were identified during the field survey. The Gouldian finch (*Chloebia gouldiae* [EN EPBC Act, P4 BC Act]) has previously been recorded within the Bow River Quarry survey area and suitable habitat for this species is present within the Undulating Grassy Plains; however, the species was not recorded during the current survey. The post-survey likelihood of occurrence assessment identified two birds (glossy ibis [*Plegadis falcinellus]* and peregrine falcon [*Falco peregrinus*]) and one mammal (northern short-tailed mouse [*Leggadine lakedownensis*]) considered 'Likely' to occur and one bird (fork-tailed swift [*Apus pacificus*]) considered 'Possible' to occur within the survey area.

REPORT CONCLUSIONS

Significant Vegetation

Vegetation may be considered significant for a range of reasons including, but not limited to: being listed as a Threatened Ecological Community under the BC Act 2016 or the EPBC Act; being classified as a Priority Ecological Community by DBCA; having a restricted distribution; the degree of historical impact from threatening processes; playing a role as a refuge for Threatened species; or providing an important function required to maintain ecological integrity of a significant ecosystem (Environmental Protection Authority 2016c). Other environmental features, such as watercourses or wetlands, and plant communities with high levels of species diversity, may also be considered significant under some circumstances (Department of Environment Regulation 2014).

Spatial data from the DBCA Threatened and Priority Ecological Communities Database were used to assess the potential presence of TECs and PECs within the survey area. A list of TECs and PECs for the Kimberley region (Department Biodiversity Conservation and Attractions 2017) was also reviewed to assess the potential presence of communities not identified in the database search.

No state (DBCA) or Commonwealth (EPBC Act) listed TECs have been recorded within or in the vicinity of the survey area. One spatially defined Priority 3 PECs occur within the survey area: 'Vegetation Association 833 as defined by John Beard's vegetation mapping for the Kimberley (Beard 1979)'. Within the survey area, this PEC is mostly in 'Excellent' condition. Vegetation Association 833 accounts for 95.3% (159.42 ha) of the survey area, which is 0.42% of its current extent in the Ord Victoria Plain IBRA bioregion (Government of Western Australia 2018).

Based on available data, no other significant vegetation is present within the survey area. The vegetation types recorded are not known to be locally restricted, are not known to act as a refuge for Threatened species, and are not known to provide an important function required to maintain ecological integrity of a significant ecosystem. The riparian vegetation occurring within the survey area does not have any specific conservation significance at a regional level

Fauna and Fauna Habitat

Habitat assessments were undertaken at three sites to describe representative habitat types present within the survey area. After assessing the vegetation types, soil units, and landforms present within the survey area, four habitat types (Creekline, Undulating Grassy Plains, Rocky Hills and Man-made Wetland) were identified, with all habitat types considered generally common at a local and regional level, excluding the Man-made Wetland habitat. The condition of habitat within the survey area was generally 'Good' to 'Very Good, with grazing and trampling by European cattle, clearing, and weeds contributing to lower condition ratings.

Seventeen vertebrate fauna species were recorded during the survey, including 12 birds, two mammals and three reptiles. A single introduced species (European cattle) was recorded within the survey area. Fauna recorded during the survey are generally common and were not restricted to the survey area.

Significant Fauna

The desktop likelihood of occurrence assessment was reviewed and revised post-survey to incorporate field survey results. The glossy ibis (*Plegadis falcinellus* [MI EPBC Act and BC Act]), peregrine falcon (*Falco peregrinus* [OS BC Act]), and northern short-tailed mouse (*Leggadina lakedownensis* [P4 BC Act]) were allocated a post-survey likelihood of occurrence rating of 'Likely' based on proximity of records, recency of records, and presence of suitable habitat within the survey area. The fork-tailed swift (*Apus pacificus* [MI EPBC Act & BC Act]) was considered 'Possible' to occur post-survey and may intermittently overfly the survey area. Although the Gouldian finch (*Chloebia gouldiae* [EN EPBC Act & P4 BC Act]) has previously been recorded within the survey area, this species was not recorded during the current survey.

The likelihood of occurrence assessment also identified fifteen species considered 'Unlikely' to occur within the survey areas due to lack of suitable habitat, distance of records from the survey area, or age of records, and these are not discussed further.

Significant species recorded:

Gouldian finch (*Chloebia gouldiae*) (Endangered EPBC Act, Priority 4 BC Act)

The Gouldian finch was formerly distributed throughout the tropical savannas of northern Australia. It is now restricted to isolated areas mostly within the Northern Territory and the Kimberley region of Western Australia (Woinarski and Palmer 2006). Known breeding habitat is characterised by rocky hills with hollow-bearing, smooth-barked gums that are close to small waterholes or springs that persist through the dry season (O'Malley 2006).

Gouldian finches forage on the ground, feeding on seeding grasses, particularly native *Sorghum* species (Pizzey and Knight 2003). Due to the restricted diet of Gouldian finches, they are particularly vulnerable to seed shortages (O'Malley 2006). The decline in populations of the Gouldian finch is representative of the general decline of granivorous birds occurring due to current land management practices. Ongoing key threats to the Gouldian finch are vegetation change through inappropriate fire regimes, and grazing impacts of stock and feral herbivores (O'Malley 2006). This species was recorded within the survey area in 2015 and has been recorded on 22 occasions within 40 km of the survey area. Although no individuals were recorded during the current survey, the Undulating Grassy Plains habitat type provides suitable habitat for this species

within the survey area. During a concurrent survey along the Great Northern Highway, six Gouldian finches were recorded.

Significant species considered likely to occur:

Glossy ibis (*Plegadis falcinellus*) (MI EPBC Act & BC Act)

The glossy ibis is typically a non-breeding visitor to Western Australia, found predominantly in the north-east, the south-west Kimberley and the Swan Coastal Plain. It is a casual or vagrant visitor to the rest of Western Australia. The preferred habitat is shallows and adjacent flats of freshwater lakes and swamps, but it is also found in river pools, flooded samphire and sewage ponds (Johnstone and Storr 1998). The glossy ibis is diurnal, feeding on molluscs, fish, beetles, and other insects by probing the water and mud with its long, curved bill (Johnstone and Storr 1998). With a recent record (2013) within a kilometre of the survey area, this species is considered likely to overfly the survey area and may intermittently utilise the Man-made Wetland habitat.

Peregrine falcon (*Falco peregrinus*) (OS BC Act)

The species is widespread in Australia but requires specific nesting sites. It does not build a nest but requires cliffs, rocky outcrops, or large tree hollows (Johnstone and Storr 1998). Suitable breeding habitat is unlikely to occur in the study area; however, due to its widespread movements, the species may also overfly all habitats of the study area intermittently. Peregrine falcons feed almost exclusively on birds, especially ducks, parrots and pigeons. With nine records in the vicinity of the survey area, this species has the potential to intermittently overfly the survey area; however, it is highly unlikely to be a regular visitor or a permanent resident.

Northern short-tailed mouse (*Leggadina lakedownensis*) (P4 BC Act)

Populations of this small, elusive rodent are distributed across northern Australia, but records of the species have been sporadic since 1969 (Moro and Kutt 2008). The nothern short-tailed mouse occupies a diverse range of habitats from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, *Acacia* shrublands, tropical eucalypt and *Melaleuca* woodlands and stony ranges. However, the species is usually found in habitats which are seasonally inundated with red or white sandy-clay soils (Moro and Kutt 2008). The diet of the northern short-tailed mouse consists primarily of invertebrates and water requirements are satisfied by consuming supplementary plant material (Moro and Kutt 2008). Studies indicate that the northern short-tailed mouse is extremely well physiologically and ecologically adapted to substantial variation in tropical climatic conditions (Moro and Kutt 2008). Numbers fluctuate greatly in response to rainfall on Thevenard and Serrurier Islands, with populations occasionally reaching plague proportions following heavy rainfall events. Conversely, a population in Kakadu which has been the subject of a long-term monitoring program has exhibited large scale population oscillations which are not correlated with environmental factors. The species is both nocturnal and solitary, spending the day in simple, single-chambered burrows (Moro and Kutt 2008).

With 34 records within 40 km of the survey area (most recently in 2012), this species was assessed as 'Likely' to occur within the survey area and may inhabit tussock grasses within the Low Hill habitat type.

Significant species considered possible to occur:

Fork-tailed swift (*Apus pacificus*) (MI EPBC Act & BC Act)

The fork-tailed swift is a small, insectivorous species with a white throat and rump, and a deeply forked tail (Morcombe 2010). Its distribution spans from central Siberia and throughout Asia, breeding in north-east and mid-east Asia, and wintering in Australia and south New Guinea. It is a relatively common trans-equatorial migrant from October to April throughout mainland Australia (Simpson and Day 2004). In Western Australia the species begins to arrive in the Kimberley in late September, the Pilbara in November and the South-west by mid-December (Johnstone and Storr 1998). In Western Australia the fork-tailed swift is considered uncommon to moderately common near the north-west, west and south-east coasts, common in the Kimberley and rare or scarce elsewhere (Johnstone and Storr 1998).

Fork-tailed swifts are nomadic in response to broad-scale weather pattern changes. They are attracted to thunderstorms where they can be seen in flocks, occasionally of up to 2,000 birds. They rarely land, living almost exclusively in the air and feeding entirely on aerial insects, especially nuptial swarms of beetles, ants, termites and native bees (Simpson and Day 2004). With three records in the vicinity of the survey area, the fork-tailed swift has the potential to intermittently overfly the survey area; however, is unlikely to utilise habitat within the survey area due to the aerial preferences exhibited by the species.

Appendix 2: Vegetation Management Plan

BOW RIVER QUARRY EXTENSION 2023

Purpose and Scope

This Vegetation Management Plan (VMP) has been prepared by Main Roads for the purpose of managing native vegetation clearing impacts associated with the Bow River Quarry Extension 2023.

The Bow River quarry is a well-established existing quarry that has been used to provide road building materials to the Kimberley roads over the past decade with existing water sources, side tracks, turnaround locations, aggregate stockpile areas and site office within the boundary of the reserve. The quarry has been and is today the main source of Road Building material for the roads within this area. As natural materials become more and more difficult to provide, product from the Bow River quarry is more and more in demand.

Approximately 460,000 tonnes of material is proposed to be processed in the Bow River Quarry. The project will require clearing a total of 3.6 ha in a 67 ha Project Development Envelope. The clearing will be undertaken using CPS 818. The proposed works will involve:

- Vegetation clearing within the blast zone.
- Extraction of rock material from blast zone.
- Cartage of rock to crushing plant and stockpiling of processed materials.

In specified circumstances, Main Roads VMP is required to be approved by the Department of Water and Environmental Regulation (DWER) as a condition of the Main Roads Statewide Clearing Permit CPS 818.

Action

Appendix 3.1 references the standard Principal Environmental Management Requirements (PEMRs) (Tables 1 to 9) that will be utilised for all proposals that involve clearing to avoid, mitigate and manage the environmental impacts of the Proposal.

Proposal specific environmental management actions are contained in Appendix 3.1.

Actions will be undertaken in accordance with those described in the relevant PEMR and the Proposal Specific Environmental Management Requirements.

Timeframes

Specifies actions to be undertaken during pre-commencement of works, during works or after the works.

Responsibilities

It is the responsibility of the Superintendent's Contract Management Team to ensure that the requirements are implemented by the Contractor. This shall be done by adhering to the Environmental Measurement and Evaluation Checklist.

Appendix 2.1: Vegetation Management

Refer to the PEMRs (D19#260830) for Specific Management Actions commonly used and guidance notes are provided.

VMP Requirement	Standard Management Actions	Specific Environmental Management Actions
Clearing	Refer to Table 1: Clearing PEMR • Specification 204 Environmental Management • Construction Environmental Management Plan • Specification 301 Vegetation Clearing and Demolition • Environment Measurement and Evaluation Checklist (for release of HOLD POINTS) Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• The locations of Priority flora and the requirements to protect vegetation outside of the pegged clearing line will be clearly communicated through site inductions and pre-start meetings, particularly on dates when clearing is undertaken. • Routine inspections of the Limits of Vegetation Clearing boundary and demarcation will be conducted to ensure no clearing outside the Development Envelope.
Pegging and Flagging	Refer to Table 2: Pegging and Flagging PEMR • Specification 204 Environmental Management • Construction Environmental Management Plan • Specification 301 Vegetation Clearing and Demolition Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable
Erosion and Sedimentation Control	Refer to Table 3: Erosion and Sedimentation Control PEMR • Specification 204 Environmental Management • Construction Environmental Management Plan Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable

VMP Requirement	Standard Management Actions	Specific Environmental Management Actions
Fauna Management	Refer to Table 4: Fauna Management PEMR • Specification 204 Environmental Management • Construction Environmental Management Plan Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable
Machinery and Vehicle Management	Refer to Table 5: Machinery and Vehicle Management PEMR • Specification 204 Environmental Management • Construction Environmental Management Plan Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable
Mulch and Topsoil Management	Refer to Table 6: Mulch and Topsoil Management • Specification 204 Environmental Management • Construction Environmental Management Plan • Specification 301 Vegetation Clearing • Specification 304 Revegetation and Landscaping Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable
Water Drainage Management	Refer to Table 7: Water Drainage Management PEMR • Specification 204 Environmental Management • Construction Environmental Management Plan	• Not Applicable

VMP Requirement	Standard Management Actions	Specific Environmental Management Actions
Weed Management	Refer to Table 8: Weed Management PEMR • Specification 204 Environmental Management • Construction Environmental Management Plan Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable
Monitoring	• Specification 204 Environmental Management • Construction Environmental Management Plan • Superintendent's Contract Management Plan & Environmental Measurement and Evaluation Checklist. Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable
Auditing	• Specification 204 Environmental Management • Superintendent's Contract Management Plan & Environmental Measurement and Evaluation Checklist. Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable

Principal Environmental Management Requirements (PEMR's)

Table 1: Clearing PEMR

STANDARD MANAGEMENT REQUIREMENTS
PRE WORKS 1. The Contractor must prepare, implement and maintain processes to ensure that the movement of all vehicles, plant and machinery does not occur outside of the Limits of Vegetation Clearing. This must include all turnaround areas. 2. The Contractor must minimise vegetation clearing and the area of disturbance on ground by utilising existing cleared area where possible.
DURING WORKS 1. The Contractor must report any damage to vegetation beyond the Limits of Vegetation Clearing as an Environment Incident. 2. The Contractor must ensure Movements are confined to the Limits of Vegetation Clearing during the works. 3. The Contractor must undertake the clearing in accordance with the Fauna PEMR.
POST WORKS NIL

Table 2: Pegging and Flagging PEMR

PRE WORKS 1. Pegging must be done in accordance with the requirements detailed in Specification 301. 2. The Contractor must clearly communicate, either at the pre-start meeting or equivalent, to the crew undertaking the clearing works, through clear maps and other additional means, what the Pegging represents.
DURING WORKS 1. The Contractor must peg the Limits of Clearing by PINK flagging tape. 2. The Contractor must peg/demarcate vegetation proposed to be retained by WHITE flagging tape. 3. The Contractor must ensure that the vegetation demarcated with PINK and WHITE flagging tape is consistent with the approved clearing areas.
POST WORKS 1. The Contractor must remove and dispose of appropriately any demarcation, pegging or flagging once proposal works are completed.

Table 3: Erosion and Sedimentation Control PEMR

PRE WORKS

1. The Contractor must develop, implement and maintain processes and procedures to ensure that:
    a. The Contractor is responsive to and addresses incidents of erosion and sedimentation within and adjacent to the work areas;
    b. Prevent water and wind soil erosion within and adjacent to the works areas;
    c. Prevent the sedimentation and siltation of watercourses located within and adjacent to the works area;
    d. Ensure that sedimentation and siltation of drainage lines due to the removal of riparian vegetation is avoided, minimised and mitigated;
    e. Ensure that loose surfaces and recently cleared areas are protected from wind and soil erosion;
    f. Minimise exposed soil working surfaces or protect them from stormwater erosion;
    g. Ensure material such as gravel, crushed rock and excavated material is stockpiled away from drainage paths and covered to prevent erosion; and,
    h. Ensure that water quality monitoring is undertaken when turbidity and sedimentation is an issue.

DURING WORKS

1. Implement, monitor and adhere to the sedimentation and erosion processes developed to address the requirements in the pre-works.

POST WORKS

1. If required, the Contractor must continue to monitor water quality until the turbidity/sedimentation dissipates.
2. The Contractor must ensure that disturbed areas are stabilised as soon as is practicable after construction activities are completed.

Table 4: Fauna Management PEMR

PRE WORKS

1. The Contractor must ensure that fauna management requirements are communicated to the crew undertaking the clearing works during the induction and pre-start meeting.
2. Where active nests, burrows or dens are identified, works must not proceed until the Contractor obtains the Superintendents approval of the management of active nests, burrows or dens adheres to the Superintendents advice.

DURING WORKS

2. The Contractor must undertake the clearing in the following manner to allow fauna to move out of the clearing area;
    a. Prior to the clearing activities commencing, use machinery to tap large trees with habitat hollows to encourage any animals evacuate; and,
    b. Undertake the clearing in one direction and towards areas of native vegetation to allow the animals to escape to adjacent habitat.
3. The Contractor must ensure that all onsite personnel undertake visual monitoring and are vigilant to the presence of fauna. Any sightings of fauna, including injury or fatality, must be reported as an Environmental Incident.
4. The Contractor must ensure that:

No pets, traps or firearms post-survey likelihood of occurrence assessment identified two birds (glossy ibis [*Plegadis falcinellus]*
and peregrine falcon [*Falco peregrinus*]) and one mammal (northern short-tailed mouse [*Leggadine lakedownensis*]) considered 'Likely' to occur and one bird (fork-tailed swift [*Apus pacificus*]) considered

    a. 'Possible' to occur within the survey area.are brought into the project area;
    b. Fauna are not fed;
    c. Fauna are not intentionally harmed or killed; and,
    d. Fauna that venture into the work area are encouraged to leave in a manner that does not harm the animal or operator (loud noise, slowly approaching in a vehicle etc.).
5. The Contractor must ensure that in the event that sick, injured or orphaned native wildlife are located on the project site, the WILDCARE Helpline ((08) 9474 9055) will be contacted for assistance. The Contractor must maintain records of any animal taken to a wildlife carer.

POST WORKS

1. The Contractor must provide any records of fauna impact to the Superintendent.

Table 5: Machinery and Vehicle Management PEMR

PRE WORKS

1. The Contractor must ensure that all areas associated with the storage, parking, servicing, wash down and refuelling of all vehicles, plant and machinery is located within the Limits of Clearing and approved by the Superintendent.
2. The Contractor must ensure that all vehicles, machinery and plant are clean on entry (i.e. free of all soil and vegetation material) and comply with the requirements of 204.B.32.
3. The Contractor must ensure that vehicle servicing and refuelling will be undertaken at designated areas approved by the Superintendent.
4. The Contractor must ensure that all staff suitably qualified and competent to undertake works, especially refuelling activities.

DURING WORKS

1. The Contractor must maintain records of checking all vehicles, machinery and plant are clean on entry.

POST WORKS

NIL

Table 6: Mulch and Topsoil Management PEMR

PRE WORKS

1. The Contractor must ensure that the movement of soil and vegetation is only undertaken in dry conditions unless otherwise approved and / or directed by the Superintendent.
2. The Contractor must ensure that poor quality topsoil and mulched vegetation does not contaminate the good quality topsoil and vegetation.

DURING WORKS

1. The Contractor must ensure that all machinery used in the removal of weed-infested topsoil must be cleaned down before and between operations to prevent the introduction and spread of weeds.
2. The Contractor must ensure the movement of large equipment over topsoil materials is avoided to minimise compaction.
3. The Contractor must ensure that Dieback and weed infected topsoil and mulch vegetation must be handled separately to minimise the risk of spreading dieback and weed species across the site and stockpiles.
4. The Contractor must ensure that stockpiling operations must occur in a manner to ensure that the properties of the topsoil are not degraded and the topsoil made unsuitable for use in revegetation are not degraded and the topsoil made unsuitable for use in revegetation.

POST WORKS

Nil

Table 7: Water Drainage Management PEMR

PRE WORKS

1. Use pollution control and containment strategies for proposal activities in Public Drinking Water Source Areas (PDWSAs) / Underground Water Pollution Control Areas (UWPCAs) and liaise with the DWER where necessary.

DURING WORKS

1. Existing natural drainage paths and channels along the road or the vicinity of the project area will not be unnecessarily blocked or restricted.
2. Temporary drainage systems may be installed to carry surface water away from the areas where excavation and foundation construction work is taking place or from any other area where the accumulation of water could cause delay or damage to the work.
3. Maintain these drainage systems in proper working order at all times.
4. Runoff from disturbed areas must be managed to minimise adverse impacts on surrounding vegetation, watercourses and properties.
5. Booms and silt fences must be used when working over or adjacent to areas of surface water in order to protect the quality of surface water from construction impacts.

POST WORKS

1. Water quality monitoring to be undertaken (if turbidity/ sedimentation is an issue).
2. Prior to backfilling the completed pipe work, certify that the entire system is flushed clean and tested.
3. Disturbed areas will be stabilised soon after construction activities are completed.
4. Culvert and drainage structures will be free of all grass, weeds, silt and debris.

level, excluding the Man-made Wetland habitat. The condition of habitat within the survey area was generally 'Good' to 'Very Good, with grazing and trampling by European cattle, clearing, and weeds contributing to lower condition ratings.
Seventeen vertebrate fauna species were recorded during the survey, including 12 birds, two mammals and three reptiles. A single introduced species (European cattle) was recorded within the survey area.

Fauna recorded during the survey are generally common and were not restricted to the survey area.

Table 8: Weed Management PEMR

PRE WORKS

1. The Contractor must remove or kill any weeds growing in proposal area that are likely to spread and result in environmental harm to adjacent areas of native vegetation that are in good or better condition.
2. The Contractor must develop, implement and maintain procedures to identify and control declared and invasive weed species within the Contract areas, to the satisfaction of the Superintendent.
3. The Contractor must prepare a weed control program, for nominated weed species for control and disposal, to the satisfaction of the Superintendent.
4. The Contractor must undertake weed management in Stockpiles as directed by the Superintendent.

DURING WORKS

1. The Contractor must implement the weed control procedures and management plan and record and manage records of its implementation.
2. The Contractor must treat nominated weed infestations as many times as necessary to control and eradicate the weed species in accordance with the approved weed control program.
3. The contractor must ensure that no known weed, pest or diseased affected soil, mulch, fill or other material is brought into the Site.

POST WORKS

1. The relevant Vegetation Maintenance Record Forms available at: https://www.mainroads.wa.gov.au/technical-commercial/contracting-to-main-roads/ must be completed and sent to the Superintendent.