

We trust this above meets your current requirements. Please contact me if you require further information in relation to the above.

Yours sincerely,

Biota Environmental Sciences Pty Ltd

Garth Humphreys
Principal Ecologist / Director

Adjunct Lecturer, University of Western Australia School of Animal Biology
Research Associate, Western Australian Museum

References

1. Biota. *Manuwarra - Red Dog Highway Stage 4 Biological Survey*. (2021).
2. DSEWPaC. *How to Use the Offsets Guide*. (2013).
3. Biota. *Yandicoogina Expansion Northern Quoll Position Paper*. (2010).
4. Biota. *Hope Downs IV Targeted Northern Quoll Survey*. (2009).
5. Biota. *Koodaideri Iron Ore Project Northern Quoll Baseline Long-Term Monitoring*. (2018).
6. Department of the Environment. *EPBC Act referral guideline for the endangered northern quoll, Dasyurus hallucatus*. (2016).
7. Armstrong, K. N. & Wilmer, W. J. The importance of determining genetic population structure for the management of Ghost Bats, *Macroderma gigas* in the Pilbara region of Western Australia. Oral presentation at the 11th Australasian Bat Society Conference, Toowoomba, Queensland, 12-14 April 2004. (2004).
8. Armstrong, K. N. & Anstee, S. D. The Ghost Bat in the Pilbara: 100 years on. *Australian Mammalogy* 22, 93–101 (2000).
9. Biologic & Bat Call WA. *Pilbara Regional Ghost Bat Review*. (2014).
10. Biota. *Ghost Bats at West Angelas: 2002 Survey, Data Review and Future Directions*. (2002).
11. Armstrong, K. M. The distribution and roost habitat of the Pilbara Leaf-nosed bat *Rhinonicteris aurantius*, in the Pilbara region of Western Australia. *Wildlife Research* 28, 95–104 (2001).
12. Armstrong, K. N. Roost microclimates of the bat *Rhinonicteris aurantius* in a limestone cave in Geikie Gorge, WA. *Australian Mammalogy* 22(1), 69–70 (2000).
13. Biota. *Koodaideri K75W Adit Rhinonicteris aurantius Colony Alternate Exit Investigations*. (2013).
14. Churchill, S. K. Distribution, abundance and roost selection of the Orange Horseshoe Bat *Rhinonicteris aurantius*, a tropical cave dweller. *Wildlife Research* 18, 343–353 (1991).
15. Cramer, V. A. et al. Research priorities for the Pilbara leaf-nosed bat (*Rhinonicteris aurantia* Pilbara form). *Australian Mammalogy* (2016).
16. Biota. *Koodaideri Orange Leaf-nosed Bat Colony Assessment*. (2012).
17. Biota. *Koodaideri Project Orange Leaf-nosed Bat Foraging Habitat and Dispersal Assessment*. (2013).
18. Biota. *Koodaideri Iron Ore Project Pilbara Leaf-nosed Bat Baseline Long-Term Monitoring*. (2018).
19. Biota. *Orange Leaf-nosed Bat Review of Potential Mining Activity Impacts at Koodaideri*. (2014).
20. Astron. *West Pilbara Iron Ore Project Activity Assessment for Bats of Conservation Significance*. (2012).
21. Biota. *A Two-Phase Fauna Survey of the West Turner Syncline Area*. (2009).
22. Biota. *West Pilbara Iron Ore Project MNES Fauna Species Habitat Assessment*. (2015).

23. Biota. Environment Protection and Biodiversity Conservation Act 1999 Strategic Assessment Biological Review. (2013).
24. Biota. Koodaideri Spring Gorge Ecological Monitoring - Phase 1 Baseline Report. (2014).
25. Davis, R. & Metcalf, B. The Night Parrot (*Pezoporus occidentalis*) in northern Western Australia: a recent sighting from the Pilbara region. *Emu* 108, 233–236 (2008).
26. DBCA. *Interim guideline for preliminary surveys of night parrot (Pezoporus occidentalis) in Western Australia.* (2017).
27. Hamilton, N., Onus, M., Withnell, B. & Withness, K. Recent sightings of the Night Parrot *Pezoporus occidentalis* from Matuwa (Lorna Glen) and Millrose Station in Western Australia. *Australian Field Ornithology* 34, 71–75 (2017).
28. Jackett, N. A., Greatwich, B. R., Swann, G. & Boyle, A. A nesting record and vocalisations of the Night Parrot *Pezoporus occidentalis* from the East Murchison, Western Australia. *Australian Field Ornithology* 34, 144–150 (2017).
29. Falkenburg, I. D. Aspects of the ecology of the Grey Falcon *Falco hypoleucos* in the South Australian arid zone. *Corella* 35, 23–28 (2010).
30. Olsen, P. D. & Olsen, J. Distribution, status, movements and breeding of the Grey Falcon *Falco hypoleucos*. *Emu* 86, 47–51 (1986).

Appendix 7 Fauna Action Management Plan



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Fauna Action Management Plan

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Karratha – Tom Price Road Stage 4

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Document Control

Report Compilation & Review	Name and Position	Document Revision	Date
Author:	Arne de Vos Principal Environmental Consultant	Rev 3	22/08/2022
Reviewer:	John Morrell Environment Officer	Rev 3	22/08/2022
Approved for Issue:	Lisa Boulden Senior Associate Environment Consultant	Rev 3	2/08/2022

1 DECLARATION OF ACCURACY

I declare that to the best of my knowledge, all the information contained in, or accompanying this document is complete, current and correct. I am duly authorised to sign this declaration on behalf of the proponent/approval holder. I am aware that:

- a. giving false or misleading information is a serious offence under section 137.1 of the Criminal Code Act 1995 (Cth)
- b. section 137.2 of the Criminal Code Act 1995 (Cth) makes it an offence for a person to produce a document to another person in compliance or purported compliance with a law of the Commonwealth where the person knows that the document is false or misleading;
- c. section 490 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading; and
- d. section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth) (EPBC Regulations) where the person knows the information or document is false or misleading.

Signed: _____ Date: _____

Full name: John Morrell, Environment Officer

Organisation: Main Roads Western Australia

EPBC Referral Number: EPBC 2020/8725

Action Management Plan Title: Manuwarra Red Dog Highway, Fauna Action Management Plan

2 INTRODUCTION

2.1 Proposed Action background

Main Roads Western Australia (Main Roads) is proposing to construct and operate the Manuwarra Red Dog Highway (MRDH) (Stage 4), which is approximately 112 km of new road from the southern end of the MRDH Stage 3 Road (Wallyinya Pool) to the Nanutarra Munjina Road (the Proposed Action).

The development envelope for the Proposed Action is 7,142 ha. All disturbance including that for laydown areas, site offices, side tracks, turnaround locations and other construction activities will occur within the development envelope. The disturbance footprint within the development envelope is approximately 650 ha in area. Of this area, approximately 550 ha is permanent clearing (e.g. road, drainage infrastructure) and approximately 100 ha is temporary clearing which will be rehabilitated.

2.2 Purpose of this Action Management Plan

As the Proposed Action may have a significant impact on Matters of National Environmental Significance (MNES), Main Roads is required to prepare Preliminary Documentation to inform the assessment of the relevant impacts on MNES of the Proposed Action.

This Action Management Plan (AMP) has been prepared as part of Preliminary Documentation to support assessment of the MRDH Stage 4 Project (EPBC 2020/8725, the Proposed Action) under the EPBC Act.

The structure and content of this AMP has been prepared in accordance with Department of Climate Change, Energy, the Environment and Water (DCCEEW) Action Management Plan Criteria (Appendix A).

2.3 Proposed Action description and location

The Proposed Action is located within the Pilbara region of WA and within the Shire of Ashburton and will be undertaken entirely within the development envelope. The northern end of the development envelope is located approximately 130 km north-north-west of Tom Price and approximately 120 km south east of Karratha. The southern end of the development envelope is located approximately 20 km north-north-west of Tom Price and 215 km south east of Karratha. The Proposed Action is located approximately 1,150 km from Perth at its closest point (Figure 1).

The road will be a two-lane single carriageway (one lane in each direction) road with associated waterway crossings and fencing.

Works will include:

- clearing of vegetation and topsoil removal;
- blasting (required in areas of cut which cannot be excavated by standard earthmoving machinery);
- excavation of material pits to provide construction material;
- water abstraction;
- creation of temporary side-tracks and turnaround locations;
- off formation drainage;

- accommodation works (i.e. fencing) and potential relocation of services;
- site office and construction compound establishment;
- construction of the road formation, including application of asphalt and bitumen;
- haulage of construction materials and any excess materials generated on site;
- stockpiling and laydown areas (mulch, aggregate, material);
- landscaping and revegetation; and
- ongoing maintenance activities.

2.4 Schedule of Action phases

2.4.1 Pre-construction

The Proposed Action is currently in the alignment definition phase which builds on the outcomes of the alignment route and corridor options assessment which was undertaken to finalise an approximately 400 m wide route corridor.

As part of the alignment definition phase, the Phase 1 'base case' concept design has been developed. The base case defines the road alignment along the centreline of the corridor alignment, the 400 – 500 m tie-in and realignment of MRDH Stage 3 at the northern extents, the 400-500 m tie-in and realignment of MRDH Stage 1 and the southern extents, and the Roebourne - Wittenoorn Road.

2.4.2 Construction

Construction will be undertaken using traditional earth-moving, equipment and construction techniques. It is noted that blasting will likely be required in areas of cut which cannot be excavated by standard earthmoving machinery.

The road formation will be built using both imported fill and cut-to-fill materials from within the development envelope.

There is insufficient design detail at this stage to confirm the design and construction method for any bridges that may be included in the design. However, the design is expected to be industry standard, such as pre-cast concrete or steel, supported on piled foundations or spread footings with mechanically stabilised earth (MSE) walls at the abutments.

The key basic raw materials required for construction of the road include sand, limestone, clay, lateritic gravel, and crushed rock aggregate. This material will be sourced in accordance with Main Roads standard practise and processes.

Where practicable, the Proposed Action will seek to balance the "cut to fill" requirements during construction to minimise any net import or export of material from the project. This will minimise the requirement to import additional material, thus minimising costs and environment impacts (e.g. carbon dioxide (CO₂) emissions) associated with transport.

Laydown and stockpiling areas (and potential access tracks) for material and equipment will be required during construction, as will areas for facilities such as site offices etc. The location of these will be established by Main Roads. All such areas will be located within the development envelope. Clearing for the material pits, laydown areas, stockpiling and facilities is expected to result in up to approximately 100 ha of vegetation clearing, which will be rehabilitated as part of the Proposed Action.

Water required for construction will be sourced from new or existing bores. It is estimated that between 148,000 and 412,000 L will be required. Any water abstraction required for construction will be undertaken to minimise drawdown and potential impacts on vegetation or fauna. Should new bores be required, a 26D licence to construct or alter a well will be submitted along with a 5C licence to extract water. These licenses will set out the permissible well locations and quantities of water that can be abstracted which will provide assurance with respect to minimising impacts to groundwater levels in the area.

2.4.3 Operation

MRDH Stage 4 will operate as a two-lane single carriageway (one lane in each direction) road. Traffic modelling indicates a likely maximum of 635 vehicles per day will utilise the road, of which up to around 230 will be heavy vehicles. The road will be operated by Main Roads including standard management and maintenance practices. MRDH Stage 4 will be subject to normal routine, recurrent and periodic maintenance during its operation. The maintenance operations are confined to the road corridor and the road itself, typically including vegetation management, drainage, road markings, signs and the road pavement.

2.5 Protected Matters

2.5.1 EPBC Act listed fauna occurrence likelihood assessment

The MNES relevant to the Proposed Action area have been determined through desktop assessments and biological surveys as follows:

- Karratha-Tom Price Road and Pannawonica-Millstream Road Weed Survey (Ecologia Environment, 2018);
- Karratha Tom Price Road (K-TP3 and K-TP4a to Rio Access) Northern Quoll Reconnaissance Survey (GHD Pty Ltd, 2017);
- Manuwarra Red Dog Highway State 4 Biological Survey (Biota 2021a); and
- Red Dog Highway Stage 4 MNES Fauna Habitat Quality Assessment. (Biota, 2021b)

Based on the survey findings, previous records from the study area, and an assessment of habitat within the survey area, six EPBC Act listed threatened species were recorded, may occur or are considered likely to occur in or near the development envelope. These species are:

Recorded:

- Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia* Pilbara form) - Vulnerable;
- Ghost Bat (*Macroderma gigas*) - Vulnerable; and
- Grey Falcon (*Falco hypoleucos*) - Vulnerable.

Likely to occur:

- Northern Quoll (*Dasyurus hallucatus*) – Endangered; and
- Pilbara Olive Python (*Liasis olivaceus barroni*) – Vulnerable.

May occur:

- Night Parrot (*Pezoporus occidentalis*) – Critically Endangered.

2.5.2 Information on MNES

2.5.2.1 Overview

The extent of habitat for each threatened fauna species listed above within the disturbance footprint and the Pilbara region is provided in Table 2-1. These fauna habitats are shown in Figure 2 to Figure 7. Section 2.5.2.2 to Section 2.5.2.7 provide an overview of the each of the threatened species as relevant to the management of the Proposed Action. A detailed description of each of the species is provided in the Preliminary Documentation.

Table 2-1 Threatened fauna habitat extent

SPECIES / HABITAT TYPE	HABITAT EXTENT WITHIN DISTURBANCE FOOTPRINT (HA) *
Northern Quoll – habitat critical to the survival of a species	4.0
Northern Quoll – supporting habitat	174.3
Pilbara Leaf-Nosed Bat – supporting habitat	178.2
Ghost Bat – supporting habitat	313.4
Pilbara Olive Python – supporting habitat	313.3
Night Parrot – supporting habitat	29.3
Grey Falcon – supporting habitat	596.1

*Extent based on current base case disturbance footprint plus an allowance of approximately 10% more than the habitat area mapped within the disturbance footprint. This allowance provides flexibility in the location of the road and construction areas for access and laydown.

2.5.2.2 Northern Quoll (*Dasyurus hallucatus*)

Species background information

The Northern Quoll is listed as Endangered under the EPBC Act (DAWE, 2021a). It is a small omnivorous marsupial with white spots against a dark brown body and with a long tail. It is predominantly nocturnal and solitary.

Northern Quolls do not have highly specific habitat requirements and occur in a variety of habitats across their range (Hill and Ward, 2010). They are most abundant in rocky terrain, which has been shown to support higher population densities and longer-lived individuals (Burnett, 1997; Oakwood, 2000). The species utilises a range of micro-habitats for foraging and denning, such as gorges, breakaways and hills, and also occurs near creek lines and drainage lines, where adjacent plains and vegetated areas provide habitats for foraging and dispersal of young.

In the Pilbara region, Northern Quolls have one breeding season per year from April to September. After 21 to 26 days of gestation, females give birth to an average of up to eight young (DAWE, 2021a). The young are carried in the pouch for up to nine weeks, then deposited in dens.

The key threats to northern quolls as identified in the 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*)' are (Hill and Ward, 2010). Of these threats, predation by feral predators, habitat degradation, habitat destruction and weeds are relevant to the Proposed Action.

Species presence

Distribution modelling of the Northern Quoll shows the Proposed Action is located within an area where the species is known or likely to occur; particularly in the Hamersley Range where approximately 40 km (200 ha) of the Proposed Action is located.

Motion cameras were deployed at 27 locations during the surveys undertaken by Biota (2021a) which included 95 camera trap nights. No observations or secondary evidence of the Northern Quoll were recorded during the Biota (2021a) survey.

While there are no records of Northern Quoll within 1 km of the development envelope, the species has been recorded previously on numerous occasions in close proximity to the development envelope. Naturemap has 152 records within 18 km of the development envelope, the closest being 4.8 km from the development envelope and the most recent being from 2018 (Biota, 2021a). There are also records within 4.1 km of the development area (Ecologica, 2014a) and within 2.1 km of the development envelope (Ecologica, 2012).

Given the extent of high-quality habitat present (particularly along major drainage lines and surrounding rocky areas) and the locations of previous recorded sightings, it is considered highly probable that a population of Northern Quoll exists in the habitat surrounding the development envelope, though this population is likely to occur at low density.

Species habitat extent

Table 2-2 identifies the suitable Northern Quoll habitat that is present in the development envelope. The distribution of these habitats is shown in Figure 2.

Table 2-2 Extent of suitable Northern Quoll habitat within the disturbance footprint and development envelope

HABITAT TYPE	HABITAT IMPORTANCE	EXTENT IN DISTURBANCE FOOTPRINT* (HA)	EXTENT IN DEVELOPMENT ENVELOPE (HA)
Habitat critical to the survival of the Northern Quoll			
HS - Mesas, caves, cliffs and free faces	Critical to the survival of the species – denning	0.14	8.4
RG - Rocky gullies	Critical to the survival of the species – foraging and dispersal	3.8	13.7
Sub-total		4.0	22.1
Supporting habitat			
RHS – Rocky hills and slopes with low open spinifex and scattered trees	Supporting habitat – foraging, dispersal	88.7	702.1

MDE - <i>Eucalyptus</i> fringed major drainage lines and associated tributaries	Supporting habitat – foraging, dispersal	85.5	1,233.1
MDM - <i>Melaleuca</i> forest/major drainage lines	Supporting habitat – foraging, dispersal	0.03	21.2
Sub-total		174.3	1,956.4
Total		178.3	1,978.5

*Extent based on current base case disturbance footprint plus an allowance of approximately 10% more than the habitat area mapped within the disturbance footprint. This allowance provides flexibility in the location of the road and construction areas for access and laydown.

Species Habitat Quality and Importance

The Northern Quoll habitat present in the development envelope represents denning, foraging and dispersal habitat for the species. Of the suitable habitats present the mesas, caves, cliffs and free faces and rocky gullies habitat types are suitable for denning. Given this, Northern Quolls present in the development envelope are most likely using the area primarily for foraging and dispersal.

The quality of the Northern Quoll habitat within the development envelope is rated '8' for denning and '7' for foraging based on Excellent condition denning and foraging habitat being present, with the species not confirmed but likely part of population in the locality (Biota, 2021b).

The following habitat types are rocky habitats within the development envelope considered to represent habitat critical to the survival of the Northern Quoll (Biota, 2021b):

- Mesas, caves, cliffs and free faces; and
- Rocky gullies.

There is a total of 4.0 ha of habitat critical to the survival of the Northern Quoll within the disturbance footprint.

Habitat critical to the survival of the Northern Quoll is defined as habitat within the modelled distribution of the species which provides shelter for breeding, refuge from fire / or predation and potential poisoning from Cane Toads (DoE, 2016). Habitat critical to the survival usually occurs in the form of (DoE, 2016; Hill and Ward, 2010):

- rocky habitats such as ranges, escarpments, mesas, gorges, breakaways, boulder fields, major drainage lines or treed creek lines;
- structurally diverse woodland or forest areas containing large diameter trees, termite mounds or hollow logs; and
- offshore islands where the northern quoll is known to exist.

Dispersal and foraging habitat associated with or connecting populations considered 'important for the long-term survival of the northern quoll' (high density populations within habitat critical to the

survival of the species, populations in habitats free of cane toads and populations subject to ongoing conservation or research actions) is also considered habitat critical to the survival of the northern quoll (DoE, 2016).

The referral guideline for the Northern Quoll (DoE, 2016) identifies foraging or dispersal habitat to be any land comprising predominantly native vegetation in the immediate area (i.e. within 1 km) of shelter habitat. Given this, Northern Quoll habitat within 1 km of the habitat identified as habitat critical to the survival of the Northern Quoll is considered to be important habitat for the species. There is 42.3 ha of this habitat within the indicative disturbance footprint.

2.5.2.3 Pilbara leaf-nosed bat (*Rhinonictoris aurantia*)

Species background information

The Pilbara Leaf-nosed Bat is listed as Vulnerable under the EPBC Act (DAWE, 2021b). It is a sub-population of the orange leaf-nosed bat (DAWE, 2021b). It is insectivorous and of moderate size, with short fur, small ears and a fleshy diamond-shaped nose-leaf surrounding the nostrils.

The Pilbara Leaf-nosed Bat is a poor thermoregulator, exhibiting evaporative water loss of more than double that of other bats (Churchill, 2008). Therefore, it has an obligate reliance on deep caves and underground mines, especially in the Pilbara (Armstrong, 2001). Its persistence in the Pilbara depends heavily on the presence of physiologically benign, humid and temperature-stable caves and dis-used mines, which it uses as roosts. These sites provide the necessary narrow temperature and humidity conditions for the species, which range from 28 to 32 °C and 96 to 100 per cent relative humidity (Churchill, 2008).

The species is generally encountered in rocky areas that provide opportunity for roosting in caves or disused underground mines (Armstrong, 2001). The species forages in *Triodia* hummock grassland, sparse tree and shrub savannah and riparian vegetation along drainage lines (Duncan et al., 1999). Other foraging habitat used by the species includes gorges with pools, gullies, rocky outcrops, major watercourses and open grassland and woodland (TSSC, 2016a).

Little is known about the breeding of the Pilbara Leaf-nosed Bat, however, studies have been undertaken on the Orange Leaf-nosed Bat in the NT (Churchill, 1995). They typically breed once a year in July, with gestation lasting approximately 150 days. Young are independent by the following February, approximately eight months after mating. Life expectancy is approximately 10 years. This cycle is assumed to be similar in the Pilbara Leaf-nosed Bat sub-species (DAWE, 2021c).

Threats to the Pilbara Leaf-nosed Bat include forced exodus of roost sites, interruption of breeding activity, underground mine collapse or flooding, mine development, blasting in adjacent mine pits and underground workings, human disturbance to roosts, roadkill, site rehabilitation of disused mine shafts and natural predators (DAWE, 2021b). Of these threats, interruption of breeding activity, blasting, human disturbance of roosts and roadkill are relevant to the Proposed Action.

Species presence

Bat sampling using ultrasonic sound recorders (USRs) was undertaken at 22 sites for a period of one to three nights at each site during the Biota (2021a) survey.

Pilbara Leaf-Nosed Bat calls were recorded at two locations within the development envelope (Figure 3), as follows:

- call recordings on two occasions (on consecutive evenings) in *Eucalyptus* fringed major drainage lines and associated tributaries habitat towards the northern end of the development envelope; and
- call recording on one occasion in Mulga Grove habitat towards the southern end of the development envelope.

No caves suitable for roosting were recorded in the development envelope. However, the species typically has a dry season foraging range of 15 to 20 km from its primary roost and does forage at greater distances if suitable water sources are available (Bullen, 2013). Accordingly, while no caves suitable for roosting were recorded in the development envelope, the call recordings suggest that there is likely one or more unknown roosts in the vicinity of the development envelope. This shows that a population of Pilbara Leaf-nosed Bats utilise the development envelope and surrounding areas as supporting habitat, and that there are likely active roost caves within 15 to 20 km of the development envelope.

Species habitat extent

Table 2-3 identifies the suitable Pilbara Leaf-Nosed Bat habitat that is present in the development envelope. The distribution of these habitats is shown in Figure 3.

Table 2-3 Extent of suitable Pilbara Leaf-nosed Bat habitat within the disturbance footprint and development envelope

HABITAT TYPE	HABITAT IMPORTANCE	EXTENT IN DISTURBANCE FOOTPRINT* (HA)	EXTENT IN DEVELOPMENT ENVELOPE (HA)
HS - Mesas, caves, cliffs and free faces	Supporting habitat - potential roosting, foraging	0.14	8.4
RHS - Rocky hills and slopes with low open spinifex and scattered trees	Supporting habitat - foraging	88.7	702.1
MDE - <i>Eucalyptus</i> fringed major drainage lines and associated tributaries	Supporting habitat - foraging	85.5	1,233.1
MDM - <i>Melaleuca</i> forest/major drainage lines	Supporting habitat - foraging, flyway, drinking	0.03	21.2
RG - Rocky gullies	Supporting habitat - foraging	3.8	13.7
Total		178.2	1,978.5

*Extent based on current base case disturbance footprint plus an allowance of approximately 10% more than the habitat area mapped within the disturbance footprint. This allowance provides flexibility in the location of the road and construction areas for access and laydown.

Species habitat quality and importance

The quality of the Pilbara Leaf-nosed Bat habitat within the development envelope is rated as '7' for roosting and '8' for foraging. No roosting sites were identified during the field survey (Biota, 2021a). Excellent condition foraging habitat is present, however, it is likely that the individuals recorded during the field survey are from a roost outside of the survey area. Extensive suitable

foraging habitat is available within an approximately 20 km radius of the development envelope (Biota, 2021b).

The conservation advice for the Pilbara Leaf-nosed Bat identifies permanent diurnal roosts, non-permanent breeding roosts and transitory diurnal roosts as habitat critical to the survival of the Pilbara Leaf-nosed bats. Nocturnal refuges are not considered habitat critical to the survival of the species but are considered important for local persistence in the area (TSSC, 2016a). Caves and complex mines deep enough to create this environment are uncommon in the Pilbara (van Dyck and Strahan, 2008).

As no suitable roosting caves have been identified within the development envelope, no habitat critical to the survival of the species (as defined above; TSSC, 2016a) has been identified within the development envelope.

The conservation advice also identifies foraging habitat as important for sustaining populations including gorges with pools, gullies, rocky outcrops, major watercourses, and open grassland and woodlands (TSSC, 2016a). As such, the following habitat types that occur in the development envelope are considered supporting habitat for the Pilbara Leaf-nosed Bat:¹

- Mesas, caves, cliffs and free faces (Priority 3 - foraging habitat).
- Rocky hills and slopes with low open spinifex and scattered trees (Priority 5 - foraging habitat);
- Rocky gullies (Priority 5 - foraging habitat);
- *Eucalyptus* fringed major drainage lines and associated tributaries (Priority 4 - foraging habitat); and
- *Melaleuca* forest/major drainage lines (Priority 4 - foraging habitat).

2.5.2.4 Ghost Bat (*Macroderma gigas*)

Species background information

The Ghost Bat is listed as Vulnerable under the EPBC Act (TSSC, 2016b). The Ghost Bat is the largest bat of sub-order Microchiroptera in Australia and is primarily insectivorous, however; it will also feed on other bats, small mammals, birds, frogs and reptiles (Milne et al., 2016; TSSC, 2016b). The bat's fur is light to dark grey and it has long ears, large eyes, a simple nose-leaf and no tail (van Dyck and Strahan, 2008). The species uses several roosts per night and often returns to the same daytime roost.

Ghost Bats occur over a range of landforms and inhabit areas with suitable caves for roost sites (Churchill, 2008). Roost sites include deep natural caves, rock crevices and disused mine adits that have a stable temperature and moderate to high relative humidity (TSSC, 2016b). In the Hamersley Range, preferred roosting habitat appears to be caves beneath bluffs of low rounded hills composed of Marra Mamba geology and larger hills of Brockman Iron Formation (Armstrong and Anstee, 2000).

Ghost Bats are known to require a number of suitable caves throughout their home ranges, due to both temporal factors (i.e. night/feeding roosts for feeding throughout the duration of the night, as well as day roosts for resting) and seasonal factors (use of certain caves as maternity roosts, depending on the right environmental conditions). The presence of day roosts and/or maternity roosts in an area is the most important indicator of suitable habitat for Ghost Bats, and these caves are generally the primary focus of conservation and/or monitoring (TSSC, 2016b).

¹ Priority 3, 4 and 5 refers to protection priorities for Pilbara Leaf-nosed habitat as defined in the conservation advice for the species (TSSC, 2016a).

The occurrence of pools of water is a critical component of the Ghost Bat foraging habitat (Armstrong, 2001) and anecdotal accounts from field observations suggest that water sources in proximity to day roost caves are likely to be important (Armstrong, 2013).

Females aggregate in maternity roosts and breed at an age of two to three years (Milne et al., 2016). Mating generally occurs in May and gestation time is assumed to be 8 months.

Threats

Threats to the Ghost Bat include habitat loss (including destruction of roost sites), disturbance of breeding sites, modification of foraging habitat, collision with fences, collapse or rework of disused mines, contamination by mining residue at roost sites, disease, poisoning by cane toads and competition for prey with introduced species. (TSSC, 2016b). Of these threats, habitat and roost sites loss, disturbance of breeding sites, modification of foraging habitat, collisions with fences and competition with introduced species are relevant to the Proposed Action.

Species presence

Bat sampling using USRs was undertaken at 22 sites for a period of one to three nights at each site during the Biota (2021a) survey. No records of Ghost Bats were identified using the USRs.

One cave containing ghost bat scat and ghost bat remains was identified within the development envelope during the Biota (2021a) survey. This cave is located approximately 300 m from the disturbance footprint in the Rocky hills and slopes with low open spinifex and scattered trees habitat type (Figure 4).

In addition, Ghost Bats caves were reported in two locations in the Hamersley section of the Biota survey area (approximately 125 m outside of the development envelope) in the Rocky hills and slopes with low open spinifex and scattered trees habitat type (Figure 4). One of these caves has been identified as a potential maternity roost cave (Biota, 2021b).

This, together with the extensive suitable foraging habitat and historical records shows that a population of Ghost Bats use the area.

Species habitat extent

Table 2-4 identifies the suitable Ghost Bat habitat that is present in the development envelope. The distribution of these habitats is shown in Figure 4.

Table 2-4 Extent of suitable Ghost Bat habitat within the disturbance footprint and development envelope

HABITAT TYPE	HABITAT IMPORTANCE	EXTENT IN DISTURBANCE FOOTPRINT* (HA)	EXTENT IN DEVELOPMENT ENVELOPE (HA)
CP - Floodplains	Supporting habitat – foraging	135.0	1,778.6
HS - Mesas, caves, cliffs and free faces	Supporting habitat – potential roosting, foraging	0.14	8.4
RHS - Rocky hills and slopes with low open spinifex and scattered trees	Supporting habitat – foraging	88.7	702.1
MDE - <i>Eucalyptus</i> fringed major drainage lines and associated	Supporting habitat – foraging, drinking	85.5	1,233.1

tributaries			
MDM - <i>Melaleuca</i> forest/major drainage lines	Supporting habitat – foraging, flyway, drinking	0.03	21.2
RG - Rocky gullies	Supporting habitat – foraging	3.8	13.7
MMW - Man-made water bodies	Supporting habitat –drinking	0.14	2.3
Total		313.4	3,882.7

*Extent based on current base case disturbance footprint plus an allowance of approximately 10% more than the habitat area mapped within the disturbance footprint. This allowance provides flexibility in the location of the road and construction areas for access and laydown.

Species habitat quality and importance

The quality of the Ghost Bat habitat within the development envelope is rated as '10' for roosting and '9' for foraging based on the confirmed roost sites and a possible maternity roost being present approximately 125 m outside of the development envelope, with excellent condition foraging habitat in proximity to the roosts (Biota, 2021b).

The conservation advice for the Ghost Bat notes that the species' persistence in the arid Pilbara depends on the physiologically benign day roosts found deep underground in humid, temperature-stable caves. The cave with evidence of Ghost Bat usage identified within the Development Envelope and the two caves located in close proximity to the development envelope area represent habitat of high importance to the Ghosts Bats in the area, with the local population likely reliant on the caves. The conservation advice for Ghost Bats suggests that suitable habitat within 5 km of diurnal roost sites provide good foraging opportunities for the species (TSSC, 2016b). Given this, the Ghost Bat habitat within 5 km of the possible maternity roost is likely of higher importance to Ghost Bats.

The remaining Ghost Bat habitat in the area is likely used as foraging, flyway and drinking habitat. Given these habitats are widely represented in the region, it is unlikely that Ghosts Bats would be restricted to or reliant on these habitats.

2.5.2.5 Pilbara Olive Python (*Liasis olivaceus barroni*)

Species background information

The Pilbara Olive Python is listed as Vulnerable under the EPBC Act (TSSC, 2008). It is a subspecies of the Olive Python (TSSC, 2008). It is a dull olive-brown to pale fawn or rich brown colour with a white belly (TSSC, 2008). It is on average 2.5 m in length, however, individuals can grow up to 4 m (Cogger, 2000). They are adept at swimming and hunt in waterholes or along tracks. Their diet consists of wallabies, euros, fruit bats, ducks, corellas, spinifex pigeons and coucals (Pearson, 2006).

The Pilbara Olive Python prefers escarpments, gorges, rocky outcrops and water holes in the ranges of the Pilbara region (Pearson, 1993; Wilson and Swan, 2003). The snake finds shelter in caves, under boulders, in water and trees overhanging water (Bush and Maryan, 2011). Radio-telemetry has shown that individuals are usually in close proximity to water and rock outcrops that attract suitable sized prey species (TSSC, 2008). It should be noted though that while the species is often associated with ephemeral or permanent water, individuals have large home ranges (between 88 ha and 449 ha) and may be recorded in rocky habitats some distance from these features (Biota, 2021a).

The Pilbara Olive Python breeding season occurs from June to August. Males travel up to 4 km in search of females. They then move to shelter to breed and remain there for up to three weeks. Females lay eggs in October which later hatch in January (DAWE, 2021c).

Threats to the Pilbara Olive Python include major fire events, predation by feral cats and foxes, predation of food sources by foxes, destruction of habitat from mining infrastructure development, tourists using waterholes (Pearson, 2006). Of these threats, predation and competition with introduced species and destruction of habitat are relevant to the Proposed Action.

Species presence

The development envelope is within the modelled distribution for the species and the species is known or likely to occur with records throughout the Hamersley Ranges. No evidence of Pilbara Olive Pythons was observed during the Biota (2021a) survey. However, there is excellent quality habitat for the species in the development envelope and surrounding areas, and nearby historical records suggest that the species is likely to be present in the area.

Known important populations of the Pilbara Olive Python in the vicinity of the development envelope exist in the Tom Price and Millstream areas (DSEWPaC, 2012).

Species habitat extent

The potential Pilbara Olive Python habitat listed in Table 2-5 is present in the development envelope. The distribution of these habitats is shown in Figure 5.

Table 2-5 Extent of suitable Pilbara Olive Python habitat within the disturbance footprint and development envelope

HABITAT TYPE	HABITAT IMPORTANCE	EXTENT IN DISTURBANCE FOOTPRINT* (HA)	EXTENT IN DEVELOPMENT ENVELOPE (HA)
CP - Floodplains	Supporting habitat - foraging	135.0	1,778.6
HS - Mesas, caves, cliffs and free faces	Supporting habitat - foraging	0.14	8.4
RHS - Rocky hills and slopes with low open spinifex and scattered trees	Supporting habitat - foraging	88.7	702.1
MDE - <i>Eucalyptus</i> fringed major drainage lines and associated tributaries	Supporting habitat - foraging	85.5	1,233.1
MDM - <i>Melaleuca</i> forest/major drainage lines	Supporting habitat - foraging	0.03	21.2
RG - Rocky gullies	Supporting habitat - foraging	3.8	13.7
Total		313.3	3,757.1

*Extent based on current base case disturbance footprint plus an allowance of approximately 10% more than the habitat area mapped within the disturbance footprint. This allowance provides flexibility in the location of the road and construction areas for access and laydown.

Species habitat quality and importance

The quality of the Pilbara Olive Python habitat within the development envelope is rated '7' based on the excellent condition foraging habitat present with the species not confirmed but likely part of population in the locality (Biota, 2021b).

The conservation advice for the Pilbara Olive Python does not identify habitat critical to the survival of the species. Given the species habitat preference the habitats shown above are considered supporting habitat for the species. None of these habitats are likely to be habitats critical to the survival of the species (DoE, 2013). Pilbara Olive Python individuals have large home ranges (between 88 ha and 449 ha), therefore they are unlikely to be dependent on the habitat to be cleared (Biota, 2021).

2.5.2.6 Night Parrot (*Pezoporus occidentalis*)

Species background information

Night Parrot is listed as Endangered under the EPBC Act (TSSC, 2016c). The species is a highly elusive, nocturnal ground dwelling parrot that grows up to 25 cm long (TSSC, 2016c). Adults are mostly bright green with black and yellow markings. They are found in the arid and semi-arid zones of Australia

Historically, the Night Parrot has been known to inhabit a wide variety of habitats, however most habitat records are of *Triodia* (Spinifex) grasslands and/or Chenopod shrublands in the arid and semi-arid zones. *Astrelba* spp. (Mitchell Grass), shrubby samphire and chenopod associations, scattered trees and shrubs, *Acacia aneura* (Mulga) woodland, treeless areas and bare gibber (desert pavement) are also associated with sightings of the species (Higgins and Davies, 1996, Garnett et al., 2011).

Nesting sites are reported within dense vegetation, primarily old and large spinifex clumps (TSSC, 2016c). The breeding parameters of Night Parrots are largely unknown. It is believed to take place after heavy rainfall, with unverified reports of breeding activity in April, July and August (NSW Government, 2017a). It is estimated that the lifespan is 10 years.

There are no known threats to the Night Parrot however the conservation advice lists threats that are considered realistic threats in absence of direct evidence. These include inappropriate fire regimes, soil disturbance from grazing by domestic or feral herbivores, predation by feral cats and foxes, competition for food by livestock or feral herbivores, disease, collision with fencing and loss or degradation of habitat (DBCA, 2017; TSSC, 2016c).

Of these threats, fencing, predation and competition with introduced species and destruction of habitat are relevant to the Proposed Action.

Species presence

The Proposed Action occurs within the modelled distribution of the Night Parrot in an area where habitat may be present (TSSC, 2016c).

Two nights of survey using auditory acoustic recording units (ARUs) within Floodplain habitat (Coolawanyah section), and five nights within Grassland plains with cracking clay habitat type (Tom Price section), were undertaken in April 2020. No Night Parrots were detected during the survey. The Night Parrot was also not recorded in surveys of areas nearby previously undertaken by Biota (2021a). However, the floodplains and the grassland plains with cracking clay habitat within the development envelope may provide habitat for Night Parrot foraging. It is considered, therefore that while this species 'May occur' within the development envelope due to the presence of

suitable habitat, it is considered highly unlikely that an important Night Parrot population is present in the development envelope.

Species Habitat Extent

Table 2-6 shows the potential Night Parrot habitat is present in the development envelope. The distribution of these habitats is shown in Figure 6.

Table 2-6 Extent of suitable Night Parrot habitat within the disturbance footprint and development envelope

HABITAT TYPE	HABITAT IMPORTANCE	EXTENT IN DISTURBANCE FOOTPRINT* (HA)	EXTENT IN DEVELOPMENT ENVELOPE (HA)
GPCC - Grassland plains with cracking clay	Supporting habitat - foraging	29.3	203.4

*Extent based on current base case disturbance footprint plus an allowance of approximately 10% more than the habitat area mapped within the disturbance footprint. This allowance provides flexibility in the location of the road and construction areas for access and laydown.

Species Habitat Quality and Importance

The quality of the Night Parrot habitat within the development envelope is rated as '3' based on there being no evidence that the species occurs in the development envelope or in close proximity and the presence of suitable foraging habitat in Poor-Good condition (Biota, 2021b)

The conservation advice for the Night Parrot does not identify habitat critical to the survival of the species. Given the species habitat preference and low habitat quality, the Grassland plains with cracking clay habitat is considered supporting habitat for the Night Parrot.

2.5.2.7 Grey Falcon (*Falco hypoleucos*)

Species background information

The Grey Falcon is listed as Vulnerable under the EPBC Act (TSSC, 2020). It is the rarest of the falcon species found in Australia and consists of a single population (TSSC, 2020). It is a medium-sized, pale falcon with a heavy thick chest, long wings and dark wing tips (TSSC, 2020). It primarily preys on birds, reptiles and mammals (NSW Government, 2017b).

Grey Falcons typically nest in the tallest trees along watercourses, particularly river red gum (*Eucalyptus camaldulensis*), though they have also been known to nest in communications towers (Marchant and Higgins, 1993). It is known to frequent timbered lowland plains, particularly *Acacia* shrublands that are crossed by tree-lined watercourses, tussock grassland and open woodland, and has been observed hunting in treeless areas (Garnett et al., 2011; Schoenjahn, 2018).

Breeding commonly occurs in tall trees such a river red gums, or on man-made structures from June to November (TSSC, 2020). Clutch size can vary from one to four eggs, which are laid in the old nests of other birds (TSSC, 2020). The young Grey Falcons stay with their parents for at least 12 months after fledging.

Threats to the Grey Falcon include grazing and clearing of arid and semi-arid rangelands, the small population size, nest shortage, collision with traffic, collision with fences, increased temperatures in arid and semi-arid Australia, predation by cats, secondary poisoning through mouse and locust control programs and taking of eggs and young for collections and falconry (NSW Government, 2017b; TSSC, 2020). Notably, the conservation advice for the Grey Falcon recognises that the

threats listed within this advice are 'based on general considerations and extrapolations from better studied species and are, therefore, speculative' (TSSC, 2020). Of these threats, collision with traffic, collision with fences and predation by introduced species are relevant to the Proposed Action.

Species presence

One Grey Falcon was observed once in flight during the Biota (2021a) survey, likely foraging. This observation was within the Rocky hills and slopes with low open spinifex and scattered tree habitat type. The location of the observation is shown Figure 7.

Species habitat extent

Table 2-7 presents the potential Grey Falcon habitat that is present in the development envelope. The distribution of these habitats is shown in Figure 7.

Table 2-7 Extent of suitable Night Parrot habitat within the disturbance footprint and development envelope

HABITAT TYPE	HABITAT IMPORTANCE	EXTENT IN DISTURBANCE FOOTPRINT* (HA)	EXTENT IN DEVELOPMENT ENVELOPE (HA)
MG - Grove Mulga	Supporting habitat - foraging	69.7	666.2
MWP - Mulga Woodland Plain	Supporting habitat - foraging	16.1	122.5
ASCC - Acacia xiphophylla shrublands over cracking clay	Supporting habitat - foraging	10.4	328.9
ASM - Mixed Acacia shrublands	Supporting habitat - foraging	157.5	1,659.2
GPCC - Grassland plains with cracking clay	Supporting habitat - foraging	29.3	203.7
CP - Floodplains	Supporting habitat - foraging	135	1,778.6
HS - Mesas, caves, cliffs and free faces	Supporting habitat - foraging	0.14	8.4
RHS - Rocky hills and slopes with low open spinifex and scattered trees	Supporting habitat - foraging	88.7	702.1
MDE - <i>Eucalyptus</i> fringed major drainage lines and associated tributaries	Supporting habitat – nesting, foraging	85.5	1,233.1
MDM - <i>Melaleuca</i> forest/major drainage lines	Supporting habitat – nesting, foraging	0.03	21.2
RG - Rocky gullies	Supporting habitat - foraging	3.8	13.7
MMW - Man-made water bodies	Supporting habitat – foraging, drinking	0.14	2.3
Total		596.1	6739.9

*Extent based on current base case disturbance footprint plus an allowance of approximately 10% more than the habitat area mapped within the disturbance footprint. This allowance provides flexibility in the location of the road and construction areas for access and laydown.

Species habitat quality and importance

The quality of the Pilbara Leaf-nosed Bat habitat within the development envelope is rated as '6' based on the confirmed record and excellent condition foraging habitat being present, but noting that the species occurs widely in similar habitats which are extensive in the locality (Biota, 2021b).

The conservation advice for the Grey Falcon does not identify habitat critical to the survival of the species. All habitats in and around the development envelope are likely to be used for foraging, at least on occasion, with waterholes or other features attracting aggregations of birds likely to be particularly attractive (Biota, 2021a). Given this preference and that the species nests in tall trees along watercourses, the habitats shown above are considered supporting habitat for the species.

2.5.3 Location and condition

The available habitat within the development envelope for each of the relevant MNES fauna for the Proposed Action is shown in:

- Figure 2 Northern Quoll habitat
- Figure 3 Pilbara Lead-nosed Bat habitat
- Figure 4 Ghost Bat habitat
- Figure 5 Pilbara Olive Python habitat
- Figure 6 Night Parrot habitat
- Figure 7 Grey Falcon habitat

These figures also show the locations of the recordings of (Biota,2021):

- Pilbara Leaf-nosed Bat – three call recordings at two locations within the development envelope
- Ghost Bat - one cave containing ghost bat scat and ghost bat remains was identified within the development envelope. Two caves within 150 m of the development envelope with one identified as a potential maternity roost cave.
- Grey Falcon – observed once in flight, likely foraging.

An assessment of the quality of the habitat that is present within the development envelope for each species has been undertaken in accordance with the guidance provided in the DCCEEW "How to use the offset assessment guide". The guidance sets out the three components that contribute to the calculation of habitat quality. These components then contribute to the final habitat quality score (DSEWPaC, 2012). An assessment of the quality of the habitat that is present in and around the development envelope for each relevant species is presented in Appendix 3 of the Preliminary Documentation with the results for each species including in Section 2.5.2.

3 MANAGEMENT OBJECTIVES

This AMP has been prepared with the objective that potential impacts of the Proposed Action to MNES are acceptable, minimised and managed. It is a 'management-based' AMP to document management actions required during Proposed Action construction and operation. Management measures within this AMP are specific to the Proposed Action.

The following management targets have been identified:

1. Prevent unauthorised clearing of EPBC Act listed threatened fauna habitat including clearing no more than:
 - a) 178.3 ha of Northern Quoll foraging, dispersal and denning habitat including no more than 4.0 ha of habitat critical to the survival of the Northern Quoll species;
 - b) 178.2 ha of Pilbara Leaf-nosed Bat roosting, foraging, flyway and drinking habitat;
 - c) 313.4 ha of Ghost Bat roosting, foraging, flyway and drinking habitat;
 - d) 313.3 ha of Pilbara Olive Python foraging habitat;
 - e) 29.3 ha of potential Night Parrot foraging habitat; and
 - f) 596.1 ha of Grey Falcon nesting, foraging and drinking habitat.
2. Prevent unauthorised impacts to groundwater levels and groundwater quality.
3. Avoid indirect impacts to groundwater dependent vegetation.
4. Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.
5. No introduction or spread of declared weeds, WONS or serious environmental weed species into surrounding native vegetation adjacent to the Development Envelope during and attributable to construction.
6. Avoid impacts to roosting caves used by Ghost Bats.
7. Minimise injury or mortality to EPBC listed threatened species during operation.

4 SMART PERFORMANCE STANDARDS

The DCCEEW request for additional information identifies the application of 'SMART' (specific, measurable, achievable, relevant and time-bound) performance standards to be applied to AMPs.

SMART performance standards are intended to relate to measurable (numerical) values which can be applied to a Proposal (rather than qualitatively measured management/monitoring actions), and may include measurements such as 'threshold criteria', 'performance indicators', 'corrective actions' and 'completion criteria'.

Table 4-1 identifies the SMART performance standards related to the measurable impacts of the Proposed Action. These SMART performance standards complement the management actions and performance targets identified in Table 6-1, the monitoring actions identified in Table 9-1, and the corrective actions identified in Table 6-1.

The 'threshold criteria' and 'completion criteria' are considered to be achievable, with the risk potential of not achieving the proposed SMART performance standards captured by the risk assessment presented in Table 5-4.

As the proposed SMART performance standards for 'threshold criteria' and 'completion criteria' relate to physical measures which can be readily controlled through standard construction management processes, it is considered the proposed SMART performance standards have a low level of uncertainty, with additional margins for safety not required.

The SMART performance standards do not require detailed statistical analysis to determine if the 'threshold criteria' and 'completion criteria' have been met, nor require statistical power to detect change (for example, seasonal or climatic variability), nor control or reference sites (for comparative purposes).

Table 4-1 SMART performance standards

THRESHOLD CRITERIA	PERFORMANCE INDICATORS	CORRECTIVE ACTIONS	COMPLETION CRITERIA
Clearing 178.3 ha of Northern Quoll foraging, dispersal and denning habitat including no more than 4.0 ha of habitat critical to the survival of the Northern Quoll species.	Area (ha) of Northern Quoll foraging, dispersal and denning habitat cleared. Area (ha) of habitat critical to the survival of the Northern Quoll species cleared.	Refer to Table 6-1	No more than 178.3 ha of Northern Quoll foraging, dispersal and denning habitat, including no more than 4.0 ha of habitat critical to the survival of the Northern Quoll species cleared.
Clearing of 178.2 ha of Pilbara Leaf-nosed Bat roosting, foraging, flyway and drinking habitat.	Area (ha) of Pilbara Leaf-nosed Bat roosting, foraging, flyway and drinking habitat cleared.		No more than 178.2 ha of Pilbara Leaf-nosed Bat roosting, foraging, flyway and drinking habitat cleared.
Clearing of 313.4 ha of roosting, foraging, flyway and drinking Ghost Bat Habitat.	Area (ha) of Ghost Bat roosting, foraging, flyway and drinking habitat cleared.		No more than 313.4 ha of Ghost Bat roosting, foraging, flyway and drinking habitat cleared.
Clearing of 313.3 ha of Pilbara Olive Python foraging habitat.	Area (ha) of Pilbara Olive Python foraging habitat cleared.		No more than 313.3 ha of Pilbara Olive Python foraging habitat cleared.
Clearing of 29.3 ha of Night Parrot foraging habitat.	Area (ha) of Night Parrot foraging habitat cleared.		No more than 29.3 ha of Night Parrot foraging habitat cleared.
Clearing of 596.1 ha of Grey Falcon habitat.	Area (ha) of Grey Falcon foraging habitat cleared.		No more than 596.1 ha of Grey Falcon habitat cleared.

5 RISK ASSESSMENT

A risk assessment of the potential impacts identified for the Proposed Action construction and operational phases has been undertaken. The risk assessment adopts likelihood and consequence criteria and a risk matrix presented in Table 5-1, Table 5-2 and Table 5-3, consistent with the Action Management Plan Criteria (Appendix A).

Table 5-4 presents the risk assessment results, incorporating a summary of mitigation measures to generate a residual risk outcome for each identified risk. Details of mitigation measures including monitoring and corrective actions are presented in Section 6.

Table 5-1 Likelihood criteria

LIKELIHOOD	CRITERIA
Highly likely	Is expected to occur during the construction/operation period
Likely	Will probably occur during the construction/operation period
Possible	Might occur during the construction/operation period
Unlikely	Could occur during construction/operation but considered unlikely or doubtful
Rare	May occur in exceptional circumstances

Table 5-2 Consequence criteria

CONSEQUENCE	CRITERIA
Minor	Minor environmental impact that can be reversed
Moderate	Isolated but substantial environmental impact that could be reversed with intensive efforts
High	Substantial environmental impact that could be reversed with intensive efforts
Major	Major loss of environmental value and real danger of continuing
Critical	Severe widespread loss of environmental value and irrecoverable environmental damage

Table 5-3 Risk ranking matrix

LIKELIHOOD	CONSEQUENCE				
	MINOR	MODERATE	HIGH	MAJOR	CRITICAL
Highly likely	Medium	High	High	Severe	Severe
Likely	Low	Medium	High	High	Severe
Possible	Low	Medium	Medium	High	Severe
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	High

Table 5-4 Risk assessment of Proposed Action to Threatened fauna

MANAGEMENT OBJECTIVE	IMPACT	CAUSE	LEVEL OF UNCERTAINTY	SUMMARY OF MITIGATION	RESIDUAL RISK		
					LIKELIHOOD	CONSEQUENCE	RISK RATING
Construction – Fauna Habitat							
<p>Prevent unauthorised clearing of EPBC Act listed threatened fauna habitat.</p> <p>Achieve SMART performance standards (Table 4-1).</p>	<p>Direct impact causing loss exceeding SMART performance standards:</p> <ul style="list-style-type: none"> 178.3 ha of Northern Quoll foraging, dispersal and denning habitat including no more than 4.0 ha of habitat critical to the survival of the Northern Quoll species 178.2 ha of Pilbara Leaf-nosed Bat roosting, foraging, flyway and drinking habitat. 313.4 ha of Ghost Bat roosting, foraging, flyway and drinking Habitat. 313.3 ha of Pilbara Olive Python foraging habitat. 29.3 ha of foraging Night Parrot habitat. 596.1 ha of Grey Falcon nesting, foraging and drinking habitat. 	<p>Unauthorised clearing of MNES fauna habitat.</p>	<ul style="list-style-type: none"> The nature of potential impact is known and predictable based on surveys within and adjacent to the development, undertaken in accordance with Environmental Protection Authority and Commonwealth guidance. The scale of potential impacts is unpredictable as it relates to unauthorised clearing, however should it occur, it is only likely to be isolated and of a much smaller scale than authorised clearing. 	<ul style="list-style-type: none"> The extent of the approved clearing will be clearly communicated in documentation. All clearing areas will be clearly marked and approved by the Main Roads superintendent prior to clearing commencing. Vegetation to be retained will be clearly marked with flagging on site. Within the constraints of other requirements (construction requirements, avoiding heritage sites), consideration will be given to habitat importance during the selection of additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around. Areas will be prioritised in the following order: <ol style="list-style-type: none"> Existing cleared areas / areas cleared for permanent works. Areas that do not contain habitat associated with EPBC Act listed threatened species that are considered likely to or may occur in or near the development envelope. Areas that contain habitat that may be utilised by EPBC Act listed threatened species that are considered likely to or may occur in or near the development envelope The following areas will not be used as additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around: <ul style="list-style-type: none"> Habitat critical to the survival of the Northern Quoll; Important foraging and dispersal habitat for the Northern Quoll (defined as Northern Quoll habitat within 1 km of habitat critical to the survival of the Northern Quoll); and Ghost Bat foraging habitat within 5 km of the possible maternity roost identified by Biota (2021a). Restrict all personnel to the approved disturbance footprint including designated access routes and parking areas. 	Unlikely	Moderate	Low
<p>Prevent unauthorised impacts to groundwater</p>	<p>Indirect impacts to EPBC Act listed threatened fauna habitat.</p>	<p>Groundwater abstraction.</p>	<ul style="list-style-type: none"> The nature of potential impact is known and predictable based on known locations of 	<ul style="list-style-type: none"> Water required for construction and dust management will be sourced from existing bores and potentially from new sources for the southern section. Should new bores be required, a 26D 	Unlikely	Moderate	Low

MANAGEMENT OBJECTIVE	IMPACT	CAUSE	LEVEL OF UNCERTAINTY	SUMMARY OF MITIGATION	RESIDUAL RISK		
					LIKELIHOOD	CONSEQUENCE	RISK RATING
levels and groundwater quality. Avoid indirect impacts to groundwater dependent vegetation.			vegetation that is dependent on groundwater. <ul style="list-style-type: none"> The scale of potential impacts is unpredictable as it relates to unauthorised groundwater abstraction and unplanned incidents.. 	licence to construct or alter a well will be submitted along with a 5C licence to extract water. <ul style="list-style-type: none"> Results of further studies on sustainable construction water abstraction will be implemented to reduce project water use as far as practicable. Main Roads will develop and implement a Groundwater and Surface Water Operating Strategy (GSWOS). The objectives of the GSWOS with respect to groundwater abstraction will be to mitigate the impact of groundwater drawdown on groundwater dependent vegetation that forms part of habitat for threatened fauna (MNES). With respect to groundwater abstraction the GSWOS will detail: <ul style="list-style-type: none"> A commitment to apply a 500 m radius buffer from the point of groundwater abstraction to any identified groundwater dependent vegetation. Groundwater water level thresholds and triggers based on further assessment of potential drawdown. Corrective actions to be implemented if groundwater level triggers and threshold are exceeded. Reporting requirements including six monthly reporting of groundwater levels for bores in the vicinity of groundwater dependent vegetation. 			
		Spills of toxic or hazardous substances	Adherence to the relevant recommendations included in: <ul style="list-style-type: none"> Water Quality Protection Note no.25. Land use compatibility tables for public drinking water source areas (DoW 2016a); Water Quality Protection Note no.44. Roads near sensitive water resources (DoW 2006); Water Quality Protection Note no.65. Toxic and hazardous substances (DoW 2015); Water Quality Protection Note no.83. Infrastructure corridors near sensitive water Resources (DoW 2007); and Water Quality Protection Note no.84. Rehabilitation of disturbed land in public drinking water source areas (DoW 2009). 	Unlikely	Minor	Low	
No introduction or spread of declared weeds, WONS or serious environmental weed species into surrounding	Indirect impacts to EPBC Act listed threatened fauna habitat.	Introduction or spread of declared weeds, WONS or serious	<ul style="list-style-type: none"> The nature of potential impact is known and predictable based on knowledge of weeds 	<ul style="list-style-type: none"> Environmental weeds within the construction site boundary will be treated according to the weed control management outlined by Weeds Australia with the aim of controlling off-site movement. Develop and maintain a weed register for declared 	Unlikely	Minor	Low

MANAGEMENT OBJECTIVE	IMPACT	CAUSE	LEVEL OF UNCERTAINTY	SUMMARY OF MITIGATION	RESIDUAL RISK		
					LIKELIHOOD	CONSEQUENCE	RISK RATING
native vegetation adjacent to the Development Envelope during and attributable to construction.		environmental weed species	<p>commonly found in the region and their impacts.</p> <ul style="list-style-type: none"> The scale of potential impacts is unpredictable as it relates to the spread of weeds. 	<p>weeds, WONS or serious environmental weed species (if identified). Register will include, for each species, details of distribution, abundance, relevant biological information and a history of control methods and their relative success;</p> <ul style="list-style-type: none"> Develop and implement vehicle and equipment clean on entry/exit procedures; All personnel will be inducted prior to their commencement on site; The induction will include weed identification and weed hygiene training; Any machinery used in the removal of weed-infested topsoil will be cleaned down before entering or leaving the work site to prevent the introduction and spread of weeds into new areas; Any soil or materials imported onto the worksite will be from weed-free areas; Where roadworks directly impact known areas of serious environmental weeds, topsoil will be removed separately, heaps delineated and spoil disposed of as soon as possible through consultation with the Main Roads environmental management representative; Weed contaminated topsoil stockpiles shall be quarantined from uncontaminated / clean topsoil stockpiles, clearly signed in the field and identified on a site plan; and Areas temporarily disturbed are to be revegetated and stabilised. 			
Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.	Indirect impacts to EPBC Act listed threatened fauna as a result of impact to their habitat habitat.	Erosion and sedimentation during construction.	<ul style="list-style-type: none"> The nature of potential impact is known and predictable based on knowledge of impacts of erosion and sedimentation. The scale of potential impacts is predictable and easily monitored. 	<p>Main Roads will develop and implement a Groundwater and Surface Water Operating Strategy (GSWOS). The objectives of the GSWOS with respect to impacts from erosion during waterway crossing construction will be to mitigate impacts of erosion that could potentially increase sedimentation into the streams throughout the construction of waterway crossings.</p> <p>With respect to potential erosion the GSWOS will detail:</p> <ul style="list-style-type: none"> An erosion monitoring program that includes baseline monitoring and monitoring upstream and downstream of the construction sites, to monitor for erosion that could potentially increase sedimentation into the streams throughout the construction of significant waterway crossings. Monitoring will include at a minimum: 	Unlikely	Minor	Low

MANAGEMENT OBJECTIVE	IMPACT	CAUSE	LEVEL OF UNCERTAINTY	SUMMARY OF MITIGATION	RESIDUAL RISK		
					LIKELIHOOD	CONSEQUENCE	RISK RATING
				<ul style="list-style-type: none"> - upstream and downstream of the crossing in Fortescue River; - immediately upstream of the confluence of Weelumurra Creek with Fortescue River and upstream of the project in Weelumurra Creek (or as far upstream as is possible given the ephemeral nature of the creek); and - Caves Creek and/or its tributaries. <ul style="list-style-type: none"> • Thresholds and triggers, and associated management actions that will be put in place to manage erosion risks during construction. 			
Construction - Northern Quoll							
Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.	Injury or mortality to Northern Quoll individuals.	Vehicle collision with fauna during construction.	<ul style="list-style-type: none"> • The nature of the impact is known, as the development envelope contains and lies adjacent to Northern Quoll habitat, and Northern Quolls have been known to be killed through vehicle strike. • The scale of the impact is unpredictable as it relates to unplanned events and individual behaviour. Collisions are unlikely to occur but if they do are expected to impact a small number of individuals. However, the number of collisions is unpredictable. 	<ul style="list-style-type: none"> • In the event of EPBC Act listed threatened fauna injury, advice shall be sought from local qualified wildlife organisations/persons, such as: <ul style="list-style-type: none"> – Pilbara Wildlife Carers Association (PWCA): Contact Main Coordinator Mob: 0438 924 842. – PWCA: Tom Price – Mob: 0438 957 463. • Contact details for these organisations will be maintained onsite to facilitate rapid transfer sick or injured wildlife to an appropriate organisation, thereby reducing the holding time and potential stress on the animal. • Where construction of the Proposed Action results in fauna fatality, this will be recorded as an environmental incident through Main Roads EQSafe system. • Speed limits between 40-80 km/hr will be applied throughout the construction site for safety purposes which will consequently reduce the risk of fauna strikes during clearing and construction. • Inductions for all personnel will include appropriate road driving procedures and significant fauna awareness. • Clearing of habitat critical to the survival of the Northern Quoll will be limited to between 1 April and 30 September to prevent coinciding with Northern Quoll when they have large pouch or dened young. • Prior to clearing any Northern Quoll critical habitat, undertake pre-clearance surveys. 	Unlikely	Minor	Low

MANAGEMENT OBJECTIVE	IMPACT	CAUSE	LEVEL OF UNCERTAINTY	SUMMARY OF MITIGATION	RESIDUAL RISK		
					LIKELIHOOD	CONSEQUENCE	RISK RATING
		Interaction with construction equipment during construction activities.	<ul style="list-style-type: none"> The nature of the impact is known, as the development envelope contains and lies adjacent to suitable habitat for Northern Quoll and Northern Quoll are susceptible to injury or mortality from construction equipment, particularly when they have large pouch or denned young. The scale of the impact is unpredictable as it relates to unplanned events and individual behaviour. Collisions are not expected to occur however if they do they will impact a small number of individuals. However, the number of collisions is unpredictable. 	<ul style="list-style-type: none"> If individuals identified in area to be cleared, clearing in this area not to commence until confirmed the identified fauna no longer present. Relocation of individuals will be considered where appropriate and in consultation with a wildlife specialist. 	Unlikely	Minor	Low
		Interaction with construction equipment during clearing activities.			Unlikely	Minor	Low
		Attraction of fauna, including introduced fauna as a result of construction camp waste leading to sickness of Northern Quolls and/or predation of Northern Quoll by introduced predators.	<ul style="list-style-type: none"> The nature of the impact is known, as the development envelope contains and lies adjacent to Northern Quoll habitat, and Northern Quolls have been known to be killed through predation by introduced predators. The scale of the impact is unpredictable as it relates to unplanned events and individual behaviour. The Proposed Actions is not predicted to significantly alter the number of introduced predators in the area above current levels. 	<ul style="list-style-type: none"> Induction for all personnel will include the requirement to report sightings of feral animals, no feeding of native and/or feral animals and no pets allowed on site. Construction camp waste including food waste will not be dumped. Waste will be appropriately segregated and contained, including use of lids that cannot be removed by fauna. 	Unlikely	Minor	Low
	Disturbance to Northern Quoll individuals from light, noise and vibration emissions.	Construction activities including blasting.	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area contains and lies adjacent to Northern Quoll habitat, and Northern Quolls have been known to be disturbed through noise emissions and attracted by increased insect activity resulting from light emissions. 	<ul style="list-style-type: none"> Night work to be minimised. It is expected that regular work hours will be 6am and 6pm. Night works will not be significant, however, due to the high temperatures in the area some night work activities may be carried out. If required lighting will be directed onto active construction areas to minimise light spill. Requirement to be included in site inductions. 	Unlikely	Minor	Low

MANAGEMENT OBJECTIVE	IMPACT	CAUSE	LEVEL OF UNCERTAINTY	SUMMARY OF MITIGATION	RESIDUAL RISK		
					LIKELIHOOD	CONSEQUENCE	RISK RATING
			<ul style="list-style-type: none"> The scale of the impact is predictable as impacts will be limited to temporary behavioural impacts. 				
Construction - Pilbara Leaf-nosed Bat and Ghost Bat management measures							
Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.	Injury or mortality to Pilbara Leaf-nosed Bat or Ghost Bat individuals.	Vehicle collision with fauna during construction.	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area contains and lies adjacent to Pilbara Leaf-nosed Bat and Ghost Bat habitat, and Bats have been known to be killed through vehicle strike. The scale of the impact is unpredictable as it relates to unplanned events and individual behaviour. Collisions are unlikely to occur but if they do are expected to impact a small number of individuals. However, the number of collisions is unpredictable. 	<ul style="list-style-type: none"> In the event of EPBC Act listed threatened fauna injury, advice shall be sought from local qualified wildlife organisations/persons, such as: <ul style="list-style-type: none"> Pilbara Wildlife Carers Association (PWCA): Contact Main Coordinator Mob: 0438 924 842. PWCA: Tom Price – Mob: 0438 957 463. Contact details for these organisations will be maintained onsite to facilitate rapid transfer of sick or injured wildlife to an appropriate organisation, thereby reducing the holding time and potential stress on the animal. Where construction of the Proposed Action results on fauna fatality, this will be recorded as an environmental incident through Main Roads EQSafe system. Speed limits between 40-80 km/hr will be applied throughout the construction site for safety purposes which will consequently reduce the risk of fauna strikes during clearing and construction. Inductions for all personnel will include appropriate road driving procedures and significant fauna awareness. 	Unlikely	Minor	Low
		Interaction with construction equipment during construction activities.	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area contains and lies adjacent to Pilbara Leaf-nosed Bat and Ghost Bat habitat, and Bats have been known to be killed through construction equipment. The scale of the impact is unpredictable as it relates to unplanned events and individual behaviour. Collisions are not expected to occur however if they do they will impact a small number of individuals. However, the number of collisions is unpredictable 		Unlikely	Minor	Low
		Interaction with construction equipment during clearing activities.	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area contains and lies adjacent to Pilbara Leaf-nosed Bat and Ghost Bat habitat, and Bats have been known to be killed through construction equipment. The scale of the impact is unpredictable as it relates to unplanned events and individual behaviour. Collisions are not expected to occur however if they do they will impact a small number of individuals. However, the number of collisions is unpredictable 		Unlikely	Minor	Low
		Attraction of introduced fauna as a result of construction camp waste leading to predation of Bats by introduced predators.	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area contains and lies adjacent to Pilbara Leaf-nosed Bat and Ghost Bat habitat, and Bats have been known to be killed 		<ul style="list-style-type: none"> Induction for all personnel will include the requirement to report sightings of feral animals, no feeding of native and/or feral animals and no pets allowed on site. Construction camp waste including food waste will not be dumped, waste will be appropriately 	Unlikely	Minor

MANAGEMENT OBJECTIVE	IMPACT	CAUSE	LEVEL OF UNCERTAINTY	SUMMARY OF MITIGATION	RESIDUAL RISK		
					LIKELIHOOD	CONSEQUENCE	RISK RATING
			<p>through predation by introduced predators.</p> <ul style="list-style-type: none"> The scale of the impact is unpredictable as it relates to unplanned events and individual behaviour. The Proposed Actions is not predicted to significantly alter the number of introduced predators in the area above current levels. 	<p>segregated and contained, including use of lids that cannot be removed by fauna.</p>			
	<p>Disturbance to foraging Pilbara Leaf-nosed Bat or Ghost Bat individuals from light, noise and vibration emissions.</p> <p>Delay in the timing of Ghost Bat emergence from roosting caves and disturb their use of commuting route</p>	<p>Construction activities including blasting.</p>	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area contains and lies adjacent to Pilbara Leaf-nosed Bat and Ghost Bat habitat and these species have been known to be attracted by increased insect activity resulting from light emissions and disturbed by noise emissions. The scale of the impact is predictable as impacts will be limited to temporary behavioural impacts. 	<ul style="list-style-type: none"> Night work to be minimised. It is expected that regular work hours will be 6am and 6pm. Night works will not be significant, however, due to the high temperatures in the area some night work activities may be carried out. If required, lighting will be directed onto active construction areas to minimise light spill. Requirement to be included in site inductions. 	Unlikely	Minor	Low
Avoid impacts to roosting caves utilised by Ghost Bats.	Disturbance of, damage to or destruction of roosting caves utilised by Ghost Bats.	<p>Unauthorised disturbance of, damage to or destruction of roosting caves utilised by Ghost Bats during clearing.</p>	<ul style="list-style-type: none"> The nature of the impact is predictable and may range from temporary disturbance of a roost to complete destruction of a maternity roost that has a significant impact on the Ghost Bat Population. The scale of the impact is unpredictable as it would depend on the ability of the local population to utilise other unknown roosts. 	<ul style="list-style-type: none"> An activity buffer of 400 m will be created within which monitoring of caves identified by Biota (2021) as Ghost Bat roosting caves would be required. A 150 m no-go zone will be created between the construction activities and known caves that have been identified as having evidence of Ghost Bat use. These no-go zones will be clearly shown on all project drawings and communicated in documentation. Caves that have been identified as having evidence of Ghost Bat use and associated no-go zones will be clearly marked on site. Ghost Bat roosts will be recorded in a site database and mapped on all construction plans. The database will be accessible to all site personnel. Confined blasting techniques (where inert material such as crushed stone is used to seal off blast holes and contain energy released) will be used within 400 m of caves known to be used by Ghost Bats in preference to unconfined methods. 	Unlikely	Moderate	Low
		<p>Blasting activities.</p>			Unlikely	Moderate	Low

MANAGEMENT OBJECTIVE	IMPACT	CAUSE	LEVEL OF UNCERTAINTY	SUMMARY OF MITIGATION	RESIDUAL RISK		
					LIKELIHOOD	CONSEQUENCE	RISK RATING
Construction – Pilbara Olive Python							
Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.	Injury or mortality to Pilbara Olive Python individuals.	Vehicle collision with fauna during construction.	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area contains and lies adjacent to Pilbara Olive Python habitat, and Pilbara Olive Pythons have been known to be killed through vehicle strike and are known to bask on roads. The scale of the impact is unpredictable as it relates to unplanned events and individual behaviour. Collisions are unlikely to occur but if they do are expected to impact a small number of individuals. However, the number of collisions is unpredictable. 	<ul style="list-style-type: none"> In the event of EPBC Act listed threatened fauna injury, advice shall be sought from local qualified wildlife organisations/persons, such as: <ul style="list-style-type: none"> Pilbara Wildlife Carers Association (PWCA): Contact Main Coordinator Mob: 0438 924 842. PWCA: Tom Price – Mob: 0438 957 463. Contact details for these organisations will be maintained onsite to facilitate rapid transfer of sick or injured wildlife to an appropriate organisation, thereby reducing the holding time and potential stress on the animal. Where construction of the Proposed Action results in fauna fatality, this will be recorded as an environmental incident through Main Roads EQSafe system. Speed limits between 40-80km/hr will be applied throughout the construction site for safety purposes which will consequently reduce the risk of fauna strikes during clearing and construction. Inductions for all personnel will include appropriate road driving procedures and significant fauna awareness. Night work to be minimised. It is expected that regular work hours will be 6am and 6pm. Night works will not be significant, however, due to the high temperatures in the area some night work activities may be carried out. If required, lighting will be directed onto active construction areas to minimise light spill. Requirement to be included in site inductions. Induction for all personnel will include the requirement to report sightings of feral animals, no feeding of native and/or feral animals and no pets allowed on site. Construction camp waste including food waste will not be dumped. Waste will be appropriately segregated and contained, including use of lids that cannot be removed by fauna. 	Unlikely	Minor	Low
Construction - Night Parrot and Grey Falcon							
Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.	Injury or mortality to Night Parrot or Grey Falcon individuals.	Vehicle collision with fauna during construction.	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area contains and lies adjacent to Night Parrot and Grey Falcon habitat. 	<ul style="list-style-type: none"> In the event of EPBC Act listed threatened fauna injury, advice shall be sought from local qualified wildlife organisations/persons, such as: 	Rare	Moderate	Low

MANAGEMENT OBJECTIVE	IMPACT	CAUSE	LEVEL OF UNCERTAINTY	SUMMARY OF MITIGATION	RESIDUAL RISK		
					LIKELIHOOD	CONSEQUENCE	RISK RATING
			<ul style="list-style-type: none"> The scale of the impact is unpredictable as it relates to unplanned events and individual behaviour. Collisions are unlikely to occur but if they do are expected to impact a small number of individuals. However, the number of collisions is unpredictable. 	<ul style="list-style-type: none"> Pilbara Wildlife Carers Association (PWCA): Contact Main Coordinator Mob: 0438 924 842. PWCA: Tom Price – Mob: 0438 957 463. Contact details for these organisations will be maintained onsite to facilitate rapid transfer sick or injured wildlife to an appropriate organisation, thereby reducing the holding time and potential stress on the animal. 			
		Interaction with construction equipment.	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area contains and lies adjacent to suitable habitat for the Night Parrot and Grey Falcon, however is not predicted that this clearing will result in a decline in population of Night Parrots or Grey Falcons, or interfere with the species recovery. 	<ul style="list-style-type: none"> Where construction of the Proposed Action results on fauna fatality, this will be recorded as an environmental incident through Main Roads EQSafe system. 	Rare	Moderate	Low
		Interaction with construction equipment during clearing activities.	<ul style="list-style-type: none"> The scale of the impact is unpredictable as it relates to unplanned events and individual behaviour. Collisions are not expected to occur however if they do they will impact a small number of individuals. However, the number of collisions is unpredictable. 	<ul style="list-style-type: none"> Speed limits between 40-80km/hr will be applied throughout the construction site for safety purposes which will consequently reduce the risk of fauna strikes during clearing and construction. Inductions for all personnel will include appropriate road driving procedures and significant fauna awareness. Induction for all personnel will include the requirement to report sightings of feral animals, no feeding of native and/or feral animals and no pets allowed on site. Construction camp waste including food waste will not be dumped. Waste will be appropriately segregated and contained, including use of lids that cannot be removed by fauna. 	Unlikely	Minor	Low
Operations – General EPBC Act listed threatened species management measures							
Minimise injury or mortality to EPBC listed threatened species during operation.	Increased injury or mortality to EPBC Act listed threatened species including: <ul style="list-style-type: none"> Northern Quoll Pilbara Leaf-nosed Bat Ghost Bat Pilbara Olive Python Night Parrot Grey Falcon. 	Vehicle strike during operations.	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area lies adjacent to MNES habitat and the MNES fauna have been known to be killed through vehicle strike. The scale of the impact is unpredictable as it relates to unplanned events and MNES fauna behaviour. Collisions are expected to impact individuals; however the frequency of collisions is unpredictable. 	<ul style="list-style-type: none"> Fauna sensitive road design will consider installing signage in places where motorists may encounter significant fauna. 	Likely	Moderate	Medium
		Collision with fencing.	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area lies adjacent to 	Fencing will utilise devices such as discs on the top wire to make them more visible to bats and birds.	Unlikely	Minor	Low

MANAGEMENT OBJECTIVE	IMPACT	CAUSE	LEVEL OF UNCERTAINTY	SUMMARY OF MITIGATION	RESIDUAL RISK		
					LIKELIHOOD	CONSEQUENCE	RISK RATING
			<p>MNES habitat and the MNES fauna (bats and birds) have been known to be injured or killed through colliding with fencing.</p> <ul style="list-style-type: none"> The scale of the impact is unpredictable as it relates to unplanned events and MNES fauna behaviour. Collisions are expected to impact individuals; however the frequency of collisions is unpredictable. 				
	Indirect impacts to listed threatened species as a result of impacts to habitat.	Changes to surface flow due to the construction of the road.	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area lies adjacent to MNES habitat that has been mapped and assessed.. The scale of the impact is predictable as changes to surface water regimes have been modelled. 	<p>Main Roads will develop and implement a Groundwater and Surface Water Operating Strategy (GSWOS). The objectives of the GSWOS with respect to surface water flows will be to mitigate the impact of change to surface water regimes on threatened fauna habitat.</p> <p>With respect to surface water flows the GSWOS will detail how</p> <ul style="list-style-type: none"> Design criteria of the infrastructure (culvert crossing, bridges and roadway embankments) and evidence on how this design will minimise potential impacts to surface water flow regimes. Post construction monitoring, inspection and reporting intervals that will be undertaken to confirm that the predicted design of these crossings have appropriately size culverts, do not cause bridge scour and ensures that there is on-going roadway embankment stability. 	Unlikely	Moderate	Low

6 ENVIRONMENTAL MANAGEMENT ACTIONS

In order to comply with relevant environmental legislation and manage impacts to the local environment, Main Roads has defined objectives, outcomes and management based provisions to ensure that impacts to MNES are avoided and minimised as far as practicable during the implementation of the Proposed Action (Table 6-1).

Table 6-1 Management measures to mitigate construction impacts to MNES

MANAGEMENT OBJECTIVE / DESIRED OUTCOME	MANAGEMENT MEASURES	PERFORMANCE TARGET/COMPLETION CRITERIA	TIMING	MONITORING/ REPORTING ACTIVITY	CORRECTIVE ACTION TRIGGER(S)	CORRECTIVE ACTION	CORRECTIVE ACTION RESPONSIBILITY
Construction - Fauna Habitat Management							
Prevent unauthorised clearing of EPBC Act listed threatened fauna habitat. Achieve SMART performance standards (Table 4-1)	The extent of the approved clearing will be clearly communicated in documentation.	Drawings and shape/CAD files showing approved clearing areas provided to Construction Contractor Representative.	Prior to commencement of clearing.	<ul style="list-style-type: none"> MRWA to check that drawings and shape/CAD files show correct approved clearing areas. Record of provision of drawings and shape/CAD files showing approved clearing areas 	<ul style="list-style-type: none"> Drawings do not show correct approved clearing areas. Shape/CAD files not provided. 	<ul style="list-style-type: none"> Clearing will not recommence until no-go areas and clearing boundaries have been reviewed and confirmed to be in place correctly, and Main Roads Superintendent provides approval to recommence Environmental incident will be recorded, and the cause investigated. Unauthorised clearing of vegetation containing habitat for MNES will be assessed for potential remediation. Rehabilitation works will commence within 6-12 months of the incident. Refresher or updated training will be conducted (if appropriate). DCCEEW will be notified along with investigation report during annual compliance reporting if triggers are met and exceeded. If the investigation shows that the damage to the environmental values is significant, the DCCEEW will be notified within a week of such investigation. Within three weeks of such incidents, the DCCEEW will be provided with an investigation report and corrective 	<ul style="list-style-type: none"> Construction Contractor Environmental Management Representative. Main Roads Superintendent.
	All clearing areas will be clearly marked and approved by the Main Roads superintendent prior to clearing commencing.	All areas to be cleared clearly marked on site.	Prior to commencement of clearing.	<ul style="list-style-type: none"> Incident reporting (EQSafe). Monthly site inspections. Site inspection prior to and following clearing to confirm no-go areas are appropriately flagged / fenced, and that clearing remains within limits. Monthly construction reports including clearing amounts. 	Clearing more than: <ul style="list-style-type: none"> 178.3 ha of Northern Quoll foraging, dispersal and denning habitat including no more than 4.0 ha of habitat critical to the survival of the Northern Quoll species 178.2 ha of Pilbara Leaf-nosed Bat roosting, foraging, flyway and drinking habitat. 313.4 ha of Ghost Bat roosting, foraging, flyway and drinking Habitat. 313.3 ha of Pilbara Olive Python foraging habitat. 29.3 ha of foraging Night Parrot habitat. 596.1 ha of Grey Falcon nesting, foraging and drinking habitat. 		
	Vegetation to be retained will be clearly marked with flagging on site.	All vegetation to be retained will be clearly marked on site.					
	Within the constraints of other requirements (construction requirements, avoiding heritage sites), consideration will be given to habitat importance during the selection of additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around. Areas will be prioritised in the following order: 1. Existing cleared areas / areas cleared for permanent works. 2. Areas that do not contain habitat associated with EPBC Act listed threatened species that are considered likely to or may occur in or near the development envelope. 3. Areas that contain habitat that may be utilised by EPBC Act listed threatened species that are considered likely to or may occur in or near the development envelope.	Selection of areas for ancillary services made with due consideration to priorities with respect to habitat importance.	During construction.	<ul style="list-style-type: none"> Construction site plan Monthly site inspections. Monthly construction reports including clearing amounts. 			

MANAGEMENT OBJECTIVE / DESIRED OUTCOME	MANAGEMENT MEASURES	PERFORMANCE TARGET/COMPLETION CRITERIA	TIMING	MONITORING/ REPORTING ACTIVITY	CORRECTIVE ACTION TRIGGER(S)	CORRECTIVE ACTION	CORRECTIVE ACTION RESPONSIBILITY
	<p>The following areas will not be used as additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around:</p> <ul style="list-style-type: none"> Habitat critical to the survival of the Northern Quoll; Important foraging and dispersal habitat for the Northern Quoll (defined as Northern Quoll habitat within 1 km of habitat critical to the survival of the Northern Quoll); and Ghost Bat foraging habitat within 5 km of the possible maternity roost identified by Biota (2021a). 					<p>actions to remediate the environmental damage to the satisfaction of the DCCEEW prior to recommending the action.</p>	
<p>Prevent unauthorised impacts to groundwater levels and groundwater quality.</p>	<p>Water required for construction and dust management will be sourced from existing bores and potentially from new sources for the southern section. Should new bores be required, a 26D licence to construct or alter a well will be submitted along with a 5C licence to extract water.</p>	<p>Audits against requirements of licences.</p>	<p>During construction.</p>	<ul style="list-style-type: none"> Audit reports 	<ul style="list-style-type: none"> Audit identifies non-compliance with licence requirements. 	<ul style="list-style-type: none"> Environmental incident will be recorded, and the cause investigated. Remedial action will be undertaken in accordance with licence requirements. DCCEEW will be notified along with investigation report during annual compliance reporting if triggers are met and exceeded. If the investigation shows that the damage to the environmental values is significant, the DCCEEW will be notified within a week of such investigation. Within three weeks of such incidents, the DCCEEW will be provided with an investigation 	<ul style="list-style-type: none"> Construction Contractor Environmental Management Representative; and Main Roads Superintendent.

MANAGEMENT OBJECTIVE / DESIRED OUTCOME	MANAGEMENT MEASURES	PERFORMANCE TARGET/COMPLETION CRITERIA	TIMING	MONITORING/ REPORTING ACTIVITY	CORRECTIVE ACTION TRIGGER(S)	CORRECTIVE ACTION	CORRECTIVE ACTION RESPONSIBILITY
						report and corrective actions to remediate.	
	Results of further studies on sustainable construction water abstraction will be implemented to reduce project water use as far as practicable.	Not applicable					
	<p>Adherence to the relevant recommendations included in:</p> <ul style="list-style-type: none"> Water Quality Protection Note no.25. Land use compatibility tables for public drinking water source areas (DoW 2016a); Water Quality Protection Note no.44. Roads near sensitive water resources (DoW 2006); Water Quality Protection Note no.65. Toxic and hazardous substances (DoW 2015); Water Quality Protection Note no.83. Infrastructure corridors near sensitive water Resources (DoW 2007); and Water Quality Protection Note no.84. Rehabilitation of disturbed land in public drinking water source areas (DoW 2009). 	Site inspections for compliance with water quality protection notes.	During construction	<ul style="list-style-type: none"> Site inspection reports 	<ul style="list-style-type: none"> Site inspection identifies non-compliance with requirements. 	<ul style="list-style-type: none"> Environmental incident will be recorded, and the cause investigated Remedial action will be undertaken within 48 hours. DCCEEW will be notified along with investigation report during annual compliance reporting if triggers are met and exceeded. If the investigation shows that the damage to the environmental values is significant, the DCCEEW will be notified within a week of such investigation. Within three weeks of such incidents, the DCCEEW will be provided with an investigation report and corrective actions to remediate. 	
Avoid indirect impacts to groundwater dependent vegetation.	<p>Main Roads will develop and implement a Groundwater and Surface Water Operating Strategy (GSWOS). The objectives of the GSWOS with respect to groundwater abstraction will be to mitigate the impact of groundwater drawdown on groundwater dependent vegetation that forms part of habitat for threatened fauna (MNES).</p> <p>With respect to groundwater abstraction the GSWOS will detail:</p> <ul style="list-style-type: none"> A commitment to apply a 500 m radius buffer from the point of groundwater abstraction to any identified groundwater dependent vegetation. 	GSWOS prepared and approved by the Minister for the Environment.	Prior to commencement of proposed action.	<ul style="list-style-type: none"> Record of Minister for the Environment approval of GSWOS. 	<ul style="list-style-type: none"> Groundwater abstraction occurs without complying with an approved GSWOS. 	<ul style="list-style-type: none"> Groundwater abstraction will cease immediately if trigger is met and will not recommence until Main Roads Superintendent provides approval to recommence. Environmental incident will be recorded, and the cause investigated. DCCEEW will be notified along with investigation report during annual compliance reporting if 	

MANAGEMENT OBJECTIVE / DESIRED OUTCOME	MANAGEMENT MEASURES	PERFORMANCE TARGET/COMPLETION CRITERIA	TIMING	MONITORING/ REPORTING ACTIVITY	CORRECTIVE ACTION TRIGGER(S)	CORRECTIVE ACTION	CORRECTIVE ACTION RESPONSIBILITY
	<ul style="list-style-type: none"> Groundwater water level thresholds and triggers based on further assessment of potential drawdown. Corrective actions to be implemented if groundwater level triggers and threshold are exceeded. Reporting requirements including six monthly reporting of groundwater levels for bores in the vicinity of groundwater dependent vegetation. 					<p>triggers are met and exceeded.</p> <ul style="list-style-type: none"> If the investigation shows that the damage to the environmental values is significant, the DCCEEW will be notified within a week of such investigation. Within three weeks of such incidents, the DCCEEW will be provided with an investigation report and corrective actions to remediate. 	
<p>No introduction or spread of declared weeds, WONS or serious environmental weed species into surrounding native vegetation adjacent to the development envelope during and attributable to construction.</p>	<ul style="list-style-type: none"> Environmental weeds within the construction site boundary will be treated according to the weed control management outlined by Weeds Australia with the aim of controlling off-site movement. Develop and maintain a weed register for declared weeds, WONS or serious environmental weed species (if identified). Register will include, for each species, details of distribution, abundance, relevant biological information and a history of control methods and their relative success; Develop and implement vehicle and equipment clean on entry/exit procedures; All personnel will be inducted prior to their commencement on site; The induction will include weed identification and weed hygiene training; Any machinery used in the removal of weed-infested topsoil will be cleaned down before entering or leaving the work site to prevent the introduction and spread of weeds into new areas; Any soil or materials imported onto the worksite will be from weed-free areas; 	<p>Stated requirements in relation to weed management implemented.</p>	<ul style="list-style-type: none"> Monthly during construction; and For 3 years post-construction. 	<ul style="list-style-type: none"> Visual inspection, pedestrian walkthrough (monthly); Photographic record, GPS of non-conformance; Weed monitoring to be undertaken along the edge of the road reserve annually post-construction for a period of 3 years. Weed monitoring reports. Records of topsoil segregation and burial or licensed waste facilities; and Records verifying plant and machinery arriving on site is clean. 	<ul style="list-style-type: none"> New significant weed infestation (i.e. above existing background levels) identified 	<ul style="list-style-type: none"> Where new weed infestation is evident, herbicide application shall be undertaken; and Review weed management process. DCCEEW will be notified along with investigation report during annual compliance reporting if triggers are met and exceeded. If the investigation shows that the damage to the environmental values is significant, the DCCEEW will be notified within a week of such investigation. Within three weeks of such incidents, the DCCEEW will be provided with an investigation report and corrective actions to remediate. 	

MANAGEMENT OBJECTIVE / DESIRED OUTCOME	MANAGEMENT MEASURES	PERFORMANCE TARGET/COMPLETION CRITERIA	TIMING	MONITORING/ REPORTING ACTIVITY	CORRECTIVE ACTION TRIGGER(S)	CORRECTIVE ACTION	CORRECTIVE ACTION RESPONSIBILITY
	<ul style="list-style-type: none"> Where roadworks directly impact known areas of serious environmental weeds, topsoil will be removed separately, heaps delineated and spoil disposed of as soon as possible through consultation with the Main Roads environmental management representative; Weed contaminated topsoil stockpiles shall be quarantined from uncontaminated / clean topsoil stockpiles, clearly signed in the field and identified on a site plan; and Areas temporarily disturbed are to be revegetated and stabilised. 						
Construction – General EPBC Act listed threatened species management measures							
Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.	<p>In the event of EPBC Act listed threatened fauna injury, advice shall be sought from local qualified wildlife organisations/persons, such as:</p> <ul style="list-style-type: none"> Pilbara Wildlife Carers Association (PWCA): Contact Main Coordinator Mob: 0438 924 842. PWCA: Tom Price – Mob: 0438 957 463. <p>Contact details for these organisations will be maintained onsite to facilitate rapid transfer sick or injured wildlife to an appropriate organisation, thereby reducing the holding time and potential stress on the animal.</p>	A list of local wildlife rescue organisations and carers is on site at all times.	During construction.	<ul style="list-style-type: none"> Monthly inspection. 	<ul style="list-style-type: none"> A list of local wildlife rescue organisations and carers is not on site. Wildlife rescue specialists not contacted immediately on discovery of an injured EPBC Act listed threatened fauna. 	<ul style="list-style-type: none"> A list of local wildlife rescue organizations and carers is obtained by site immediately Refresher training will be conducted within 1 week of determining that requirement is not be met. 	<ul style="list-style-type: none"> Construction Contractor Environmental Management Representative. Main Roads Superintendent.
	Where construction of the Proposed Action results in an MNES listed fauna fatality, this will be recorded as an environmental incident through Main Roads EQSafe system.	All fauna fatalities that occur as a result of the construction of the Proposed Action will be recorded as an environmental incident through Main Roads EQSafe system.	During construction.	<ul style="list-style-type: none"> Routine inspections 	<ul style="list-style-type: none"> Routine inspections find deceased fauna near the construction activities and the impact is attributable to the Proposed Action. 	<ul style="list-style-type: none"> Refresher training will be conducted within 1 week of determining that requirement is not met. 	
	Speed limits between 40-80 km/hr will be applied throughout the construction site for safety purposes which will consequently reduce the risk of fauna strikes during clearing and construction.	No incidents of speeding within the construction site boundary.		<ul style="list-style-type: none"> Monthly inspection of records 	<ul style="list-style-type: none"> Any incident of speeding within the construction boundary. 	<ul style="list-style-type: none"> Refresher training will be conducted within 1 week of determining that requirement is not met. 	

MANAGEMENT OBJECTIVE / DESIRED OUTCOME	MANAGEMENT MEASURES	PERFORMANCE TARGET/COMPLETION CRITERIA	TIMING	MONITORING/ REPORTING ACTIVITY	CORRECTIVE ACTION TRIGGER(S)	CORRECTIVE ACTION	CORRECTIVE ACTION RESPONSIBILITY
	Inductions for all personnel will include appropriate road driving procedures and significant fauna awareness.	Induction material includes required information.		<ul style="list-style-type: none"> Review of induction material Monthly inspection of induction records. 	<ul style="list-style-type: none"> Required information not including in induction material. Monthly inspection finds any personnel working on site not correctly inducted. 	<ul style="list-style-type: none"> Review and update induction material Persons not correctly inducted are to immediately cease work and not recommence until induction complete. 	
	Night work to be minimised. It is expected that regular work hours will be between 6 am and 6 pm. Night works will not be significant, however, due to the high temperatures in the area, some night work activities may be carried out. If required, lighting will be directed onto active construction areas to minimise light spill. Requirement to be included in site inductions.	Induction material includes required information.		<ul style="list-style-type: none"> Review of induction material. Monthly inspection of induction records. Monthly inspections of lighting. 	<ul style="list-style-type: none"> Required information not including in induction material. Monthly inspection finds personnel on site not correctly inducted. Monthly inspection finds requirement not being complied with. 	<ul style="list-style-type: none"> Review and update induction material Personnel not correctly inducted to immediately cease work and not recommence until induction complete. Refresher training will be conducted within 1 week of determining that requirement is not being met. 	
	Induction for all personnel will include the requirement to report sightings of feral animals, no feeding of native and/or feral animals and no pets allowed on site.	Induction material includes requirement information.		<ul style="list-style-type: none"> Monthly inspection of induction records 	<ul style="list-style-type: none"> Monthly inspection finds personnel working on site not correctly inducted. Instances of personnel not complying with requirement. 	<ul style="list-style-type: none"> Personnel not correctly inducted to immediately cease work and not recommence until induction complete. Refresher training will be conducted within 1 week of determining that requirement is not being met. 	
	Construction camp waste including food waste will not be dumped. Waste will be appropriately segregated and contained, including use of lids that cannot be removed by fauna.	Construction camp waste segregated, stored in fauna proof containers and disposed of appropriately.		<ul style="list-style-type: none"> Monthly inspection Waste disposal records. 	<ul style="list-style-type: none"> Monthly inspection or review of records find waste not being segregated, stored correctly or disposed of appropriately. 	<ul style="list-style-type: none"> Review and update waste management procedures and increase frequency of inspections. 	
	Main Roads will develop and implement a Groundwater and Surface Water Operating Strategy (GSWOS). The objectives of the GSWOS with respect to impacts from erosion during waterway crossing construction will be to mitigate impacts of erosion that could potentially increase sedimentation into the streams throughout the construction of waterway crossings.	GSWOS prepared and approved by Minister for the Environment.	Prior to commencement of Proposed Action.	<ul style="list-style-type: none"> Record of Minister for the Environment approval of GWSOP. 	<ul style="list-style-type: none"> Construction of significant waterways crossings occurs without complying with an approved GWSOP. 	<ul style="list-style-type: none"> Waterway crossing construction will cease immediately if trigger is met and will not recommence until Main Roads Superintendent provides approval to recommence. 	

MANAGEMENT OBJECTIVE / DESIRED OUTCOME	MANAGEMENT MEASURES	PERFORMANCE TARGET/COMPLETION CRITERIA	TIMING	MONITORING/ REPORTING ACTIVITY	CORRECTIVE ACTION TRIGGER(S)	CORRECTIVE ACTION	CORRECTIVE ACTION RESPONSIBILITY
	<p>With respect to potential erosion the GSWOS will detail:</p> <ul style="list-style-type: none"> • An erosion monitoring program that includes baseline monitoring and monitoring upstream and downstream of the construction sites, to monitor for erosion that could potentially increase sedimentation into the streams throughout the construction of significant waterway crossings. Monitoring will include at a minimum: <ul style="list-style-type: none"> - upstream and downstream of the crossing in Fortescue River; - immediately upstream of the confluence of Weelumurra Creek with Fortescue River and upstream of the project in Weelumurra Creek (or as far upstream as is possible given the ephemeral nature of the creek); and - Caves Creek and/or its tributaries. • Thresholds and triggers, and associated management actions that will be put in place to manage erosion risks during construction. 					<ul style="list-style-type: none"> • Environmental incident will be recorded, and the cause investigated. • DCCEEW will be notified along with investigation report during annual compliance reporting if triggers are met and exceeded. • If the investigation shows that the damage to the environmental values is significant, the DCCEEW will be notified within a week of such investigation. • Within three weeks of such incidents, the DCCEEW will be provided with an investigation report and corrective actions to remediate.. 	

MANAGEMENT OBJECTIVE / DESIRED OUTCOME	MANAGEMENT MEASURES	PERFORMANCE TARGET/COMPLETION CRITERIA	TIMING	MONITORING/ REPORTING ACTIVITY	CORRECTIVE ACTION TRIGGER(S)	CORRECTIVE ACTION	CORRECTIVE ACTION RESPONSIBILITY
Construction - Northern Quoll management measures							
Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.	Clearing of habitat critical to the survival of the Northern Quoll will be limited to between 1 April and 30 September to prevent coinciding with Northern Quoll when they have large pouch or denned young.	No clearing of habitat critical to the survival of the Northern Quoll occurs between 1 April and 30 September.	During construction.	<ul style="list-style-type: none"> Monthly site inspections. 	<ul style="list-style-type: none"> Clearing of habitat critical to the survival of the Northern Quoll occurs between 1 April and 30 September. 	<ul style="list-style-type: none"> Clearing of habitat critical to the survival of the Northern Quoll will cease immediately if trigger is met. Clearing of habitat critical to the survival of the Northern Quoll will not recommence until after 30 September and Main Roads Superintendent provides approval to recommence. Environmental incident will be recorded, and the cause investigated. DCCEEW will be notified along with investigation report during annual compliance reporting if triggers are met and exceeded. If the investigation shows that the damage to the environmental values is significant, the DCCEEW will be notified within a week of such investigation. Within three weeks of such incidents, the DCCEEW will be provided with an investigation report and corrective actions to remediate. 	<ul style="list-style-type: none"> Construction Contractor Environmental Management Representative Main Roads Superintendent
	Prior to clearing any Northern Quoll critical habitat, undertake pre-clearance surveys. If individuals identified in area to be cleared, clearing in this area not to commence until confirmed the identified fauna no longer present. Relocation of individuals will be considered where appropriate and in consultation with a wildlife specialist.	No clearing to be undertaken in critical habitat until surveys confirm species is not present in the area to be cleared.	Survey to be undertaken two weeks prior to commencement of clearing.	<ul style="list-style-type: none"> Records of pre-clearance surveys. 	<ul style="list-style-type: none"> Clearing of habitat critical to the survival of Northern Quoll occurs without the survey confirmation that species is not present. 	<ul style="list-style-type: none"> Clearing will cease immediately if trigger is met. Clearing will not recommence until preclearance survey confirms species is not present and Main Roads Superintendent provides approval to recommence. 	

MANAGEMENT OBJECTIVE / DESIRED OUTCOME	MANAGEMENT MEASURES	PERFORMANCE TARGET/COMPLETION CRITERIA	TIMING	MONITORING/ REPORTING ACTIVITY	CORRECTIVE ACTION TRIGGER(S)	CORRECTIVE ACTION	CORRECTIVE ACTION RESPONSIBILITY
						<ul style="list-style-type: none"> Environmental incident will be recorded, and the cause investigated. DCCEEW will be notified along with investigation report during annual compliance reporting if triggers are met and exceeded. If the investigation shows that the damage to the environmental values is significant, the DCCEEW will be notified within a week of such investigation. Within three weeks of such incidents, the DCCEEW will be provided with an investigation report and corrective actions to remediate. 	
	Construction site inductions will provide detailed information about Northern Quolls.	Induction material contains required information.	During construction	<ul style="list-style-type: none"> Review of induction material. 	<ul style="list-style-type: none"> Induction material does not contain required information Monthly inspection finds personnel working on site not correctly inducted. 	<ul style="list-style-type: none"> Review and revise induction material. Personnel that are not correctly inducted to immediately cease work and not recommence until induction complete. 	<ul style="list-style-type: none"> Construction Contractor Environmental Management Representative Main Roads Superintendent
Construction - Pilbara Leaf-nosed Bat and Ghost Bat management measures							
Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.	Construction site inductions will provide detailed information about Pilbara Leaf-nosed Bats and Ghost Bats.	Induction material contains required information.	During construction	<ul style="list-style-type: none"> Review of contractor induction material 	<ul style="list-style-type: none"> Induction material does not contain required information Monthly inspection finds personnel working on site not correctly inducted. 	<ul style="list-style-type: none"> Review and revise induction material. Personnel that are not correctly inducted to immediately cease work and not recommence until induction complete. 	<ul style="list-style-type: none"> Construction Contractor Environmental Management Representative. Main Roads Superintendent.
Avoid impacts to roosting caves utilised by Ghost Bats.	An activity buffer of 400 m will be created within which monitoring of caves identified by Biota (2021) as Ghost Bat roosting caves would be required. A 150 m no-go zone will be created between the construction activities and known caves that have been identified as	Drawings include no-go zones and are provided to Construction Contractor Representative.	Contract award and prior to commencement of clearing.	<ul style="list-style-type: none"> Record of provision of drawings showing no-go zones. 	<ul style="list-style-type: none"> Drawings do not show correct approved clearing areas 	<ul style="list-style-type: none"> Clearing/blasting not to commence until drawings are reviewed and revised to show required no-go zone. 	<ul style="list-style-type: none"> Construction Contractor Environmental Management Representative. Main Roads Superintendent.

MANAGEMENT OBJECTIVE / DESIRED OUTCOME	MANAGEMENT MEASURES	PERFORMANCE TARGET/COMPLETION CRITERIA	TIMING	MONITORING/ REPORTING ACTIVITY	CORRECTIVE ACTION TRIGGER(S)	CORRECTIVE ACTION	CORRECTIVE ACTION RESPONSIBILITY
	having evidence of Ghost Bat use. These no-go zones will be clearly shown on all project drawings and communicated in documentation.						
	Caves that have been identified as having evidence of Ghost Bat use and associated no-go zones will be clearly marked on site.	All no-go zones clearly marked out on site.	Prior to commencement of clearing or blasting. During construction.	<ul style="list-style-type: none"> • Incident reporting (EQSafe). • Monthly site inspections. • Site inspection by Construction Contractor Environmental Management Representative prior to and following clearing to confirm no-go areas are appropriately flagged / fenced, and that clearing remains within limits. 	<ul style="list-style-type: none"> • Clearing or blasting activities occurring within 150 m of caves that have been identified as having evidence of Ghost Bat use, unless a pre-blasting survey indicates that no bats are present. 	<ul style="list-style-type: none"> • Clearing and blasting within 150 m of the caves will cease immediately if trigger is met and will not recommence until no-go areas have been reviewed and confirmed to be in place correctly, and Main Roads Superintendent provides approval to recommence. • Environmental incident will be recorded, and the cause investigated • DCCEEW will be notified along with investigation report during annual compliance reporting if triggers are met and exceeded. • If the investigation shows that the damage to the environmental values is significant, the DCCEEW will be notified within a week of such investigation. <p>Within three weeks of such incidents, the DCCEEW will be provided with an investigation report and corrective actions to remediate.</p>	

MANAGEMENT OBJECTIVE / DESIRED OUTCOME	MANAGEMENT MEASURES	PERFORMANCE TARGET/COMPLETION CRITERIA	TIMING	MONITORING/ REPORTING ACTIVITY	CORRECTIVE ACTION TRIGGER(S)	CORRECTIVE ACTION	CORRECTIVE ACTION RESPONSIBILITY
	<p>Main Roads will prepare a Noise and Vibration Management Plan to address any risks to Ghost Bats. This plan will be prepared for approval by DCCEEW prior to any blasting occurring within 400 m of a cave with evidence of Ghost Bat usage.</p> <p>The purpose of this plan will be to meet the stated management objective to “Avoid impacts to roosting caves used by Ghost Bats”. This plan will outline the blasting activities, noise and vibration monitoring (in relation to the caves) and an adaptive management approach.</p> <p>The noise and vibration plan will include a requirement for the blasting contractor to ensure that the predicted peak particle velocity (PPV) values for each blast is included in the blast design. The PPV will be required to be calculated using an industry recognised approach that incorporates predictive mechanisms for ground vibration and is in accordance with AS 2187.</p> <p>Following consultation with a fauna specialist a threshold for the predicted PPV will be agreed between Main Roads and DCCEEW to ensure no impact to any cave being used by Ghost Bats.</p> <p>The plan will also specify procedures for monitoring of the PPV including monitoring of blasts undertaken away from the Ghost Bat caves, to verify that impact thresholds will not be exceeded during blasting activities within 400 m of a cave with evidence of Ghost Bat usage.</p>	<p>Noise and Vibration Management Plan approved by DCCEEW prior to blasting occurring within 400 m of a cave with evidence of Ghost Bat usage.</p> <p>Following consultation with a fauna specialist a threshold for the predicted PPV will be agreed between Main Roads and DCCEEW to ensure no impact to any cave being used by Ghost Bats.</p>		<ul style="list-style-type: none"> Record of DCCEEW approval of noise and vibration management plan. Monitoring of PPV during blasting at caves with evidence of Ghost Bat usage. 	<ul style="list-style-type: none"> Blasting occurs within 400 m of a cave with evidence of Ghost Bat usage without complying with an approved Noise and Vibration Management Plan. PPV as measured during blasting at caves with evidence of Ghost Bat usage exceeds threshold level. Following consultation with a fauna specialist a threshold for the predicted PPV will be agreed between Main Roads and DCCEEW to ensure no impact to any cave being used by Ghost Bats. 	<ul style="list-style-type: none"> Blasting will cease immediately if trigger is met. Blasting will not recommence until Main Roads Superintendent provides approval to recommence. Environmental incident will be recorded, and the cause investigated. DCCEEW will be notified along with investigation report during annual compliance reporting if triggers are met and exceeded. If the investigation shows that the damage to the environmental values is significant, the DCCEEW will be notified within a week of such investigation. Within three weeks of such incidents, the DCCEEW will be provided with an investigation report and corrective actions to remediate. 	
	<p>Ghost Bat roosts will be recorded in a site database and mapped on all construction plans. The database will be accessible to all site personnel.</p>	<p>All identified ghost bat roosts recorded in database and mapped on all construction plans.</p>		<ul style="list-style-type: none"> Monthly site inspections. 	<ul style="list-style-type: none"> Bat roosting areas not recorded in site database and mapped on construction plans. 	<ul style="list-style-type: none"> Clearing and blasting to cease until database and drawing reviewed and revised. 	

MANAGEMENT OBJECTIVE / DESIRED OUTCOME	MANAGEMENT MEASURES	PERFORMANCE TARGET/COMPLETION CRITERIA	TIMING	MONITORING/ REPORTING ACTIVITY	CORRECTIVE ACTION TRIGGER(S)	CORRECTIVE ACTION	CORRECTIVE ACTION RESPONSIBILITY
	<p>Confined blasting techniques (where inert material such as crushed stone is used to seal off blast holes and contain energy released) will be used within 400 m of caves known to be used by Ghost Bats in preference to unconfined methods.</p>	<p>Database is accessible to all site personnel.</p> <p>Contractor method statement includes confined blasting technique.</p>		<ul style="list-style-type: none"> Review of contractor method statement. Monthly inspection. 	<ul style="list-style-type: none"> Unconfined blast technique used within 400 m of caves known to be used by Ghost Bats, unless pre-blasting survey indicates that no bats are present. 	<ul style="list-style-type: none"> Environmental incident will be recorded, and the cause investigated. Blasting activities to cease immediately and not recommence until Main Roads Superintendent provides approval to recommence. DCCEEW will be notified along with investigation report during annual compliance reporting if triggers are met and exceeded. If the investigation shows that the damage to the environmental values is significant, the DCCEEW will be notified within a week of such investigation. Within three weeks of such incidents, the DCCEEW will be provided with an investigation report and corrective actions to remediate. 	
Operations – General EPBC Act listed threatened species management measures							
<p>Minimise injury or mortality to EPBC listed threatened species during operation.</p>	<p>Fauna sensitive road design will consider installing signage in places where motorists may encounter significant fauna.</p>	<p>Design documents include fauna friendly signage.</p>	<p>Pre-construction and during construction.</p>	<ul style="list-style-type: none"> Pre-construction design reviews. Post-construction as built reviews against the design. 	<ul style="list-style-type: none"> Pre-construction review finds requirement not included. Post-construction as-built review find requirement not implemented. 	<ul style="list-style-type: none"> Pre-construction - review and revise design. Post-construction – rectify no-conformance. 	<ul style="list-style-type: none"> Design contractor. Main Roads Superintendent.

MANAGEMENT OBJECTIVE / DESIRED OUTCOME	MANAGEMENT MEASURES	PERFORMANCE TARGET/COMPLETION CRITERIA	TIMING	MONITORING/ REPORTING ACTIVITY	CORRECTIVE ACTION TRIGGER(S)	CORRECTIVE ACTION	CORRECTIVE ACTION RESPONSIBILITY
	<p>Fencing will utilise devices such as discs on the top wire to make them more visible to bats and birds. Barbed wire will not be used in fencing.</p>	<p>Design documents include requirement of devices such as discs on the top wire of fencing.</p>					
	<p>Main Roads will develop and implement a Groundwater and Surface Water Operating Strategy (GSWOS). The objectives of the GSWOS with respect to surface water flows will be to mitigate the impact of change to surface water regimes on threatened fauna habitat.</p> <p>With respect to surface water flows the GSWOS will detail how</p> <ul style="list-style-type: none"> • Design criteria of the infrastructure (culvert crossing, bridges and roadway embankments) and evidence on how this design will minimise potential impacts to surface water flow regimes. • Post construction monitoring, inspection and reporting intervals that will be undertaken to confirm that the predicted design of these crossings have appropriately size culverts, do not cause bridge scour and ensures that there is on-going roadway embankment stability. 	<p>GSWOS prepared and approved by Minister for the Environment.</p>	<p>Prior to commencement of Proposed Action.</p>	<ul style="list-style-type: none"> • Record of Minister for the Environment approval of GWSOP. 	<ul style="list-style-type: none"> • Construction of significant waterways crossings occurs without complying with an approved GWSOP. 	<ul style="list-style-type: none"> • Waterway crossing construction will cease immediately if trigger is met and will not recommence until Main Roads Superintendent provides approval to recommence. • Environmental incident will be recorded, and the cause investigated. • DCCEEW will be notified along with investigation report during annual compliance reporting if triggers are met and exceeded. • If the investigation shows that the damage to the environmental values is significant, the DCCEEW will be notified within a week of such investigation. • Within three weeks of such incidents, the DCCEEW will be provided with an investigation report and corrective actions to remediate. 	

7 REVEGETATION / REHABILITATION

Main Roads will re-establish pre-existing native vegetation on cleared areas not required for ongoing road usage.

Vegetation clearing for laydown and stockpile areas, site offices and other temporary purposes (approximately 100 ha) will be rehabilitated using locally native species, which will be formulated to reflect the surrounding vegetation, be characteristic of significant fauna habitat.

Revegetation along the development envelope will comply with *MRWA Vegetation Placement within the Road Reserve Doc. No. 6707/022* (Main Roads, 2013). This guide defines the recommended setbacks and clearance requirements that apply to all revegetation or landscaping associated with new road construction.

Re-vegetation activities will target the establishment of native vegetation cover greater than 50%.

The following measure will be undertaken to achieve this target.

- rehabilitation will be planned as part of the initial clearing works in order to identify:
 - requirements for suitable plant and equipment;
 - suitable topsoil for re-use;
 - suitable areas for soil and vegetation storage; and
 - the need for seed collection.
- topsoil will be scraped and stockpiled for reuse in the revegetation of temporary construction and laydown areas following completion of construction;
- native vegetation in areas to be cleared will be stripped off using a bulldozer with rake blade (or similar) and stockpiled for reuse;
- compacted areas will be ripped prior to seeding/planting to provide an area of seed/seedling establishment and improve infiltration;
- topsoil will be applied to areas requiring rehabilitation as soon as reasonably practicable;
- topsoil will be respread as evenly as practicable to an optimum depth of 50 mm;
- vegetation will be respread over the topsoil as evenly as practicable;
- revegetation of temporary construction laydown areas will use seed stock in stockpiled topsoil;
- for each site to be rehabilitated a reference site is to be established for comparison against the rehabilitation. This can be established either through a baseline survey of the vegetation prior to clearing, or a reference site within 100 m of the clearing area;
- monitoring of rehabilitated areas to be undertaken at a six-monthly interval for the first year following completion of construction, and then annually for the following two years;
- undertaking of corrective actions to improve vegetation quality within the revegetated areas, within three months of becoming aware that an area of revegetation no longer meets the completion criteria of >50% native vegetation cover; corrective actions may cease once the completion criteria have again been achieved.

8 ADAPTIVE MANAGEMENT

This AMP adopts an ‘adaptive management’ approach which seeks to embed a cycle of monitoring, reporting and implementing change, where required. Accordingly, it is intended that this AMP may be updated (as required) over the life of the Proposed Action to reflect changes in the monitoring and management practices, subject to the results of the monitoring to identify that the environmental objectives are being achieved. The AMP may also be revised to address learnings from the implementation of corrective actions, should this occur.

In addition, auditing and review schedules are necessary to embed a formal process to identify and consider any need to update the AMP in order to achieve improved environmental performance (which may not otherwise be triggered by management or monitoring outcomes).

8.1 Environmental auditing

This AMP will be audited annually by Main Roads during construction for the Proposed Action to ensure the implementation of the management and monitoring measures, and to confirm the management measures specified are achieving the environmental outcomes.

The proposed auditing schedule for this AMP is identified in Table 8-1.

Table 8-1 Environmental audit schedule

TIMING	ACTION	SCHEDULE
Pre-construction	Review of construction procedures to ensure AMP management / monitoring actions are incorporated within works procedures	Prior to construction (single event)
Construction	Inspections by site environmental personnel to identify compliance with AMP	Periodic (monthly)
	Independent ‘third-party’ audit for assessment of compliance with AMP	Annually (once per calendar year)
Post construction	Independent ‘third-party’ audit for assessment of compliance with AMP	Yearly until rehabilitated area successfully established

The results of the construction and post construction independent ‘third-party’ audit findings will be reported to DCCEE as part of annual compliance reporting as outlined within Section 10.

8.2 Management review program

Main Roads proposes to review this AMP annually in order to consider:

- management and monitoring actions;
- opportunities for improvement in environmental performance (for example, changes to construction methodology or timing);
- identify a need to update this AMP to capture changes to the management and/or monitoring actions; and
- identify any general need to update this AMP (for example, to capture new information on relevant MNES knowledge or management, or updates to the EPBC Act or Policy Statements).

Main Roads acknowledge that a revision to this AMP may trigger a need for additional approval by DCCEE prior to implementing any changes to the specified management or monitoring actions.

The proposed AMP review schedule for the Proposed Action is identified in Table 8-2. The proposed review will be undertaken by a suitably qualified ecologist or relevant expert.

Table 8-2 AMP Review schedule

TIMING	ACTION	SCHEDULE
Pre-construction Construction	<ul style="list-style-type: none"> • Review of AMP management and monitoring actions. • Review of opportunities for an improvement in environmental performance. • Address learnings from corrective actions. • Revise AMP (if appropriate) and seek approval of DCCEEW for revised AMP. 	Annually (once per calendar year)

9 MONITORING PROGRAM AND DATA MANAGEMENT

9.1 Monitoring program

Key monitoring actions have been identified to monitor the potential impacts of the Proposed Action to MNES and habitat during and post construction. These encompass monitoring of both direct and indirect impacts of the Proposed Action. Monitoring will be undertaken by suitably qualified individuals for the methodology type specified. The proposed monitoring program for the Proposed Action is identified in Table 9-1.

9.2 Data management

Main Roads will maintain records on the implementation of this AMP in accordance with Main Roads' corporate standard document control procedures. The retention of records held by Main Roads will be maintained and managed in accordance with the *Western Australian State Records Act 2000 (WA)*.

9.3 Baseline data

The below figures present the baseline data of relevant MNES extent developed from on-ground surveys:

- Figure 2 Northern Quoll habitat
- Figure 3 Pilbara Lead-nosed Bat habitat
- Figure 4 Ghost Bat habitat
- Figure 5 Pilbara Olive Python habitat
- Figure 6 Night Parrot habitat
- Figure 7 Grey Falcon habitat.

Table 9-1 Proposed monitoring program

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
Construction - Flora					
Prevent the unauthorised clearing of the single Fringed Fire-bush plant identified during the Biota (2021a) survey.	Drawings and shape/CAD files showing approved clearing areas provided to Construction Contractor Representative.	<ul style="list-style-type: none"> Monthly site inspections. Monthly construction reports including clearing amounts. 	<ul style="list-style-type: none"> Site inspection prior to and following clearing to confirm no-go area is appropriately marked out on site. 	<ul style="list-style-type: none"> 50 m no-go zone around single Fringe Fire Bush plant identified during the Biota (2021a) survey. 	<ul style="list-style-type: none"> Prior to commencement of clearing. Monthly.
	All no-go zones clearly marked out on site.				
Construction - Fauna Habitat					
Prevent unauthorised clearing of EPBC Act listed threatened fauna habitat. Achieve SMART performance standards (Table 4-1)	Drawings and shape/CAD files showing approved clearing areas provided to Construction Contractor Representative.	<ul style="list-style-type: none"> Record of provision of drawings and shape/CAD files showing approved clearing areas. 	<ul style="list-style-type: none"> Pre-construction review. 	n/a	<ul style="list-style-type: none"> Prior to construction.
	All areas to be cleared clearly marked on site.	<ul style="list-style-type: none"> Incident reporting (EQSafe). Monthly site inspections. 	<ul style="list-style-type: none"> Visual inspection. Photographic record, GPS of non-conformance. 	<ul style="list-style-type: none"> Disturbance footprint and surrounds. 	<ul style="list-style-type: none"> Prior to commencement of clearing. Monthly.
	All vegetation to be retained will be clearly marked on site.				
Selection of areas for ancillary services made with due consideration to priorities with respect to habitat importance.	<ul style="list-style-type: none"> Construction site plan Monthly site inspections. 	<ul style="list-style-type: none"> Written records. Visual inspection. Photographic record, GPS of non-conformance. 	<ul style="list-style-type: none"> Ancillary service areas. 	<ul style="list-style-type: none"> Prior to commencement of clearing. Monthly. 	

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
		<ul style="list-style-type: none"> Monthly construction reports including clearing amounts. 			
	Approved disturbance footprint including designated access routes and parking areas communicated.	<ul style="list-style-type: none"> Construction site plan showing all approved access areas. 	<ul style="list-style-type: none"> Review of construction site plan. 	n/a	<ul style="list-style-type: none"> Monthly.
Prevent unauthorised impacts to groundwater levels and groundwater quality.	Audits against requirements of licences (26D and 5C)	<ul style="list-style-type: none"> Audit reports 	<ul style="list-style-type: none"> Audits 	n/a	<ul style="list-style-type: none"> As per license requirement
	Site inspections for compliance with water quality protection notes	<ul style="list-style-type: none"> Monthly site inspections. 	<ul style="list-style-type: none"> Written records. Visual inspection 	n/a	<ul style="list-style-type: none"> Monthly.
Avoid indirect impacts to groundwater dependent vegetation.	GSWOS prepared and approved by the Minister for the Environment.	<ul style="list-style-type: none"> Record of Minister for the Environment approval of GSWOS. 	<ul style="list-style-type: none"> Review of written records. 	N/A	<ul style="list-style-type: none"> Prior to commencement of proposed action.
No introduction or spread of declared weeds, WONS or serious environmental weed species into surrounding native vegetation adjacent to the development envelope during and attributable to construction.	Stated requirements in relation to weed management implemented.	<ul style="list-style-type: none"> Monthly site inspections. 	<ul style="list-style-type: none"> Visual inspection, pedestrian walkthrough (monthly); Photographic record, GPS of non-conformance; Weed monitoring to be undertaken along 	Disturbance footprint and surrounds.	Monthly during construction; and For 3 years post-construction.

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
			the edge of the road reserve annually post-construction for a period of 3 years. <ul style="list-style-type: none"> • Weed monitoring reports. • Records of topsoil segregation and burial or licensed waste facilities; and • Records verifying plant and machinery arriving on site is clean. 		
Construction – All EPBC Act listed threatened species					
Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.	A list of local wildlife rescue organisations and carers is on site at all times.	<ul style="list-style-type: none"> • Monthly inspection. 	<ul style="list-style-type: none"> • Visual inspection. 	n/a	n/a
	All fauna fatalities that occur as a result of the construction of the Proposed Action will be recorded as an environmental incident through Main Roads EQSafe system.	<ul style="list-style-type: none"> • Routine inspections. 	<ul style="list-style-type: none"> • Visual inspection 	Construction site.	Opportunistic.

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
	No incidents of speeding within the construction site boundary.	<ul style="list-style-type: none"> Visual monitoring by all construction personnel Incident reporting (EQSafe). 	<ul style="list-style-type: none"> Visual inspection. 	<ul style="list-style-type: none"> Construction site. 	<ul style="list-style-type: none"> Opportunistic.
	Induction material includes required information	<ul style="list-style-type: none"> Review of induction material Inspection of induction records. 	<ul style="list-style-type: none"> Review of written records. 	n/a	<ul style="list-style-type: none"> Monthly.
	Construction camp waste including food waste will not be dumped. Waste will be appropriately segregated and contained, including use of lids that cannot be removed by fauna.	<ul style="list-style-type: none"> Monthly inspection Waste disposal records. 	<ul style="list-style-type: none"> Visual inspection Review of waste disposal records. 	n/a	<ul style="list-style-type: none"> Monthly.
	GSWOS prepared and approved by the Minister for the Environment.	<ul style="list-style-type: none"> Record of Minister for the Environment approval of GSWOS. 	<ul style="list-style-type: none"> Review of written records. 	N/A	<ul style="list-style-type: none"> Prior to commencement of proposed action.
Construction - Northern Quoll management measures					
Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.	No clearing of habitat critical to the survival of the Northern Quoll occurs between 1 April and 30 September.	<ul style="list-style-type: none"> Monthly site inspections. 	<ul style="list-style-type: none"> Visual inspection. Review of written records. 	<ul style="list-style-type: none"> Habitat critical to the survival of the Northern Quoll. 	<ul style="list-style-type: none"> Monthly.
	No clearing to be undertaken in critical habitat until surveys	<ul style="list-style-type: none"> Records of pre-clearance surveys. 	<ul style="list-style-type: none"> Visual inspection. 	<ul style="list-style-type: none"> Habitat critical to the survival of the Northern Quoll. 	<ul style="list-style-type: none"> Two weeks prior to clearing commencing.

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
	confirm species is not present in the area to be cleared.				
	Induction material contains required information.	<ul style="list-style-type: none"> Review of contractor induction material. 	<ul style="list-style-type: none"> Review of written records. 	N/A	<ul style="list-style-type: none"> Monthly.
Construction - Pilbara Leaf-nosed Bat and Ghost Bat management measures					
Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.	Induction material contains required information.	<ul style="list-style-type: none"> Review of contractor induction material. 	<ul style="list-style-type: none"> Review of written records. 	N/A	<ul style="list-style-type: none"> Monthly.
Avoid impacts to roosting caves utilised by Ghost Bats.	Drawings including no-go zones provided to Construction Contractor Representative.	<ul style="list-style-type: none"> Record of provision of drawings showing no-go zones. 	<ul style="list-style-type: none"> Pre-construction review. 	N/A	<ul style="list-style-type: none"> Prior to construction.
	All no-go zones clearly marked out on site.	<ul style="list-style-type: none"> Incident reporting (EQSafe). Monthly site inspections. 	<ul style="list-style-type: none"> Review of written record Visual inspection. Photographic record, GPS of non-conformance. 	<ul style="list-style-type: none"> Important Pilbara Leaf-nosed Bat. Important Ghost Bat habitat. 	<ul style="list-style-type: none"> Prior to commencement of clearing. Monthly.
	Noise and Vibration Management Plan approved by DCCEEW.	<ul style="list-style-type: none"> Record of DCCEEW approval of Noise and Vibration Management Plan. 	<ul style="list-style-type: none"> Review of written records. 	N/A	<ul style="list-style-type: none"> Prior to blasting occurring within 400 m of a cave with evidence of Ghost Bat usage.

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
	<p>PPV as measured during blasting at caves with evidence of Ghost Bat usage exceeds threshold level. Following consultation with a fauna specialist a threshold for the predicted PPV will be agreed between Main Roads and DCCEEW to ensure no impact to any cave being used by Ghost Bats.</p>	<ul style="list-style-type: none"> Monitoring of PPV during blasting at caves with evidence of Ghost Bat usage. 	<ul style="list-style-type: none"> A minimum of two blast vibration monitors. Detailed monitoring method to be outlined in the noise and vibration management plan. 	<ul style="list-style-type: none"> Caves with evidence of Ghost Bat usage 	<ul style="list-style-type: none"> Every blast within 400 m of a cave with evidence of Ghost Bat usage.
	<p>All identified Ghost Bat roosts recorded in database and mapped on all construction plans. Database is accessible to all site personnel.</p>	<ul style="list-style-type: none"> Monthly site inspections. 	<ul style="list-style-type: none"> Review of written records. 	<p>N/A</p>	<p>N/A</p>
	<p>Contractor method statement includes confined blasting technique.</p>	<ul style="list-style-type: none"> Review of contractor method statement. Monthly inspection. 	<ul style="list-style-type: none"> Review of method statement. 	<p>N/A</p>	<ul style="list-style-type: none"> Prior to commencement of blasting
<p>Operations – All EPBC Act listed threatened species</p>					
<p>Minimise injury or mortality to EPBC listed</p>	<p>Design documents include fauna friendly signage.</p>	<ul style="list-style-type: none"> Pre-construction design reviews. 	<ul style="list-style-type: none"> Design review Visual inspection. 	<p>N/A</p>	<ul style="list-style-type: none"> Pre and Post construction.

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
threatened species during operation.	Design documents include requirement of devices such as, discs on the top wire of fencing.	<ul style="list-style-type: none"> Post-construction as built reviews against the design. 			

10 REPORTING

Main Roads will report to DCCEEW on the implementation of this AMP as part of annual compliance reporting under the conditions of approval for the Proposed Action.

Where compliance audits undertaken by Main Roads identify that the environmental management actions and/or the environmental objectives are not being achieved (i.e. non-compliance or an environmental incident), Main Roads will notify DCCEEW as soon as reasonably practicable. Consistent with standard document control procedures, Main Roads will maintain copies of all reports submitted to DCCEEW. The reporting requirements for this AMP are identified in Table 10-1.

Table 10-1 Reporting requirements

ASPECT	REPORT FROM	REPORT TO	REPORTING FREQUENCY
Implementation of AMP	Manager Environment	DCCEEW	Annually (as part of annual compliance reporting)
Non-compliance with AMP or Environmental Incident impacting MNES	Manager Environment	DCCEEW	As soon as reasonably practicable but not more than 7days

The format and content of annual reporting will be in accordance with the requirements of the annual reporting conditions. The format and content of reporting of a non-compliance event or an environmental incident will be subject to the nature of the non-compliance/incident and will include all requested information from DCCEEW. In consideration of this, specific templates for reporting these are not provided as part of this AMP.

11 ROLES AND RESPONSIBILITIES

This AMP identifies the environmental management of activities to be undertaken by Main Roads in implementation of the Proposed Action. Main Roads acknowledges that the environmental management actions contained within this AMP are legally required to be met.

The Manager Environment at Main Roads will maintain responsibility for implementation of the management actions outlined within this AMP, on behalf of Main Roads' Managing Director. Management actions may be undertaken by employees and/or contractors of Main Roads on behalf of Managing Director.

Where management actions are undertaken by employees and/or contractors of Main Roads, these will be communicated and documented to the relevant personnel.

12 REFERENCES

- Armstrong, K.N., Anstee, S.D., 2000. The ghost bat in the Pilbara: 100 years on. *Aust. Mammal.* 22, 93–101.
- Armstrong, K.N., 2001. The distribution and roost habitat of the orange leaf-nosed bat, *Rhinonictoris aurantius*, in the Pilbara region of Western Australia. *Wildl. Res.* 28, 95–104.
- Armstrong, K.N., 2013. Pilbara Leaf-nosed Bat *Rhinonictoris aurantia* (unnamed Pilbara form) in Van Dyck, S, ed *Field companion to the Mammals of Australia*. New Holland, London.
- Biota, 2021a. Manuwarra Red Dog Highway Stage 4 Biological Survey. Biota Environmental Sciences Pty Ltd. Report prepared for Main Roads Western Australia
- Biota 2021b. Manuwarra – Red Dog Highway Stage 4 MNES Fauna Habitat Quality Assessment. Biota Environmental Sciences Pty Ltd. Report prepared for Main Roads Western Australia
- Bullen, R.D., 2013. Pilbara leaf-nosed bat (*Rhinonictoris aurantia*); summary of current data on distribution, energetics, threats. Presentation to Department of Environment and Conservation Pilbara leaf-nosed bat workshop, Kensington WA, 25 June 2013.
- Burnett, S., 1997. Colonizing Cane Toads cause population declines in native predators: reliable anecdotal information and management implications. *Pac. Conserv. Biol.* 3, 65–72.
- Bush, B., Maryan, B., 2011. *Field Guide to the Snakes of the Pilbara, Western Australia*. Western Australian Museum, Perth.
- Churchill, S., 2008. *Australian Bats*. Allen & Unwin, Crows Nest NSW.
- Churchill, S., 1995. Reproductive ecology of the orange horseshoe bat, *Rhinyonycteris aurantius* (Hipposideridae: Chiroptera), a tropical cave-dweller. *Wildl. Res.* 22, 687–697.
- Cogger, H.G., 2000. *Reptiles and Amphibians of Australia - 6th edition*. Reed New Holland, Sydney, NSW.
- Department of Agriculture, Water and the Environment (DAWE), 2021a. *Dasyurus hallucatus* — Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] SPRAT Profile. Species Profile Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=331 (accessed 14 January 2021)
- Department of Agriculture, Water and the Environment (DAWE), 2021b. *Rhinonictoris aurantia* (Pilbara form) — Pilbara Leaf-nosed Bat SPRAT Profile [WWW Document]. Species Profile Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=82790 (accessed 14 January 2021).
- Department of Agriculture, Water and the Environment (DAWE), 2021c. *Liasis olivaceus barroni* - Olive Python (Pilbara subspecies) SPRAT Profile. Species Profile Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=66699 (accessed 15 January 21).
- Department of Biodiversity, Conservation and Attractions (DBCA), 2017. Night Parrot. Available at: <https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals/night->

[parrot#:~:text=Night%20parrots%20are%20highly%20cryptic,semi%20Darid%20areas%20of%20Aus](#)
(accessed 14 January 2021)

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

Department of the Environment (DoE), 2016. EPBC Act referral guideline for the endangered northern quoll, Commonwealth of Australia 2016. Available at:
<http://environment.gov.au/system/files/resources/d7e011a7-bf59-40ed-9387-9afcb8d590f8/files/referral-guideline-northern-quoll.pdf>

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), 2012 Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy.

Department of Water (DoW), 2006. Water Quality Protection Note no.44. Roads near sensitive water resources. Available from
https://www.water.wa.gov.au/__data/assets/pdf_file/0012/4116/81912.pdf

Department of Water (DoW), 2007. Water Quality Protection Note no.83. Infrastructure corridors near sensitive water Resource. Available from
https://www.water.wa.gov.au/__data/assets/pdf_file/0010/4042/82127.pdf

Department of Water (DoW). Water Quality Protection Note no.84. Rehabilitation of disturbed land in public drinking water source areas. Available from
https://www.water.wa.gov.au/__data/assets/pdf_file/0008/4112/86605.pdf

Department of Water (DoW), 2010. Millstream Water Reserve drinking water source protection plan. West Pilbara Water Supply. Available from:
https://www.water.wa.gov.au/__data/assets/pdf_file/0014/4541/93957.pdf (accessed: 29/06/2020)

Department of Water (DoW), 2015. Water Quality Protection Note no.65. Toxic and hazardous substances. Available from
https://www.water.wa.gov.au/__data/assets/pdf_file/0010/5959/82270.pdf

Department of Water (DoW), 2016a. Water quality protection note no. 25: Land use compatibility tables for public drinking water source areas. Available from
https://www.water.wa.gov.au/__data/assets/pdf_file/0014/1733/12441.pdf

Duncan, A., Baker, G.B., Montgomery, N., 1999. The Action Plan for Australian Bats. Environment Australia, Canberra.

Garnett, S., Szabo, J., Dutson, G., 2011. The Action Plan for Australian Birds 2010. CSIRO Publishing.

Higgins, P.J., Davies, S.J.J.F., 1996. Handbook of Australian, New Zealand and Antarctic Birds. Volume 3, Snipe to Pigeons. Oxford University Press, Melbourne, Victoria.

Hill, B.M. & S.J. Ward, 2010. National Recovery Plan For the Northern Quoll *Dasyurus hallucatus*. Department of Natural Resources, Environment, The Arts and Sport, Darwin.

Marchant, S., Higgins, P.J. (Eds.), 1993. Handbook of Australian, New Zealand & Antarctic Birds, Vol. 2: Raptors to Lapwings. Oxford University Press, Melbourne.

Milne, D.J., Burwell, C.J., Pavey, C.R., 2016. Dietary composition of insectivorous bats of the Top End of Australia. Aust. Mammal. 38, 213–220.

NSW Government, 2017a. Night Parrot – Profile. Office of Environment and Heritage. Available at: <https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20174> (accessed 14 January 2021)

NSW Government, 2017b. Grey Falcon – Profile. Office of Environment and Heritage. Available at: <https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10330> (accessed 14 January 2021)

Oakwood, M., 2000. Reproduction and demography of the northern quoll, *Dasyurus hallucatus*, in the lowland savanna of northern Australia. *Aust. J. Zool.* 48, 519–539.

Pearson, D.J., 1993. Distribution, status and conservation of pythons in Western Australia. *Herpetol. Aust. Diverse Discip.* 393–395.

Pearson, D. J., 2006. Giant pythons of the Pilbara. *Landscape* 19, 32-39.

Schoenjahn, J., 2018. Adaptations of the rare endemic Grey Falcon *Falco hypoleucos* that enable its permanent residence in the arid zone of Australia (PhD Thesis). The University of Queensland. Available at: <https://doi.org/10.14264/uql.2018.741> (accessed 21 February 2021)

Threatened Species Scientific Committee (TSSC), 2008. Conservation Advice *Liasis olivaceus barroni* (Olive Python – Pilbara subspecies). Canberra: Department of the Environment, Water, Heritage and the Arts.

Threatened Species Scientific Committee (TSSC), 2016a. Conservation Advice *Rhinonicteris aurantia* (Pilbara form) (Pilbara Leaf-nosed Bat). Canberra: Department of the Environment.

Threatened Species Scientific Committee (TSSC), 2016b. Conservation Advice *Macroderma gigas* ghost bat. Canberra: Department of the Environment.

Threatened Species Scientific Committee (TSSC), 2016c. Conservation Advice *Pezoporus occidentalis* night parrot. Canberra: Department of the Environment.

Threatened Species Scientific Committee (TSSC), 2020. Conservation Advice *Falco hypoleucos* Grey Falcon. Canberra: Department of Agriculture, Water and the Environment.

Tidemann, C.R., Priddel, D.M., Nelson, J.E. and Pettigrew, J.D. (1985) Foraging behaviour of the Australian ghost bat, *Macroderma gigas* (Microchiroptera: Megadermatidae). *Australian Journal of Zoology* 33: 705-713.

van Dyck, S., Strahan, R. (Eds.), 2008. *The Mammals of Australia*, 3rd edition. Reed New Holland, Sydney, NSW.

Wilson, S., Swan, G., 2003. *A Complete Guide to Reptiles of Australia*. Reed New Holland, Sydney.

13 GLOSSARY OF TERMS

Term/Abbreviation/Acronym	Definition
AMP	Action Management Plan
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ha	Hectares
MNES	Matters of National Environmental Significance
MRDH	Manuwarra Red Dog Highway
MSE	Mechanically Stabilised Earth
PWCA	Pilbara Wildlife Carers Association
SMART	Specific, measurable, achievable, relevant and time-bound
WA	Western Australia

14 FIGURES

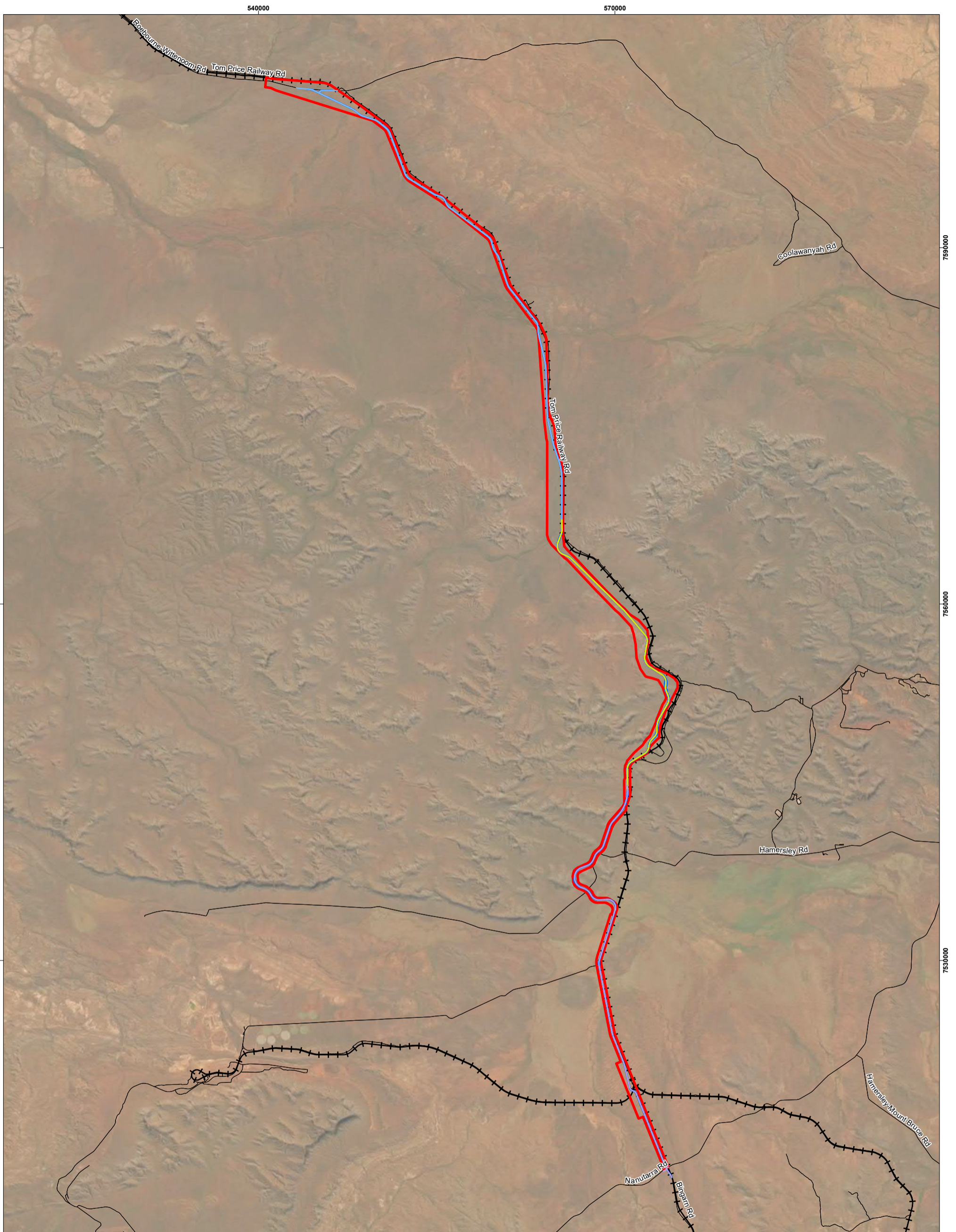
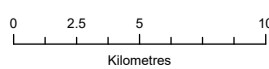


Figure 1 Proposed Action Location Layout Plan

- Legend**
- Coolawanyah Section
 - Hamersley Section
 - Tom Price Section
 - Roads
 - + Railways
 - Disturbance Footprint
 - Development Envelope



Jacobs

JACOBS, 263 Adelaide Terrace, Perth WA 6000
Tel: +61 8 9469 4400 Fax: +61 8 9469 4488

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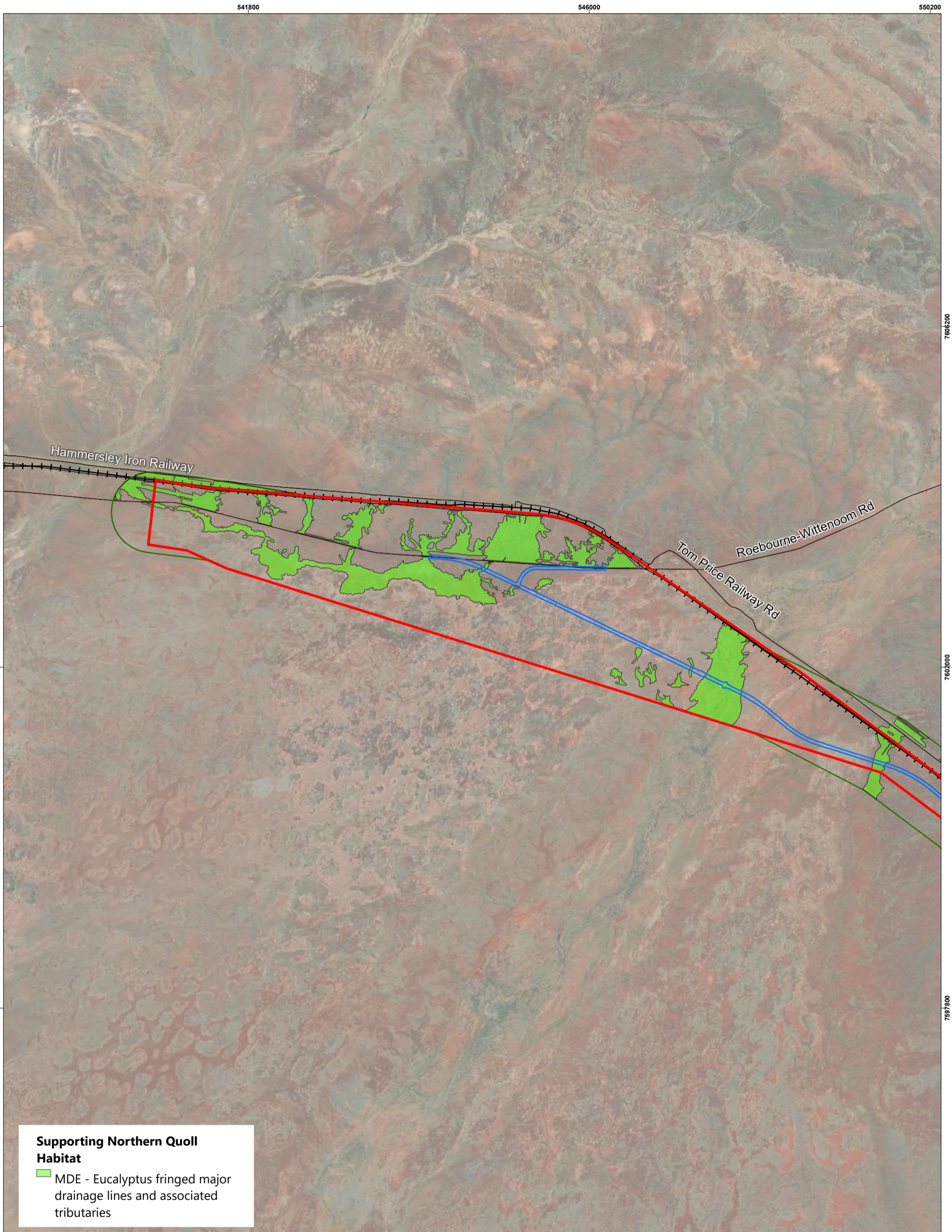
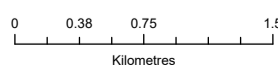
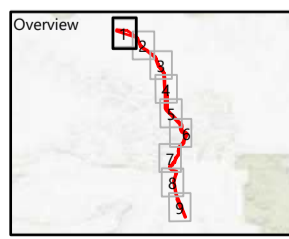


Figure 2 Northern Quoll Habitat

Legend

- Roads
- + Railways
- ▭ Disturbance Footprint
- ▭ Development Envelope
- ▭ Fauna Habitat Survey Boundary



Jacobs

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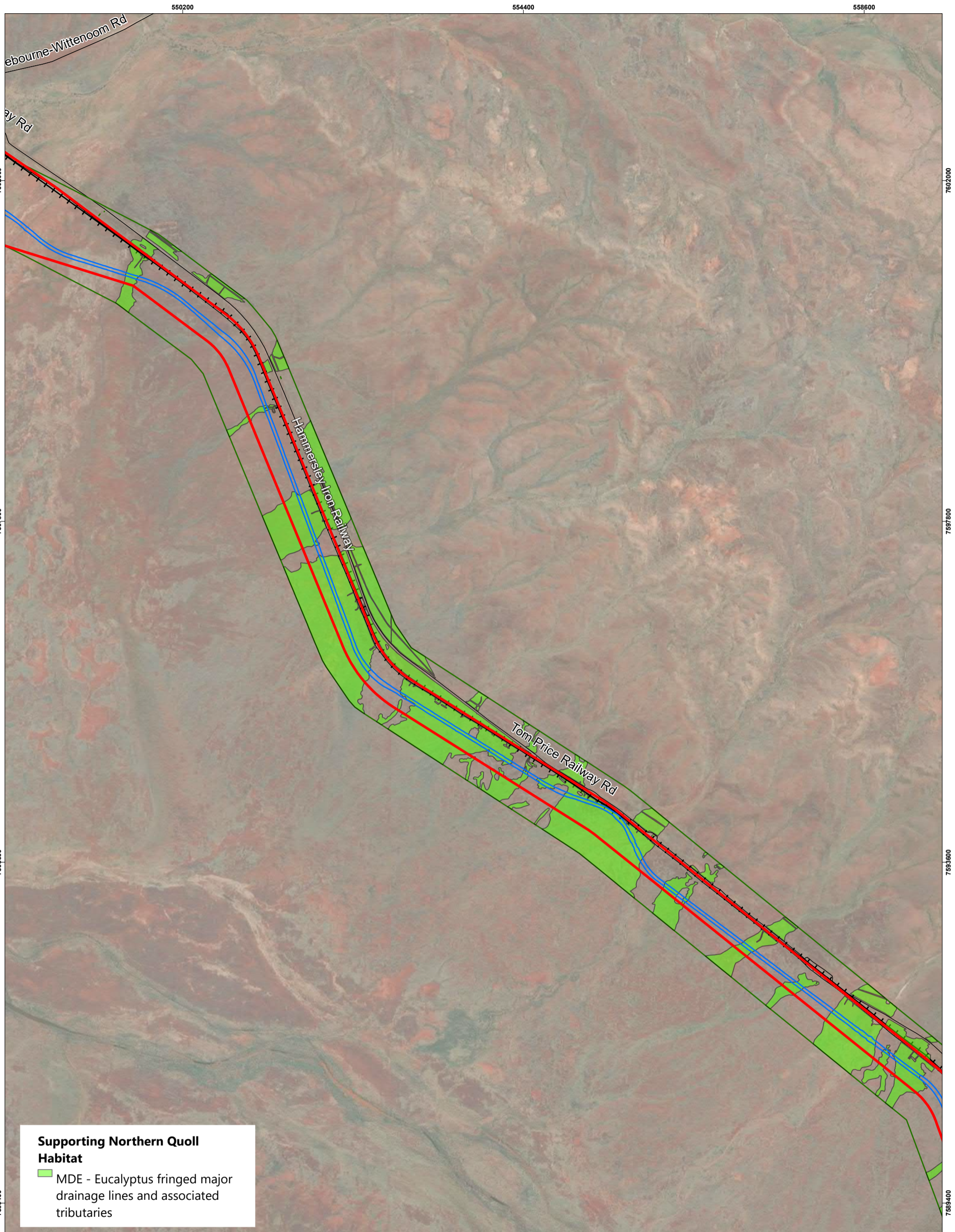
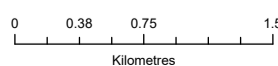
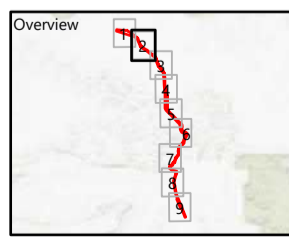


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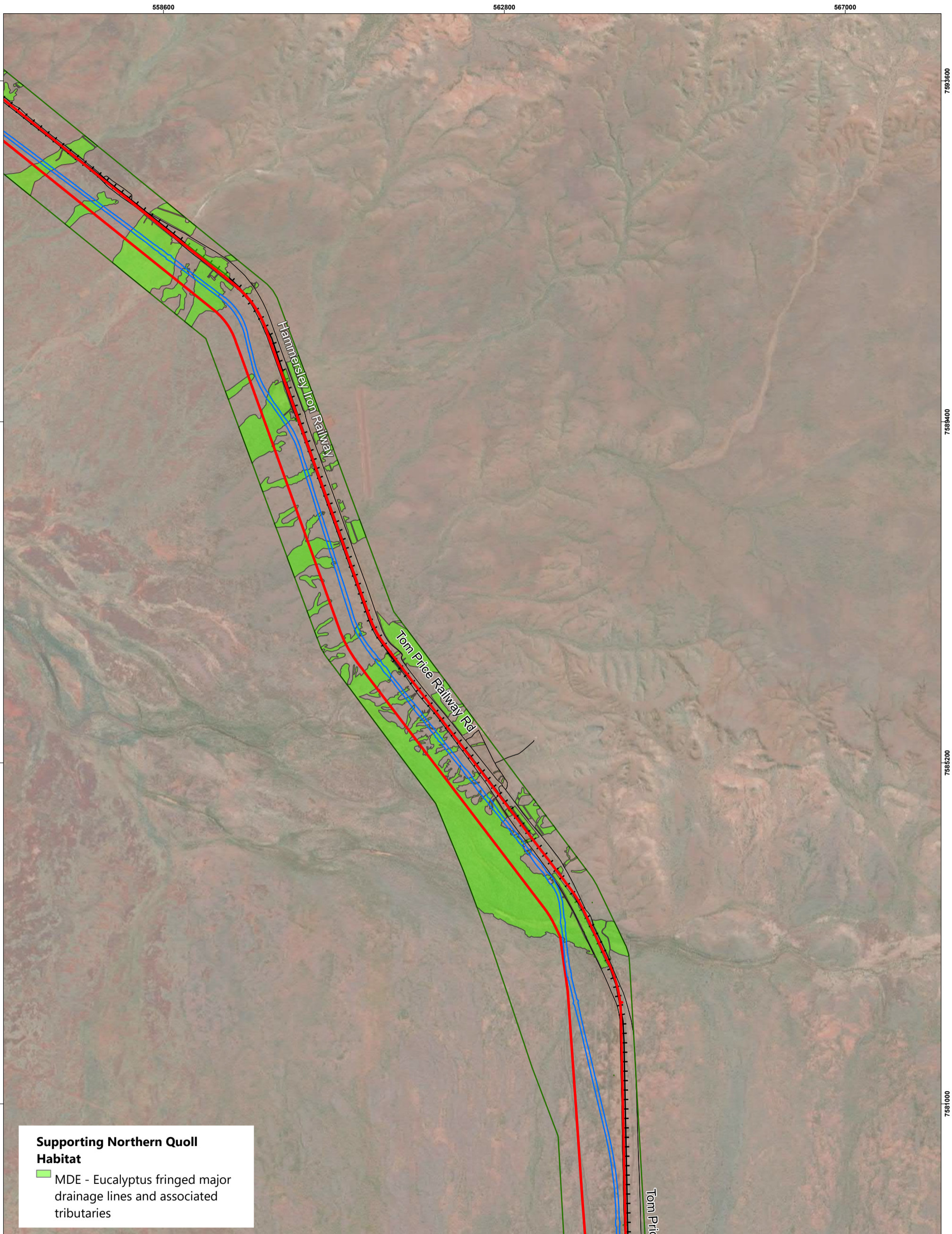
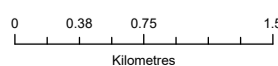
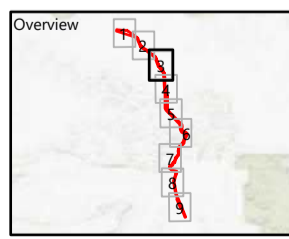


Figure 2 Northern Quoll Habitat

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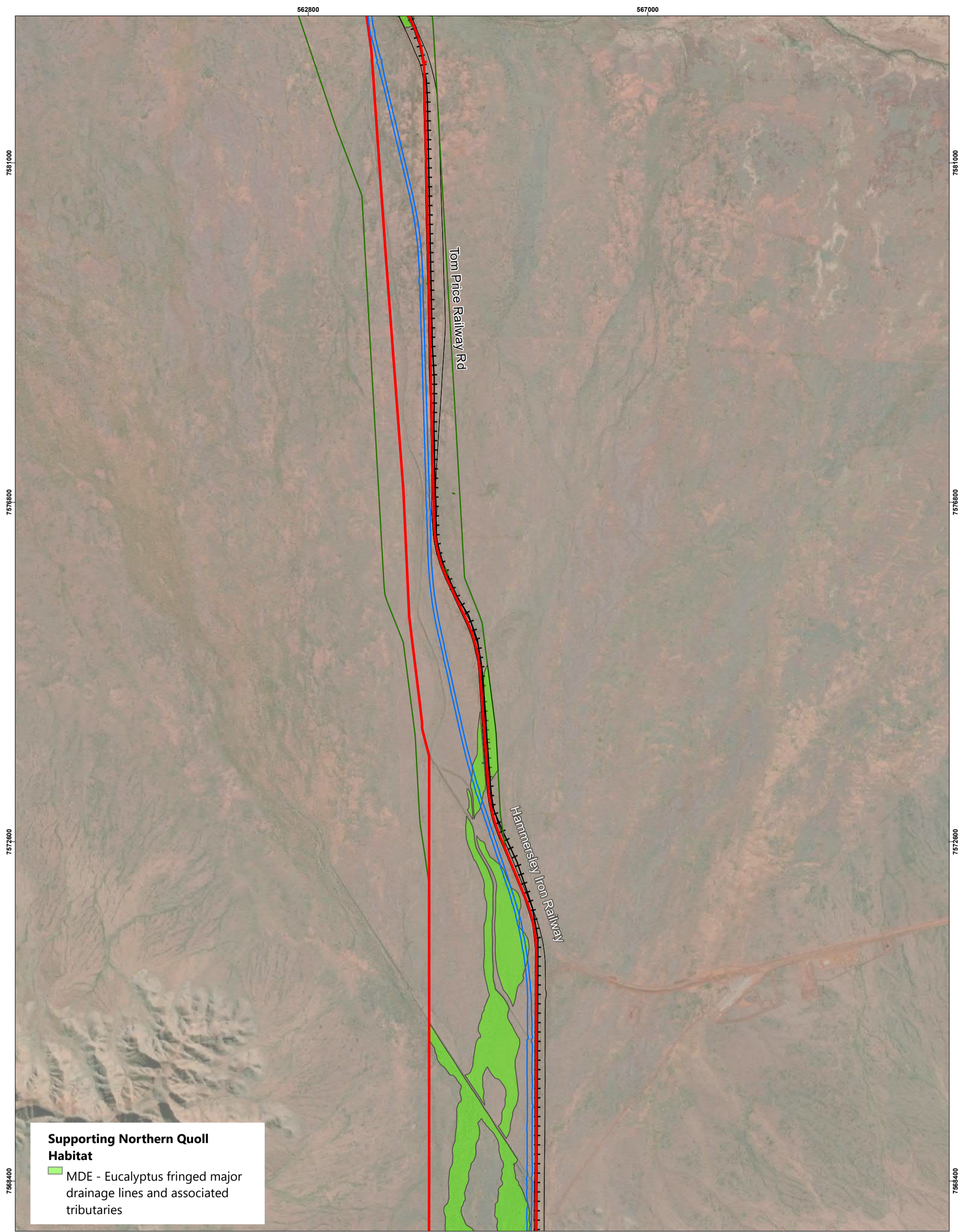
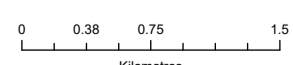
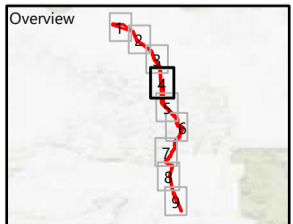


Figure 2 Northern Quoll Habitat

- Legend**
- Roads
 - + Railways
 - ▭ Disturbance Footprint
 - ▭ Development Envelope
 - ▭ Fauna Habitat Survey Boundary



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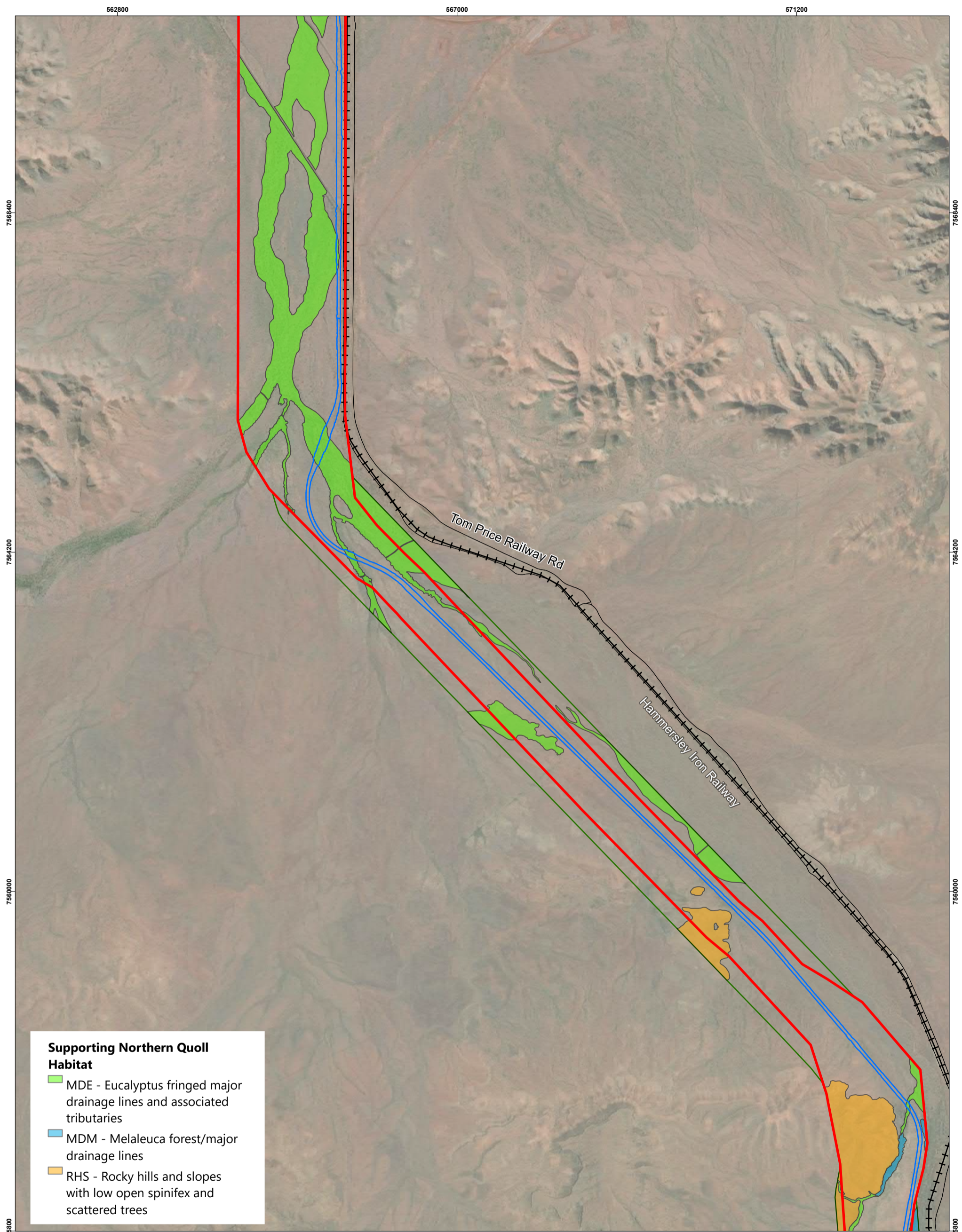
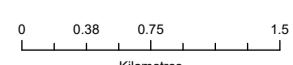
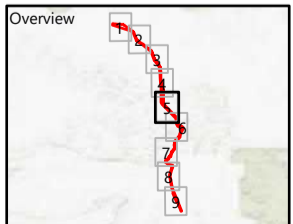


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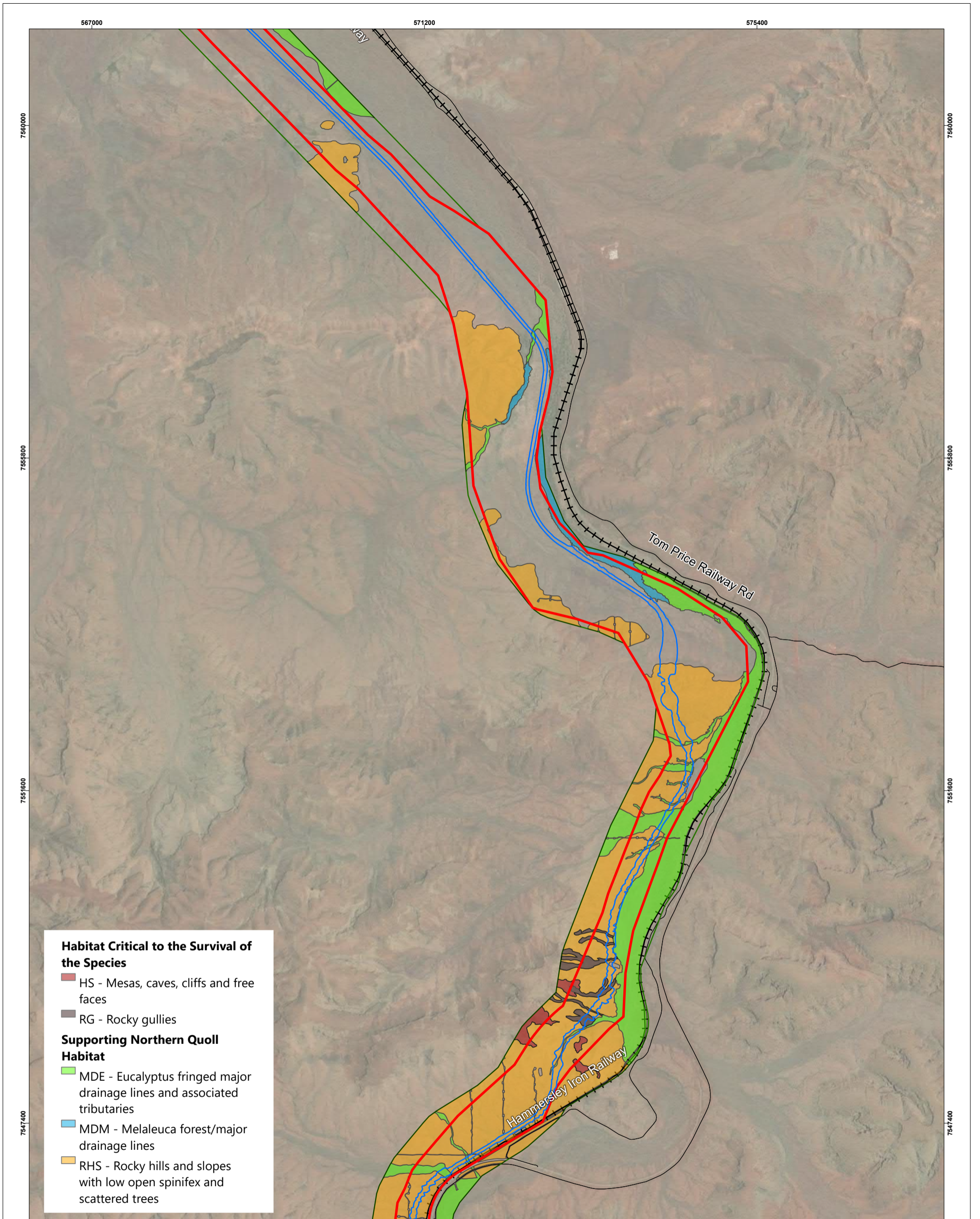
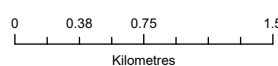
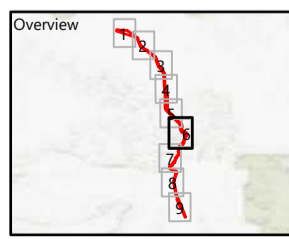


Figure 2 Northern Quoll Habitat



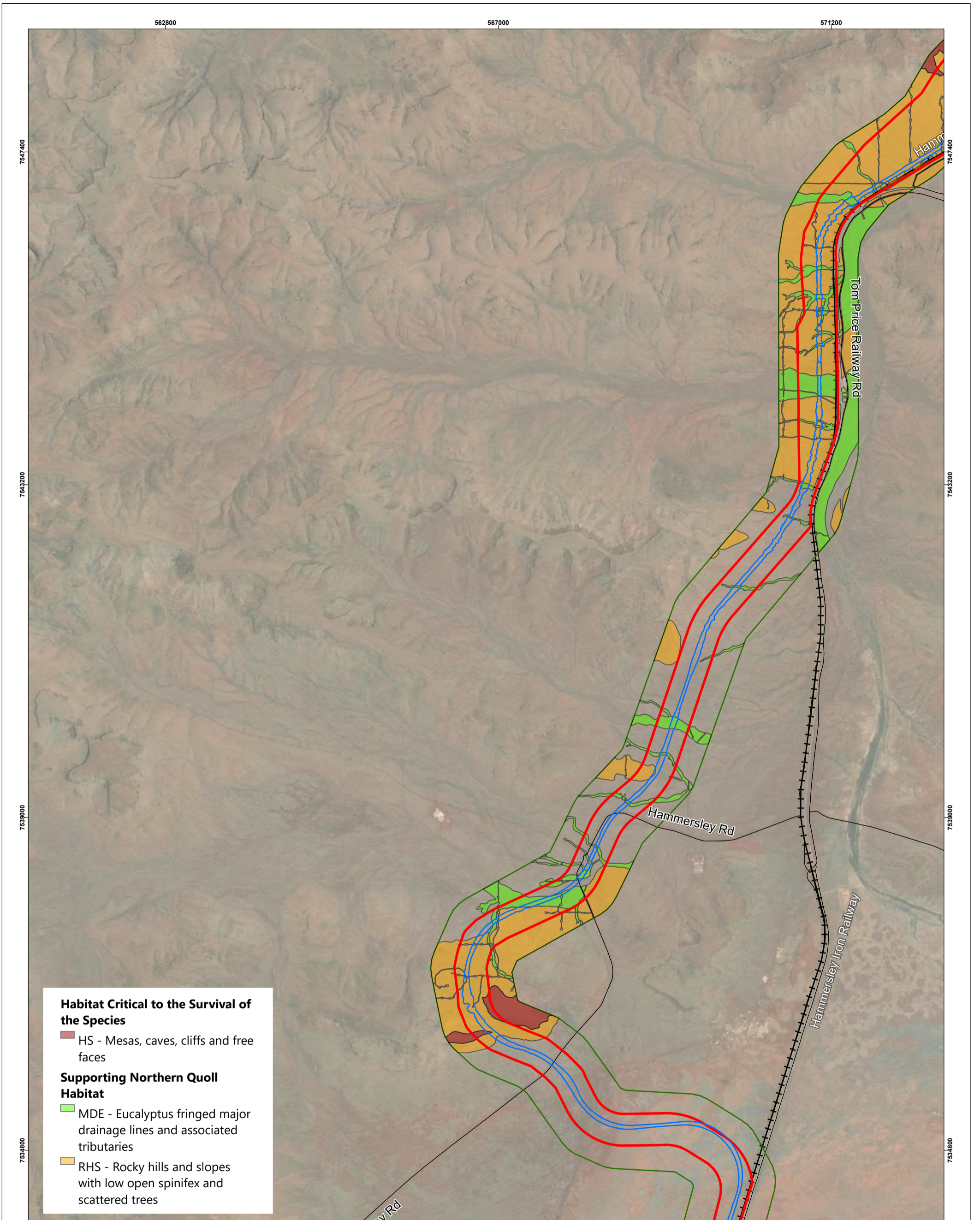
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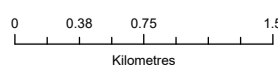
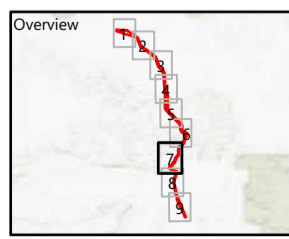
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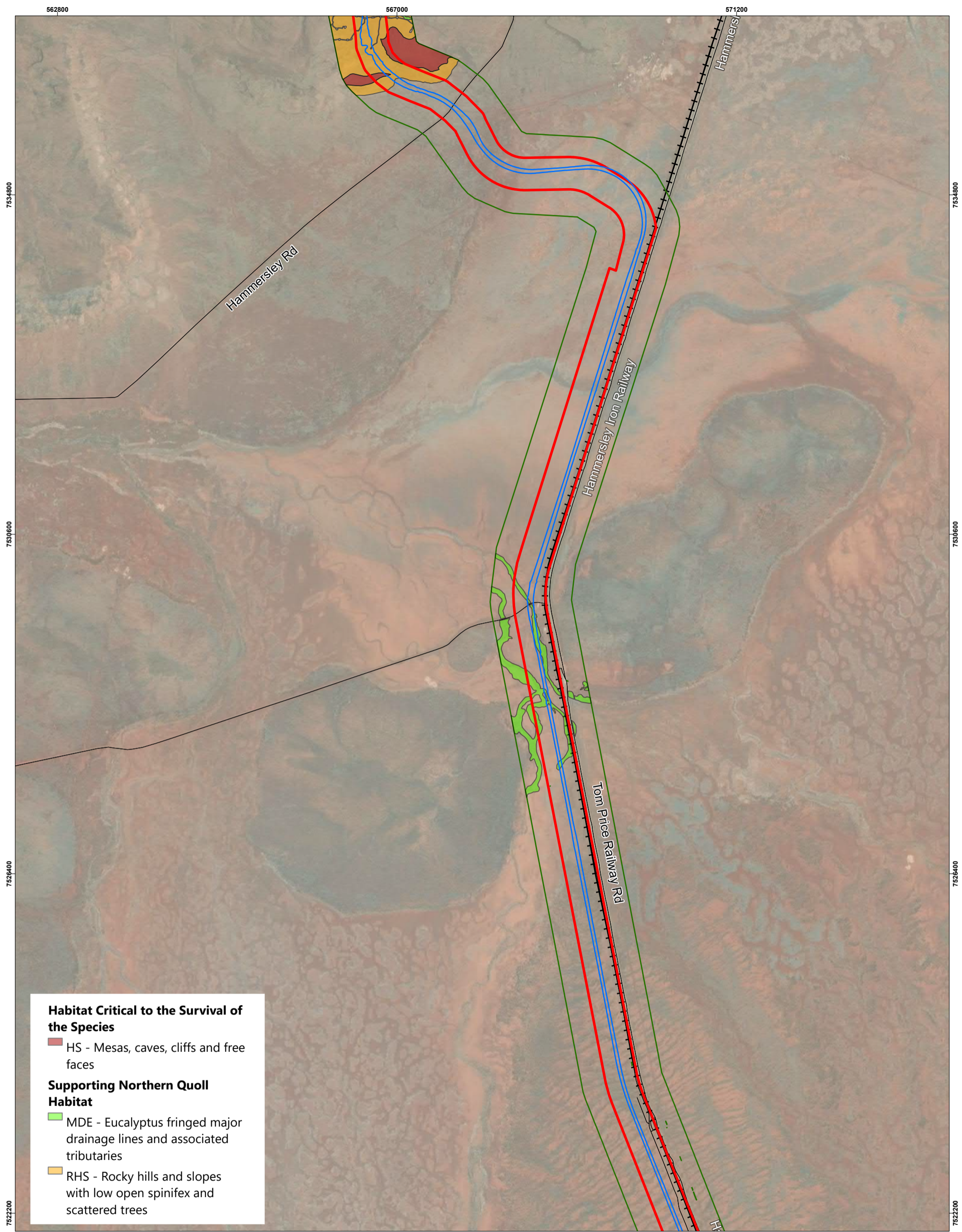
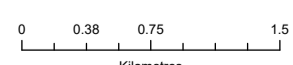
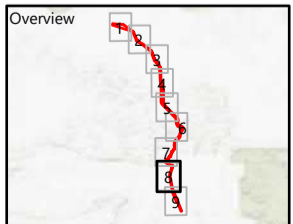


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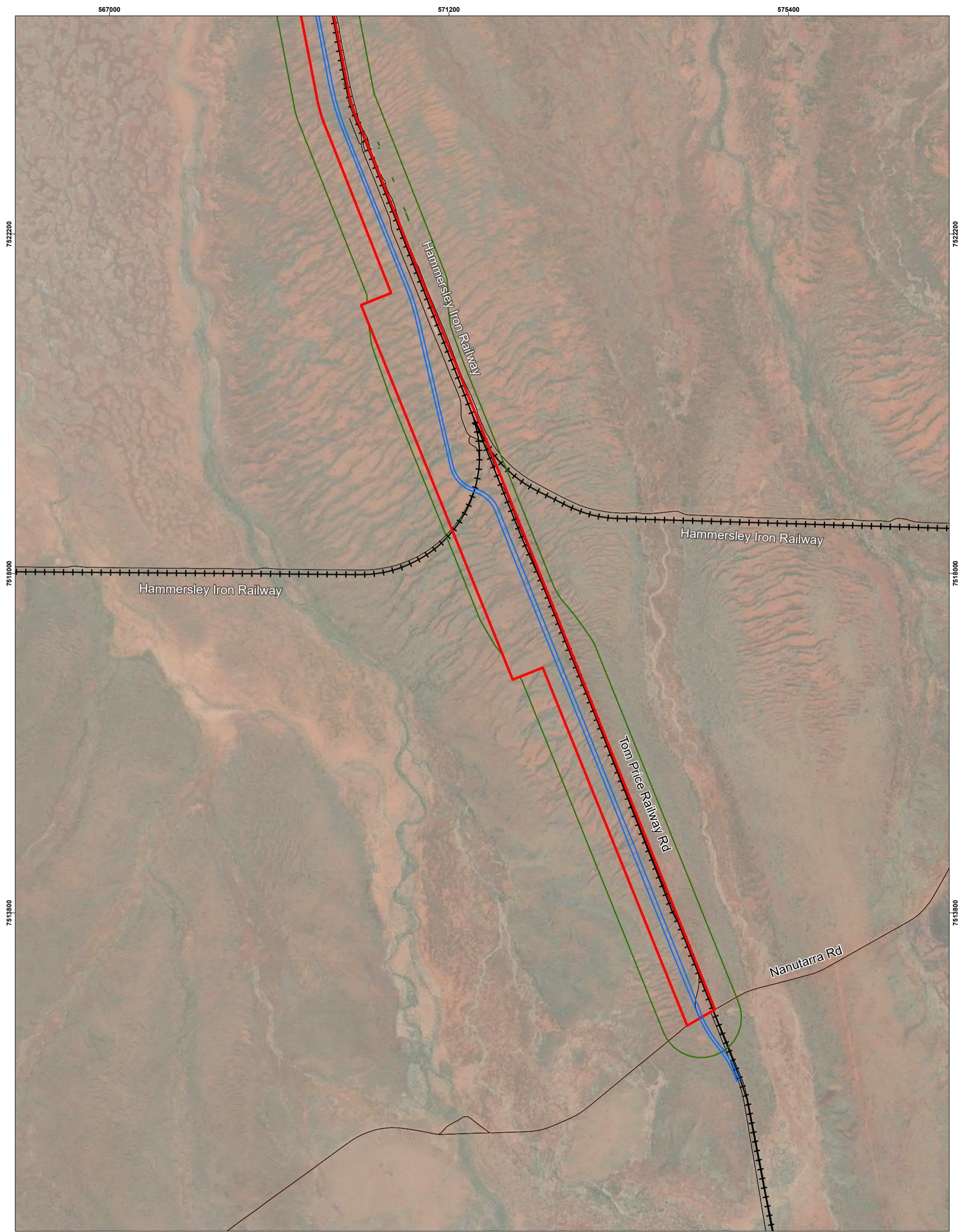
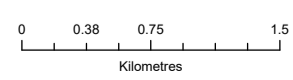
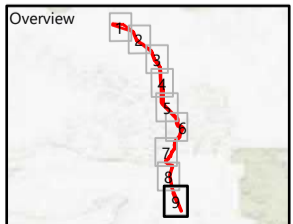


Figure 2 Northern Quoll Habitat

Legend

- Roads
- + Railways
- ▭ Disturbance Footprint
- ▭ Development Envelope
- ▭ Fauna Habitat Survey Boundary



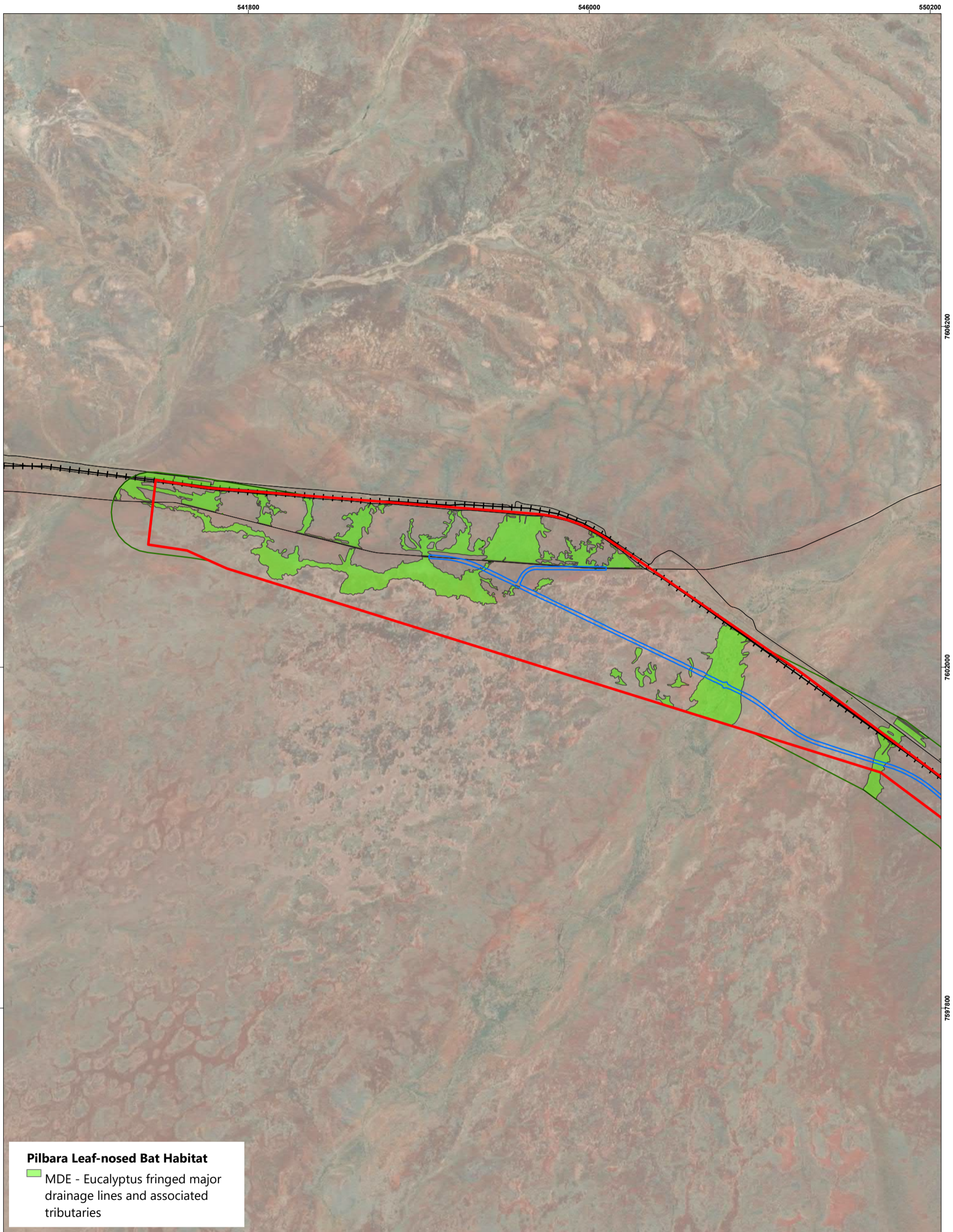
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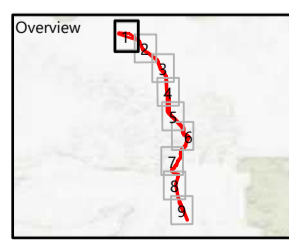


Pilbara Leaf-nosed Bat Habitat
 ■ MDE - Eucalyptus fringed major drainage lines and associated tributaries

Figure 3 Pilbara Leaf-nosed Bat Habitat

Legend

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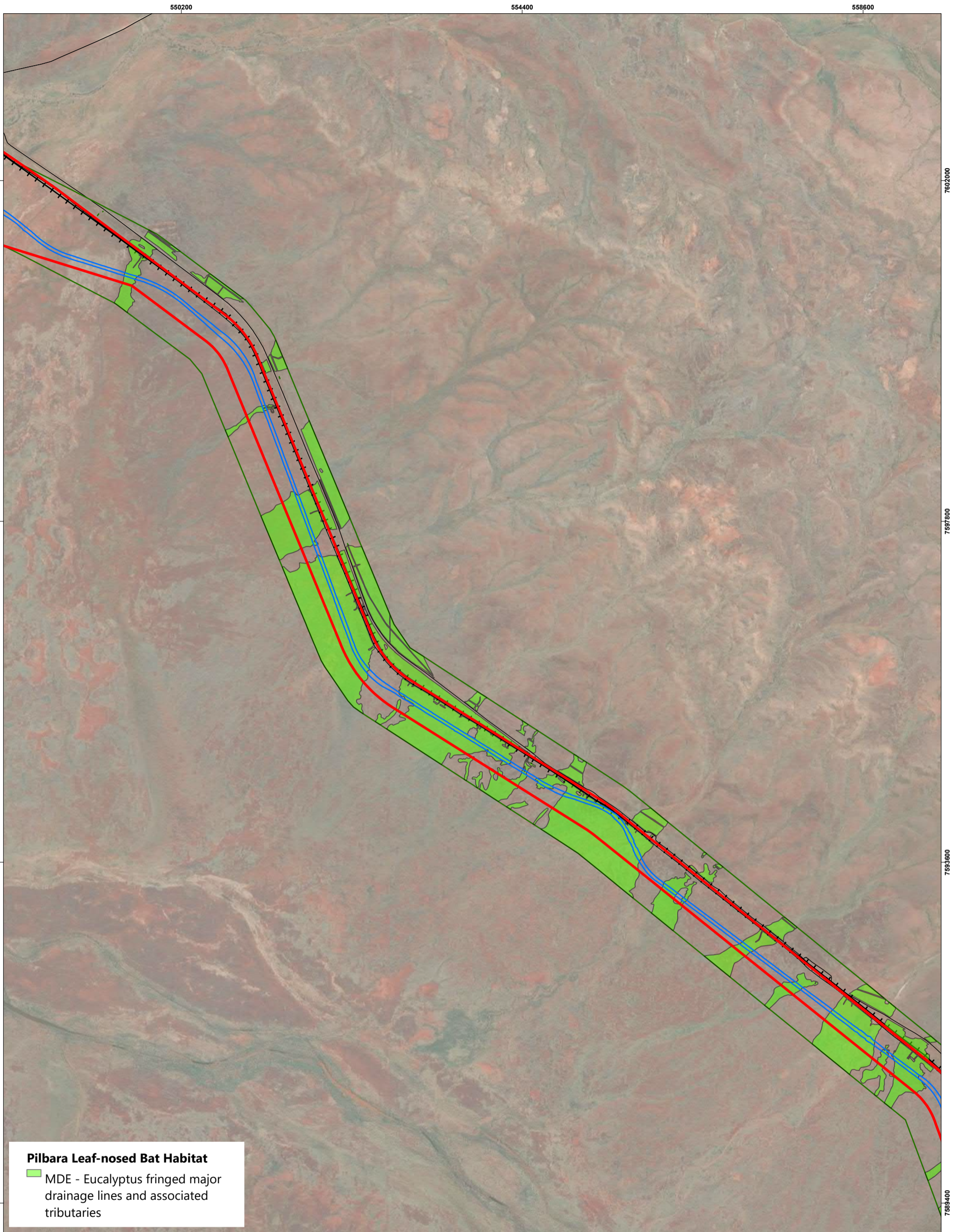
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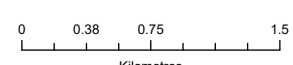
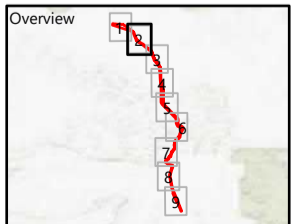
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Pilbara Leaf-nosed Bat Habitat
 MDE - Eucalyptus fringed major drainage lines and associated tributaries

Figure 3 Pilbara Leaf-nosed Bat Habitat

- Legend**
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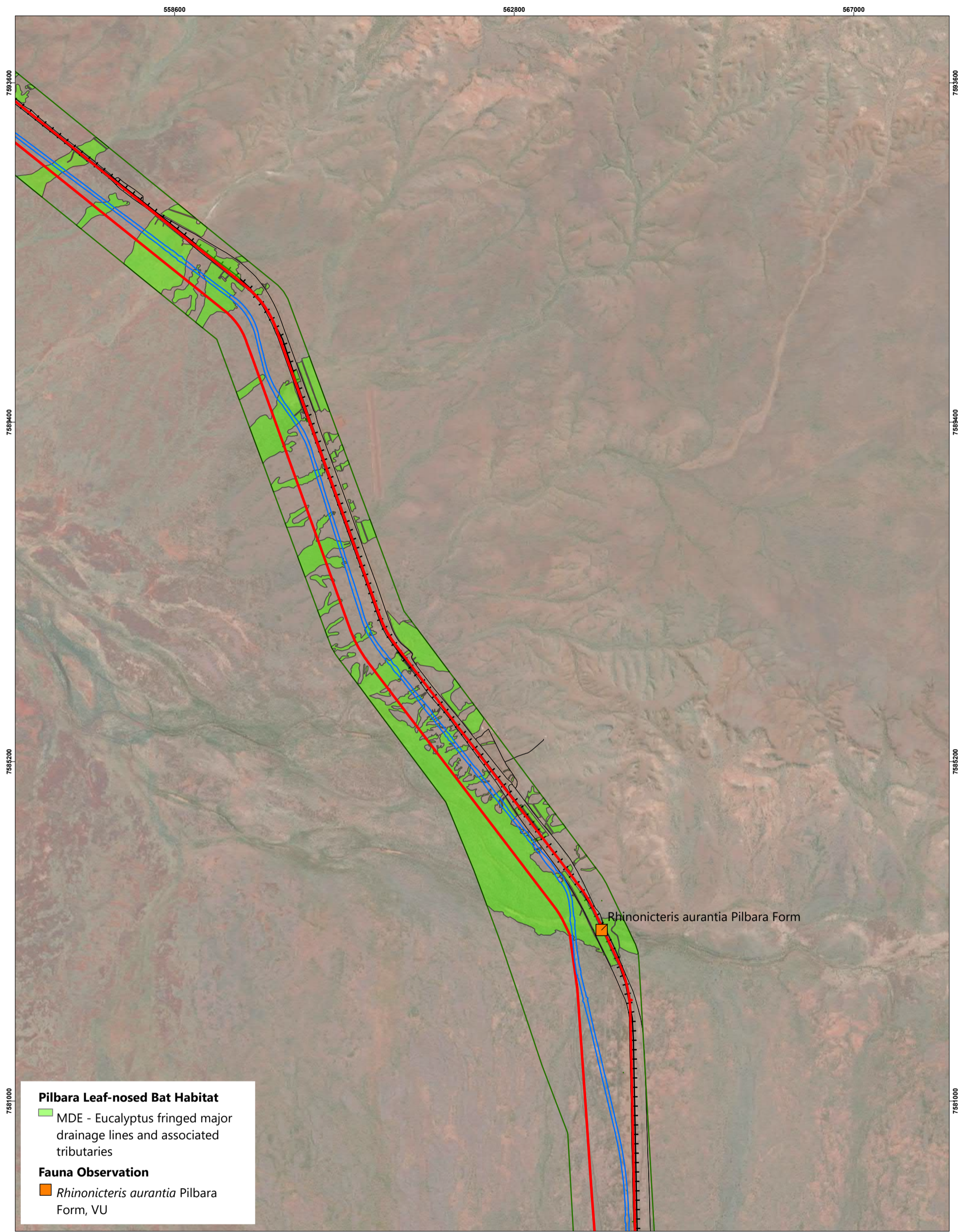


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Pilbara Leaf-nosed Bat Habitat

- MDE - Eucalyptus fringed major drainage lines and associated tributaries

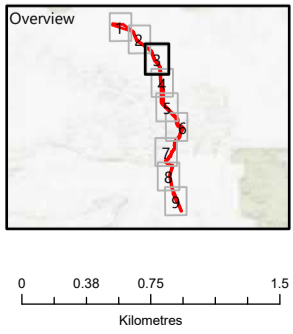
Fauna Observation

- *Rhinonictes aurantia* Pilbara Form, VU

Rhinonictes aurantia Pilbara Form

Figure 3 Pilbara Leaf-nosed Bat Habitat

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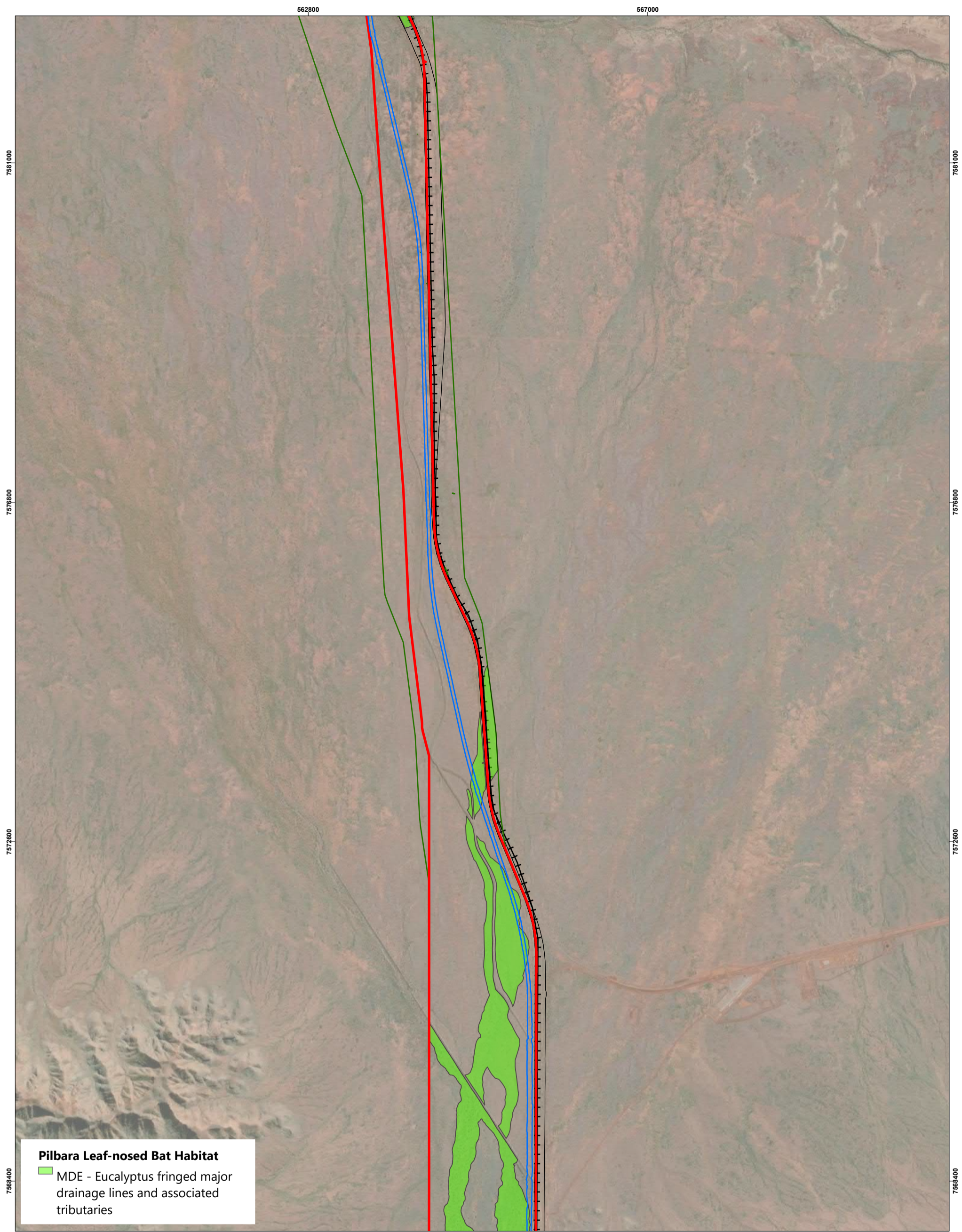
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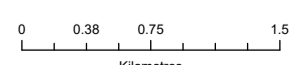
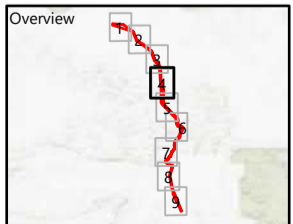


Pilbara Leaf-nosed Bat Habitat

- MDE - Eucalyptus fringed major drainage lines and associated tributaries

Figure 3 Pilbara Leaf-nosed Bat Habitat

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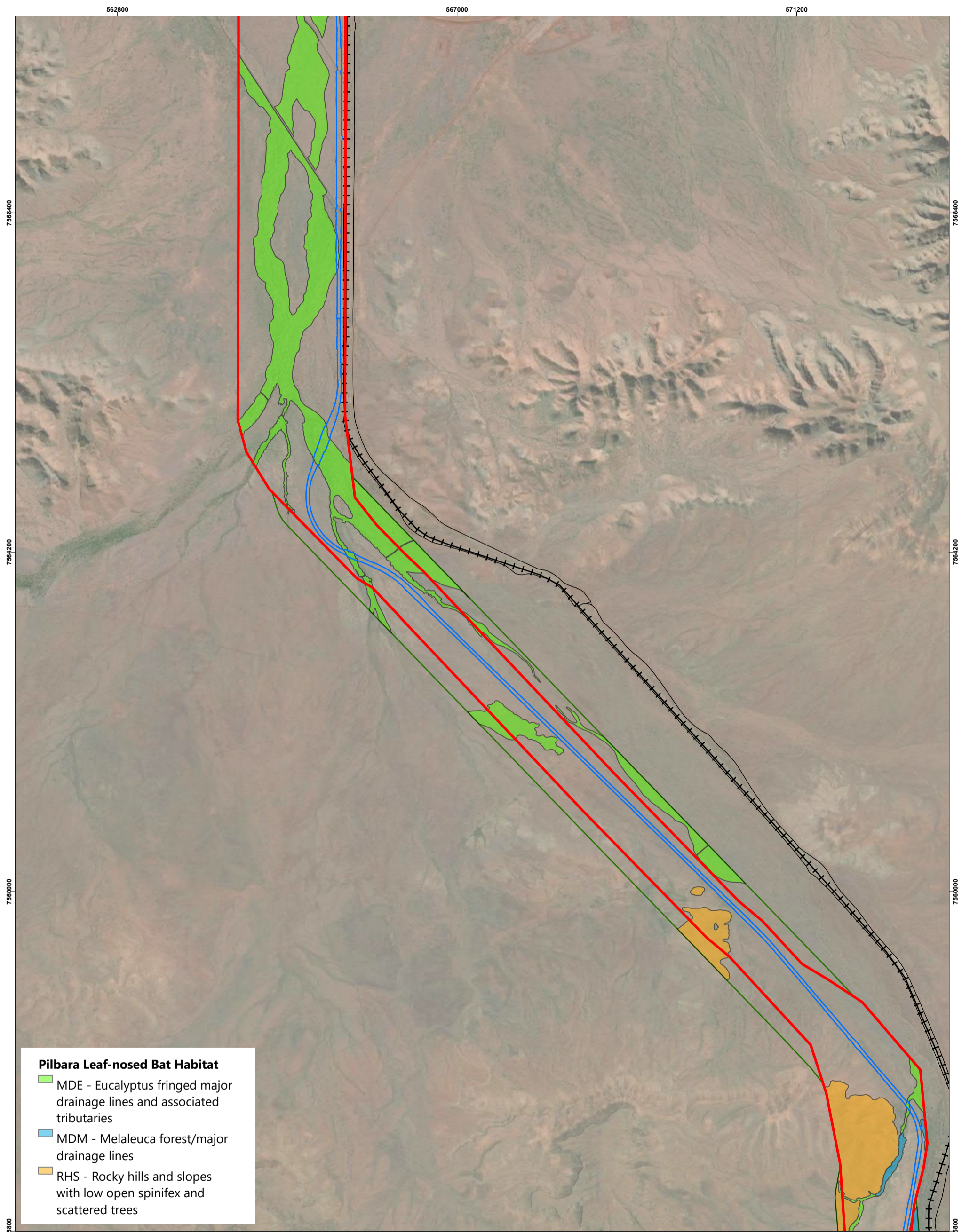
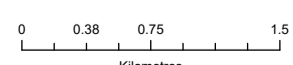
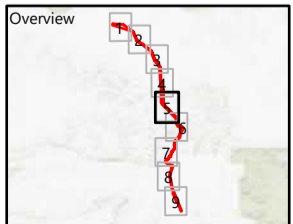


Figure 3 Pilbara Leaf-nosed Bat Habitat



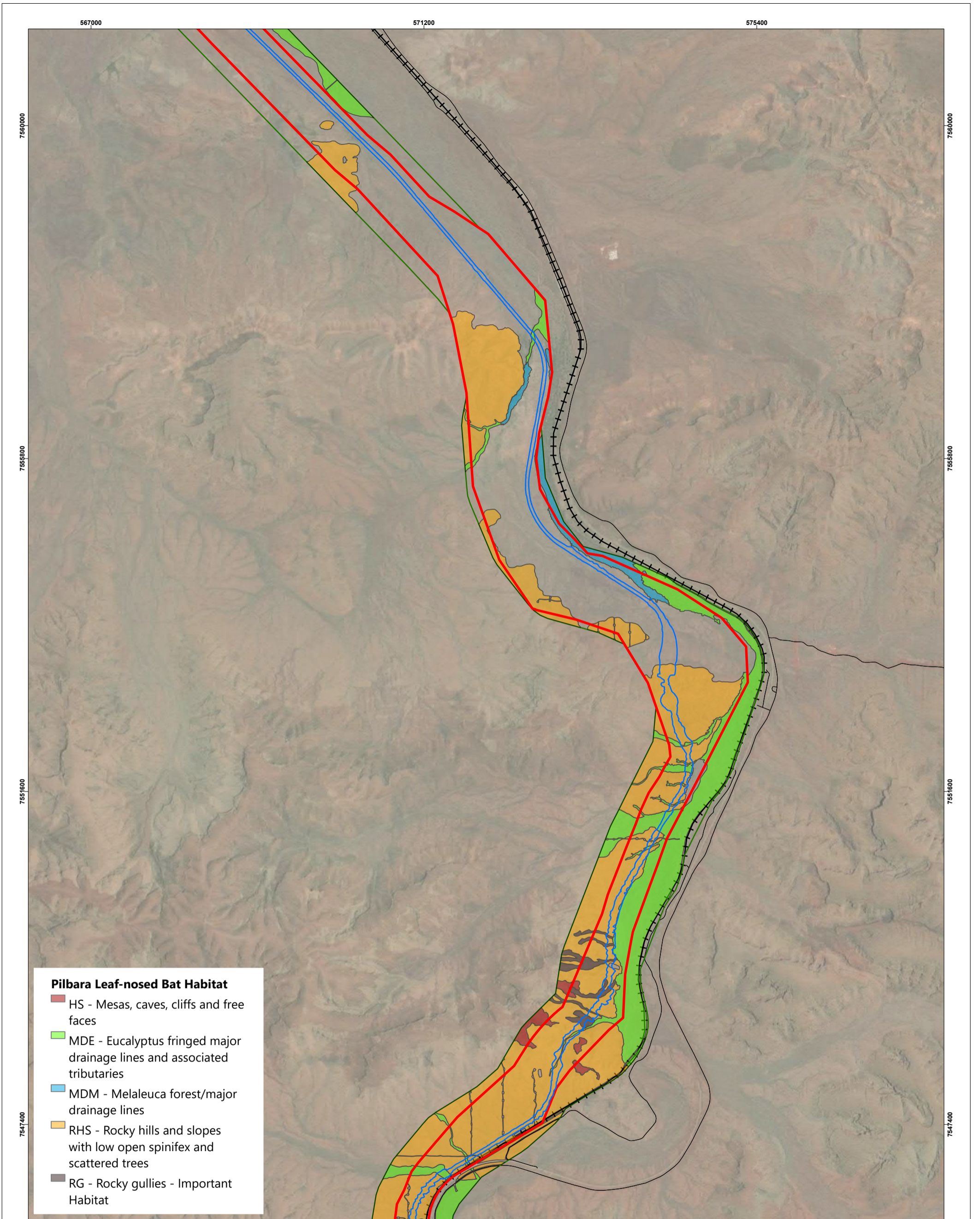
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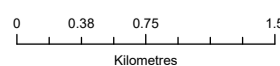
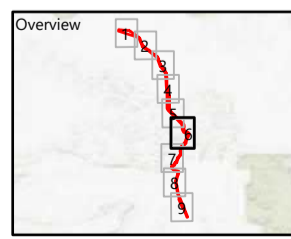
Pilbara Leaf-nosed Bat Habitat

- HS - Mesas, caves, cliffs and free faces
- MDE - Eucalyptus fringed major drainage lines and associated tributaries
- MDM - Melaleuca forest/major drainage lines
- RHS - Rocky hills and slopes with low open spinifex and scattered trees
- RG - Rocky gullies - Important Habitat

Figure 3 Pilbara Leaf-nosed Bat Habitat

Legend

- Roads
- + Railways
- ▭ Disturbance Footprint
- ▭ Development Envelope
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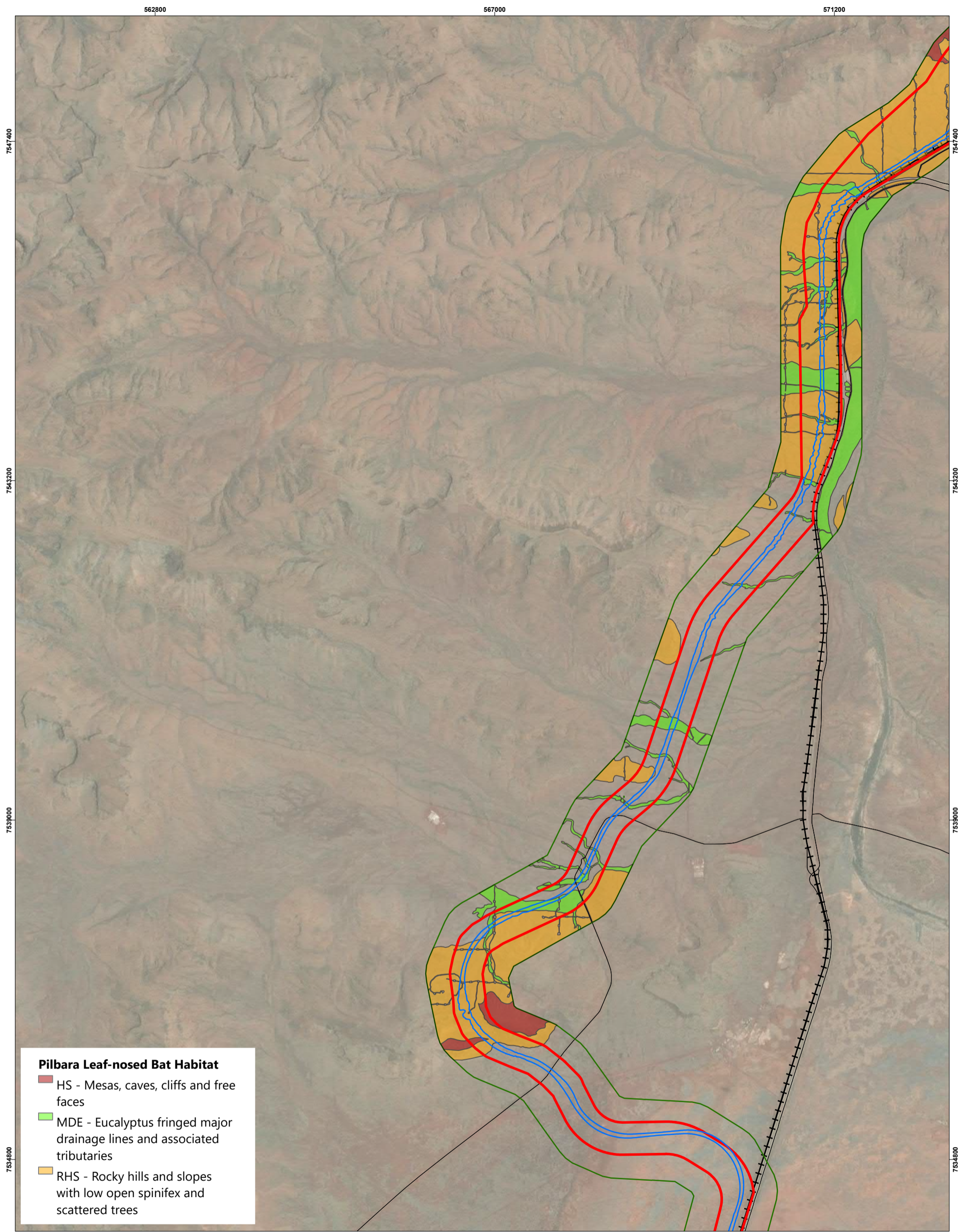


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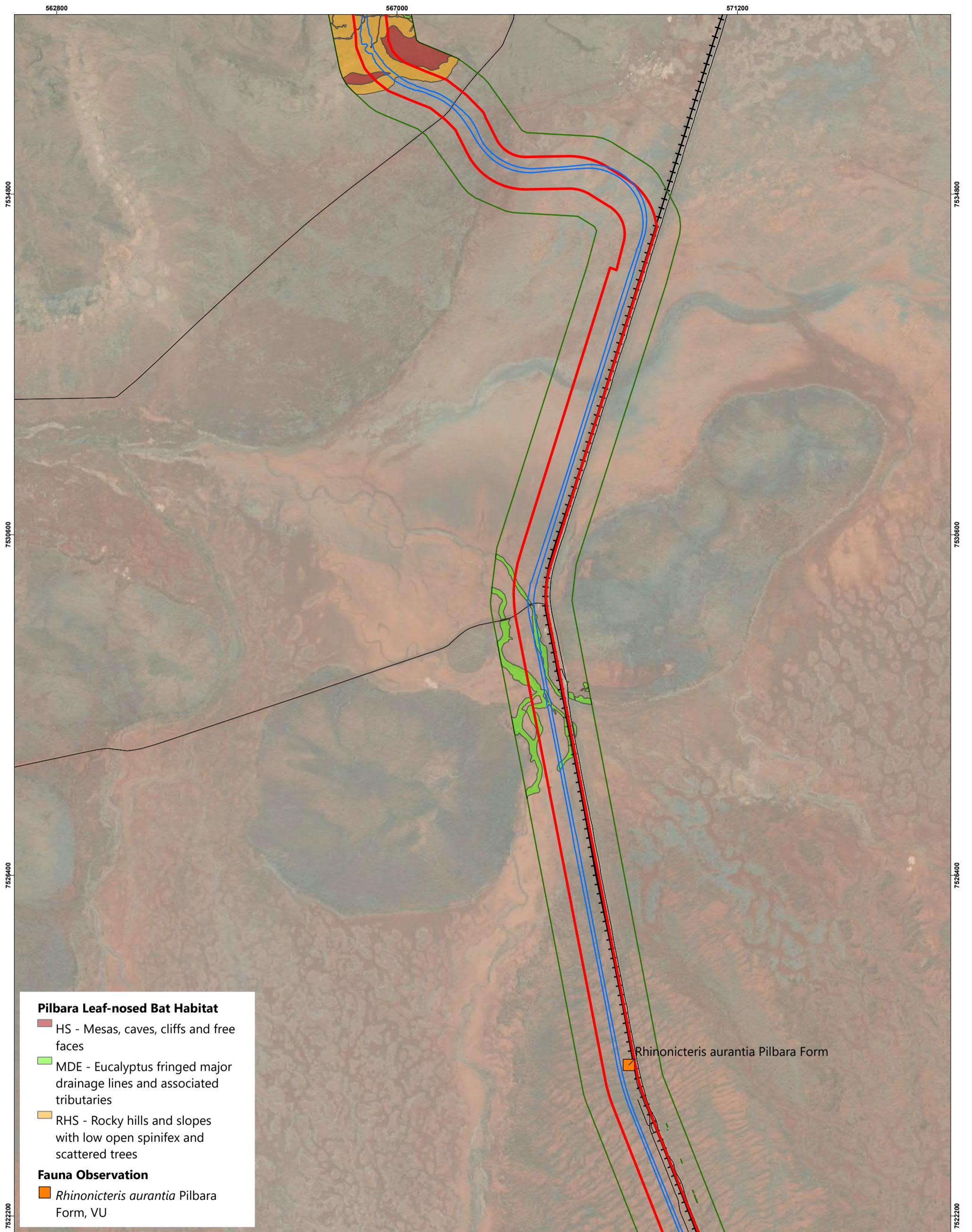
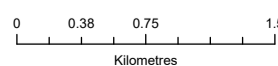
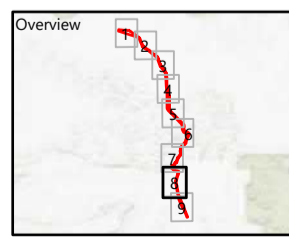


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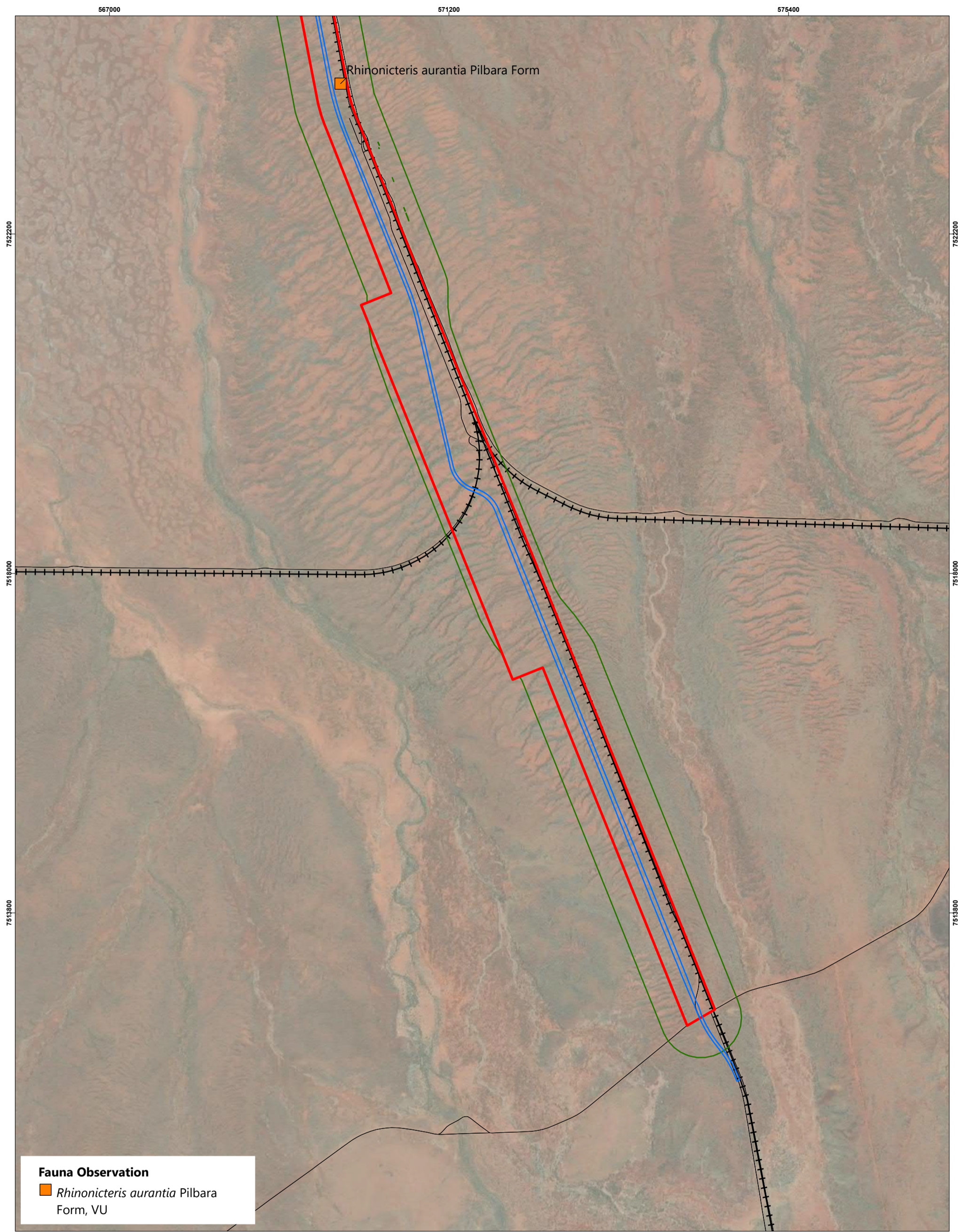
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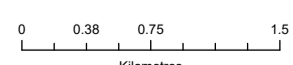
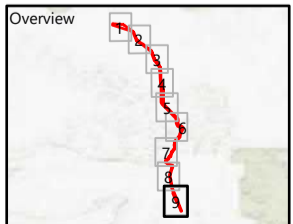
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Fauna Observation
 ■ *Rhinonictes aurantia* Pilbara Form, VU

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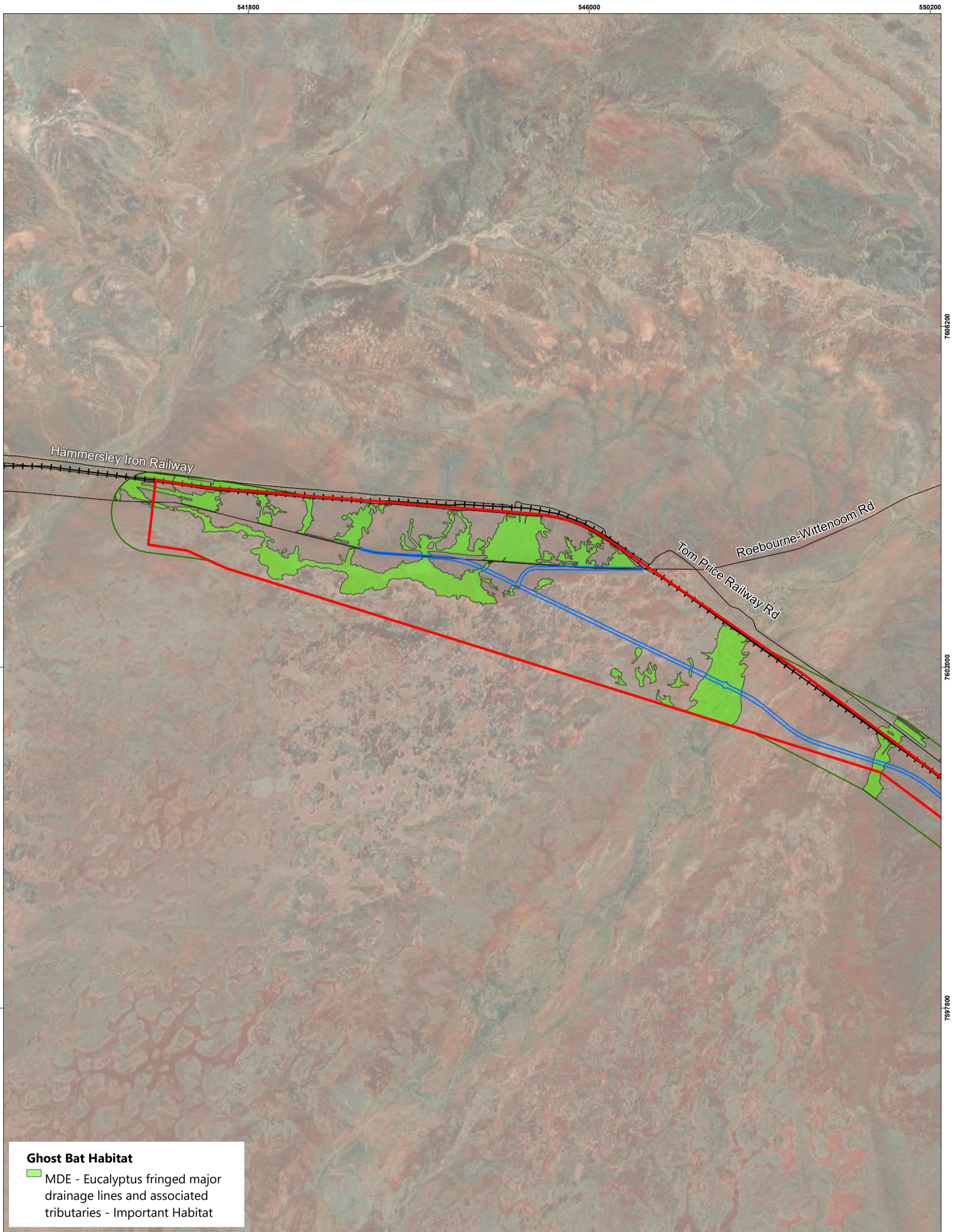
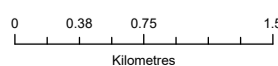
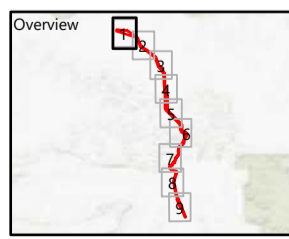


Figure 4 Ghost Bat Habitat

Legend

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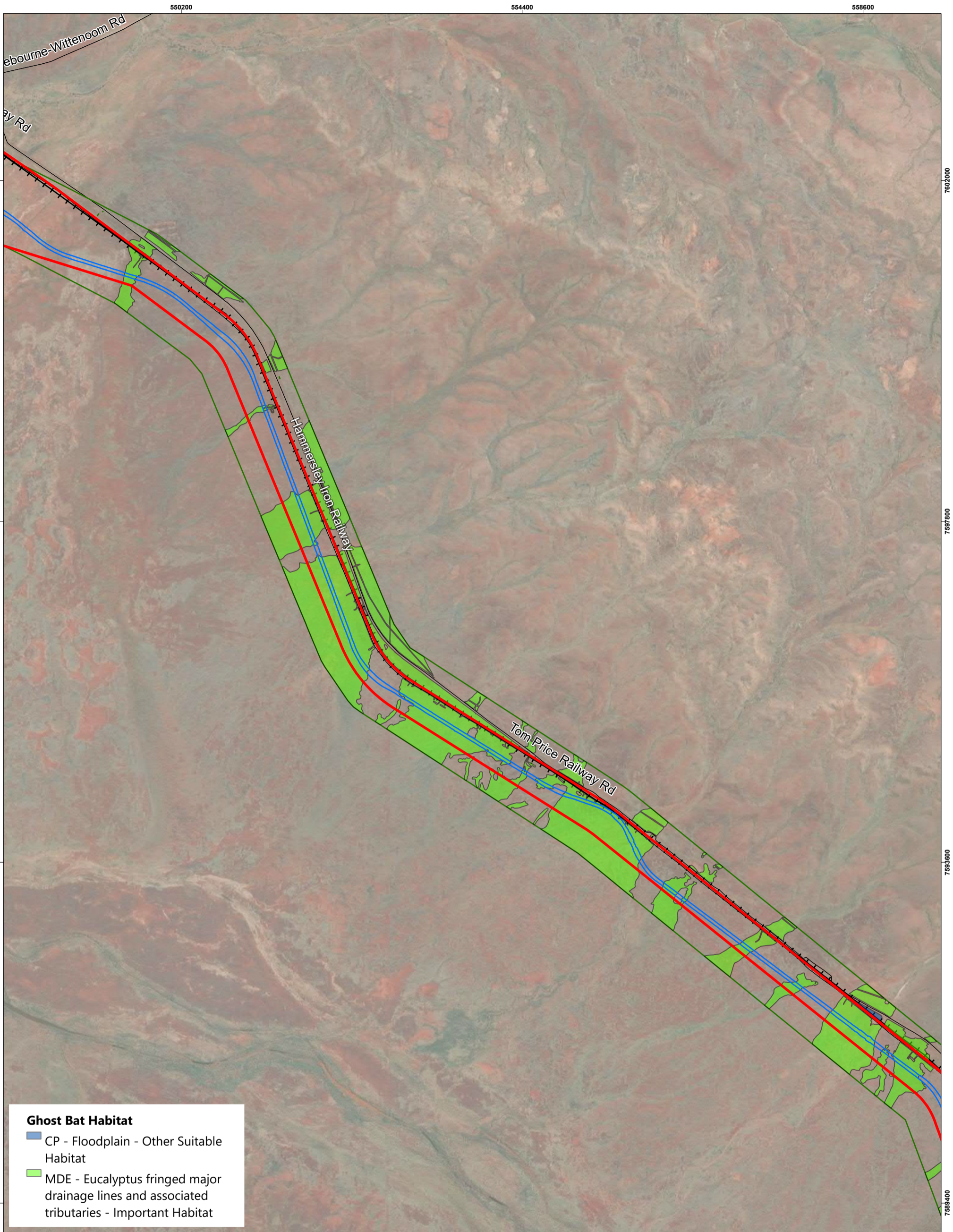
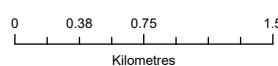
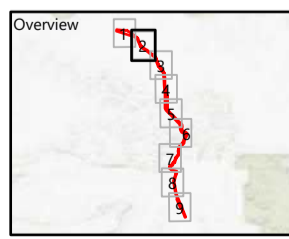


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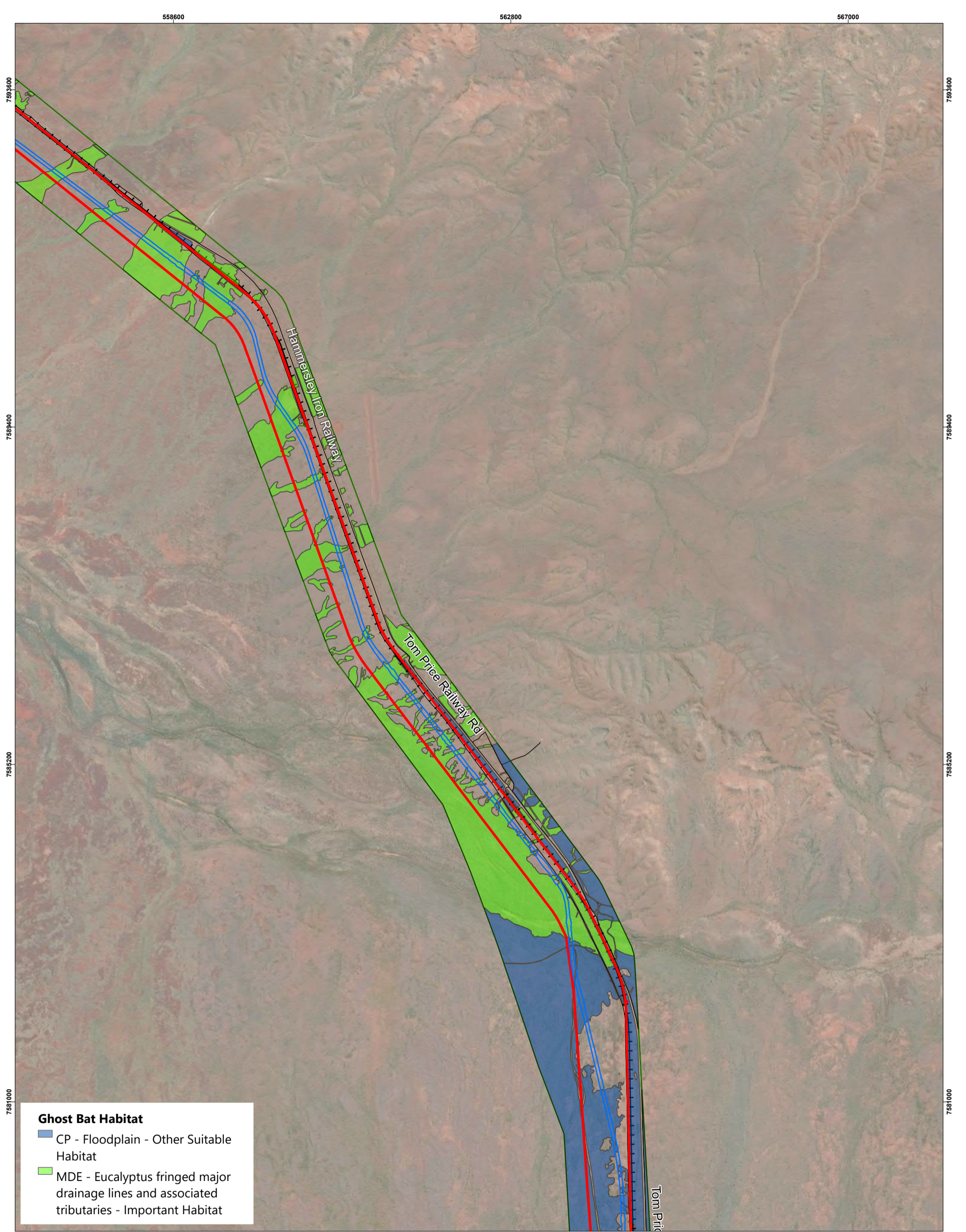
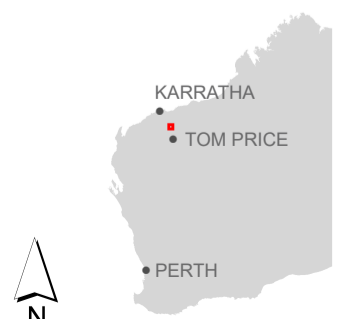
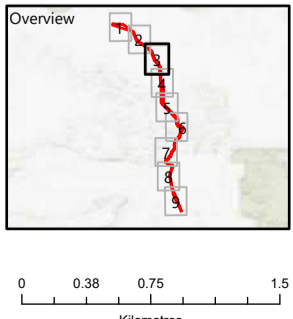


Figure 4 Ghost Bat Habitat

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 - ▭ Development Envelope
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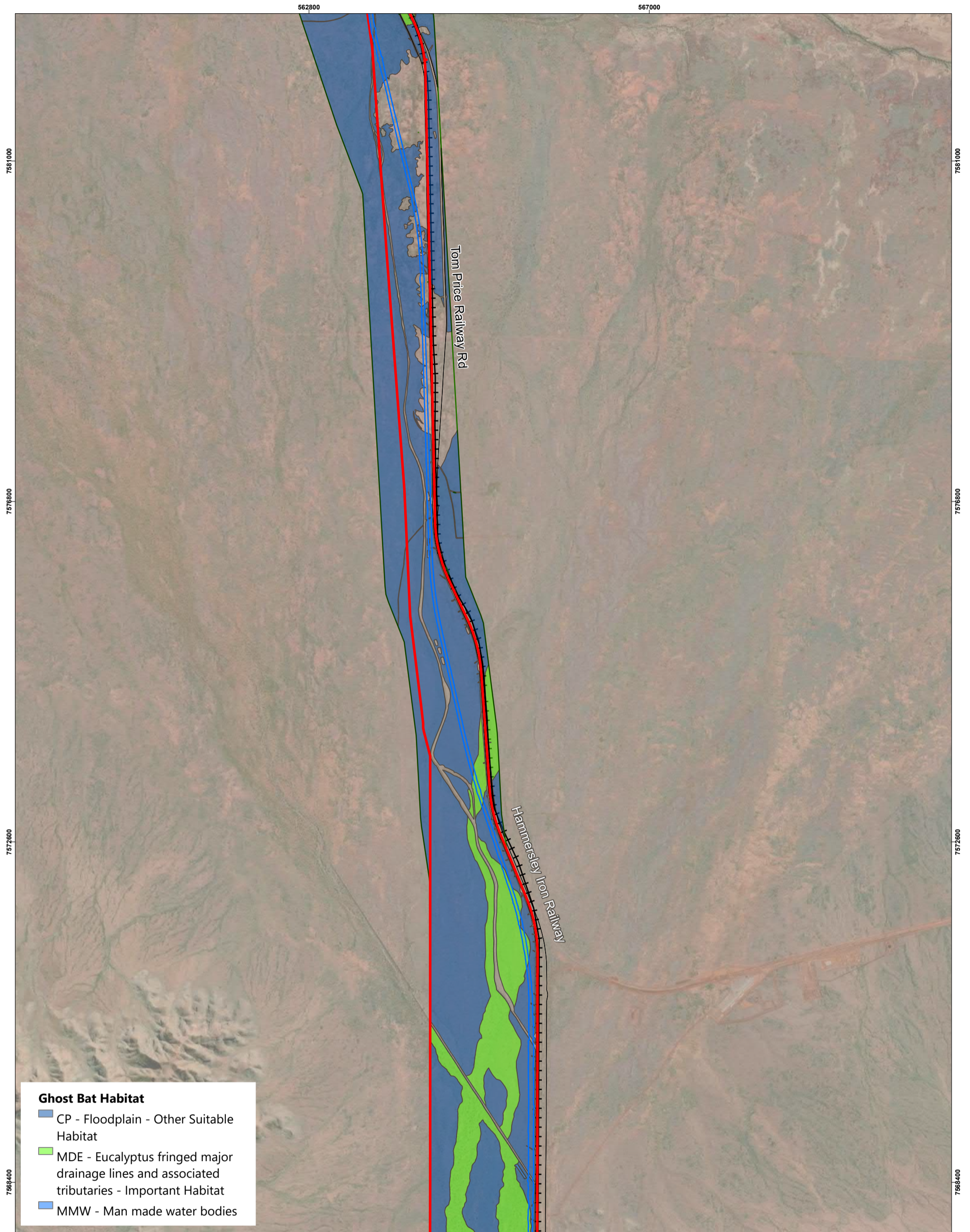
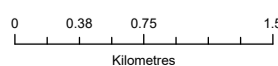
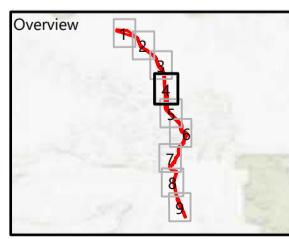


Figure 4 Ghost Bat Habitat

Legend

- Roads
- + Railways
- Disturbance Footprint
- ▭ Development Envelope
- ▭ Fauna Habitat Survey Boundary



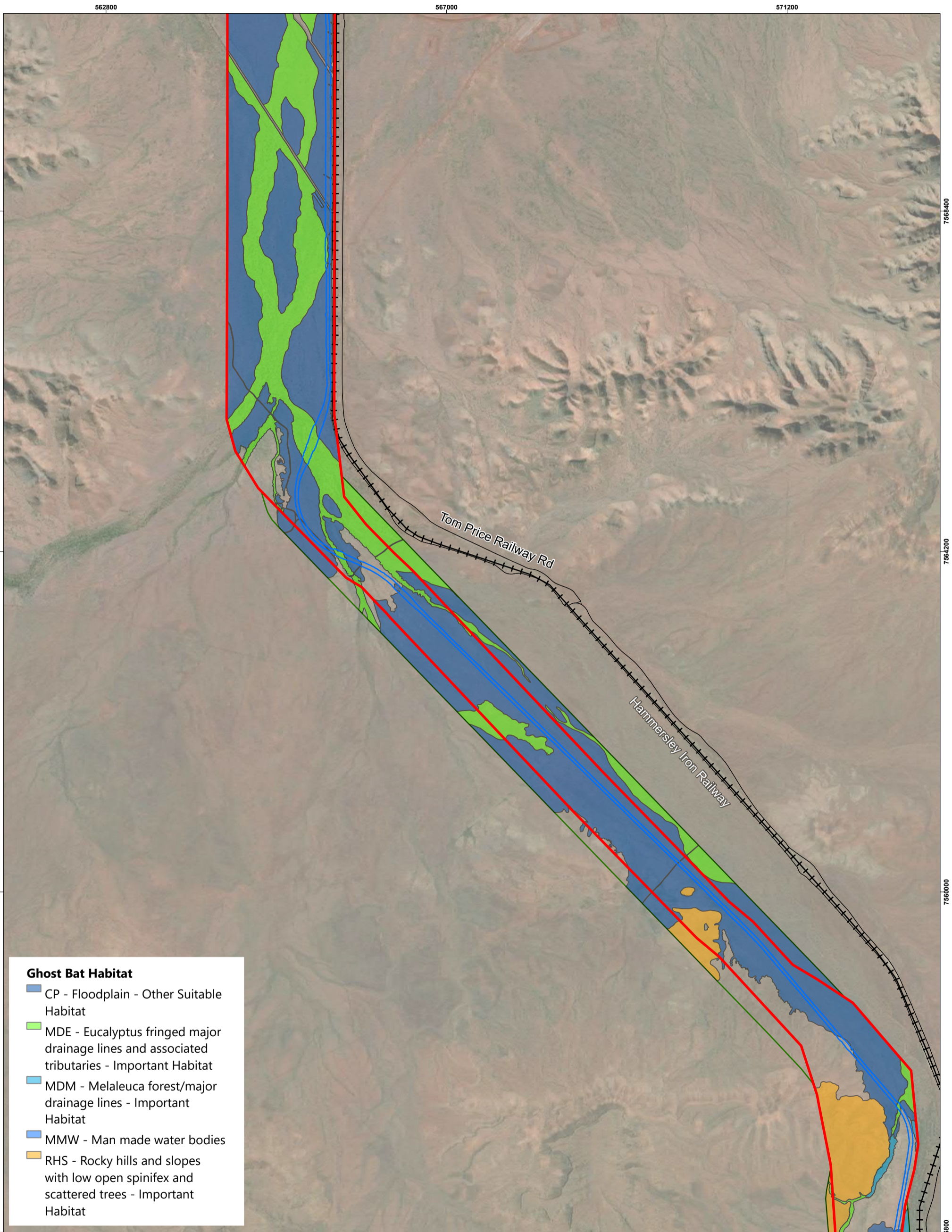
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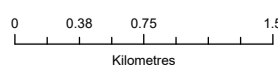
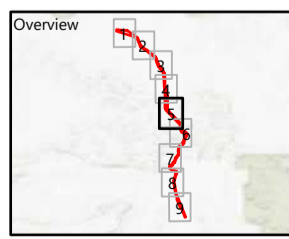
Ghost Bat Habitat

- CP - Floodplain - Other Suitable Habitat
- MDE - Eucalyptus fringed major drainage lines and associated tributaries - Important Habitat
- MDM - Melaleuca forest/major drainage lines - Important Habitat
- MMW - Man made water bodies
- RHS - Rocky hills and slopes with low open spinifex and scattered trees - Important Habitat

Figure 4 Ghost Bat Habitat

Legend

- Roads
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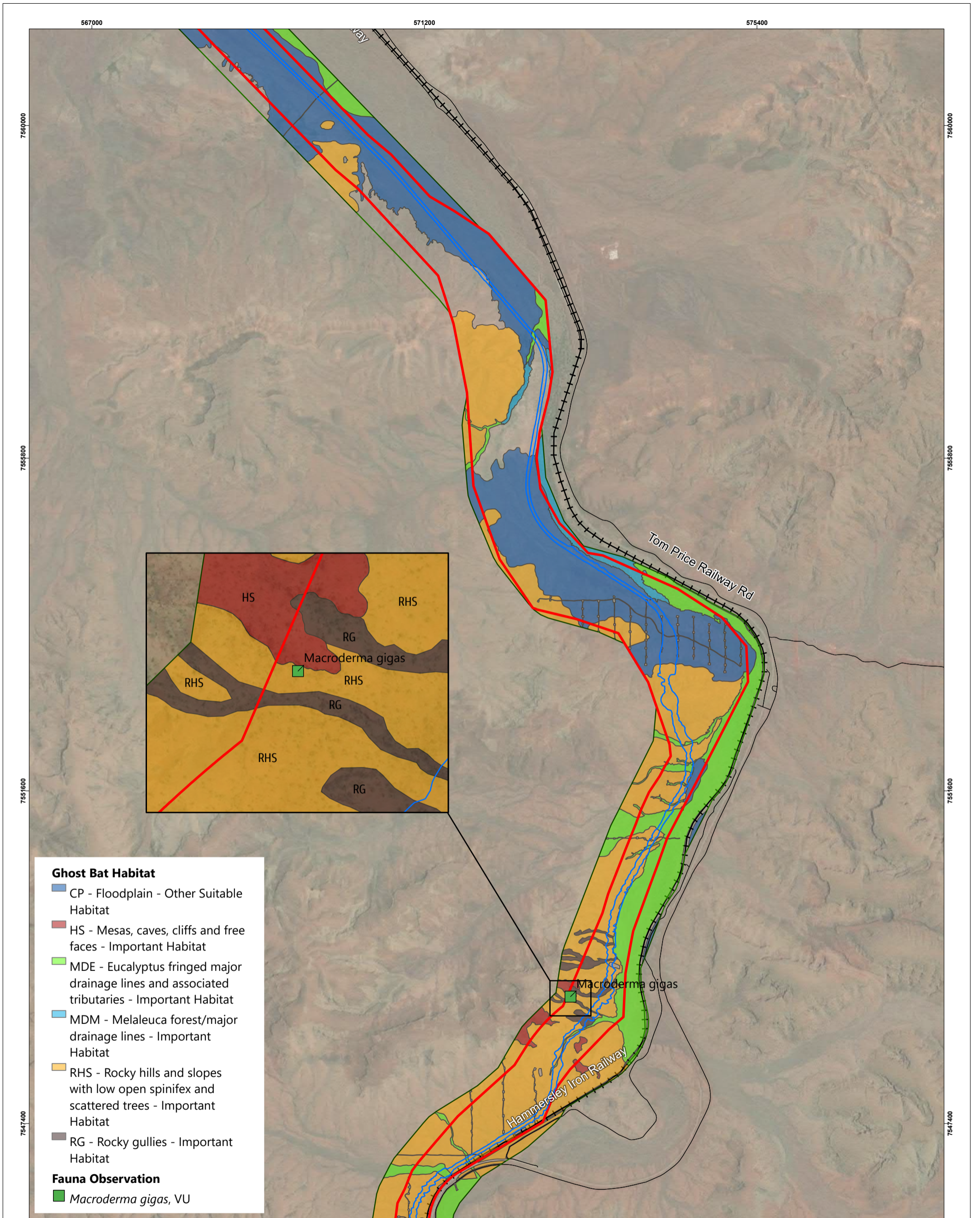
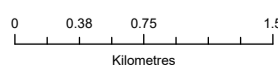
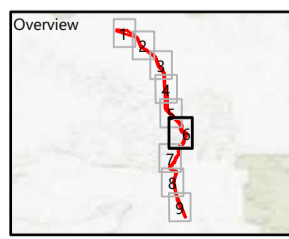


Figure 4 Ghost Bat Habitat

Legend

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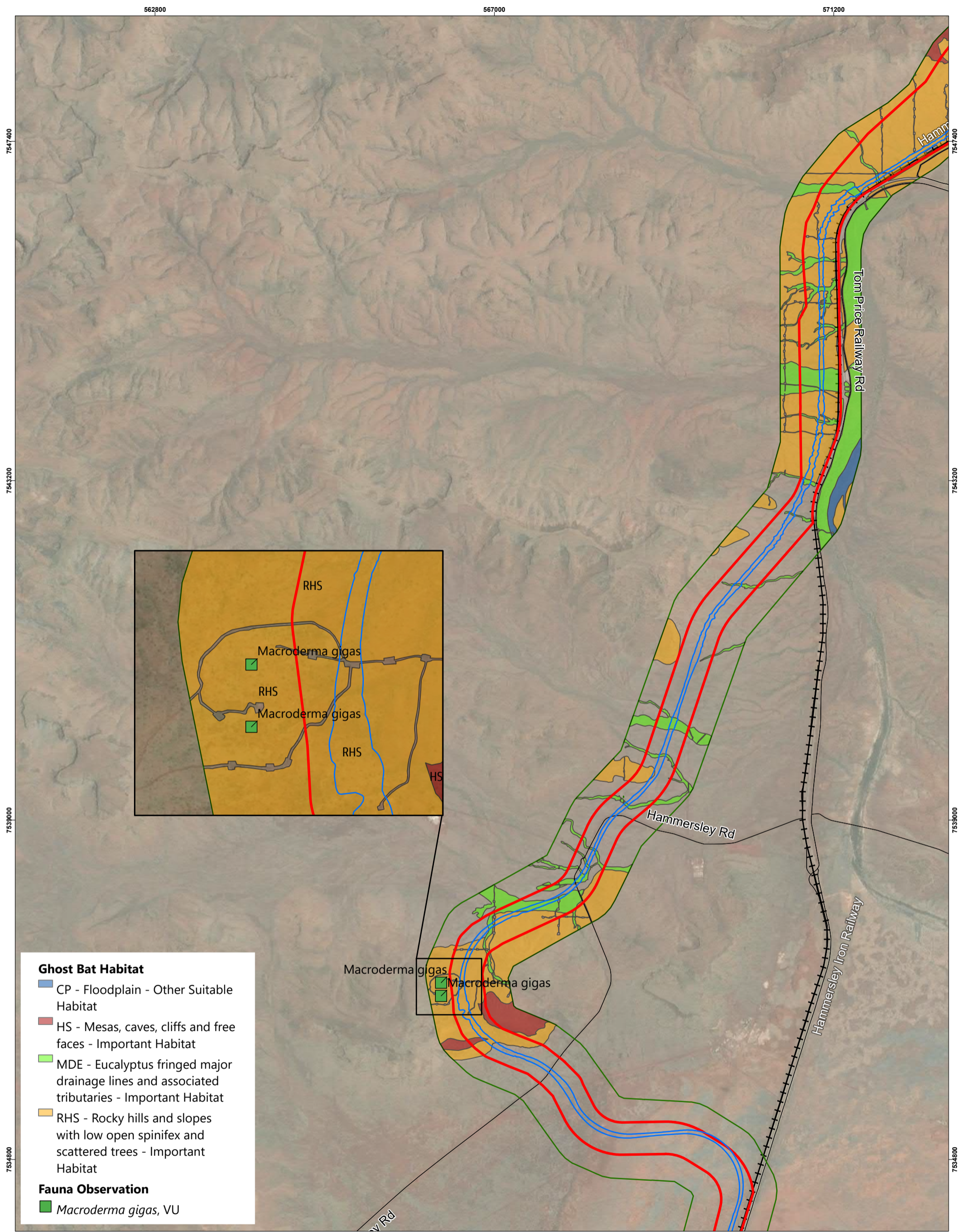
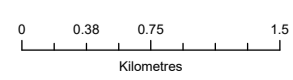
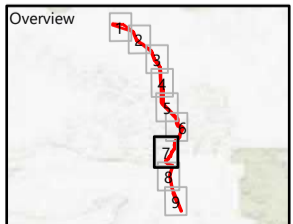


Figure 4 Ghost Bat Habitat



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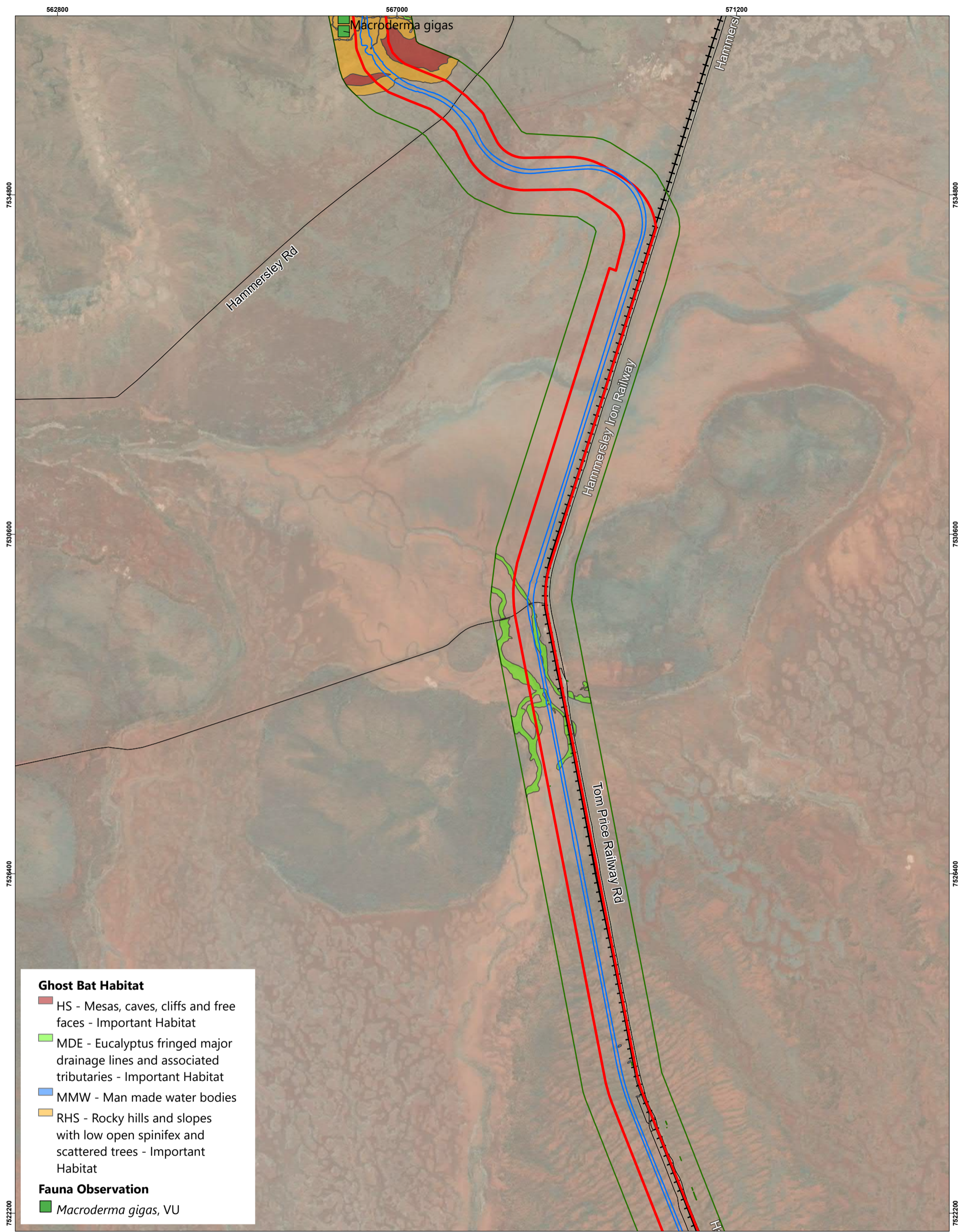
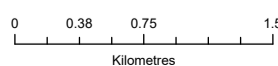
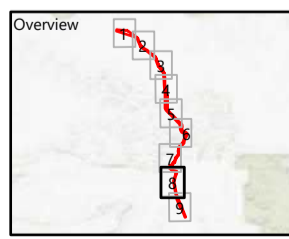


Figure 4 Ghost Bat Habitat

Legend

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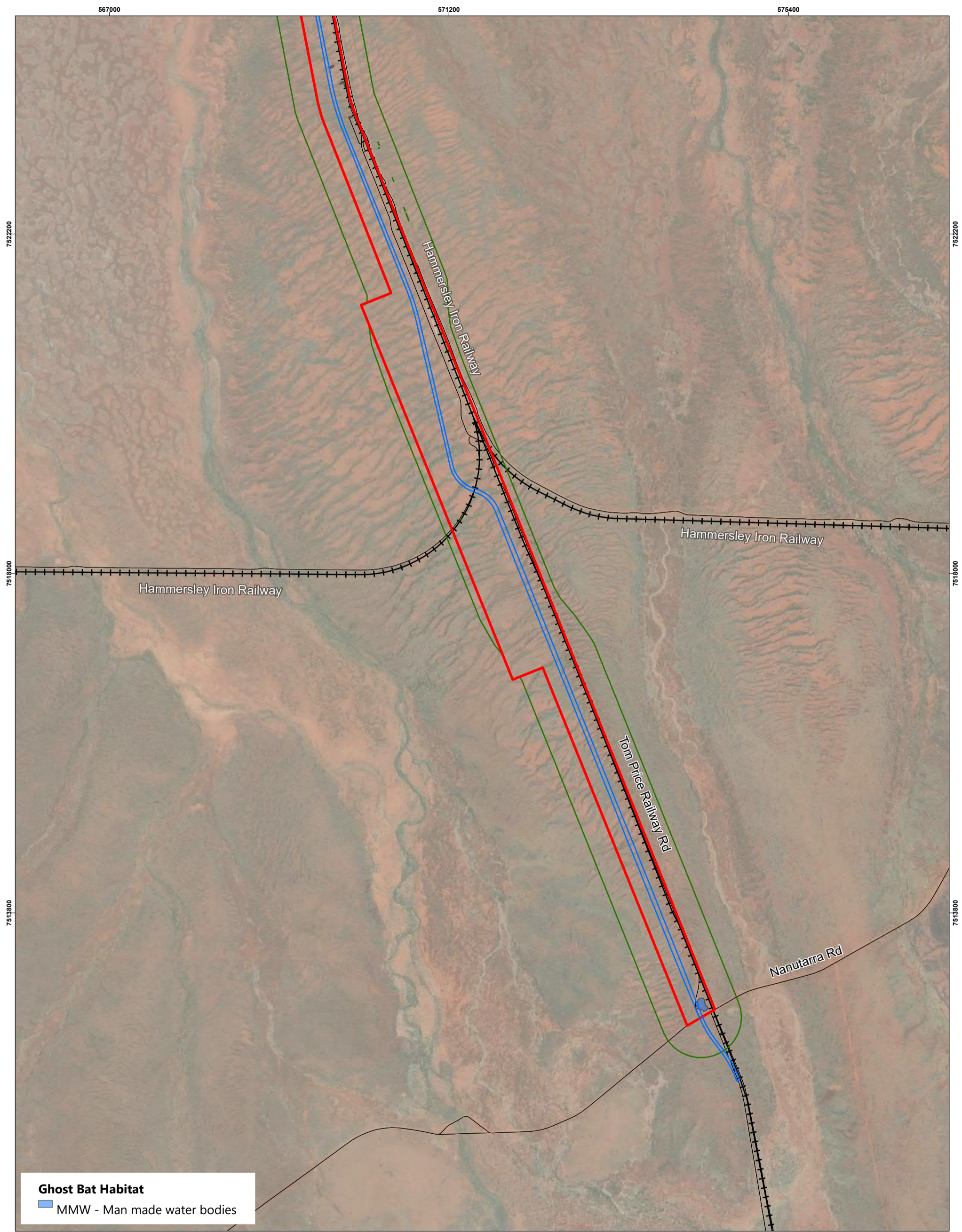
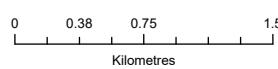
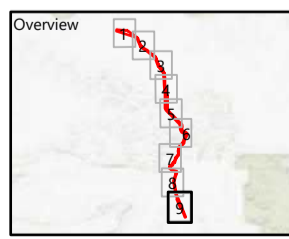


Figure 4 Ghost Bat Habitat

Legend

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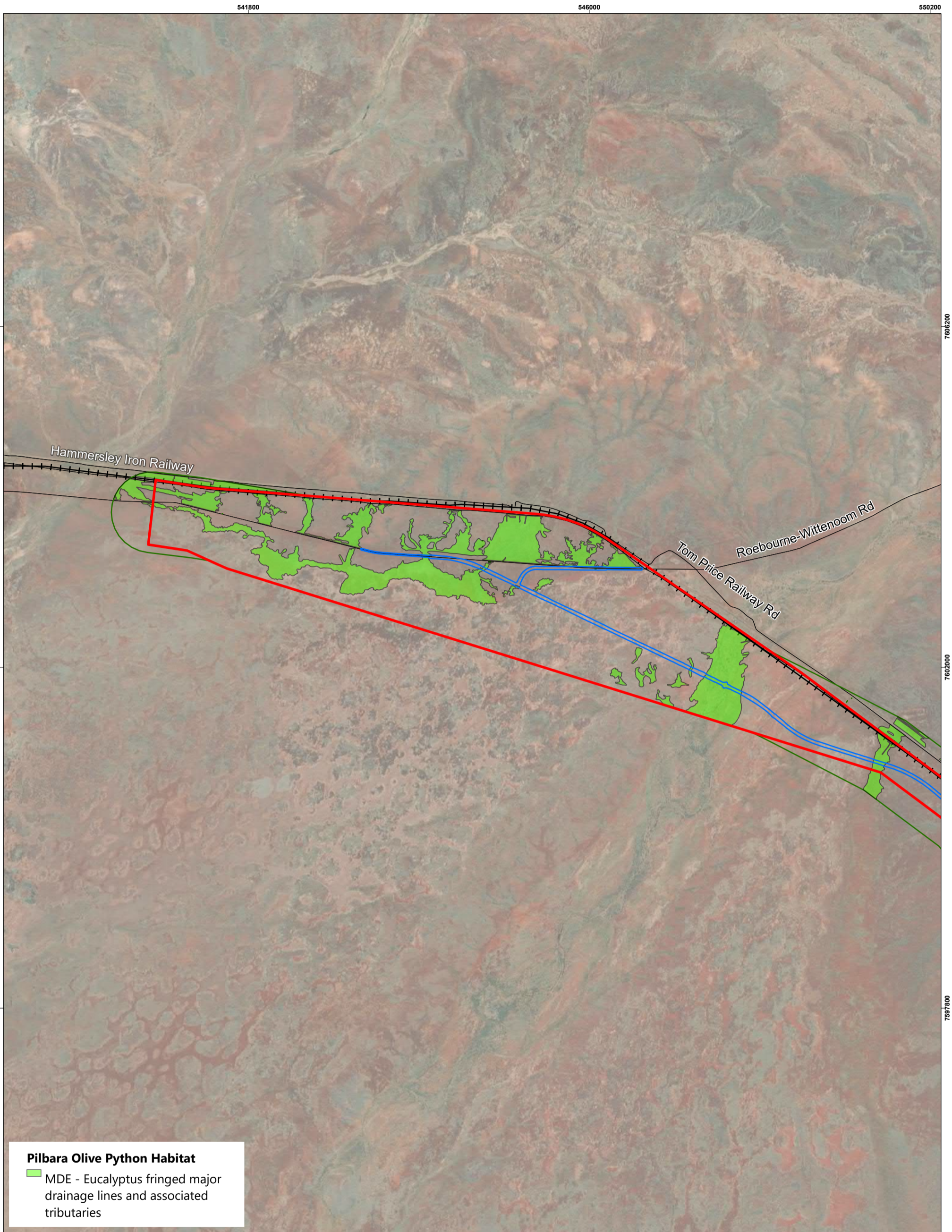
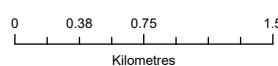
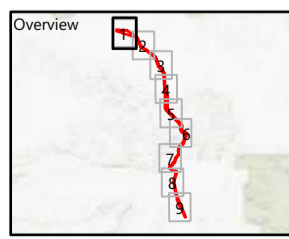


Figure 5 Pilbara Olive Python Habitat

Legend

- Roads
- + Railways
- ▭ Disturbance Footprint
- ▭ Development Envelope
- ▭ Fauna Habitat Survey Boundary



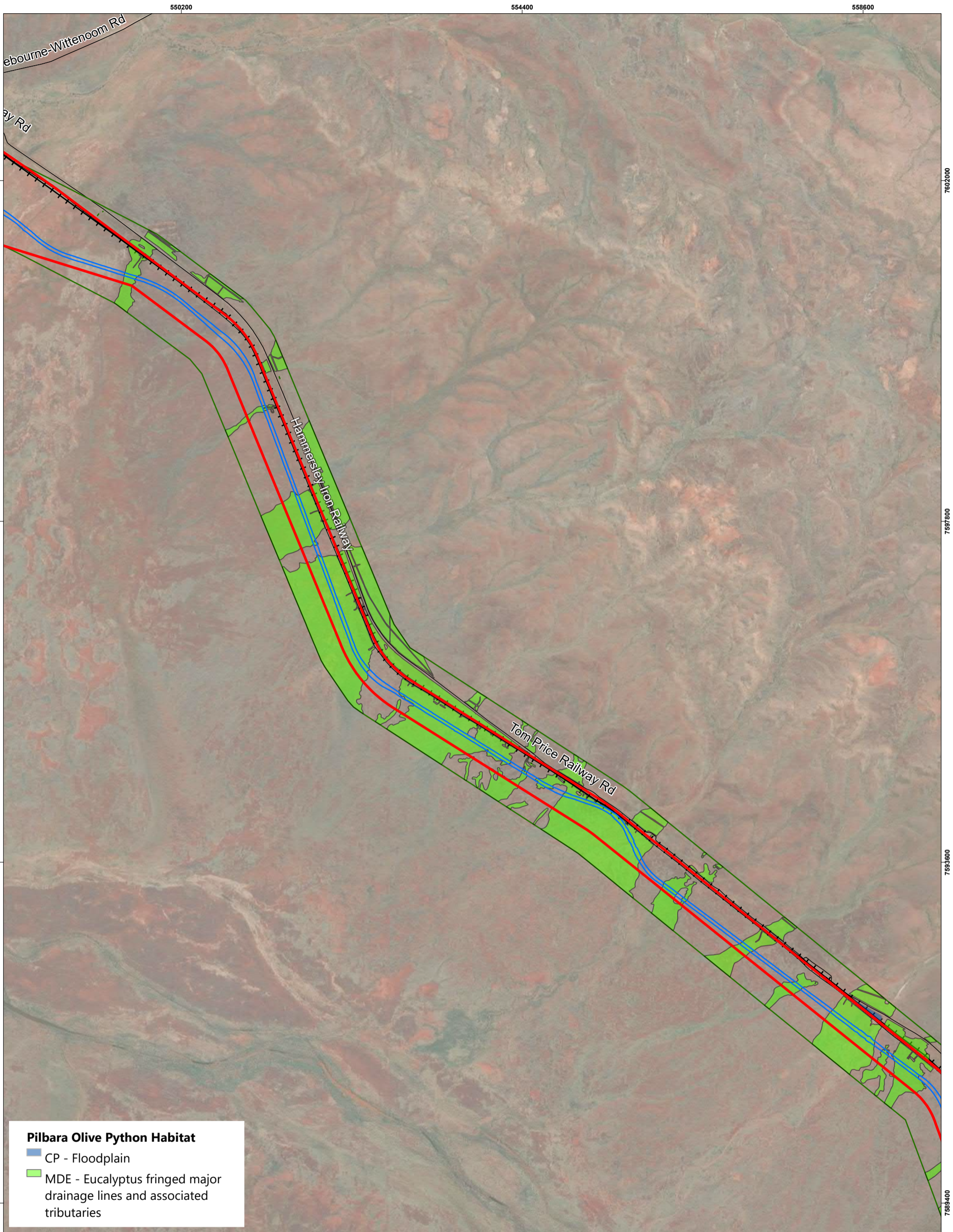
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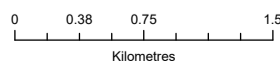
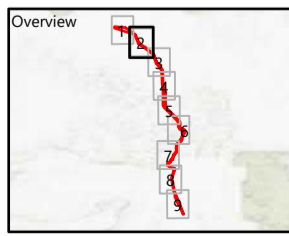
Pilbara Olive Python Habitat

- CP - Floodplain
- MDE - Eucalyptus fringed major drainage lines and associated tributaries

Figure 5 Pilbara Olive Python Habitat

Legend

- Roads
- + Railways
- ▭ Disturbance Footprint
- ▭ Development Envelope
- ▭ Fauna Habitat Survey Boundary



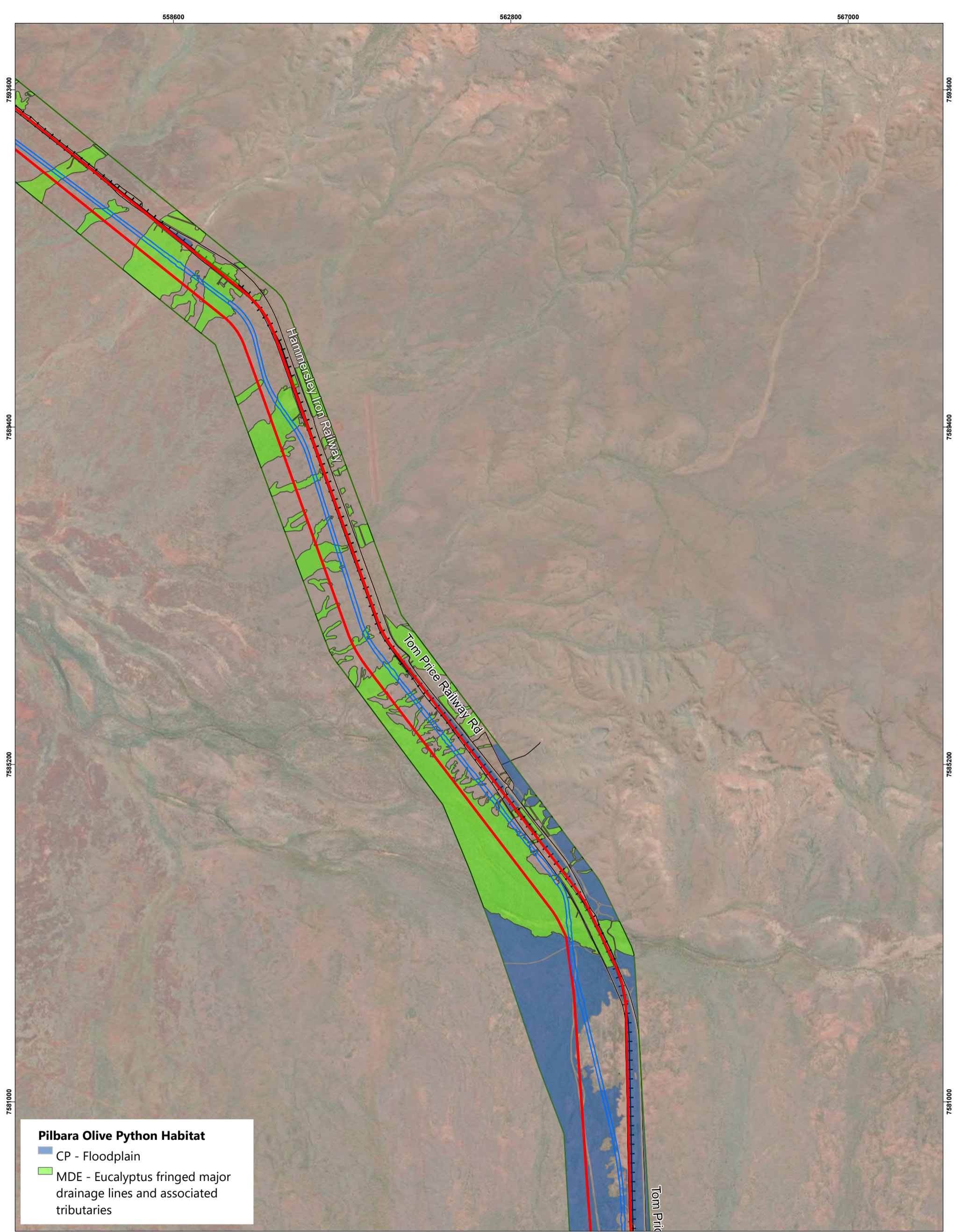
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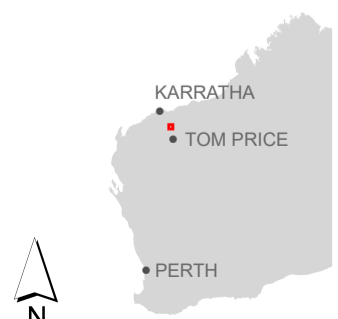
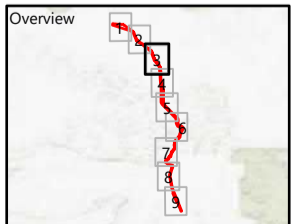


Pilbara Olive Python Habitat

- CP - Floodplain
- MDE - Eucalyptus fringed major drainage lines and associated tributaries

Figure 5 Pilbara Olive Python Habitat

- Legend**
- Roads
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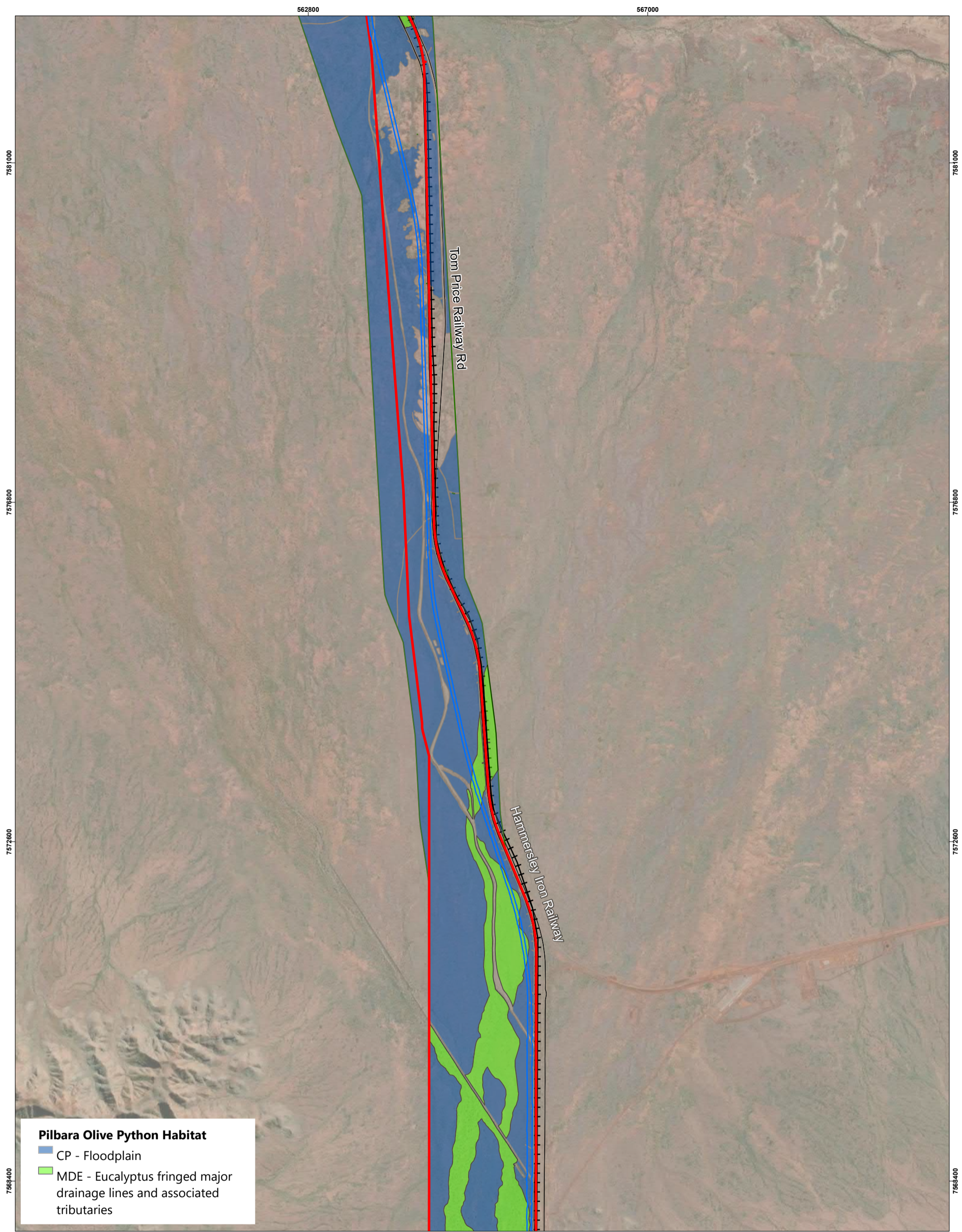
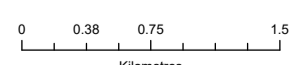
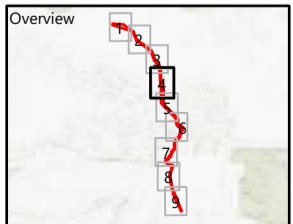


Figure 5 Pilbara Olive Python Habitat

- Legend**
- Roads
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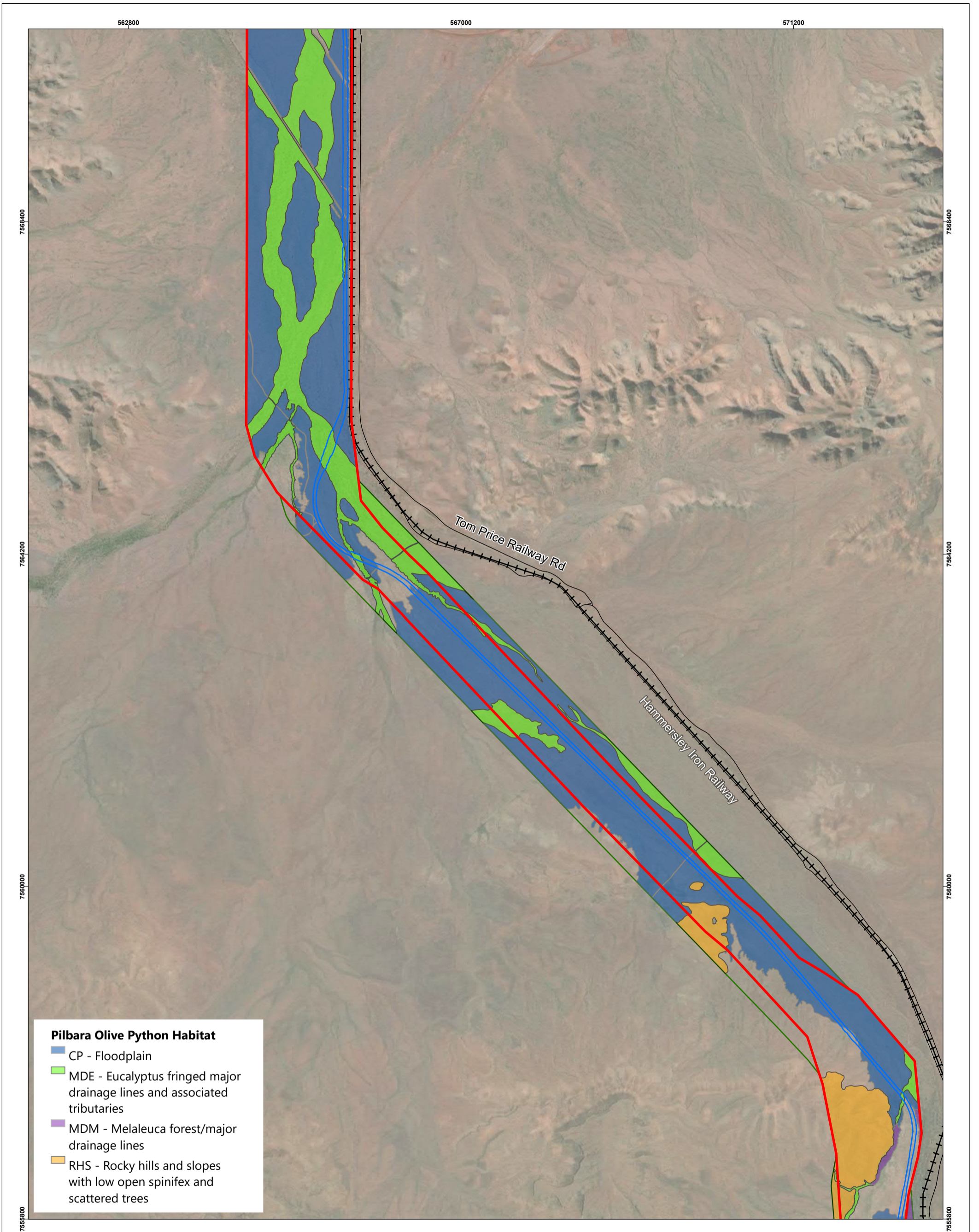
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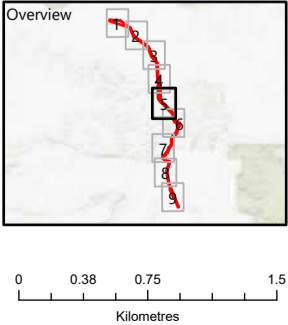
Pilbara Olive Python Habitat

- CP - Floodplain
- MDE - Eucalyptus fringed major drainage lines and associated tributaries
- MDM - Melaleuca forest/major drainage lines
- RHS - Rocky hills and slopes with low open spinifex and scattered trees

Figure 5 Pilbara Olive Python Habitat

Legend

- Roads
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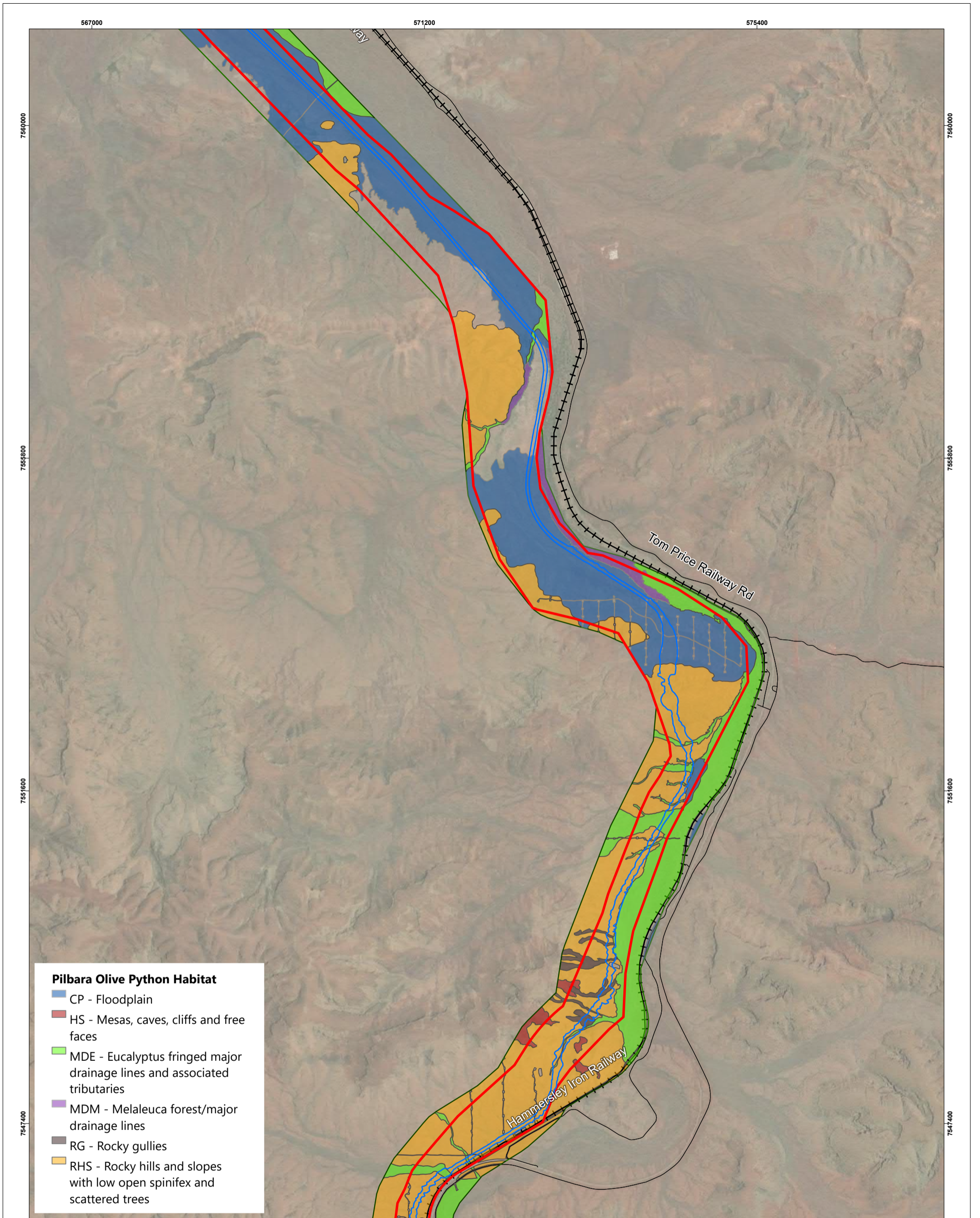
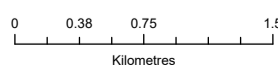
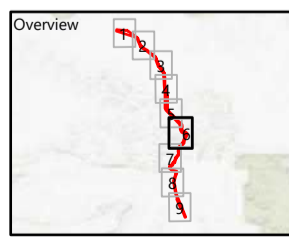


Figure 5 Pilbara Olive Python Habitat

Legend

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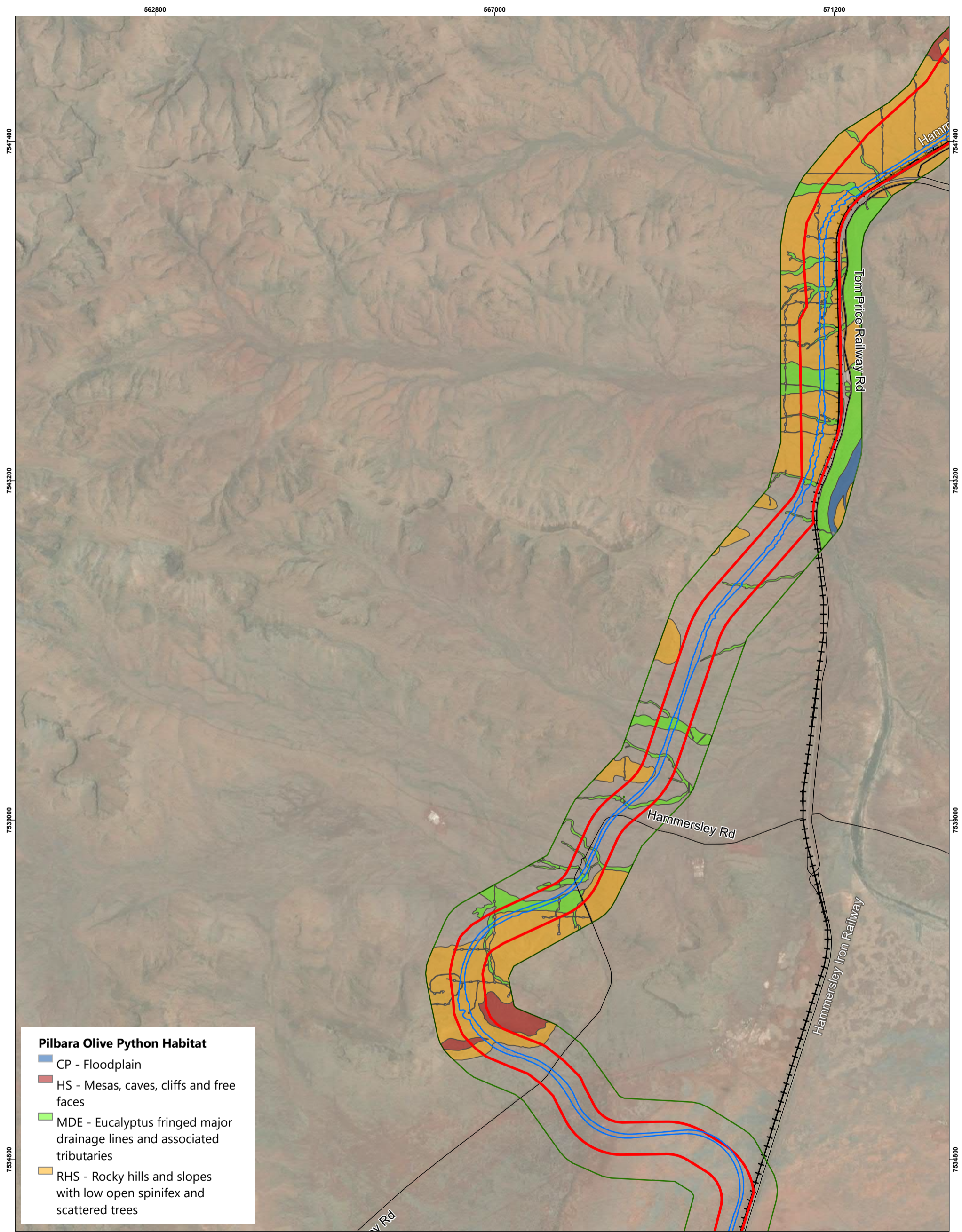
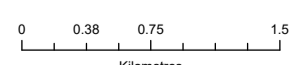
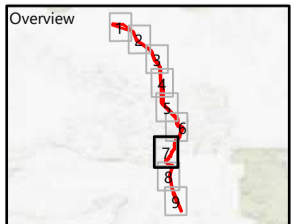


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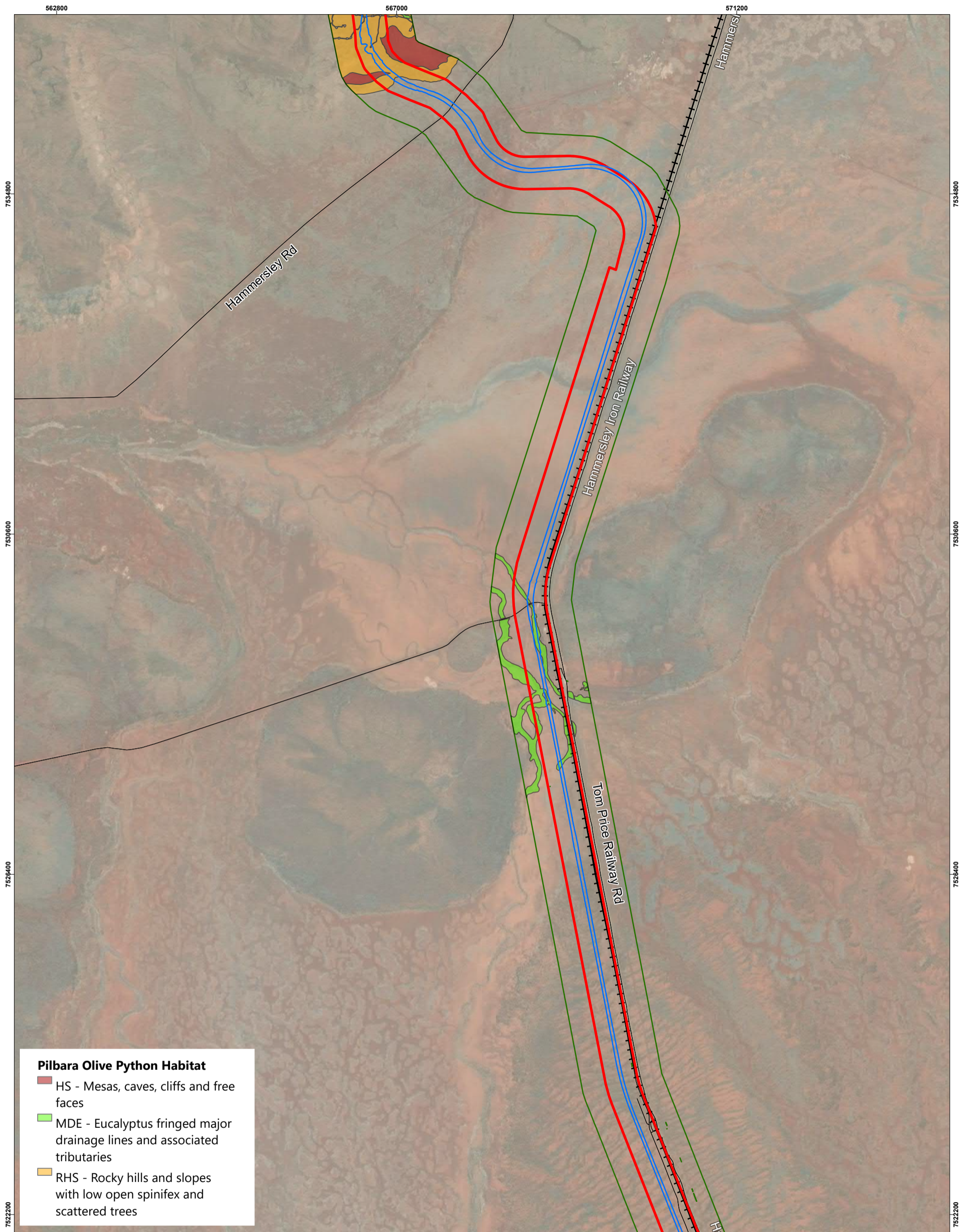
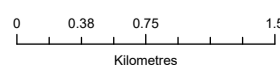
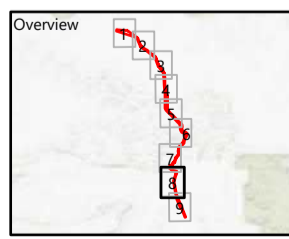


Figure 5 Pilbara Olive Python Habitat



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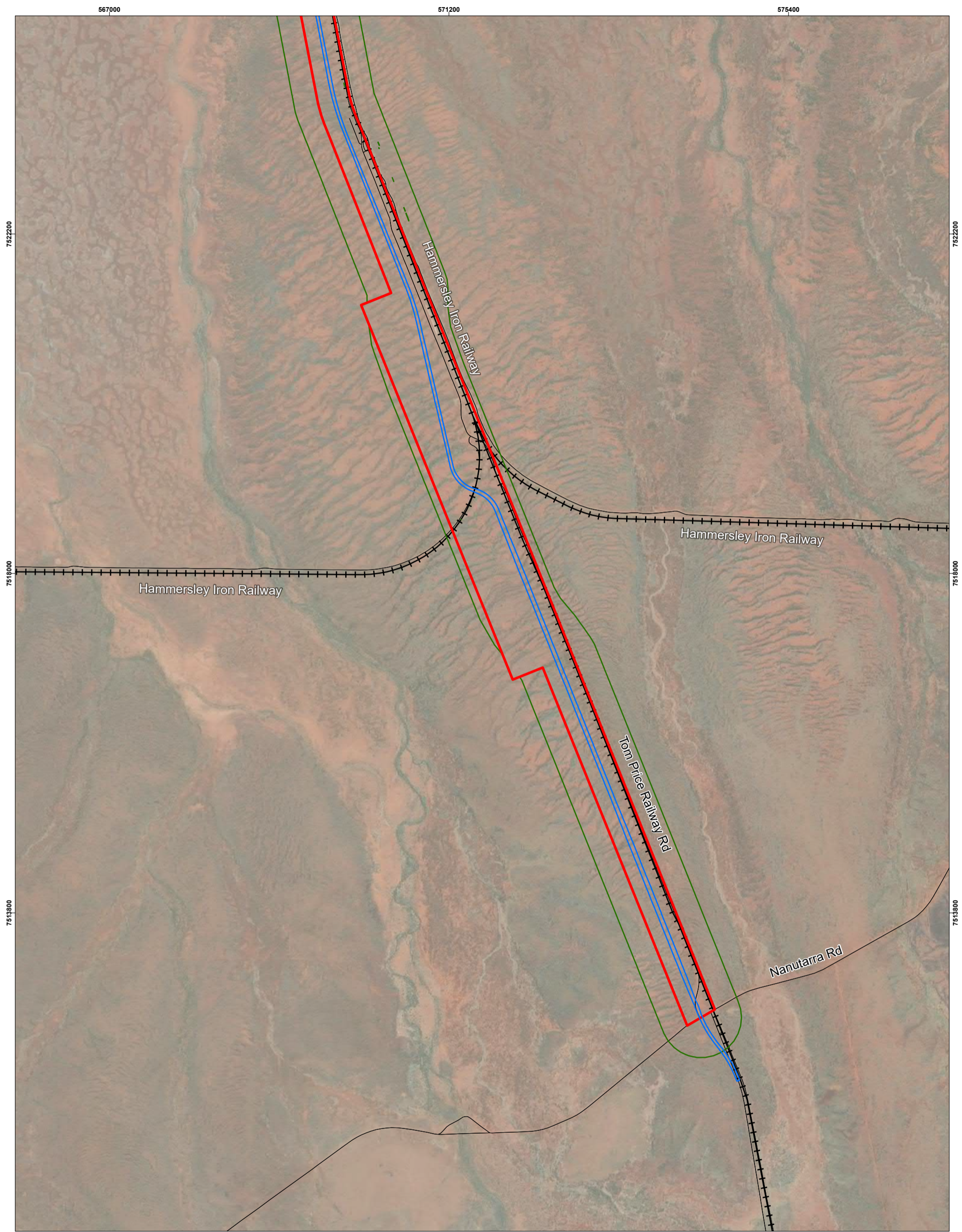
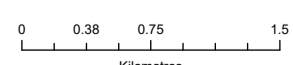
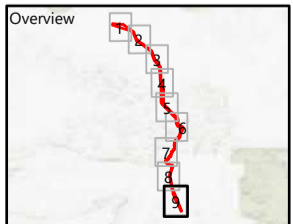


Figure 5 Pilbara Olive Python Habitat

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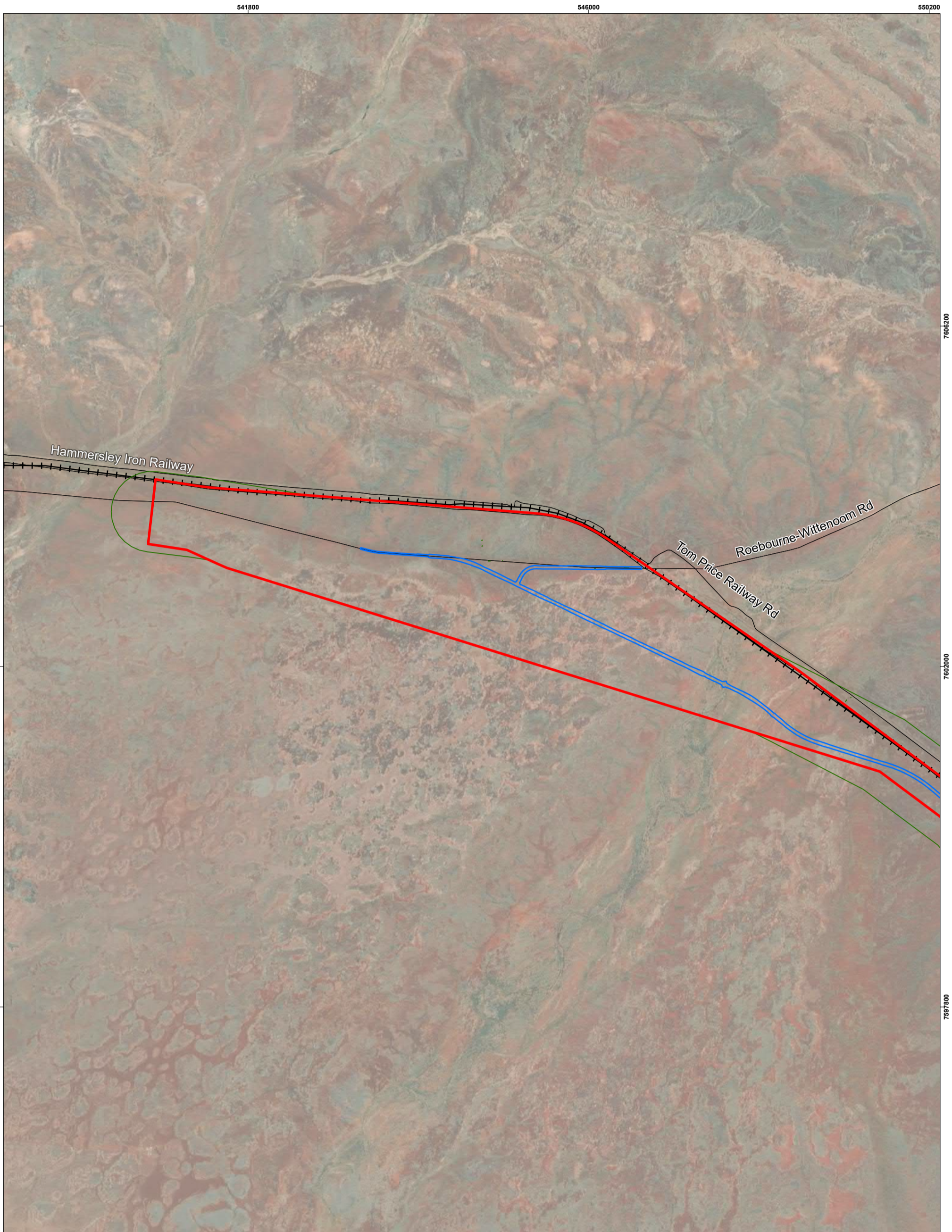
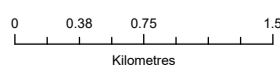
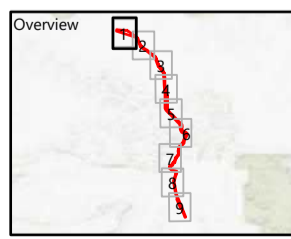


Figure 6 Night Parrot Habitat

Legend

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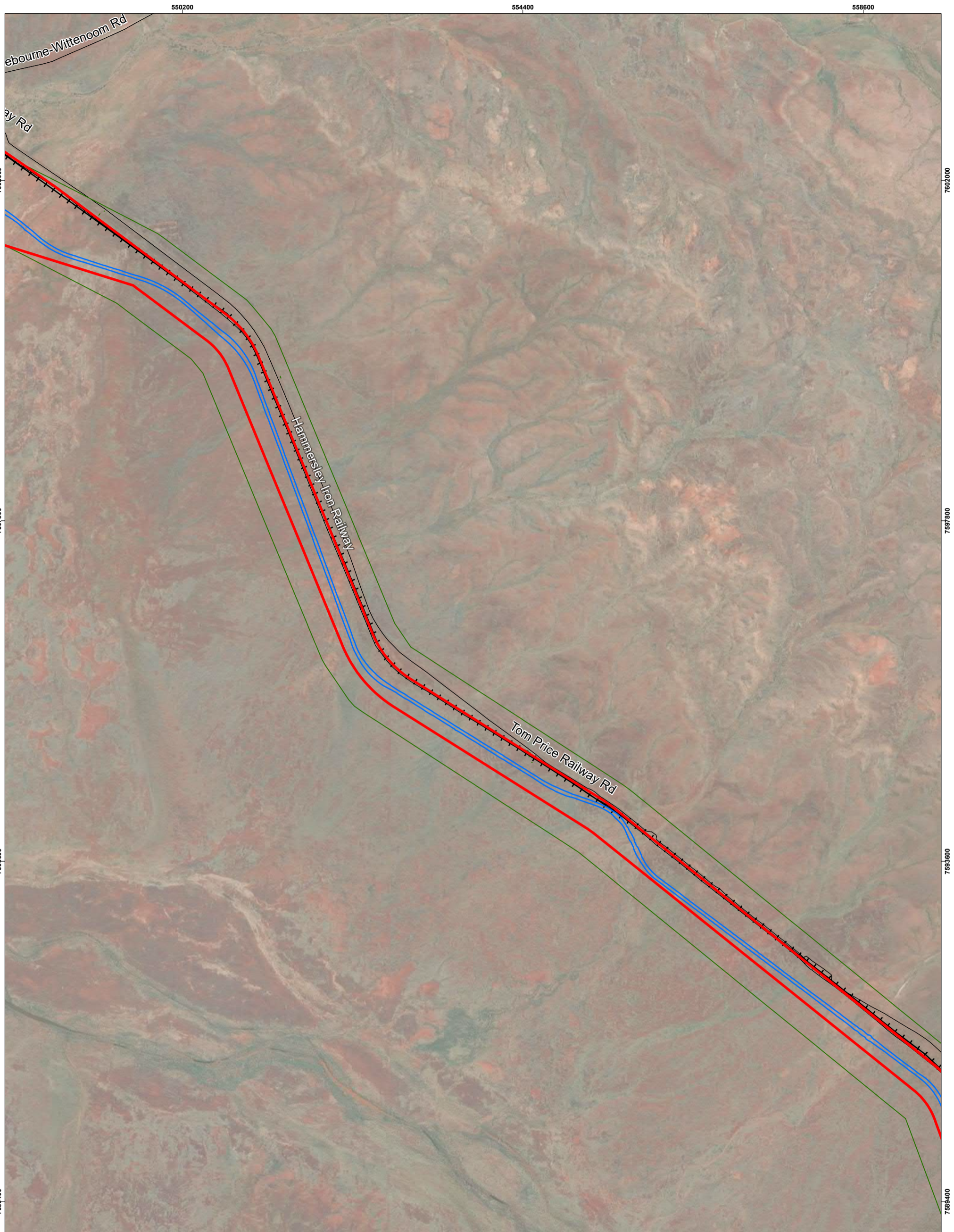
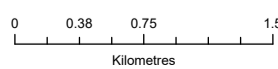
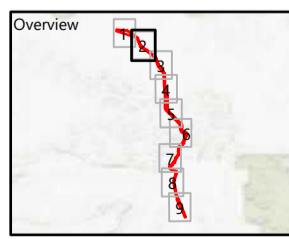


Figure 6 Night Parrot Habitat

Legend

- Roads
- + Railways
- ▭ Disturbance Footprint
- ▭ Development Envelope
- ▭ Fauna Habitat Survey Boundary



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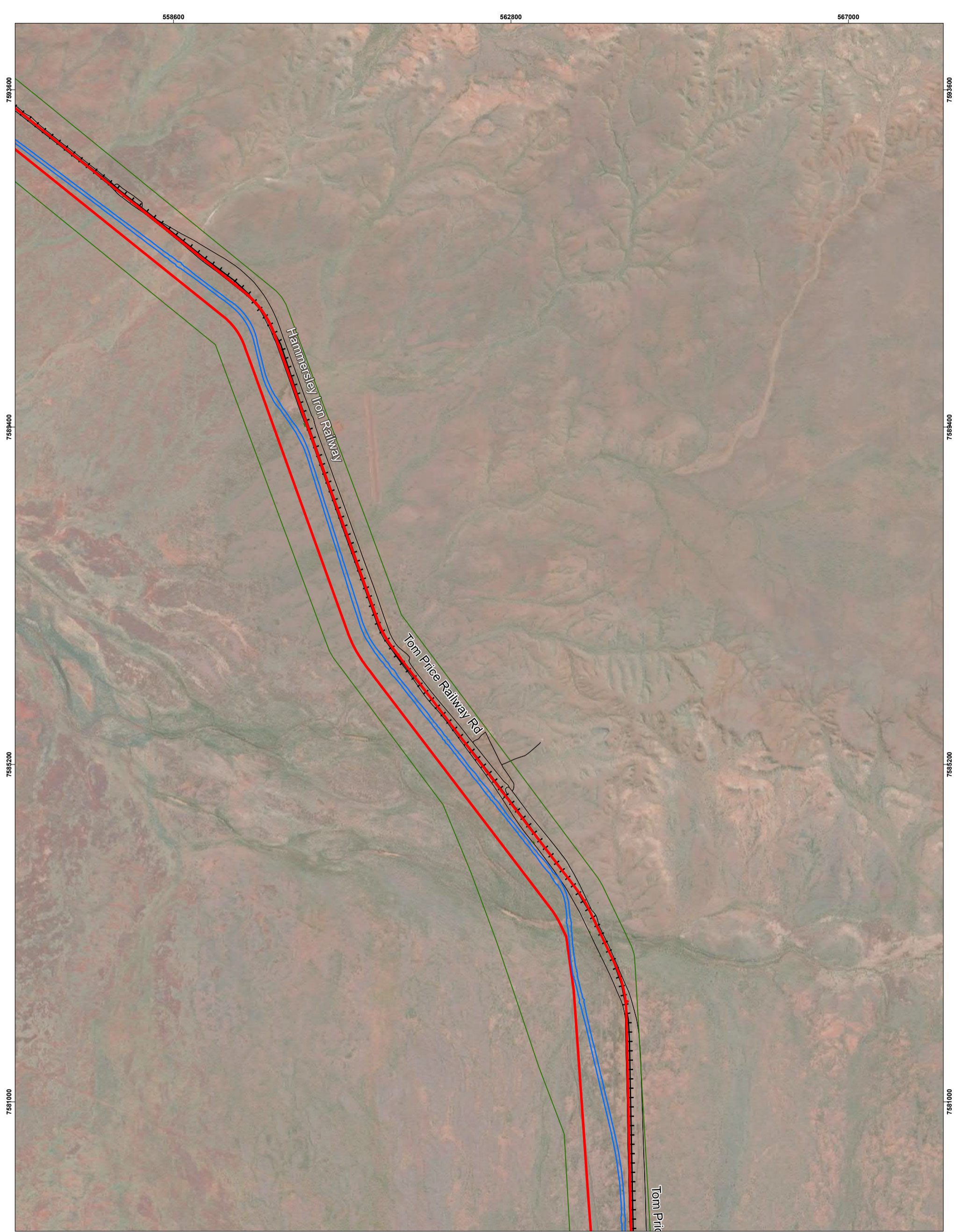
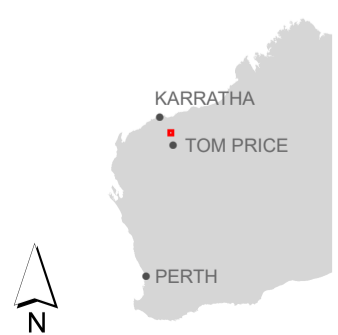
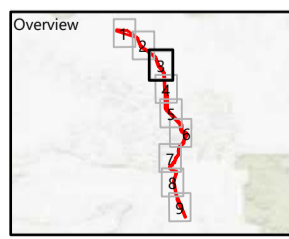


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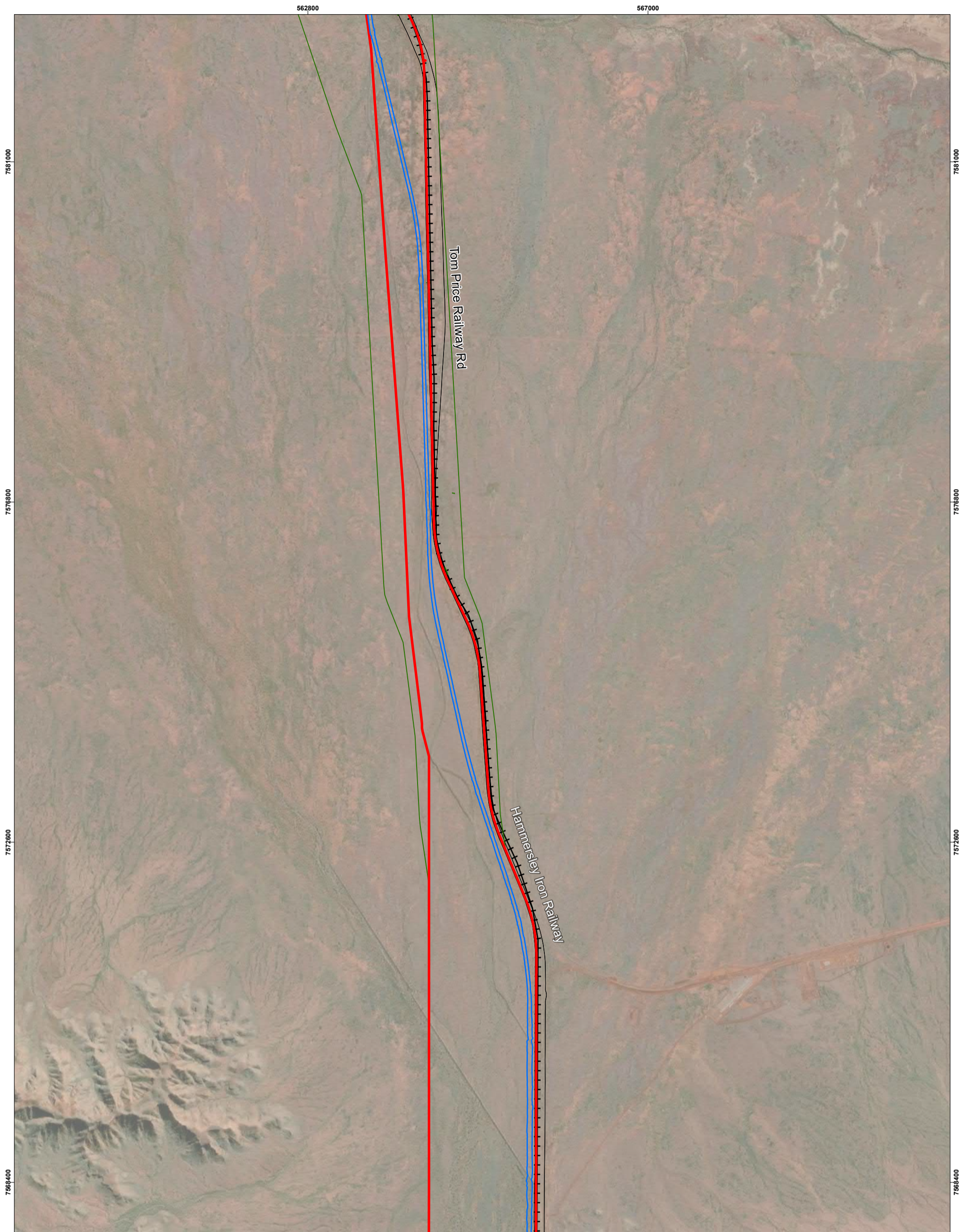
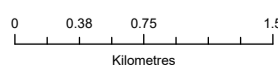
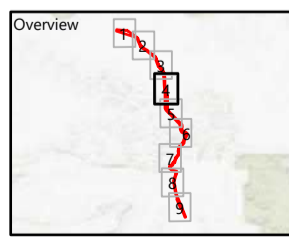


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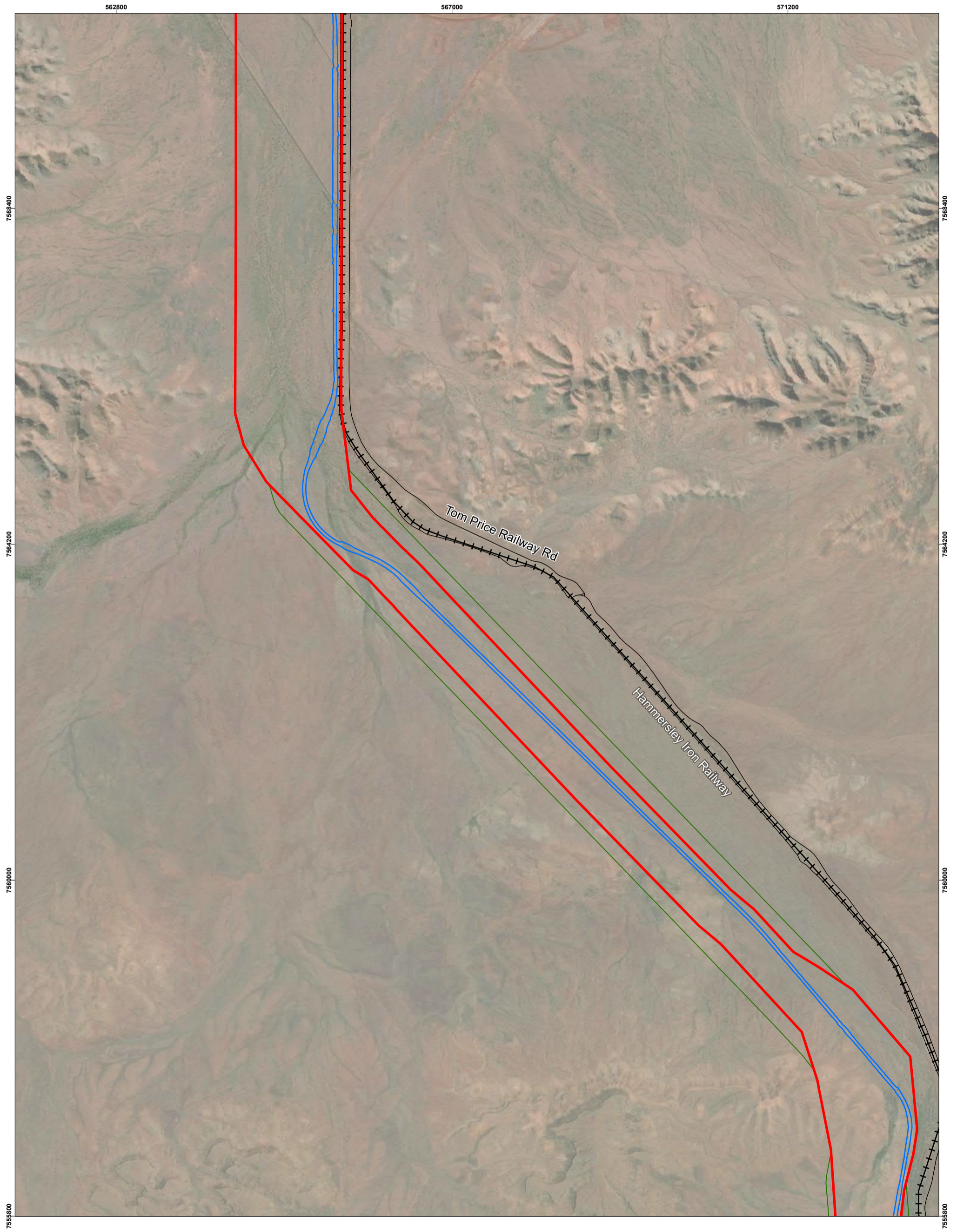
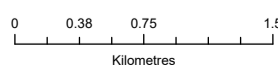
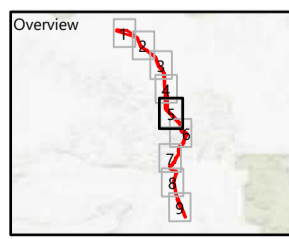


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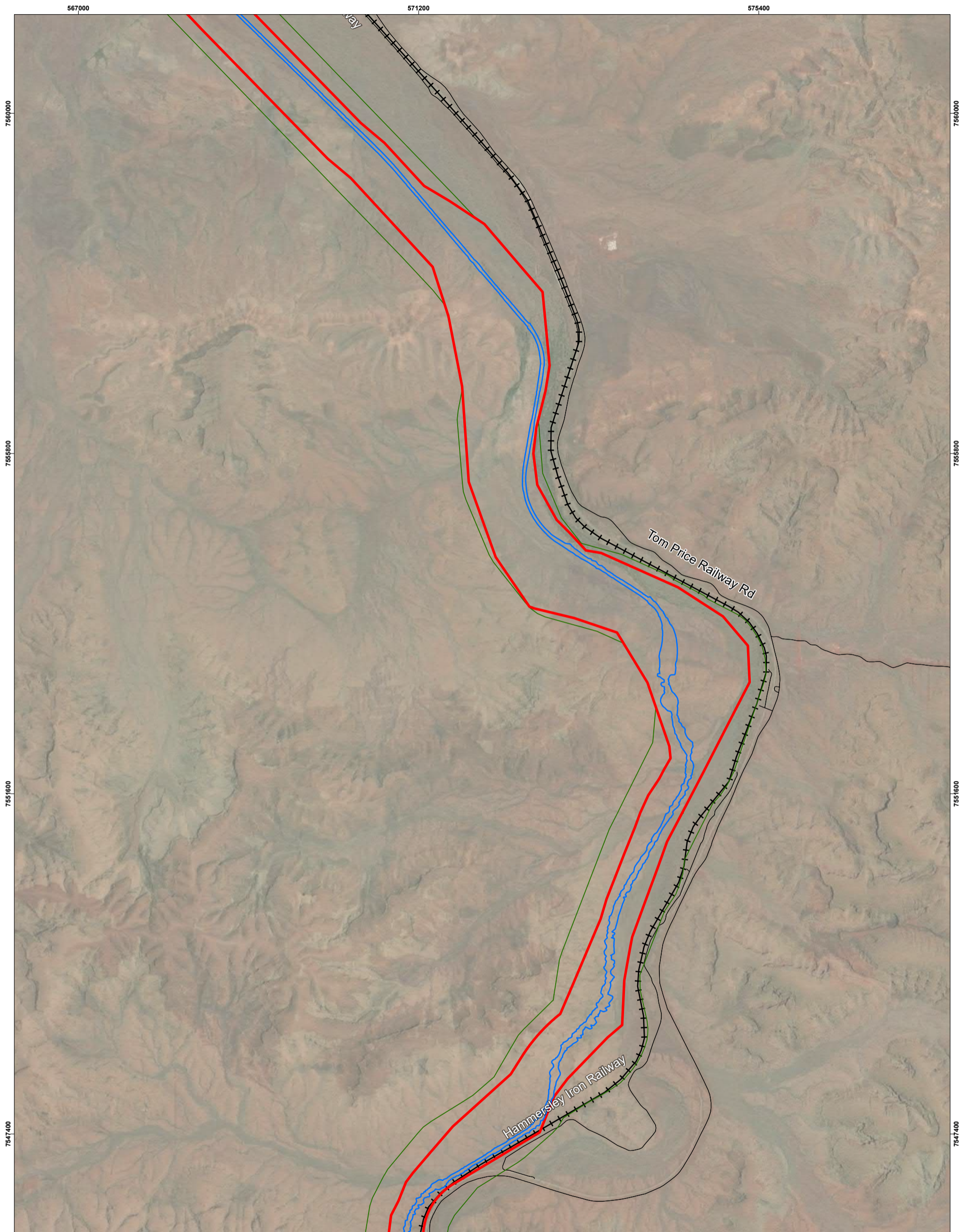
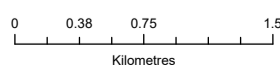
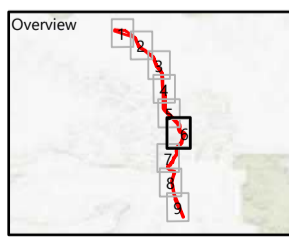


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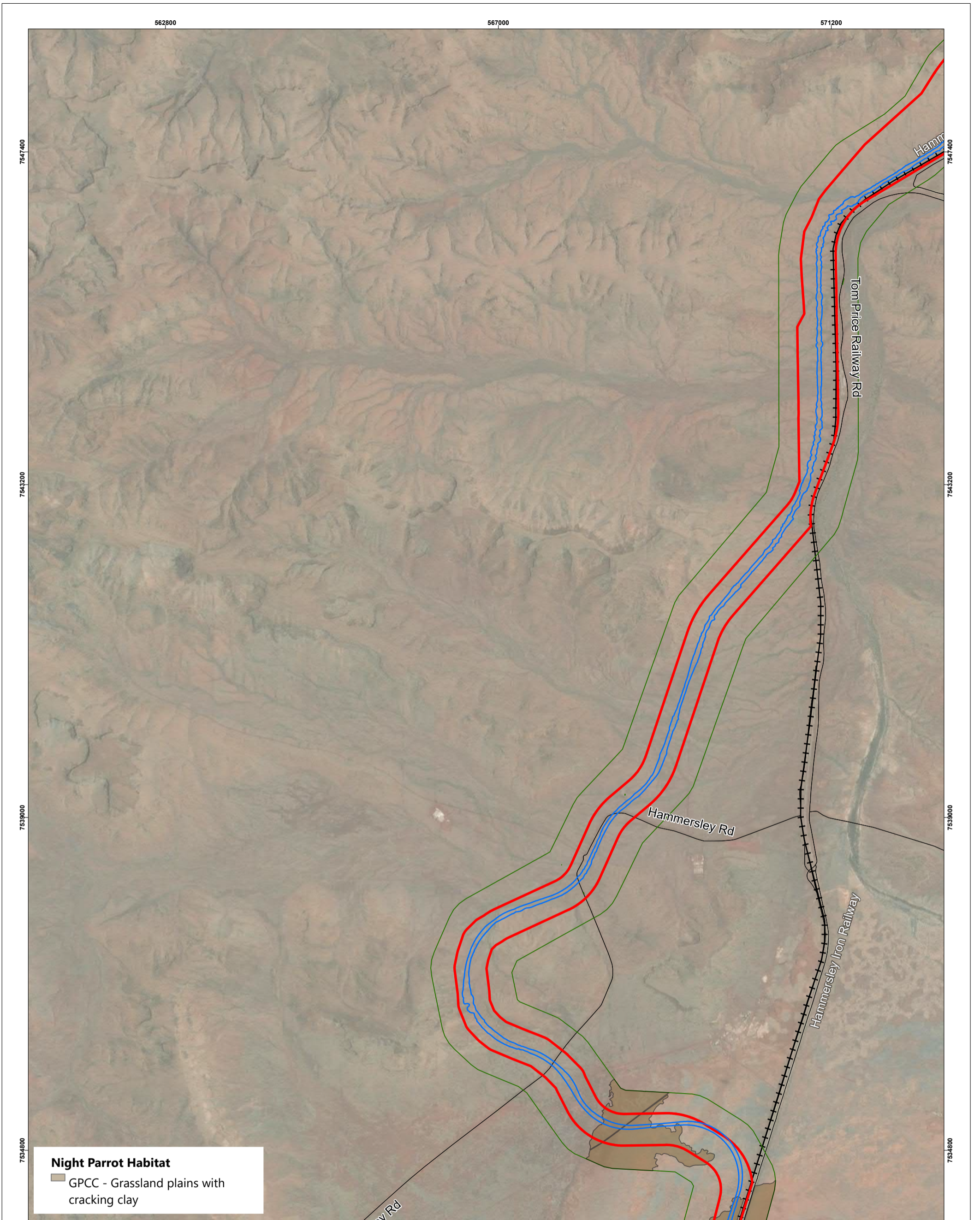
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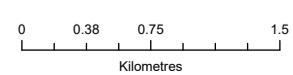
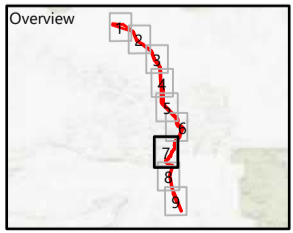
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Night Parrot Habitat
 GPCC - Grassland plains with cracking clay

Figure 6 Night Parrot Habitat

- Legend**
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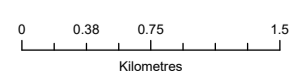
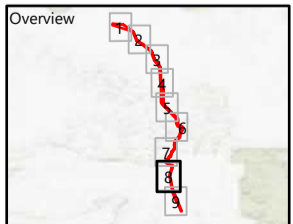
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Night Parrot Habitat
 GPCC - Grassland plains with cracking clay

Figure 6 Night Parrot Habitat

- Legend**
- Roads
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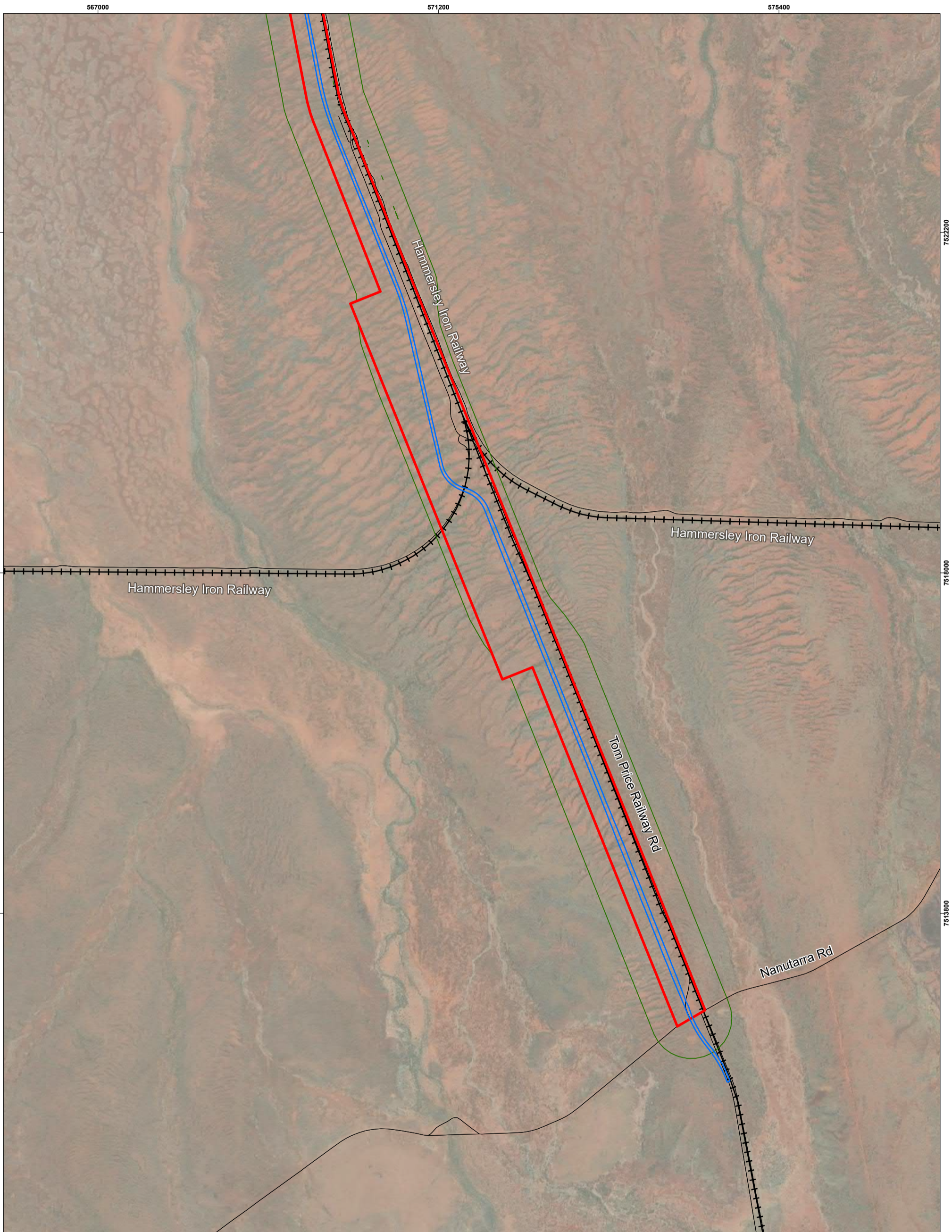
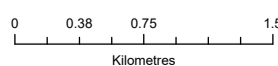
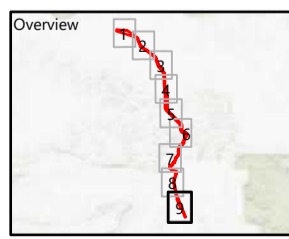


Figure 6 Night Parrot Habitat

Legend

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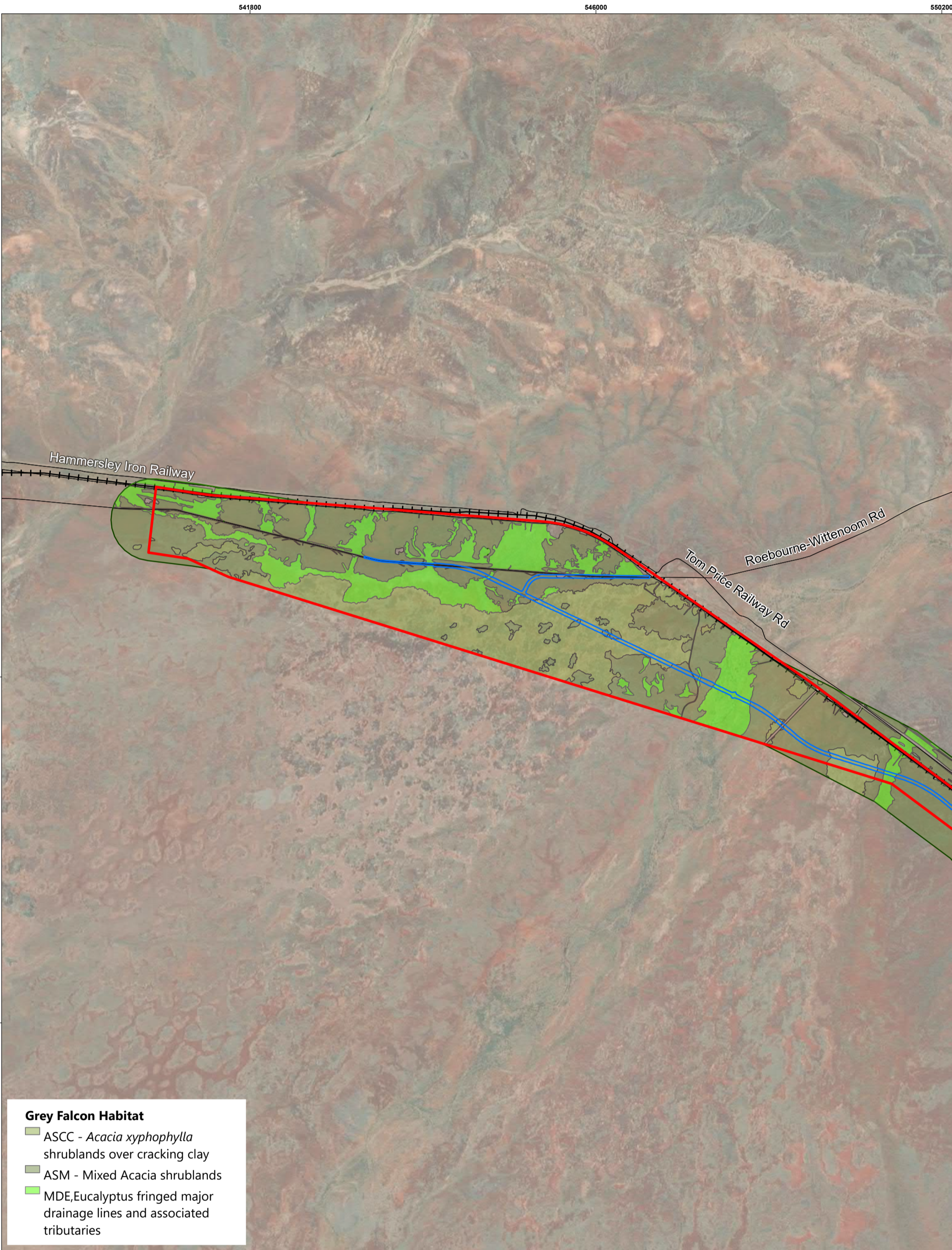
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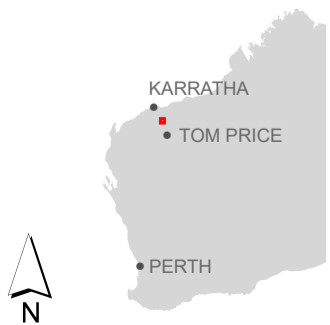
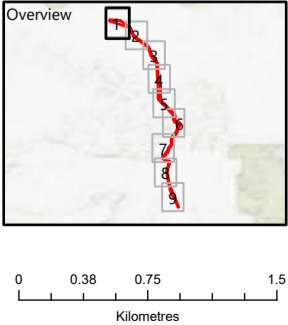


Grey Falcon Habitat

- ASCC - *Acacia xyphophylla* shrublands over cracking clay
- ASM - Mixed Acacia shrublands
- MDE, Eucalyptus fringed major drainage lines and associated tributaries

Figure 7 Grey Falcon Habitat

- Legend**
- Roads
 - + Railways
 - ▭ Disturbance Footprint
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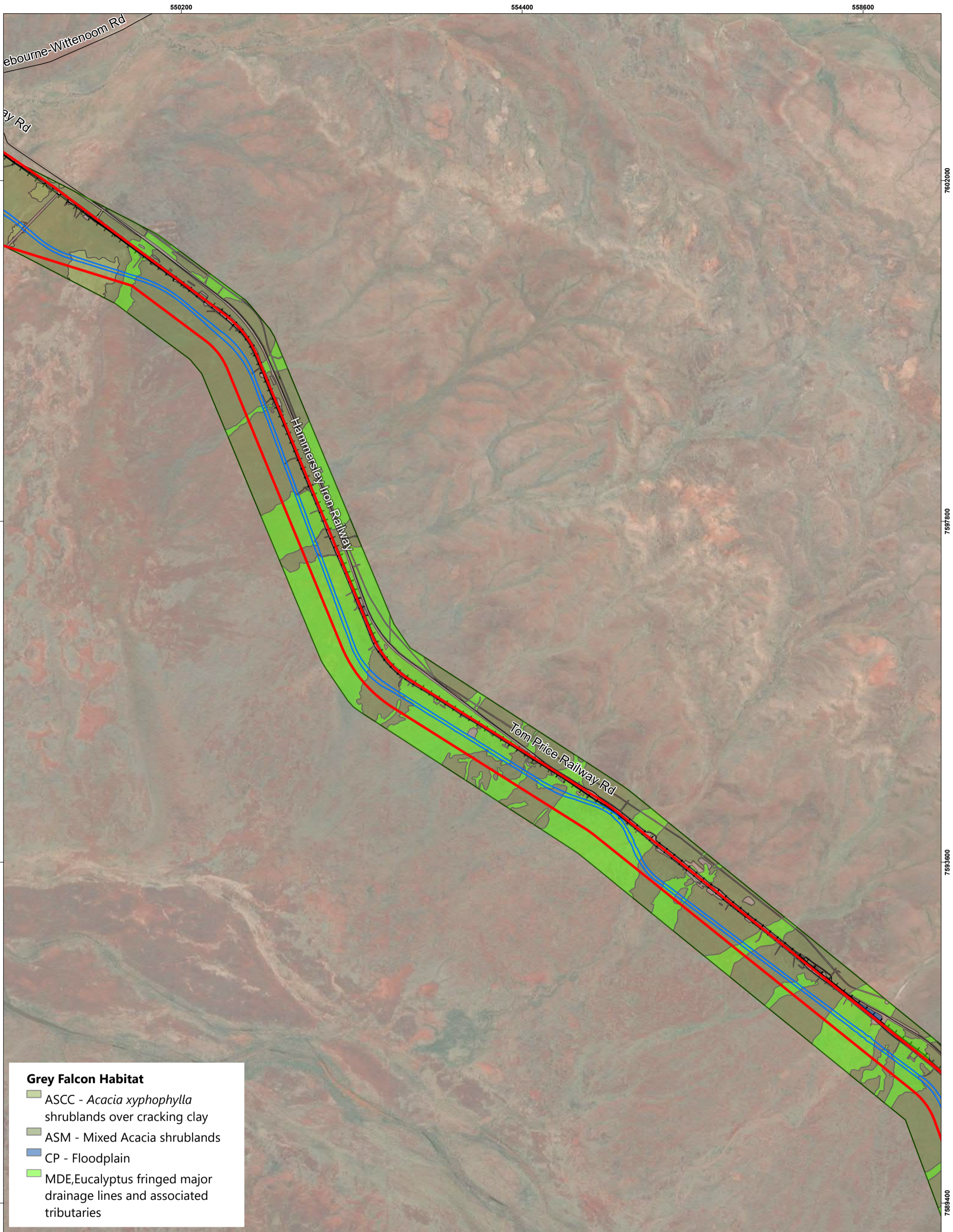
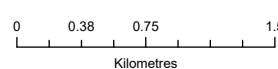
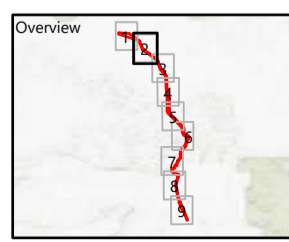


Figure 7 Grey Falcon Habitat



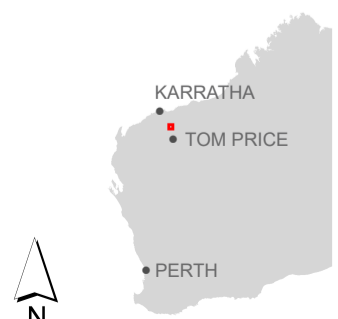
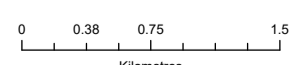
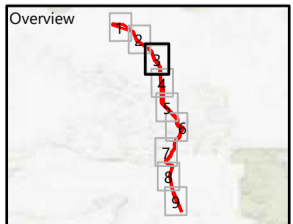
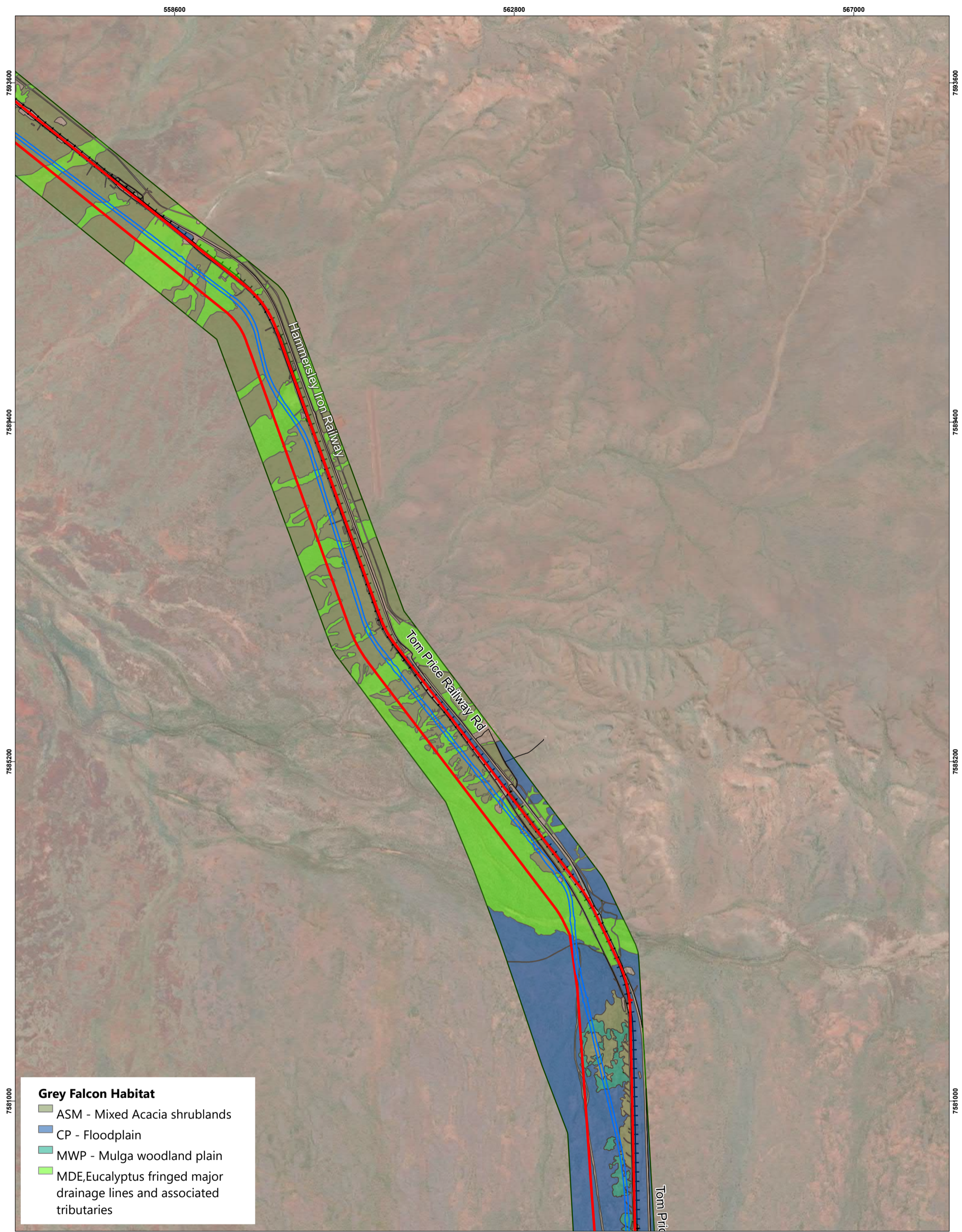
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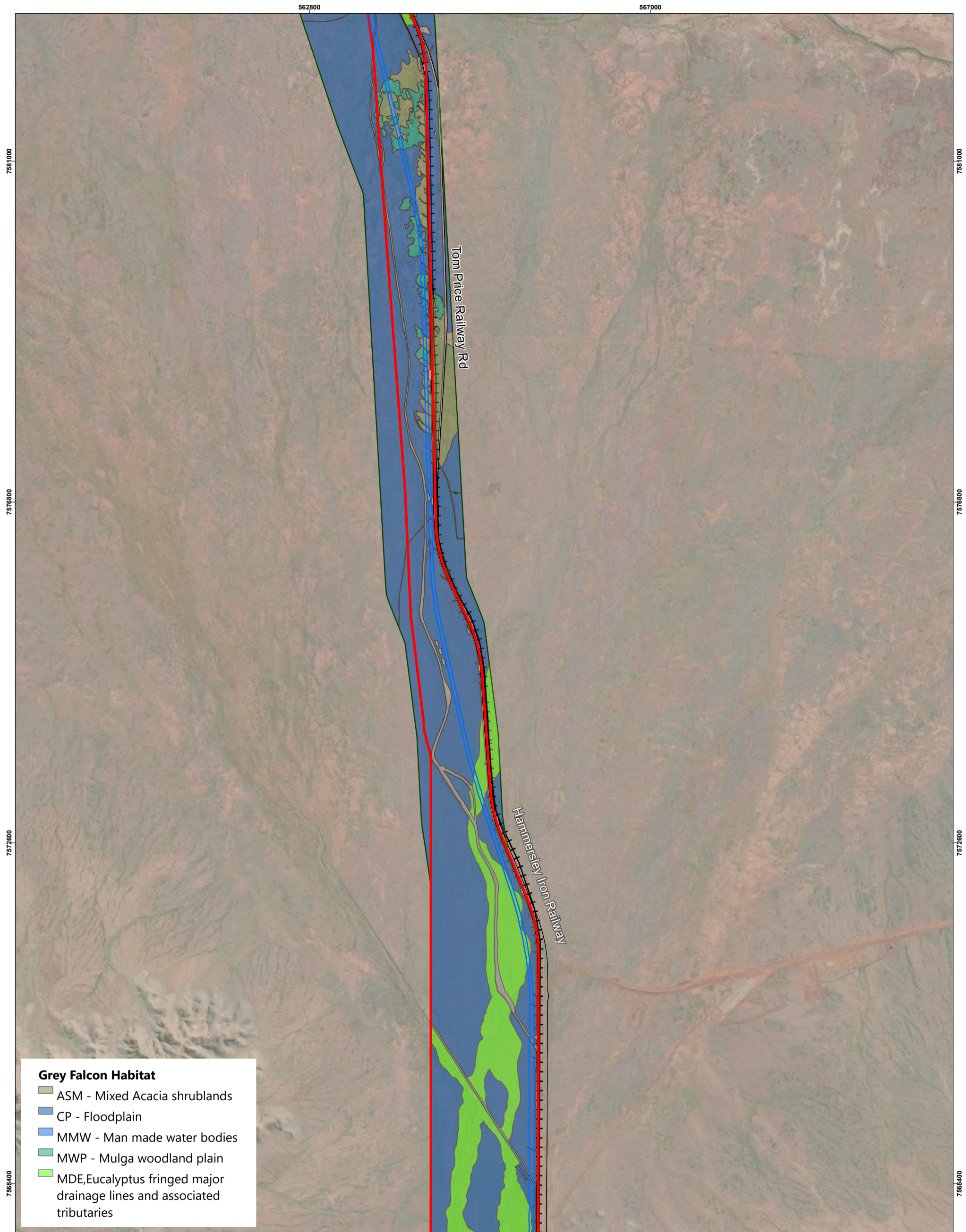
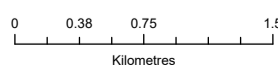
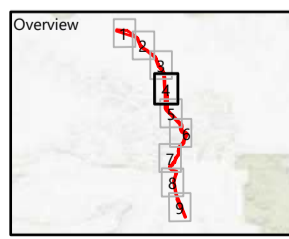


Figure 7 Grey Falcon Habitat

Legend

- Roads
- + Railways
- Disturbance Footprint
- ▭ Development Envelope
- ▭ Fauna Habitat Survey Boundary



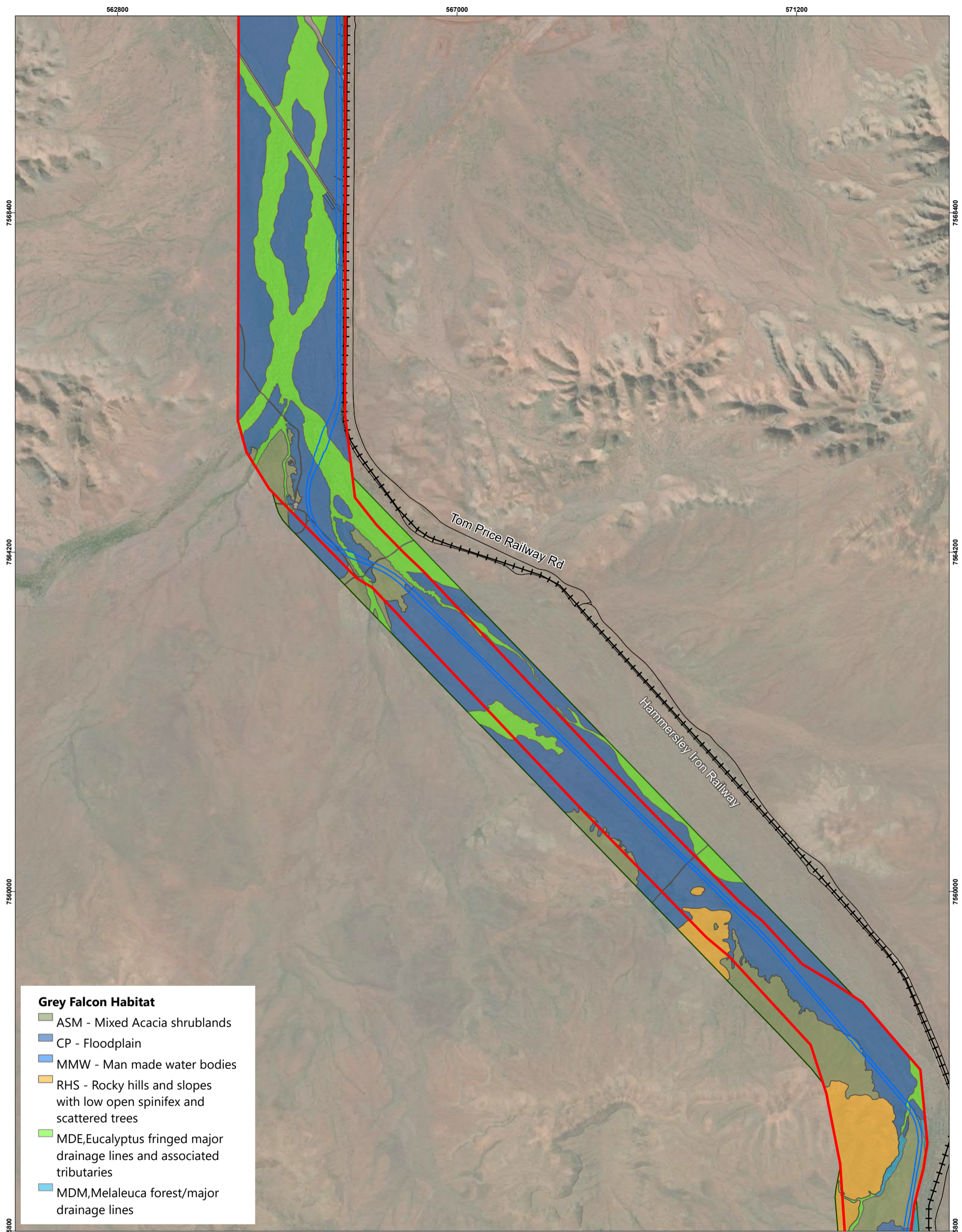
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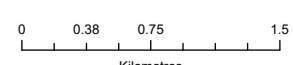
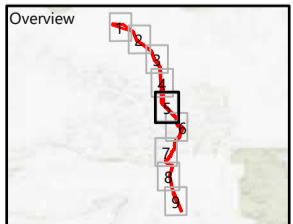


- Grey Falcon Habitat**
- ASM - Mixed Acacia shrublands
 - CP - Floodplain
 - MMW - Man made water bodies
 - RHS - Rocky hills and slopes with low open spinifex and scattered trees
 - MDE, Eucalyptus fringed major drainage lines and associated tributaries
 - MDM, Melaleuca forest/major drainage lines

Figure 7 Grey Falcon Habitat

Legend

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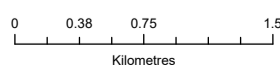
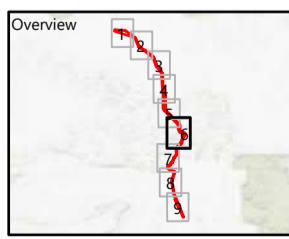
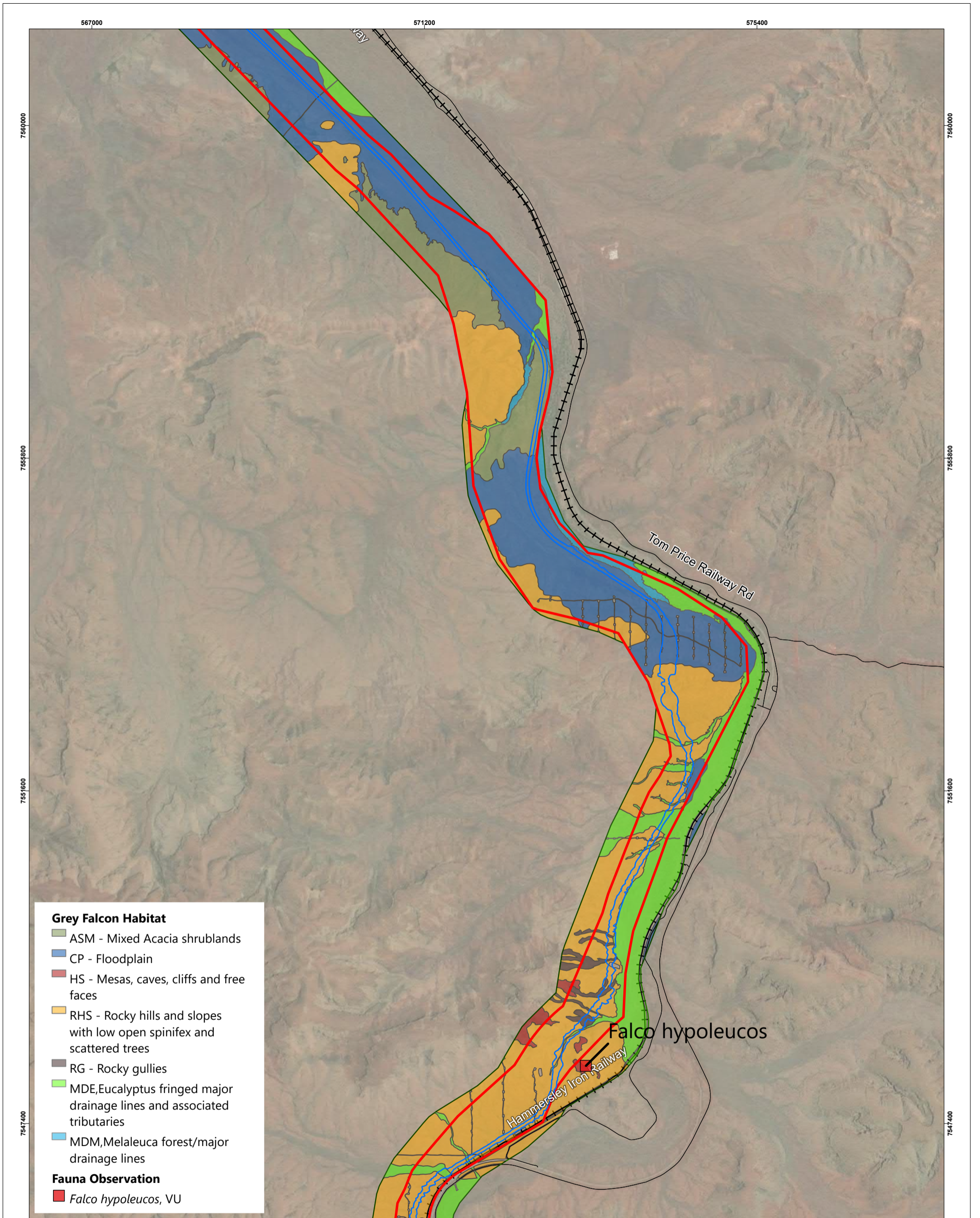
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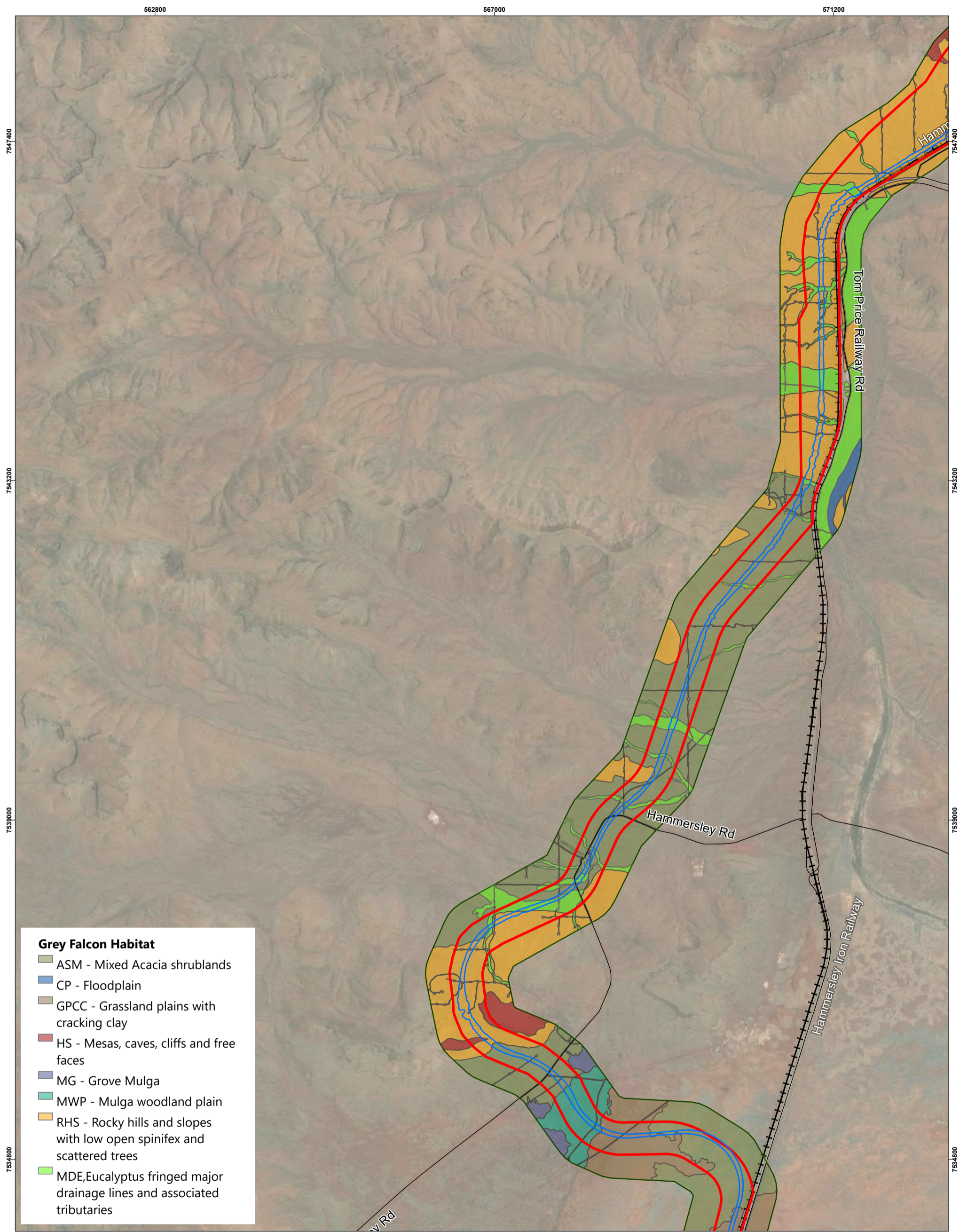
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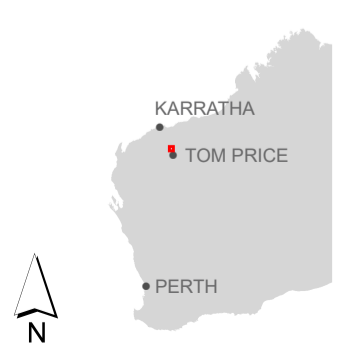
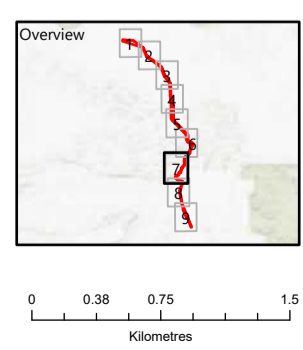
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- Grey Falcon Habitat**
- ASM - Mixed Acacia shrublands
 - CP - Floodplain
 - GPCC - Grassland plains with cracking clay
 - HS - Mesas, caves, cliffs and free faces
 - MG - Grove Mulga
 - MWP - Mulga woodland plain
 - RHS - Rocky hills and slopes with low open spinifex and scattered trees
 - MDE, Eucalyptus fringed major drainage lines and associated tributaries

Figure 7 Grey Falcon Habitat

- Legend**
- Roads
 - + Railways
 - Disturbance Footprint
 - ▭ Development Envelope
 - ▭ Fauna Habitat Survey Boundary



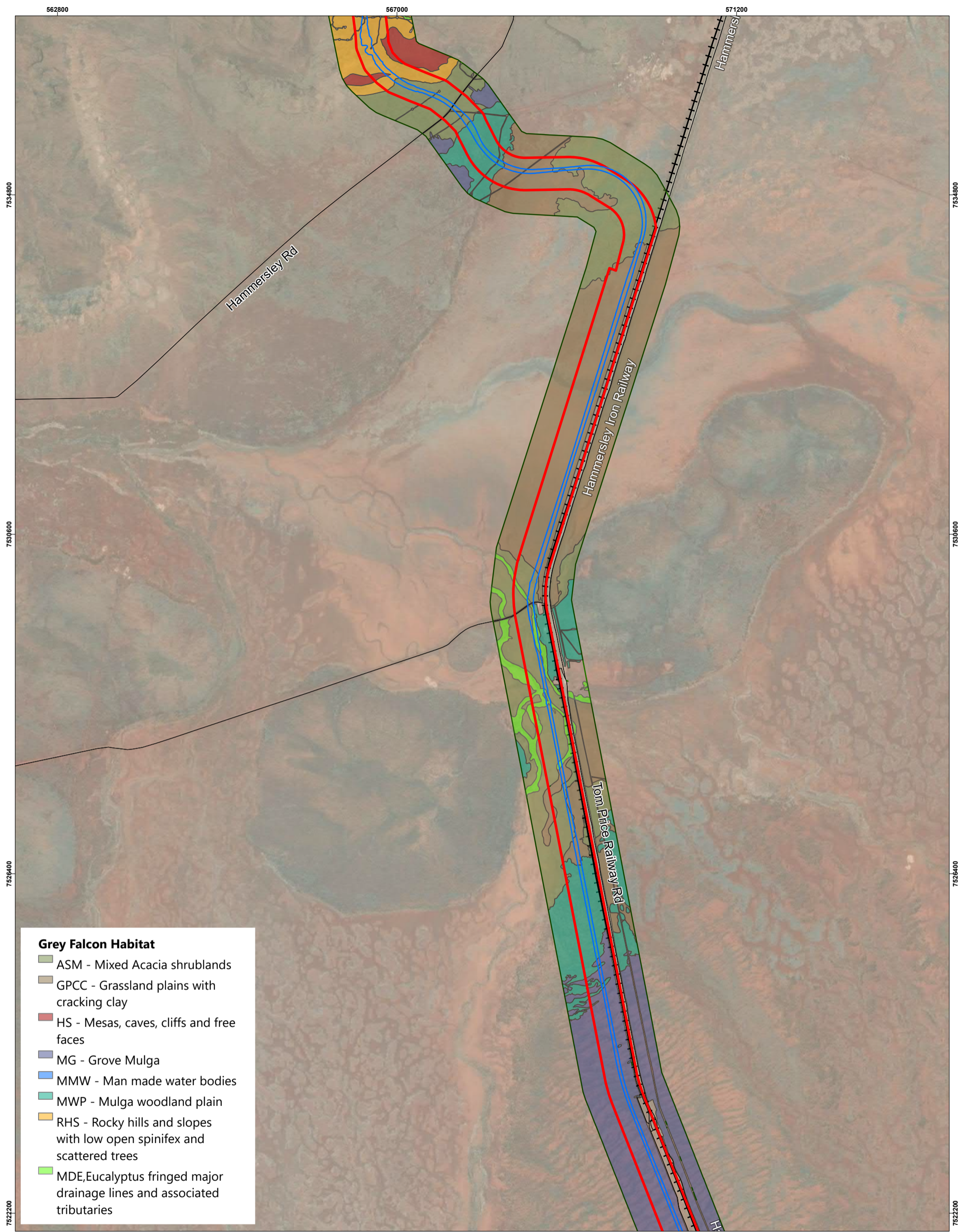
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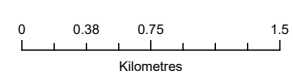
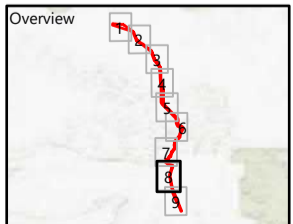
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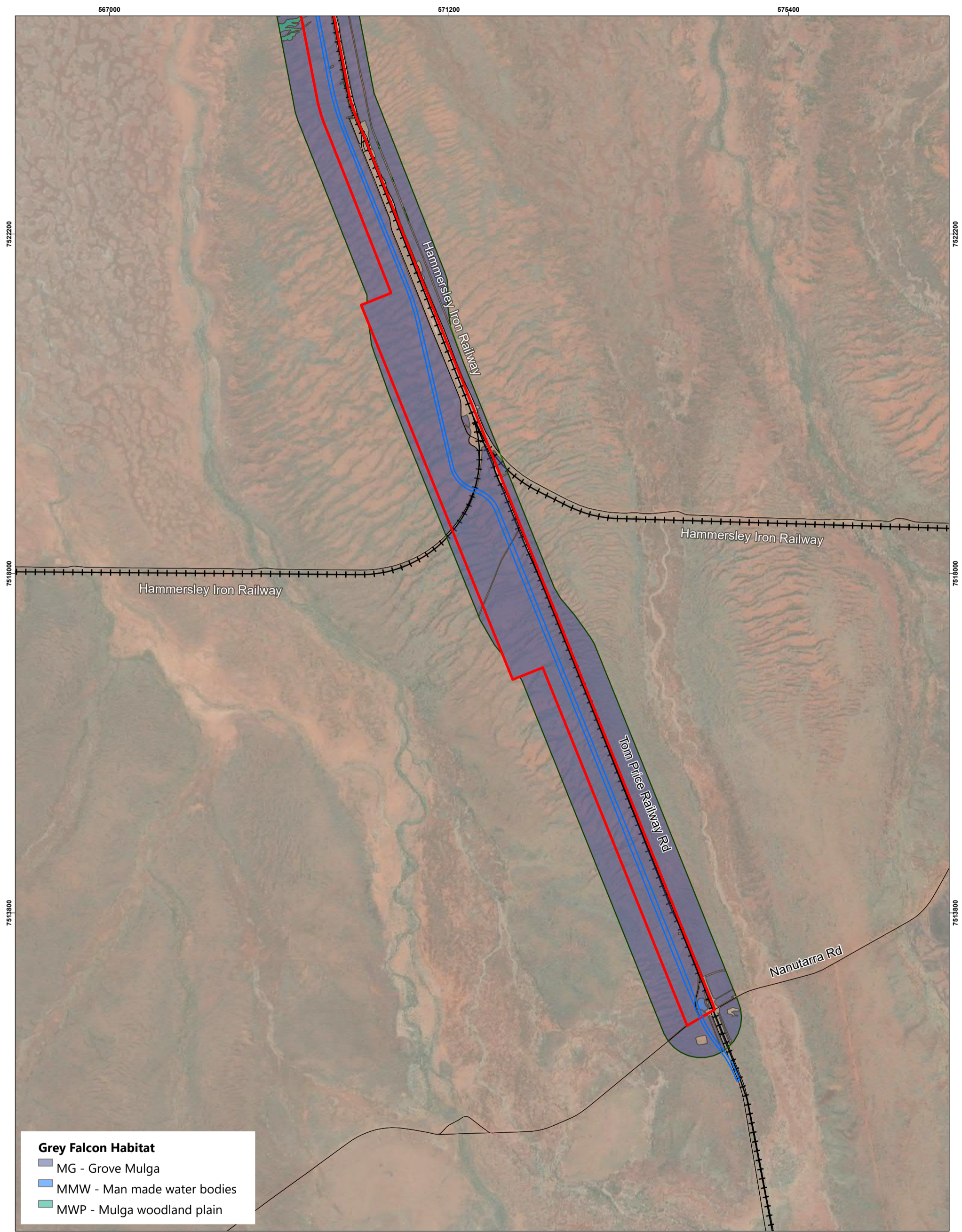
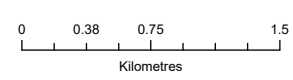
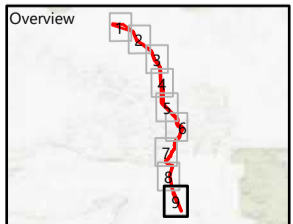


Figure 7 Grey Falcon Habitat

Legend

- Roads
- + Railways
- ▭ Disturbance Footprint
- ▭ Development Envelope
- ▭ Fauna Habitat Survey Boundary



Jacobs

JACOBS, 263 Adelaide Terrace, Perth WA 6000
Tel: +61 8 9469 4400 Fax: +61 8 9469 4488

This map has been compiled with data from numerous sources with different levels of accuracy and reliability and is considered by the authors to be fit for its intended purpose at the time of publication.

However, it should be noted that the information shown may be subject to change and ultimately, map users are required to determine the suitability of use for any particular purpose.

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Appendix A DCCEEW Action Management Plan Criteria



Action Management Plan Criteria

1. Includes (in the plan itself) a declaration of accuracy signed by the proponent/approval holder when submitting the plan:

Declaration of Accuracy

I declare that to the best of my knowledge, all the information contained in, or accompanying this document is complete, current and correct. I am duly authorised to sign this declaration on behalf of the proponent/approval holder. I am aware that:

- a. *giving false or misleading information is a serious offence under section 137.1 of the Criminal Code Act 1995 (Cth)*
- b. *section 137.2 of the Criminal Code Act 1995 (Cth) makes it an offence for a person to produce a document to another person in compliance or purported compliance with a law of the Commonwealth where the person knows that the document is false or misleading;*
- c. *section 490 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading; and*
- d. *section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth) (EPBC Regulations) where the person knows the information or document is false or misleading.*

Signed:

Full name (please print):

Organisation (please print):

EPBC Referral Number:

Name of Action Management Plan this document and declaration refers to:

Date:



<p>2. Outlines the plan's purpose and provides contextual information including, but not limited to:</p> <ul style="list-style-type: none">a. location and nature of relevant action activities;b. a schedule of action phases (e.g. commencement, construction, operation and decommissioning);c. information on protected matters to:<ul style="list-style-type: none">i. guide management approach; andii. establish 'baseline' condition prior to commencement of the action, quantified using the relevant protected matter attribute (e.g. quality score for area of habitat, no. of individuals or water quality);d. location of protected matters (and/or their habitat) in relation to the action location/boundary; ande. management objectives for protected matters and strategies to manage key risks to achieving those objectives.
<p>3. Establishes SMART² 'performance standards' used to evidence achievement of management objectives and which are comprised of:</p> <ul style="list-style-type: none">a. performance indicators, used to measure performance against a management objective, and specify physical, chemical or biological parameters that will be measured to assess environmental health and/or condition; andb. performance criteria, which are the numerical values for performance indicators established as one or more of the following functional types:<ul style="list-style-type: none">i. threshold criteria, acceptable numerical level(s) beyond which there is likely to be an unacceptable impact to protected matters and if breached will require corrective actions;ii. trigger criteria, numerical level(s) to forewarn of approaching unacceptable impacts to protected matters and, if breached, require mitigation activities (trigger action response plan or TARPs) to avoid realisation of that impact; oriii. completion criteria, numerical level(s) to achieve and maintain specified management objectives.
<p>4. Assesses the risk that the plan's objectives will not be met and identifies the sources of those risks and strategies for managing them. Includes a risk assessment which must:</p> <ul style="list-style-type: none">a. identify events that will, may, or are likely to prejudice attainment of 'performance standards';

² *Specific, Measurable, Achievable, Relevant and Time-bound*. For detail on SMART see page 11 of the Draft *Outcomes-based conditions guidance* available at <https://www.environment.gov.au/system/files/consultations/7c4a2b5b-2282-45c4-8e67-f0b5155ab12a/files/draft-outcomes-based-conditions-guidance.pdf>



- b. assess the likelihood and consequences of those events, and characterise residual risk levels³ (assuming management activities are implemented) using the risk matrix below:

RISK MATRIX						
Qualitative measure of likelihood (how likely is it that this event/circumstance will occur after management activities are implemented)						
Highly likely		Is expected to occur in most circumstances				
Likely		Will probably occur during the life of the project				
Possible		Might occur during the life of the project				
Unlikely		Could occur but considered unlikely or doubtful				
Rare		May occur in exceptional circumstances				
Qualitative measure of consequences (what will be the consequence/result if the issue does occur)						
Minor		Minor incident of environmental damage that can be reversed <i>(e.g. short-term delays to achieving plan objectives, implementing low-cost, well-characterised corrective actions)</i>				
Moderate		Isolated but substantial instances of environmental damage that could be reversed with intensive efforts <i>(e.g. short term delays to achieving plan objectives, implementing well-characterised, high-cost/effort corrective actions)</i>				
High		Substantial instances of environmental damage that could be reversed with intensive efforts <i>(e.g. medium-long term delays to achieving objectives, implementing uncertain, high-cost/effort corrective actions)</i>				
Major		Major loss of environmental amenity and real danger of continuing <i>(e.g. plan objectives are unlikely to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies)</i>				
Critical		Severe widespread loss of environmental amenity and irrecoverable environmental damage <i>(e.g. plan objectives are unable to be achieved, with no evidenced mitigation strategies)</i>				
		Consequence				
Likelihood		Minor	Moderate	High	Major	Critical
	Highly Likely	Medium	High	High	Severe	Severe
	Likely	Low	Medium	High	High	Severe
	Possible	Low	Medium	Medium	High	Severe
	Unlikely	Low	Low	Medium	High	High
	Rare	Low	Low	Low	Medium	High

³ The risk assessment may also include the risk level prior to any management, however, this is not necessary for the purpose of the plan



<ul style="list-style-type: none">c. state the level of uncertainty and apply a 'margin of safety' where uncertainty is high (i.e. enhance monitoring and management activities until uncertainty is reduced to an acceptable level);d. identify additional management activities that will be implemented (i.e. through <i>TARPs</i>) if <i>trigger criteria</i> are realised, to avoid unacceptable impacts to protected matters;e. include a 'stop work' response if <i>TARPs</i> are not effective; andf. identify effective <i>corrective actions</i> that will be implemented to repair/mitigate unacceptable impacts to protected matters that are project attributable.
<p>5. Specifies management activities that will be implemented to ensure the plan's 'performance standards' are met. Each management activity must:</p> <ul style="list-style-type: none">a. include timeframes for implementation;b. be clearly related to meeting 'performance standards'; andc. be derived from recognised and demonstrably appropriate principles, practice, or guidelines, and be justified - technically, scientifically and/or legally (e.g. by recommendation in an EPBC Act protected matter conservation advice, recovery plan and threat abatement plan).
<p>6. Includes an 'adaptive management' and review program to ensure uncertainty will reduce over time, and 'performance standards' are efficiently met. The program must:</p> <ul style="list-style-type: none">a. require frequent review of the effectiveness of management activities with high levels of uncertainty;b. ensure new information is collected and incorporated into the plan, as a result of implementing the plan and from relevant external sources (e.g. literature, EPBC Act policy statements);c. include a schedule and triggers for internal auditing of the plan's implementation and its effectiveness in meeting 'performance standards'; andd. require periodic review and technical evaluation (i.e. by a suitably qualified ecologist or relevant expert), and revision of the plan:<ul style="list-style-type: none">i. according to approved timeframes;ii. in response to changing circumstances; andiii. to address learnings from implementing <i>corrective actions and/or TARPs</i>.
<p>7. Includes a monitoring program adequate to inform 'adaptive management' and to demonstrate 'performance standards' have been, will be, or are likely to be met and maintained. The monitoring program must:</p> <ul style="list-style-type: none">a. engage suitably qualified persons to design and conduct monitoring, and analyse monitoring data; andb. describe the monitoring methodology that will be implemented including, but not limited to:<ul style="list-style-type: none">i. monitoring area/site selection;



<ul style="list-style-type: none">ii. sampling technique and intensity over space and time;iii. the statistical analyses that will be employed; andiv. an assessment of effectiveness and constraints to use, including but not limited to:<ul style="list-style-type: none">o consistency with relevant Commonwealth, State or Territory guidelines;o capability of detecting change in environmental condition due to management interventions, taking into consideration effects of seasonal and climatic variability; ando statistical power.
8. Includes a program for handling and storing information/data for the purpose of 'adaptive management', reporting, publishing and auditing in accordance with conditions of the approval (e.g. for compliance purposes).
9. Includes as an appendix to the plan quantitative and qualitative 'baseline' data from on-ground surveys and photo-point monitoring sites within the action boundary or offset site(s) and data from 'benchmark', 'control' or reference sites outside the action boundary or offset site(s).
10. Includes a program to report on plan implementation. The program must: <ul style="list-style-type: none">a. identify EPBC Act approval reporting obligations and how those obligations will be met;b. include reporting template/s; andc. include a schedule and triggers for reporting types (e.g. annual compliance, environmental incidents and non-compliance).
11. Specifies roles, responsibilities and accountabilities for implementing the plan.
12. Ensures maps and diagrams used are clearly legible when printed on A4 and that they: <ul style="list-style-type: none">a. show the project area in a regional context;b. show areas with differing environmental condition or habitat quality, protected areas, management zones and buffer or 'no-go' zones';c. show the location (or general location) of monitoring plots and management activities that will be undertaken, and are scaled to enable the reader to clearly identify local landmarks (e.g. fences, tracks, buildings)d. include a legend, metric graphic bar scales, north point, local grid lines and a title block showing: EPBC Act number; project name; author; datum; scale (e.g. 1:25 000); source and date of data/imagery.
13. References scientific, legal or other claims or statements that support the effectiveness of the plan (e.g. literature, published guidelines, legislation, conservation advice, recovery plans and threat abatement plans).
14. Makes clear, firm commitments. Uses 'will' and 'must' when committing to actions and not: 'where possible'; 'where practicable'; 'as required'; 'to the greatest extent possible'; 'should'; or 'may'.



15. Includes a glossary of terms comprised of: acronyms; terms open to different interpretations, not in common use; technical; or terms used as defined in the approval conditions.

Appendix 8 Stakeholder Consultation

STAKEHOLDER	DATE	CONSULTATION TYPE	CONSULTATION TOPIC/OUTCOME
Commonwealth Government			
Department of Agriculture, Water and the Environment (DAWE)	24/02/2021	Meeting	<p>Main Roads updated DAWE on the project in terms of:</p> <ul style="list-style-type: none"> project design, biological survey and timing of further surveys; and potential changes to the development envelope. <p>Main Roads advised that changes to the development envelope could be provided at any time (i.e. request to vary Proposed Action under section 156A of the EPBC Act).</p> <p>It was agreed that the revised/final development envelope would be provided at the end of the assessment process. The current development envelope will be used in the current response to the DAWE information request.</p>
Department of Agriculture, Water and the Environment (DAWE)	Ongoing monthly meetings with DAWE updating progress on projects having major project status. Most recent meeting 06/10/2021.	Meeting	John Braid provided update on the status of the MRDH Preliminary Documentation and advised that submission was expected by 15/10/2021.
State Government			
DWER (EPA Services)	February 2021 September 2021	Meeting	<p>Information on potential changes to the development envelope provided to EPA Services.</p> <p>Likely date for submission of ERD (late October 2021 or early November 2021) provided to EPA Services.</p>

STAKEHOLDER	DATE	CONSULTATION TYPE	CONSULTATION TOPIC/OUTCOME
Pilbara Development Commissions (PDC)	17/04/2020	Video Conference	Project update provided and discussions on demand assessment considerations (i.e. current and future potential road users). Input provided by the PDC into the demand assessment for regional travel movements.
DWER (EPA Services)	26/03/2020	Video Conference	Briefed new EPA Services Officer on the project and seek advice /agreement on the State approvals process for the project
DWER (EPA Services)	28/02/2020	Email	Email advising that for the purposes of the State approvals process, the project should be referred as a 'Revised Proposal' (using section 38 referral form) for EPA consideration. The email provided some examples of other projects (e.g. Mesa A and H) that may offer guidance in relation to the referral, approval and characterisation of 'Revised Proposals' in a table.
DWER (EPA Services)	23/01/2020	Face to Face Meeting	Overview of the project and key environmental issues provided. Main Roads advised EPA it is of the view that the Project will require referral to the EPA (and Commonwealth Department of the Environment and Energy, now DAWE) for assessment. Main Roads advised to: <ul style="list-style-type: none"> demonstrate that the Proposal does not meet the criteria for a section 45c amendment to the existing Ministerial Statement; and then, should the Proposal not meet the criteria for a section 45c, it is most likely the Proposal would be assessed as a Revised Proposal.
DBCA	01/11/2019	Phone Conversation	Phone conversation to offer to brief DBCA on the Proposal DBCA expressed a preference for a preliminary project meeting to be held in conjunction with the EPA Services team.
DWER (Water)	28/10/2019	Face to Face Meeting	Discussion of the project and expected approvals pathways. DWER advised Main Roads that: <ul style="list-style-type: none"> early engagement and involvement with the EPA is recommended;

STAKEHOLDER	DATE	CONSULTATION TYPE	CONSULTATION TOPIC/OUTCOME
			<ul style="list-style-type: none"> there are four Water Quality Protection Notes (WQPNs) that should be referenced in the development of the project: WQPNs 44, 65, 83 and 84; that new roads are compatible activities in Priority (P) 1, P2 and P3 areas of public drinking water source areas, with conditions; beds and banks permits are required; and borrow pits must be free draining. <p>Main Roads were advised that Justine Shailes (Program Manager in the Karratha Office) will be the main point of contact for the Project.</p>
Water Corporation	24/08/2020	Email Correspondence	Requested Water Corporation comments on preferred alignment within proposed corridors.
Local Government			
Shire of Ashburton	09/06/2020	Video Conference (Elected Members Forum)	Main Roads provided an update on the progress of Proposed Action.
Shire of Ashburton	19/05/2020	Meeting	Discussion of the term "Pilbara Proof" and its meaning to the Shire of Ashburton (e.g. impact on the road from cyclonic weather/flooding); the Shire's expectations for the design of the road and for ongoing communications / engagement with the council and wider community.
Shire of Ashburton	14/07/2020	Meeting	Requested documents and information from the Shire of Ashburton: <ul style="list-style-type: none"> electronic copies of the banners; electronic copies of corridor maps; requested that the Project Team consult with the MP for SoA; and requested to send summary notes of the ministerial briefing content.

STAKEHOLDER	DATE	CONSULTATION TYPE	CONSULTATION TOPIC/OUTCOME
Community			
Yindjibarndi Aboriginal Corporation (YAC)	27/05/2020	Video Conference	Discussion on heritage survey access; project update; discussed potential development of an Indigenous Reference Group.
Wintawari Guruma Aboriginal Corporation (WGAC)	08/05/2020	Video Conference	Discussion of a preferred Hamersley Homestead corridor alignment; heritage survey access; project update; potential development of an Indigenous Reference Group.
WGAC and Wintawari Guruma Traditional Owners	27/02/2020	Face to Face Meeting	Drive-through of alignment options and discussion of least impact option for Hamersley Station Homestead and Weelumurra Law Ground. Feedback received from stakeholders as to possible impacts and areas to be avoided. Further conversation required regarding alignment options at the next WGAC board meeting before decision made.
WGAC	28/01/2020	Office-based Face to Face Meeting	Alignment options and concerns related to the Hamersley Station Homestead discussed. Focus on least impact option for the homestead. In-field walk-over of alignment options to the west of the homestead with Wintawari Guruma Traditional Owners requested by WGAC.
WGAC	14/11/2019	Face to Face Meeting	Discussion of options for the corridor alignment with regards to heritage issues. WGAC advised that: <ul style="list-style-type: none"> • preferred option was a corridor to the east of the current railway; • that the Weelumurra Creek is now a lodged site under the <i>Aboriginal Heritage Act 1972</i>; and • expressed concerns regarding social impacts to the Hamersley Station Homestead. WGAC requested more information regarding alignment options around the homestead.

STAKEHOLDER	DATE	CONSULTATION TYPE	CONSULTATION TOPIC/OUTCOME
YAC	13/11/2019	Face to Face meeting	<p>Discussion of options for the corridor alignment with regards to heritage issues.</p> <p>The YAC:</p> <ul style="list-style-type: none"> advised Main Roads of the importance of Weelumurra Creek and asked for the least impact possible; discussed the importance of Millstream as a public drinking water source area; and look forward to a heritage survey over the proposed corridor to determine heritage issues more clearly.
Land owners			
Coolawanyah Station	18/06/2020 and 15/07/2020	Email and Meeting	<p>Updates provided on heritage survey dates.</p> <p>Requested input on proposed corridors.</p> <p>Provided maps of 400 to 800 m wide corridor through Coolawanyah.</p> <p>Requested a topographical map of the area of the corridor, to check change in flow due to infilling of corrugated culverts to narrower smooth culverts, and to send aerial data from the flyover.</p>
FMG	15/06/2020	Video Conference	<p>Discussion of the corridor alignment and potential implications for tenure/FMG use of the sealed road.</p> <p>FMG requested files on proposed corridor to assess against future tenement considerations.</p>
Rio Tinto	20/05/2020	Email	{Provided current corridor information and propose further discussions.
Balla Balla Infrastructure	19/05/2020	Email	Provided a project update, discussed traffic demand and the sharing of information.
Coolawanyah Station	28/04/2020	Phone Conversation	<p>Discussion of current corridor alignment, including key changes to the corridor and next phases of refining the alignment.</p> <p>An email with the current corridor alignment was provided as follow up.</p>

STAKEHOLDER	DATE	CONSULTATION TYPE	CONSULTATION TOPIC/OUTCOME
FMG	24/04/2020	Video Conference	Discussion of FMG land tenure and any implications of the currently proposed corridors. Discussions regarding potential transport needs for FMG to provide context to the demand assessment report.
Balla Balla Infrastructure	23/04/2020	Phone Conversation	Update that alignment corridor would be provided to stakeholder once approved. Stakeholder may then commence further discussion with Main Roads. Main Roads to investigate challenges of the stakeholder's confidentiality agreement.
Rio Tinto	20/04/2020	Meeting	Discussion of synergies with Rio Tinto's ongoing rail renewal project for potential sourcing of construction materials; and potential synergies with future quarries or borrow pits.
Rio Tinto	17/04/2020	Meeting	Discussion of environmental surveys (location and schedule), geotechnical investigations and accommodation for local contractors; synergies in resources (e.g. ballast); traffic demand and crossing information.
FMG	Dec 2019 – Feb 2020	Various Electronic Correspondence	Correspondence to achieve alignment on suitable locations and design for the future MRDH Stage 4 intersection with FMG infrastructure; Eliwana rail arch (Bridge number 1870). FMG provided the 100% design report for this infrastructure to Main Roads.
Coolawanyah Station	05/01/2020	Email	Input received from Coolawanyah Station Owner and Manager Kim Parsons regarding specific concerns for the station.
Coolawanyah Station	09/10/2019	Email	Email communication to station owner and Manager to introduce Main Roads Project Manager and invite consultation on the project for which alignment selection has now commenced.
Committees and Reference Groups			
Chamber of Minerals and Energy (CME) Members	20/04/2020	Email	Email to CME Members providing an overview of the MRDH Stage 4 Project and seeking input from CME Members.

STAKEHOLDER	DATE	CONSULTATION TYPE	CONSULTATION TOPIC/OUTCOME
<ul style="list-style-type: none"> • Rio Tinto • Coolawanyah Station • PDC • DWER • City of Karratha • Karratha and Districts Chamber of Commerce and Industry (KDCCI) • Shire of Ashburton • Balla Balla Infrastructure 	10/12/2019	Face to Face Workshop (Karratha Tom Price (now MRDH) Stage 4 Preliminary Sustainability Workshop)	A Preliminary Sustainability Workshop was held to define the main issues and opportunities associated with Stage 4 of the MRDH.
Public Consultation - Tom Price Shopping Centre	15/07/2020	Public Information Booth	Two key themes of feedback focused on when the project will be completed, and scepticism that the works will go ahead as the works had been discussed for some 30 years. No negative feedback on the Proposal was received from local Tom Price residents. Strong interest received from visitors to the region.
<ul style="list-style-type: none"> • City of Karratha • Greening Australia • Rangelands NRM 	4/11/2020	Virtual (Environmental Legacy Workshop)	<p>An Environmental Legacy Workshop was held to define the main environmental legacy needs and opportunities associated with Stage 4 of the MRDH.</p> <p>The following legacy opportunities were identified in the workshop:</p> <ul style="list-style-type: none"> • enhance biodiversity and maximise positive environmental outcomes Maximise network resilience; • maximise 'on alignment' materials/resources; • maximise local employment and skills legacy; • maximise shared land use and infrastructure; • maximise social and cultural capital; and • maximise innovation and challenge beyond business as usual.

STAKEHOLDER	DATE	CONSULTATION TYPE	CONSULTATION TOPIC/OUTCOME
<ul style="list-style-type: none"> City of Karratha PDC Shire of Ashburton SMEC 	24/11/2020	Virtual (Resilience and Climate/Natural Hazard Workshop)	<p>A Resilience and Climate/Natural Hazard Workshop was held to develop a shared understanding of resilience and how it applies to MRDH and the Pilbara Region.</p> <p>The following opportunities were discussed in the MRDH Stage 4 Resilience Workshop to reduce the impact of identified stressors:</p> <ul style="list-style-type: none"> health infrastructure and services; social cohesion/ social stability; and opportunities for reuse of materials.
<ul style="list-style-type: none"> FMG Rio Tinto PICCI 	26/11/2020	Face to Face Workshop (Tom Price Social and Community Legacy Workshop)	<p>A Social and Community Legacy Workshop was held in Tom Price to define the main social legacy needs and opportunities associated with Stage 4 of the MRDH .</p> <p>The following legacy opportunities were identified in the workshop::</p> <ul style="list-style-type: none"> maximise social and cultural capital; maximise local employment and skills legacy; maximise shared land use and infrastructure; maximise 'on alignment' materials/resources; maximise network resilience; enhance biodiversity and maximise positive environmental outcomes; and maximise innovation and challenge beyond business as usual.
<ul style="list-style-type: none"> Shire of Ashburton PDC Rio Tinto Karratha Visitors Centre Coolawanyah Station 	15/12/2020	Virtual (Social and Community Legacy Workshop)	<p>A virtual Social and Community Legacy Workshop was held to define the main social legacy needs and opportunities associated with Stage 4 of the MRDH.</p>

STAKEHOLDER	DATE	CONSULTATION TYPE	CONSULTATION TOPIC/OUTCOME
<ul style="list-style-type: none">• FMG• Tom Price Arts Hub• BBI• Velocity Motel• Tourism Naturally			