



Clearing Permit Decision Report

1. Application details and outcomes

1.1. Permit application details

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| Permit number: | 8175/2 |
| Permit type: | Purpose Permit |
| Applicant name: | Pilgangoora Operations Pty Ltd |
| Application received: | 26 April 2023 |
| Application area: | 1,330.1 hectares |
| Purpose of clearing: | Mineral Production and Associated Activities |
| Method of clearing: | Mechanical Removal |
| Tenure: | Mining Leases 45/78, 45/333, 45/511, 45/1256 Miscellaneous Licences 45/402, 45/411, 45/413, 45/414, 45/417, 45/421, 45/429, 45/430 |
| Location (LGA area/s): | Shire of East Pilbara |
| Colloquial name: | Pilgangoora Lithium-Tantalum Project |

1.2. Description of clearing activities

Pilgangoora Operations Pty Ltd proposes to clear up to 1,330.1 hectares of native vegetation within a boundary of approximately 2,192.7 hectares, for the purpose of mineral production and associated activities. The project is located approximately 70 kilometres south-southeast of Port Hedland, within the Shire of East Pilbara.

The application is to allow for continued operation of the Pilgangoora Lithium-Tantalum Project (Pilgangoora, 2023c).

Clearing permit CPS 8175/1 was granted by the Department of Mines, Industry Regulation and Safety on 11 October 2018 and was valid from 3 November 2018 to 31 December 2023. The permit authorised the clearing of up to 1,330.1 hectares of native vegetation within a boundary of approximately 2,251 hectares, for the purpose of mineral production and associated activities. This permit replaced CPS 7449/3.

On 26 April 2023, the Permit Holder applied to amend CPS 8175/1 to extend the permit duration by five years, to 31 December 2028, and add Miscellaneous Licences 45/421 and 45/429. Miscellaneous Licences 45/388 and 45/426 are no longer live and will be replaced by Miscellaneous Licences 45/421 and 45/429. The permit boundary has been reduced due to tenure changes for this project; however, the amount of clearing authorised remains unchanged.

1.3. Decision on application and key considerations

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|-----------------------|---------------------------------------|
| Decision: | Grant |
| Decision date: | 19 September 2023 |
| Decision area: | 1,330.1 hectares of native vegetation |

1.4. Reasons for decision

This clearing permit application was made in accordance with section 51KA(1) of the *Environmental Protection Act 1986* (EP Act) and was received by the Department of Mines, Industry Regulation and Safety (DMIRS) on 26 April 2023. DMIRS advertised the application for a public comment for a period of 7 days, and no submissions were received.

In making this decision, the Delegated Officer had regard for the site characteristics (Appendix B), relevant datasets (Appendix E), supporting information provided by the applicant (Appendix A) including the results of biological surveys, the clearing principles set out in Schedule 5 of the EP Act (Appendix C), proposed avoidance and minimisation measures (Section 3.1), relevant planning instruments and any other matters considered relevant to the assessment (Section 3.3).

The assessment identified that the proposed clearing may result in:

- the potential introduction and spread of weeds into adjacent vegetation, which could impact on the quality of the adjacent vegetation and its habitat values;
- impacts to conservation significant flora;
- impacts to conservation significant fauna or their habitats;
- potential land degradation; and
- impacts to riparian vegetation.

After consideration of the available information, as well as the applicant's minimisation and mitigation measures (see Section 3.1), the Delegated Officer determined the proposed clearing can be minimised and managed to be unlikely to lead to an unacceptable risk to environmental values.

The conditions currently imposed on clearing permit CPS 8172/1 are considered adequate to manage the impacts of clearing:

- take hygiene steps to minimise the risk of the introduction and spread of weeds
- commence construction no later than three months after undertaking clearing to reduce the risk of erosion
- a watercourse management condition to avoid clearing riparian vegetation where practicable, and maintain existing surface water flow
- a flora management condition requiring a targeted flora survey to be undertaken prior to clearing within L 45/413 or L 45/414 for *Quoya zonalis*, submit the report to the CEO, and maintain a 50 metre buffer around identified individuals

The following conditions were not imposed on clearing permit CPS 8175/1, however will be imposed on this version:

- avoid, minimise to reduce the impacts and extent of clearing;
- a flora management condition where no clearing of identified *Euploca mutica* or within 10 metres is permitted, unless first approved by the CEO; and
- undertake slow, progressive one-directional clearing to allow terrestrial fauna to move into adjacent habitat ahead of the clearing activity.

The assessment has changed since the assessment for CPS 8175/1 for principles (a), (b), and (c). A review of available information has revealed further consideration was needed for the impacts to conservation significant flora and fauna.

2. Legislative context

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

In addition to the matters considered in accordance with section 51O of the EP Act (see Section 1.4), the Delegated Officer has also had regard to the objects and principles under section 4A of the EP Act, particularly:

- the precautionary principle
- the principle of intergenerational equity
- the principle of the conservation of biological diversity and ecological integrity.

Other legislation of relevance for this assessment include:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Conservation and Land Management Act 1984* (WA) (CALM Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Mining Act 1978* (WA)

Relevant agreements (treaties) considered during the assessment include:

- Japan-Australia Migratory Bird Agreement
- China-Australia Migratory Bird Agreement
- Republic of Korea-Australia Migratory Bird Agreement

The key guidance documents which inform this assessment are:

- *A guide to the assessment of applications to clear native vegetation* (DER, December 2014)
- *Procedure: Native vegetation clearing permits* (DWER, October 2021)
- Technical guidance – *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016)
- Technical guidance – *Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA, 2016)
- Technical guidance – *Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA, 2020)

3. Detailed assessment of application

3.1. Avoidance and mitigation measures

Pilgangoora (2023a) have outlined they maintain following internal databases, and avoidance and mitigation measures:

- Internal company wide GIS layer that contains conservation significant flora locations.
- Investigation of alternate placement of activities during planning activities.
- Land Use Certificate Procedure – to outline the process for managing work activities which disturb ground or vegetation as part of construction, commissioning and operation of the Pilgangoora Operations. Objectives of the LUC Procedure include:
 - Ensure all work activities are undertaken within approved project boundaries.
 - Ensure all work activities are undertaken in accordance with project environmental requirements and approvals conditions.
 - Minimise the total footprint of disturbance as far as practicable for the safe and efficient completion of work activities.
 - Minimise potential impacts to fauna, fauna habitat and potential sensitive areas.

The Delegated Officer was satisfied that the applicant has made a reasonable effort to avoid and minimise potential impacts of the proposed clearing on environmental values.

3.2. Assessment of impacts on environmental values

A review of current environmental information (Section 3.2.1, Section 3.2.2, Appendix B, and Appendix C) reveals that the assessment against the clearing principles has changed from the Clearing Permit Decision Report CPS 8175/1 for principles (a), (b), and (c).

Principle (a) is now at variance, principle (b) is now at variance, and principle (c) is now not likely to be at variance.

Compared to the previous version of the permit, contemporary environmental information was considered during this assessment, in the form of flora and vegetation surveys, fauna surveys, and spatial data. This newer information required further discussion.

3.2.1. Biological values (flora) - Clearing Principles (a and c)

Assessment

A number of flora and vegetation surveys have been conducted over the application area and surrounds in September and October 2013, August 2015, March and April 2016, September 2017, May 2018, October 2022, and March 2023 (APM, 2022; 2023; Ecologia, 2017; 2018; MMWC, 2016a; 2016b; Natural Areas, 2014; 2016).

Four priority flora species were recorded during the above surveys: *Euphorbia clementii* (P3), *Euploca mutica* (P3) (previously *Heliotropium muticum*, P1), *Stackhousia clementii* (P3), and *Triodia chichesterensis* (P3) (APM, 2023; Ecologia, 2018; MMWC, 2016a; 2016b; Natural Areas, 2014). The only species that was recorded within the application area is *Euploca mutica* (MMWC, 2016b), however, there is a potential for *Triodia chichesterensis* to be present within the application area given the mapped population is directly adjacent to the proposed boundary (Ecologia, 2018).

Euploca mutica is known from 76 locations, extending from Port Hedland approximately 143 kilometres south, and from Marble Bar extending approximately 240 kilometres west (Western Australian Herbarium, 1998-; GIS Database). There are 33 known locations of *Euploca mutica* within 50 kilometres of the application area (GIS Database).

MMWC (2016b) recorded approximately 675 *Euploca mutica* individuals over 87 point locations. The majority of the Western Australian Herbarium (1998-) records have small population sizes, making the population within the application area significant in terms of the number of individuals recorded at one location (DPaW, 2017).

AMP (2023) conducted a flora and vegetation survey on E 45/2287 (outside the application area, adjacent M 45/1256) in March 2023. This survey recorded four additional point locations of *Euploca mutica* that were not recorded by MMWC (2016b), totalling to 31 individuals (APM, 2023). There are 708 confirmed individuals across 94 point locations within the broader Pilgangoora Lithium-Tantalum Project (Pilgangoora, 2023a), of which 492 are located within the application area (MMWC, 2016b). Pilgangoora (2023a) have impacted an estimated total of 56 *Euploca mutica* individuals through clearing under CPS 8175/1. Currently there are no clearing or construction works proposed that intersect the remaining *Euploca mutica* population (Pilgangoora, 2023a).

Triodia chichesterensis is known from 42 locations within the Western Australian Herbarium (1998-). For the majority of these records *Triodia chichesterensis* is described as the most abundant, common, or dominant species recorded within the vegetation assemblage (Western Australian Herbarium, 1998-). AMP (2023) recorded three point locations with a total of 7,500 individuals, and Ecologia (2018) recorded a population of in excess of 1,000 individuals. Both of the surveys that recorded *Triodia chichesterensis* were undertaken adjacent to the application area; however, there is a potential for this species to occur within the application area given their proximity. The proposed clearing is unlikely to significantly impact *Triodia chichesterensis*, were this species to occur within the application area given the records in excess of 8,500 individuals found adjacent (Ecologia, 2018; AMP, 2023).

CPS 8175/1 was granted with the following flora management condition:

8. Flora management

- (a) Prior to undertaking any clearing within Miscellaneous Licence 45/413 or Miscellaneous Licence 45/414 authorised under this Permit, the Permit Holder shall engage a botanist, to conduct a targeted flora survey of the areas to be cleared for the presence of *Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4.).
- (b) Prior to undertaking any clearing within Miscellaneous Licence 45/413 or Miscellaneous Licence 45/414 authorised under this Permit, the Permit Holder shall provide the results of the targeted flora survey in a report to the CEO.
- (c) The Permit Holder shall ensure that no clearing occurs within 50 metres of identified *Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4.), unless first approved by the CEO.

Pityrodia sp. Marble Bar is now formally named *Quoya zonalis*, a threatened flora species (Western Australian Herbarium, 1998-). A targeted flora survey was conducted on 20-22 June 2017 over L 45/413 and L 45/430, due to the determination that L 45/414 was unsuitable for construction of the pipeline and road as originally proposed (Ecologia, 2017; PML, 2023). No clearing works have been undertaken or are proposed in the future for L 45/414 (PLM, 2023).

The targeted flora survey report was provided to DMIRS on 1 November 2017, and no *Quoya zonalis* individuals were identified (Ecologia, 2017). It was determined from the survey that there is no suitable habitat for *Quoya zonalis* to be present within L 45/413 and L 45/430 (Ecologia, 2017). Given L 45/414 is still part of the application area and has not been surveyed, the existing flora management condition will be retained on the permit.

Conclusion

Based on the above assessment, the proposed clearing may result in a significant impact to *Euploca mutica* at a local scale, should further clearing works be undertaken in the area that intersects the recorded population. The population within the application area is significant in terms of the number of individuals recorded at one location (DPaW, 2017). In addition, none of the known records of *Euploca mutica* occur within a conservation area (Western Australian Herbarium, 1998-), therefore

minimising impacts to the population at the Pilgangoora Lithium-Tantalum project through a flora management condition is recommended.

Conditions

To address the above impacts, the following management measures will be required as conditions on the clearing permit:

- a flora management condition where no clearing of identified *Euploca mutica* or within 10 metres is permitted, unless first approved by the CEO.

3.2.2. Biological values (fauna) - Clearing Principles (a and b)

Assessment

A fauna survey was conducted over the majority of the main Pilgangoora mining operation in August 2015 by MMWC Environmental Pty Ltd. The same area was again subject to a single phase fauna survey in March 2016 by 360 Environmental Pty Ltd. Areas not surveyed consist of linear infrastructure, required for access and a borefield pipeline, and are unlikely to present provide significantly different fauna habitat compared to the main Pilgangoora mining operation.

Both surveys recorded four broad fauna habitats present within the application area (360 Environmental, 2016a; MMWC, 2016b):

- rocky hill
- stony plain
- drainage line
- sand plain

These habitats are widespread and common in the local area and broader Pilbara bioregion (MMWC, 2016b), however the drainage line habitat is considered high value fauna habitat, primarily due to its foraging potential (360 Environmental, 2016a). Potential impacts to the drainage line habitat as a result of the proposed clearing may be minimised by the continued implementation of a watercourse management condition. Aerial imagery indicates the drainage line habitat occurs within parts of the application area that were not surveyed, in addition to occurring extensively in areas adjacent and the wider local area (GIS Database). The linear nature of proposed impacts in unsurveyed areas (required for access and a borefield pipeline), is likely to reduce the overall impact on drainage line habitat, provided standard management measures (e.g. culverts) are implemented.

Two conservation significant fauna species were identified within the application area through extensive targeted surveying or by secondary evidence (i.e. mounds): Pilbara leaf-nosed bat (*Rhinoicteris aurantia* (Pilbara), VU) and western pebble-mound mouse (*Pseudomys chapmani*, P4) (360 Environmental, 2015; 2016a; 2016b; MMWC, 2015; 2016b).

A Pilbara leaf nosed bat survey was undertaken within the application area and surrounds by 360 Environmental between 12-16 October 2015. Echolocation call data was collected across 24 sites (seven located within the application area), and each detector was deployed for a single night (360 Environmental, 2015). A foraging habitat assessment was undertaken at each detector site (360 Environmental, 2015).

A total of 29 Pilbara leaf-nosed bat calls were detected across three of the sites within the application area, and a total of 365 calls were recorded across 17 of the 24 sites (360 Environmental, 2015). The calls recorded within the application area were all within ephemeral creek line habitats (360 Environmental, 2015). The seven sites within the application area were evaluated as occasional foraging areas due to the presence of suitable vegetation and seasonal water (360 Environmental, 2015). Cliff lines and breakaways in these areas may be utilised as flyaway areas (360 Environmental, 2015). These areas correlate with mapped drainage lines (360 Environmental, 2015; GIS Database).

Following the echolocation survey, a Pilbara leaf-nosed bat roost survey was undertaken by 360 Environmental on 18 and 22 January 2016. This survey was to determine the location of the nearby roost, based on the data collected by 360 Environmental (2016b). The roost was determined to be approximately 3.5 kilometres northeast of the application area, consisting of a historical mining area with an adit and two shafts. No roosts were identified within the application area, which offers primarily foraging and dispersal habitat (360 Environmental, 2015; 2016b).

MMWC (2016b) recorded two disused western pebble-mound mouse mounds within the application area, both located within stony plan habitat (GIS Database). Natural Area (2016) recorded two active western pebble-mound mouse mounds in March 2016, and Ecologia (2018) recorded one inactive western pebble-mound mouse mound in May 2018, all within 0.5 kilometres from the application area. APM (2022; 2023) recorded seven active and four intermediate mounds (determined by Anstee, 1996 methodology) between 0.14 and 1.74 kilometres from the application area in October 2022 and March 2023. APM (2022) also captured one western pebble-mound mouse on a motion sensor camera in October 2022, 0.77 kilometres from the application area. Based on these records it is likely that western pebble-mound mouse may utilise habitat within the application area.

A northern quoll (*Dasyurus hallucatus*, EN) targeted survey was undertaken on a tenement outside the application area (M 45/1266) by Terrestrial Ecosystems between 23-24 September and 11-12 November 2019. This tenement is directly adjacent to the Pilgangoora operations, and contains rocky hill habitat that is absent from the application area (360 Environmental, 2016a; MMWC, 2016b; Terrestrial Ecosystems, 2020).

Twelve camera traps (of 30) recorded northern quolls, all within the rocky hills habitat type along the north-south rocky ridgeline (Terrestrial Ecosystems, 2020). It was not possible to determine the population size from camera traps; however, it was still possible to determine there were multiple individuals of both sexes within the population (Terrestrial Ecosystems, 2020). The surveys conducted by MMWC (2016b) and 360 Environmental (2016a) also utilised camera traps, at 11 and nine locations respectively. None of these camera traps captured northern quoll, and no secondary evidence was observed during these surveys (MMWC, 2016b; 360 Environmental, 2016a). APM (2023) recorded northern quoll scat approximately 265 metres from the application area in March 2023.

While there is limited denning habitat for northern quoll within the application area, it should be noted that a dead northern quoll was recorded in August 2018, along the main access road of the application area (GIS Database). This, and the recent scat record (APM, 2023) suggests northern quolls may utilise the application area as foraging and/or dispersal habitat.

Conservation significant fauna species that have previously been recorded within the application area (excluding avian species) are Gane's blind snake (*Anilius ganei*, P1) and spectacled hare-wallaby (*Lagorchestes conspicillatus leichardti*, P4) (GIS Database).

The one record for Gane's blind snake is from 2005 (GIS Database). Little is known about this species, however it is possibly associated with damp gorges and gullies, but not restricted to them (360 Environmental, 2016a; APM, 2022; MMWC, 2016b; GIS Database). Given the limited records within 50 kilometres of the application (two), and the absence of perennial drainage lines, it is unlikely to occur within the application area (GIS Database).

The records for spectacled hare-wallaby within the application area are from 1990-1996 (GIS Database). Old growth tussock grassland provide protection to spectacled hare-wallaby, however given the application area last experienced a fire in 2015 it is unlikely that there will be preferred habitat available for this species (GIS Database).

Other species that have previously been recorded within the application area (Appendix B.4), or possibly occur within the application area are highly mobile avian species that are unlikely to be reliant upon the available habitats (GIS Database).

A short-range endemic (SRE) survey was conducted over the application area and surrounds which recorded at least 23 species belonging to eight SRE groups (Bennelongia, 2016). No listed and no confirmed SRE species were collected (Bennelongia, 2016). There were eleven species collected within the study area that were classed as potential SREs, all of which were collected in areas outside the proposed disturbance and are not of conservation concern (Bennelongia, 2016). Three species were collected from impact areas only, but these are in the SRE category "data deficient", which is a category applied to species with unknown ranges for which SRE status cannot be assessed (Bennelongia, 2016). These three species were collected from habitats that are not restricted at a local, sub-regional or regional level (Bennelongia, 2016). Significant impacts to SRE fauna are not anticipated (Bennelongia, 2016).

Conclusion

Based on the above assessment, the proposed clearing may result in direct impacts to western pebble-mound mouse, and unintentional mortality to northern quoll. There may also be loss of foraging habitat for Pilbara leaf-nosed bat, however this is likely to only be supporting habitat as there is no permanent water source within the application area (GIS Database).

Pilgangoora (2023b) reported that 513.94 hectares of native vegetation has been cleared under the permit as of 30 June 2023. Given there is an allowance of 816.16 hectares remaining under the permit, a slow, progressive one-directional clearing condition may allow western pebble-mound mouse and northern quoll to move to surrounding habitat when they utilise the application area.

Conditions

To address the above impacts, the following management measures will be required as conditions on the clearing permit:

- undertake slow, progressive one-directional clearing to allow terrestrial fauna to move into adjacent habitat ahead of the clearing activity.

3.3. Relevant planning instruments and other matters

The clearing permit amendment application was advertised on 14 July 2023 by the Department of Mines, Industry Regulation and Safety inviting submissions from the public. No submissions were received in relation to this application.

There are two native title claims (WCD2018/015, WCD2019/010) over the area under application (DPLH, 2023). These claims have been determined by the Federal Court on behalf of the claimant groups. However, the mining tenure has been granted in accordance with the future act regime of the *Native Title Act 1993* and the nature of the act (i.e. the proposed clearing activity) has been provided for in that process, therefore, the granting of a clearing permit is not a future act under the *Native Title Act 1993*.

There is one registered Aboriginal Sites of Significance within the application area (DPLH, 2023). It is the proponent's responsibility to comply with the *Aboriginal Heritage Act 1972* and ensure that no Aboriginal Sites of Significance are damaged through the clearing process.

Other relevant authorisations required for the proposed land use include:

- A Programme of Work approved under the *Mining Act 1978*.
- A Mining Proposal / Mine Closure Plan approved under the *Mining Act 1978*.

It is the proponent's responsibility to liaise with the Department of Water and Environmental Regulation and the Department of Biodiversity, Conservation and Attractions, to determine whether a Works Approval, Water Licence, Bed and Banks Permit, or any other licences or approvals are required for the proposed works.

End

Appendix A. Additional information provided by applicant

| Information requested from applicant | Information provided by applicant |
|--|---|
| <p>Condition 8 of CPS 8175/1 required the permit holder to undertake a targeted flora survey within Miscellaneous Licence 45/413 or Miscellaneous Licence 45/414 prior to any clearing, for <i>Quoya zonalis</i>, and submit the report to DMIRS. The report provided was a targeted survey over Miscellaneous Licence 45/413 and Miscellaneous Licence 45/430. Annual clearing reports state no clearing has been undertaken on Miscellaneous Licence 45/413 or Miscellaneous Licence 45/414, so there is no non-compliance, however why were Miscellaneous Licences 45/413 and 45/430 surveyed?</p> | <p>The applicant informed DMIRS that it was decided upon review, Miscellaneous Licence 45/414 was unsuitable for the construction of a pipeline and road as originally intended. No construction or clearing works have been completed nor are proposed in the future for that tenement. Miscellaneous Licence 45/430 was surveyed with Miscellaneous Licence 45/413 as Pilgangoora Operations planned to install a borefield pipeline on that tenement.</p> |
| <p>The original assessment for CPS 8175/1 noted that impacts to <i>Euploca mutica</i> (P3) (previously <i>Heliotropium muticum</i> (P1)) within the application will unlikely impact the conservation status of the species.</p> <p>It was queried whether Pilgangoora Operations had any additional information about <i>Euploca mutica</i>, other than what is provided in MMWC (2016b). Such as number of individuals that have been impacted so far, avoidance/mitigation measures, etc.</p> <p>In addition, does Pilgangoora Operations have an amount they are proposing to impact under this clearing permit in the future?</p> | <p>A recent survey undertaken outside the application area by APM (2023) located further records to the MMWC (2016b) survey. In addition, further survey work is planned which potential to increase data related to <i>Euploca mutica</i>.</p> <p>It was reported that at the broader Pilgangoora Lithium operations, there are 94 point locations, and 708 individuals of <i>Euploca mutica</i>.</p> <p>It was estimated that Pilgangoora Operations has impacted a total of 54 <i>Euploca mutica</i> individuals, and that there are currently no clearing works proposed that intersect the remaining <i>Euploca mutica</i> population within the application area.</p> |

Appendix B. Site characteristics

B.1. Site characteristics

| Characteristic | Details | | | | | | | | | |
|------------------------|---|---|------|-------------|------------|----|---|-------------|----|---|
| Local context | <p>The area proposed to be cleared is part of an expansive tract of native vegetation in the extensive land use zone of Western Australia (GIS Database). It is surrounded by large areas of uncleared land and mining operations (GIS Database).</p> <p>Approximately 99% of the local area (50 kilometre radius from the centre of the area proposed to be cleared) remains uncleared (GIS Database).</p> | | | | | | | | | |
| Ecological linkage | <p>The application area is not considered a significant ecological linkage. The vegetation immediately surrounding the application area and the majority of the region remains uncleared (GIS Database).</p> | | | | | | | | | |
| Conservation areas | <p>The application area is not located within any conservation areas (GIS Database). The nearest legislated conservation area is Mungaroo Range Nature Reserve, located approximately 62 kilometres southwest of the application area (GIS Database).</p> | | | | | | | | | |
| Vegetation description | <p>The vegetation of the application area is broadly mapped as the following Beard vegetation associations:</p> <p>82: Hummock grasslands, low tree steppe; snappy gum over <i>Triodia wiseana</i>; 93: Hummock grasslands, shrub steppe; kanji over soft spinifex; and 619: Medium woodland; river gum (<i>Eucalyptus camaldulensis</i>) (GIS Database).</p> <p>A flora and vegetation survey was undertaken over the majority of the application area (covering M 45/333, M 45/78, M 45/511 and M 45/1256) by MMWC Environmental Pty Ltd. A total of eleven vegetation types were identified within the application area (MMWC, 2016b):</p> <table border="1"> <thead> <tr> <th>Landform</th> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Sand plain</td> <td>1a</td> <td>Scattered low trees of <i>Corymbia hamersleyana</i> over open shrubland of <i>Acacia acradenia</i>, <i>Acacia inaequilatera</i> and <i>Acacia ancistrocarpa</i> over low open shrubland of <i>Tephrosia</i> sp. Bungaroo Creek (M.E. Trudgen 11601) over open hummock grassland of <i>Triodia wiseana</i> and <i>Triodia epactia</i></td> </tr> <tr> <td>Stony plain</td> <td>2a</td> <td>Scattered low trees of <i>Corymbia hamersleyana</i> over scattered tall shrubs of <i>Acacia inaequilatera</i> over low open shrubland of <i>Acacia stellaticeps</i> and <i>Corchorus parviflorus</i> over open hummock grassland of <i>Triodia</i> sp. Shovelanna Hill (S. van Leeuwen 3835) and <i>Triodia wiseana</i></td> </tr> </tbody> </table> | Landform | Type | Description | Sand plain | 1a | Scattered low trees of <i>Corymbia hamersleyana</i> over open shrubland of <i>Acacia acradenia</i> , <i>Acacia inaequilatera</i> and <i>Acacia ancistrocarpa</i> over low open shrubland of <i>Tephrosia</i> sp. Bungaroo Creek (M.E. Trudgen 11601) over open hummock grassland of <i>Triodia wiseana</i> and <i>Triodia epactia</i> | Stony plain | 2a | Scattered low trees of <i>Corymbia hamersleyana</i> over scattered tall shrubs of <i>Acacia inaequilatera</i> over low open shrubland of <i>Acacia stellaticeps</i> and <i>Corchorus parviflorus</i> over open hummock grassland of <i>Triodia</i> sp. Shovelanna Hill (S. van Leeuwen 3835) and <i>Triodia wiseana</i> |
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| Characteristic | Details | | | |
|----------------|--|-----------------|---|--|
| | Hill | 3a | Scattered tall shrubs of <i>Acacia inaequilatera</i> over scattered shrubs of <i>Acacia acradenia</i> over hummock grassland of <i>Triodia wiseana</i> , <i>Triodia brizoides</i> and <i>Triodia</i> sp. Shovelanna Hill (S. van Leeuwen 3835) | |
| | | 3b | Scattered shrubs of <i>Acacia inaequilatera</i> over hummock grassland of <i>Triodia wiseana</i> and <i>Triodia</i> sp. Shovelanna Hill (S. van Leeuwen 3835) | |
| | | 3c | Scattered low trees of <i>Corymbia hamersleyana</i> over high shrubland of <i>Acacia orthocarpa</i> over hummock grassland of <i>Triodia</i> sp. Shovelanna Hill (S. van Leeuwen 3835) and <i>Triodia wiseana</i> | |
| | River | 4a | Low woodland of <i>Eucalyptus victrix</i> over high open shrubland of <i>Acacia tumida</i> var. <i>pilbarensis</i> , <i>Melaleuca glomerata</i> and <i>Acacia bivenosa</i> over open hummock grassland of <i>Triodia epactia</i> over open tussock grassland of * <i>Cenchrus ciliaris</i> and <i>Cymbopogon ambiguus</i> | |
| | Creek | 5a | Low open woodland of <i>Corymbia hamersleyana</i> and <i>Corymbia candida</i> subsp. <i>dipsodes</i> over high shrubland of <i>Acacia ampliceps</i> , <i>Acacia acradenia</i> , <i>Melaleuca glomerata</i> , <i>Acacia pyrifolia</i> and <i>Petalostylis labicheoides</i> over very open hummock grassland of <i>Triodia epactia</i> over open tussock grassland of * <i>Cenchrus ciliaris</i> , * <i>Cenchrus setiger</i> and <i>Cymbopogon ambiguus</i> over scattered sedges of <i>Cyperus vaginatus</i> | |
| | | 5b | Low open woodland of <i>Eucalyptus victrix</i> and <i>Corymbia hamersleyana</i> over high shrubland of <i>Acacia acradenia</i> over scattered shrubs of <i>Acacia bivenosa</i> over open hummock grassland of <i>Triodia epactia</i> over very open tussock grassland of * <i>Cenchrus ciliaris</i> and <i>Cymbopogon ambiguus</i> | |
| | Gully | 6a | Scattered low trees of <i>Corymbia hamersleyana</i> over high open shrubland of <i>Acacia acradenia</i> and <i>Grevillea wickhamii</i> subsp. <i>hispidula</i> over scattered shrubs of <i>Acacia bivenosa</i> and <i>Cajanus cinereus</i> over open hummock grassland of <i>Triodia epactia</i> and <i>Triodia wiseana</i> over very open tussock grassland of <i>Eriachne mucronata</i> and <i>Cymbopogon ambiguus</i> | |
| | | 6b | Scattered low trees of <i>Corymbia hamersleyana</i> over high shrubland of <i>Acacia acradenia</i> over open shrubland of <i>Acacia bivenosa</i> over open hummock grassland of <i>Triodia epactia</i> | |
| | | 6c | Scattered low trees of <i>Corymbia hamersleyana</i> over high shrubland of <i>Acacia tumida</i> var. <i>pilbarensis</i> and <i>Petalostylis labicheoides</i> over open hummock grassland of <i>Triodia epactia</i> and <i>Triodia angusta</i> over very open tussock grassland of <i>Eriachne benthamii</i> | |
| | <p>The Pilgangoora Access Road (L 45/388) was not surveyed; however, 14 relevés were surveyed along the length of L 45/388 at nine proposed borrow pit locations, which provide information on the likely habitat types present throughout the length of L45/388. The following twelve vegetation types were identified (MMWC, 2016a):</p> | | | |
| | | Landform | Type | Description |
| | Stony plain | | 1a | Scattered low trees of <i>Corymbia hamersleyana</i> over open hummock grassland of <i>Triodia wiseana</i> and <i>Triodia</i> sp. Shovelanna Hill (S. van Leeuwen 3835) |
| | | 1b | Low open woodland of <i>Corymbia hamersleyana</i> over high open shrubland of <i>Acacia bivenosa</i> over hummock grassland of <i>Triodia angusta</i> and <i>Triodia wiseana</i> over scattered tussock grasses of <i>Eragrostis eriopoda</i> | |
| | | 1c | Scattered low trees of <i>Corymbia hamersleyana</i> over open shrubland of <i>Acacia acradenia</i> and <i>Acacia bivenosa</i> over <i>Triodia wiseana</i> | |
| | | 1d | Scattered low trees of <i>Corymbia hamersleyana</i> over open shrubland of <i>Acacia ancistrocarpa</i> over open hummock grassland of <i>Triodia epactia</i> and <i>Triodia brizoides</i> | |
| | | 1e | Open shrubland of <i>Acacia ancistrocarpa</i> over open hummock grassland of <i>Triodia brizoides</i> and <i>Triodia epactia</i> | |
| | | 1f | Scattered low trees of <i>Eucalyptus victrix</i> and <i>Corymbia hamersleyana</i> over open shrubland of <i>Acacia acradenia</i> over low open shrubland of <i>Acacia stellaticeps</i> over open hummock grassland of <i>Triodia wiseana</i> over very open tussock grassland of * <i>Cenchrus</i> sp. | |
| Sand plain | | 2a | Low open woodland of <i>Corymbia hamersleyana</i> over high open shrubland of <i>Acacia orthocarpa</i> over open hummock grassland of <i>Triodia wiseana</i> | |
| | | 2b | Scattered low trees of <i>Corymbia hamersleyana</i> over low open heath of <i>Acacia stellaticeps</i> over open hummock grassland of <i>Triodia brizoides</i> | |

| Characteristic | Details | | | | | | | | | | | | |
|----------------------------|--|---|---|---|--|--------------|--|------------------------|---|---|--|----------------------------|--|
| | <table border="1"> <tr> <td>River bank</td> <td>3a</td> <td>Low open woodland of <i>Melaleuca argentea</i> over open heath of <i>Melaleuca argentea</i> and <i>Acacia trachycarpa</i> over very open hummock grassland of <i>Triodia epactia</i> over scattered herbs of <i>Cassytha capillaris</i></td> </tr> <tr> <td>Creek</td> <td>4a</td> <td>Low open woodland of <i>Eucalyptus victrix</i> over high shrubland of <i>Acacia ampliceps</i> and <i>Melaleuca glomerata</i> over open hummock grassland of <i>Triodia angusta</i> and <i>Triodia epactia</i> over scattered tussock grasses of <i>Eriachne benthamii</i></td> </tr> <tr> <td>Broad shallow drainage</td> <td>5a</td> <td>Scattered low trees of <i>Corymbia hamersleyana</i> and <i>Corymbia zygophylla</i> over open scrub of <i>Acacia tumida</i> var. <i>pilbarensis</i> and <i>Acacia acradenia</i> over hummock grassland of <i>Triodia wiseana</i></td> </tr> <tr> <td>Flood plain</td> <td>6a</td> <td>Scattered low trees of <i>Corymbia hamersleyana</i> over high open shrubland of <i>Acacia trachycarpa</i> and <i>Hakea lorea</i> subsp. <i>lorea</i> over open hummock grassland of <i>Triodia wiseana</i></td> </tr> </table> | River bank | 3a | Low open woodland of <i>Melaleuca argentea</i> over open heath of <i>Melaleuca argentea</i> and <i>Acacia trachycarpa</i> over very open hummock grassland of <i>Triodia epactia</i> over scattered herbs of <i>Cassytha capillaris</i> | Creek | 4a | Low open woodland of <i>Eucalyptus victrix</i> over high shrubland of <i>Acacia ampliceps</i> and <i>Melaleuca glomerata</i> over open hummock grassland of <i>Triodia angusta</i> and <i>Triodia epactia</i> over scattered tussock grasses of <i>Eriachne benthamii</i> | Broad shallow drainage | 5a | Scattered low trees of <i>Corymbia hamersleyana</i> and <i>Corymbia zygophylla</i> over open scrub of <i>Acacia tumida</i> var. <i>pilbarensis</i> and <i>Acacia acradenia</i> over hummock grassland of <i>Triodia wiseana</i> | Flood plain | 6a | Scattered low trees of <i>Corymbia hamersleyana</i> over high open shrubland of <i>Acacia trachycarpa</i> and <i>Hakea lorea</i> subsp. <i>lorea</i> over open hummock grassland of <i>Triodia wiseana</i> |
| River bank | 3a | Low open woodland of <i>Melaleuca argentea</i> over open heath of <i>Melaleuca argentea</i> and <i>Acacia trachycarpa</i> over very open hummock grassland of <i>Triodia epactia</i> over scattered herbs of <i>Cassytha capillaris</i> | | | | | | | | | | | |
| Creek | 4a | Low open woodland of <i>Eucalyptus victrix</i> over high shrubland of <i>Acacia ampliceps</i> and <i>Melaleuca glomerata</i> over open hummock grassland of <i>Triodia angusta</i> and <i>Triodia epactia</i> over scattered tussock grasses of <i>Eriachne benthamii</i> | | | | | | | | | | | |
| Broad shallow drainage | 5a | Scattered low trees of <i>Corymbia hamersleyana</i> and <i>Corymbia zygophylla</i> over open scrub of <i>Acacia tumida</i> var. <i>pilbarensis</i> and <i>Acacia acradenia</i> over hummock grassland of <i>Triodia wiseana</i> | | | | | | | | | | | |
| Flood plain | 6a | Scattered low trees of <i>Corymbia hamersleyana</i> over high open shrubland of <i>Acacia trachycarpa</i> and <i>Hakea lorea</i> subsp. <i>lorea</i> over open hummock grassland of <i>Triodia wiseana</i> | | | | | | | | | | | |
| Vegetation condition | <p>Surveys of the application area determined the vegetation to be the following conditions (MMWC, 2016a; 2016b; Trudgen, 1991):</p> <table border="1"> <tr> <td>Excellent</td> <td>Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.</td> </tr> <tr> <td>Very good</td> <td>Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.</td> </tr> <tr> <td>Good</td> <td>More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.</td> </tr> <tr> <td>Poor</td> <td>Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.</td> </tr> <tr> <td>Very poor</td> <td>Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.</td> </tr> <tr> <td>Completely degraded</td> <td>Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.</td> </tr> </table> <p>The full Trudgen (1991) condition rating scale is provided in Appendix D.</p> | Excellent | Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement. | Very good | Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks. | Good | More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds. | Poor | Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds. | Very poor | Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species. | Completely degraded | Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs. |
| Excellent | Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement. | | | | | | | | | | | | |
| Very good | Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks. | | | | | | | | | | | | |
| Good | More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds. | | | | | | | | | | | | |
| Poor | Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds. | | | | | | | | | | | | |
| Very poor | Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species. | | | | | | | | | | | | |
| Completely degraded | Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs. | | | | | | | | | | | | |
| Climate and landform | The application area is mapped at an elevation of 150-250 metres AHD (GIS Database). The climate of the Chichester subregion is described as semi-desert-tropical, with the nearest weather station recording an average rainfall of approximately 386.4 millimetres per year (BoM, 2023; CALM, 2002). | | | | | | | | | | | | |
| Soil description | <p>The soils and landforms within the application area are primarily mapped as (DPIRD, 2023; Van Vreeswyk et al., 2004; GIS Database):</p> <table border="1"> <thead> <tr> <th>LAND SYSTEM</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>MACROY</td> <td> <p>Landform: erosional surfaces; gently undulating stony plains and interfluves with quartz surface mantles, sandy surfaced plains, minor calcrete plains, closely spaced tributary drainage lines in upper parts of system becoming much wider downslope; minor granite hills</p> <p>Soils: red shallow loam, red deep sandy duplex</p> </td> </tr> <tr> <td>TALGA</td> <td> <p>Landform: erosional surfaces; hill tracts and ridges on basalt, greenstones, schist, other metamorphics and chert with rocky rounded crests and ridge tops extending for many kilometres; very steep upper slopes, more gently inclined lower footslopes, restricted lower stony plains and interfluves</p> <p>Soils: stony soil, calcareous shallow loam, red shallow loam</p> </td> </tr> </tbody> </table> <p>To a much lesser extent, the application area is also mapped within the following land systems (DPIRD, 2023; Van Vreeswyk et al., 2004; GIS Database):</p> <table border="1"> <thead> <tr> <th>LAND SYSTEM</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> </tbody> </table> | LAND SYSTEM | DESCRIPTION | MACROY | <p>Landform: erosional surfaces; gently undulating stony plains and interfluves with quartz surface mantles, sandy surfaced plains, minor calcrete plains, closely spaced tributary drainage lines in upper parts of system becoming much wider downslope; minor granite hills</p> <p>Soils: red shallow loam, red deep sandy duplex</p> | TALGA | <p>Landform: erosional surfaces; hill tracts and ridges on basalt, greenstones, schist, other metamorphics and chert with rocky rounded crests and ridge tops extending for many kilometres; very steep upper slopes, more gently inclined lower footslopes, restricted lower stony plains and interfluves</p> <p>Soils: stony soil, calcareous shallow loam, red shallow loam</p> | LAND SYSTEM | DESCRIPTION | | | | |
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| MACROY | <p>Landform: erosional surfaces; gently undulating stony plains and interfluves with quartz surface mantles, sandy surfaced plains, minor calcrete plains, closely spaced tributary drainage lines in upper parts of system becoming much wider downslope; minor granite hills</p> <p>Soils: red shallow loam, red deep sandy duplex</p> | | | | | | | | | | | | |
| TALGA | <p>Landform: erosional surfaces; hill tracts and ridges on basalt, greenstones, schist, other metamorphics and chert with rocky rounded crests and ridge tops extending for many kilometres; very steep upper slopes, more gently inclined lower footslopes, restricted lower stony plains and interfluves</p> <p>Soils: stony soil, calcareous shallow loam, red shallow loam</p> | | | | | | | | | | | | |
| LAND SYSTEM | DESCRIPTION | | | | | | | | | | | | |

| Characteristic | Details |
|------------------------|---|
| | <p>PLATFORM</p> <p>Landform: erosional surfaces formed by partial dissection of the old tertiary surface; very gently inclined upper plains with extensive marginal dissection zones with gently inclined to steep slopes, closely spaced dendritic or sub-parallel drainage patterns with narrow floors in upper parts</p> <p>Soils: stony soil</p> |
| | <p>RIVER</p> <p>Landform: flood plains and river terraces subject to fairly regular overbank flooding from major channels and watercourses, sandy banks and poorly defined levees and cobble plains</p> <p>Soils: red deep sand, red loamy earth</p> |
| | <p>SATIRIST</p> <p>Landform: mainly depositional surfaces; level to very gently inclined stony plains, plains with gilgai microrelief, low stony rises and drainage flats; sparse tributary drainage patterns with minor channels</p> <p>Soils: red/brown non-cracking clay, hard cracking clay</p> |
| Land degradation risk | The above land systems are generally not susceptible to erosion, however the River land system is highly susceptible to erosion if vegetative cover is removed (Van Vreeswyk et al., 2004; GIS Database). The significant number of drainage lines intersection the application area may also be prone to erosion if vegetation cover is removed (GIS Database). |
| Waterbodies | The desktop assessment indicated that multiple minor non-perennial drainage lines intersect the application area (GIS Database). The application area also intersects the Turner River along the access road, which is described as a major non-perennial watercourse (GIS Database). |
| Hydrogeography | The application area is located within the Pilbara Surface Water Area and the Pilbara Groundwater Area, which are proclaimed under the <i>Rights in Water and Irrigation Act 1914</i> (GIS Database). The mapped groundwater salinity is 500-1000 total dissolved solids milligrams per litre, which is described as marginal water quality (GIS Database). |
| Flora | There are records of 23 conservation significant flora within 50 kilometres of the application area (GIS Database). |
| Ecological communities | There are no known threatened or priority ecological communities mapped within the application area (GIS Database). The nearest known ecological community is the Gregory Land System priority ecological community (P3), located approximately 14.8 kilometres west of the application area (GIS Database). |
| Fauna | There are records of 29 fauna species of conservation significance within 50 kilometres of the application area (GIS Database). |

B.2. Vegetation extent

| | Pre-European area (ha) | Current extent (ha) | Extent Remaining % | Current extent in all DBCA managed land (ha) | Current proportion (%) of pre-European extent in all DBCA Managed Lands |
|---|------------------------|---------------------|--------------------|--|---|
| IBRA Bioregion - Pilbara | 17,808,657 | 17,731,764 | ~99 | 1,801,714 | 10.12 |
| Beard vegetation associations - State | | | | | |
| 82 | 2,565,901 | 2,553,206 | ~99 | 295,377 | 11.51 |
| 93 | 3,044,309 | 3,040,640 | ~99 | 59,536 | 1.96 |
| 619 | 119,373 | 118,205 | ~99 | 236 | 0.20 |
| Beard vegetation associations - Pilbara bioregion | | | | | |
| 82 | 2,563,583 | 2,550,888 | ~99 | 295,377 | 11.52 |
| 93 | 3,042,114 | 3,038,471 | ~99 | 59,536 | 1.96 |

| | | | | | |
|-----|---------|---------|-----|-----|------|
| 619 | 118,920 | 118,116 | ~99 | 236 | 0.20 |
|-----|---------|---------|-----|-----|------|

Government of Western Australia (2019)

B.3. Flora analysis table

A database search returned the following conservation significant flora species with records within a 50 kilometre radius of the application area, with consideration for the site characteristics set out above, relevant datasets, the results of flora surveys, and Florabase (Appendix B.1; APM, 2023; Ecologia, 2017; 2018; MMWC, 2016a; 2016b; Natural Area, 2014; Western Australian Herbarium, 1998-; GIS Database):

| Species | Conservation status | Distance of closest record to application area (km) | Habitat description | Suitable habitat? [Y, N, N/A] | Are surveys adequate to identify? [Y, N, N/A] |
|--|---------------------|---|--|---|---|
| <i>Abutilon</i> sp. <i>Pritzelianum</i> | 3 | 31.71 | Broad sandy plains, pebbly plains and drainage tracts supporting hard and soft spinifex hummock grasslands with <i>Acacia</i> shrubs on red deep sand or loamy earth | Y | Y |
| <i>Acacia leeuweniana</i> | 1 | 18.43 | Stony or sandy plains and occasional tor fields based on granite supporting hard and soft spinifex hummock grasslands on stony soils or red deep sandy duplex | Y | Y |
| <i>Acacia levata</i> | 3 | 27.99 | Hillslopes and stony plains supporting hummock grassland with scattered shrubs on red sand or loamy sand over granite | Y | Y |
| <i>Bulbostylis burbridgeae</i> | 4 | 11.95 | Hillslopes and stony plains, supporting hummock grasslands and <i>Acacia</i> shrubland on granitic soils | Y | Y |
| <i>Dolichocarpa</i> sp. Hamersley Station | 3 | 39.23 | Stony and hardpan plains supporting hummock grasslands and <i>Acacia</i> and mallee woodlands on red-brown non-cracking clay and hard cracking clay | N | Y |
| <i>Eragrostis crateriformis</i> | 3 | 14.04 | Broad sandy plains, pebbly plains and drainage tracts, creek banks, depressions, supporting hard and soft spinifex hummock grasslands with scattered <i>Acacia</i> shrubs on clayey loam or clay | N | Y |
| <i>Euphorbia clementii</i> | 3 | 0.29 | Gravelly hillsides, stony grounds supporting hummock grasslands on stony soils | Y; recorded outside application area by Ecologia (2018) | Y |
| <i>Euphorbia inappendiculata</i> var. <i>inappendiculata</i> | 2 | 39.23 | Alluvial plains and stony slopes supporting hummock grasslands on red-brown clay | N | Y |
| <i>Euploca mutica</i> | 3 | 0.03 | Stony plains and drainage tracks supporting hummock grassland with scattered <i>Acacia</i> shrubs and mallee on red deep sandy duplex | Y; recorded by MMWC (2016b) | Y |
| <i>Gomphrena leptophylla</i> | 3 | 10.02 | Open flats, sandy creek beds, edges salt pans and marshes, stony hillsides supporting hummock grassland on sand, sandy to clayey loam, granite, quartzite | N | Y |
| <i>Gymnanthera cunninghamii</i> | 3 | 1.16 | Stony plains and occasional tor fields based on granite supporting hard and soft spinifex shrubby grasslands on sandy soils | Y | Y |
| <i>Josephinia</i> sp. Woodstock | 1 | 48.43 | Stony plains and occasional tor fields based on granite, seasonal drainage lines, supporting hard and soft spinifex shrubby grasslands on red sand | Y | Y |
| <i>Nicotiana umbratica</i> | 3 | 2.54 | Granite hills, rocky outcrops, domes, tor fields and sandy plains supporting spinifex grasslands with scattered shrubs on shallow red sand and stony soils | Y | Y |
| <i>Phyllanthus hebecarpus</i> | 3 | 13.89 | Granite hills, domes, tor fields and sandy plains supporting spinifex grasslands with scattered shrubs on shallow red sand and stony soils | Y | Y |

| | | | | | |
|--|---|-------|--|---|---|
| <i>Ptilotus mollis</i> | 4 | 21.62 | Stony hills and screes supporting hummock grassland on stony soils | N | Y |
| <i>Quoya zonalis</i> | T | 11.20 | Rugged sandstone hills, ridges, stony footslopes and interfluves supporting low <i>Acacia</i> shrublands or hard spinifex grasslands with scattered shrubs on stony soils | N; confirmed by Ecologia (2017) | Y |
| <i>Rothia indica</i> subsp. <i>australis</i> | 3 | 19.96 | Sandhills and sandy flats supporting hummock grasslands on red sandy soils | Y | Y |
| <i>Stackhousia clementii</i> | 3 | 0.27 | Sandstone hills supporting <i>Acacia</i> shrubland and hummock grasslands on skeletal soils. | Y; recorded outside application area by Natural Area (2014) | Y |
| <i>Stylidium weeliwoffi</i> | 3 | 15.56 | Edge of watercourses supporting hummock grassland, mulga and <i>Melaleuca</i> woodland on red sandy clay and stony soils | N | Y |
| <i>Terminalia supranitifolia</i> | 3 | 4.79 | Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex and occasionally soft spinifex grasslands with scattered shrubs on red shallow sand and stony soils | Y | Y |
| <i>Themeda</i> sp. Panorama | 1 | 16.99 | Rugged sandstone hills, ridges, stony footslopes and interfluves supporting low <i>Acacia</i> shrublands or hard spinifex grasslands with scattered shrubs on stony soils | Y | Y |
| <i>Triodia basitricha</i> | 3 | 21.77 | Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands with <i>Acacia</i> and occasional <i>Eucalyptus</i> on stony soils | N | Y |
| <i>Triodia chichesterensis</i> | 3 | 0.22 | Hills and ridges of greenstone and chert and stony plains supporting hard and soft spinifex grasslands on stony soils and red deep sandy duplex | Y; recorded outside application area by Ecologia, (2018) and APM (2023) | Y |
| <i>Vigna triodiophila</i> | 3 | 8.76 | Rugged granitic hills supporting shrubby hard and soft spinifex grasslands on stony soils and red shallow sand | N | Y |

T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority

B.4. Fauna analysis table

A database search returned the following conservation significant fauna species with records within a 50 kilometre radius of the application area, with consideration for the site characteristics set out above, relevant datasets, and the results of fauna (Appendix B.1; 360 Environmental, 2016a; MMWC, 2016b; GIS Database).

The likelihood of occurrence was determined by utilising the metric defined by 360 Environmental (2016a) and MMWC (2016b):

Recorded recorded during the field survey or site reconnaissance

Likely habitat is present in the survey area and the survey area is in the species' known distribution

Possible limited or no suitable habitat is present in survey area, but is nearby. The species has good dispersal abilities and is known from the general area

Unlikely no suitable habitat is present in survey area but is nearby, the species has poor dispersal abilities, but is known from the general area; or suitable habitat is present, however, the survey area is outside of the species' known distribution

| Species name | Conservation status | | Distance of closest record to application area (km) (GIS Database) | Habitat availability | Likelihood of occurrence | Number of known records (total in 50 kilometres) | Are surveys adequate to identify? [Y, N, N/A] |
|---|---------------------|------|--|----------------------|--|--|---|
| | WA | EPBC | | | | | |
| <i>Actitis hypoleucos</i> common sandpiper | MI | MI | 7.45 | may fly above | unlikely | 4 | Y |
| <i>Anilius ganei</i> Gane's blind snake (Pilbara) | P1 | | within | limited habitat | unlikely (360 Environmental, 2016a; MMWC, 2016b) | 2 | N |
| <i>Apus pacificus</i> fork-tailed swift | MI | MI | within | may fly above | unlikely (360 Environmental, 2016a; MMWC, 2016b) | 11 | Y |

| Species name | Conservation status | | Distance of closest record to application area (km) (GIS Database) | Habitat availability | Likelihood of occurrence | Number of known records (total in 50 kilometres) | Are surveys adequate to identify? [Y, N, N/A] |
|--|---------------------|------|--|---|---|--|---|
| | WA | EPBC | | | | | |
| <i>Arenaria interpres</i> ruddy turnstone | MI | MI | 39.19 | may fly above | unlikely | 1 | Y |
| <i>Calidris acuminata</i> sharp-tailed sandpiper | MI | MI | 39.19 | may fly above | unlikely | 1 | Y |
| <i>Calidris ruficollis</i> red-necked stint | MI | MI | 39.19 | may fly above | unlikely | 1 | Y |
| <i>Charadrius veredus</i> oriental plover | MI | MI | within | may fly above | unlikely | 1 | Y |
| <i>Ctenotus nigrilineatus</i> pin-striped finesnout Ctenotus | P1 | | 34.06 | no suitable habitat | unlikely (360 Environmental, 2016a; MMWC, 2016b) | 1 | Y |
| <i>Dasycercus blythi</i> brush-tailed mulgara | P4 | | 4.92 | limited habitat | possible (360 Environmental, 2016a; MMWC, 2016b) | 119 | Y |
| <i>Dasyurus hallucatus</i> northern quoll | EN | EN | within | foraging; dispersal | possible (360 Environmental, 2016a; MMWC, 2016b) | 1254 | Y |
| <i>Falco hypoleucos</i> grey falcon | VU | | 5.03 | foraging | possible (360 Environmental, 2016a; MMWC, 2016b) | 8 | Y |
| <i>Falco peregrinus</i> peregrine falcon | OS | | within | foraging | possible (360 Environmental, 2016a; MMWC, 2016b) | 4 | Y |
| <i>Fregata ariel</i> lesser frigatebird | MI | MI | 39.19 | may fly above | unlikely | 1 | Y |
| <i>Glareola maldivarum</i> Oriental pratincole | MI | MI | 38.88 | may fly above | unlikely | 4 | Y |
| <i>Hydroprogne caspia</i> caspiian tern | MI | MI | 39.19 | may fly above | unlikely | 2 | Y |
| <i>Lagorchestes conspicillatus leichardti</i> spectacled hare-wallaby (mainland) | P4 | | within (historical) | limited habitat | possible (360 Environmental, 2016a; MMWC, 2016b) | 151 | Y |
| <i>Leggadina lakedownensis</i> northern short-tailed mouse, kerakenga | P4 | | 34.06 | limited habitat | possible (360 Environmental, 2016a; MMWC, 2016b) | 1 | Y |
| <i>Liasis olivaceus barroni</i> Pilbara olive python | VU | VU | 5.66 | limited habitat, drainage lines may provide hunting sites | unlikely (360 Environmental, 2016a); possible (MMWC, 2016b) | 56 | Y |
| <i>Macroderma gigas</i> ghost bat | VU | VU | 2.67 | foraging; dispersal | possible (360 Environmental, 2016a); likely (MMWC, 2016b) | 110 | Y |
| <i>Macrotis lagotis</i> bilby, dalgyte, ninu | VU | VU | 0.21 | limited habitat | possible (360 Environmental, 2016a; MMWC, 2016b) | 388 | Y |
| <i>Pandion cristatus</i> osprey, eastern osprey | MI | MI | 39.19 | may fly above | unlikely | 3 | Y |
| <i>Pluvialis fulva</i> Pacific golden plover | MI | MI | 39.19 | may fly above | unlikely | 1 | Y |
| <i>Pseudomys chapmani</i> western pebble-mound mouse, ngadji | P4 | | within | suitable habitat present, mostly cleared | recorded | 122 | Y |
| <i>Rhinonictis aurantia</i> (Pilbara) Pilbara leaf-nosed bat | VU | VU | 0.19 | foraging | recorded | 378 | Y |
| <i>Sminthopsis longicaudata</i> long-tailed dunnart | P4 | | 10.35 | limited habitat | possible (360 Environmental, 2016a; MMWC, 2016b) | 3 | Y |
| <i>Thalasseus bergii</i> crested tern | MI | MI | 39.19 | may fly above | unlikely | 1 | Y |

| Species name | Conservation status | | Distance of closest record to application area (km) (GIS Database) | Habitat availability | Likelihood of occurrence | Number of known records (total in 50 kilometres) | Are surveys adequate to identify? [Y, N, N/A] |
|---|---------------------|------|--|----------------------|--------------------------|--|---|
| | WA | EPBC | | | | | |
| <i>Tringa brevipes</i> grey-tailed tattler | P4 | MI | 39.19 | may fly above | unlikely | 1 | Y |
| <i>Tringa glareola</i> wood sandpiper | MI | MI | 30.56 | may fly above | unlikely | 1 | Y |
| <i>Tringa nebularia</i> common greenshank, greenshank | MI | MI | 39.19 | may fly above | unlikely | 2 | Y |

CR: critically endangered, EN: endangered, VU: vulnerable, P: priority, OS: other specially protected species, MI: migratory

Appendix C. Assessment against the clearing principles

| Assessment against the clearing principles | Variance level | Is further consideration required? |
|---|--|--|
| Environmental value: biological values | | |
| <p><u>Principle (a):</u> "Native vegetation should not be cleared if it comprises a high level of biodiversity."</p> <p><u>Assessment:</u> The area proposed to be cleared contains locally significant flora and fauna habitats.</p> | At variance <i>changed from CPS 8175/1</i> | Yes <i>Refer to Section 3.2.1, above.</i> |
| <p><u>Principle (b):</u> "Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna."</p> <p><u>Assessment:</u> The area proposed to be cleared contains habitat for conservation significant fauna.</p> | At variance <i>changed from CPS 8175/1</i> | Yes <i>Refer to Section 3.2.2, above.</i> |
| <p><u>Principle (c):</u> "Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora."</p> <p><u>Assessment:</u> The area proposed to be cleared is unlikely to contain habitat for threatened flora species listed under the BC Act.</p> | Not likely to be at variance <i>changed from CPS 8175/1</i> | Yes <i>Refer to Section 3.2.1, above.</i> |
| <p><u>Principle (d):</u> "Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community."</p> <p><u>Assessment:</u> There are no known state or federally listed threatened ecological communities (TECs) located within or in close proximity to the application area (GIS Database). The nearest known ecological community is the Gregory Land System priority ecological community (P3), located approximately 14.8 kilometres west of the application area (GIS Database).</p> <p>Flora and vegetation surveys of the application area and surrounds did not record vegetation that could be representative of a TEC (MMWC, 2016a; 2016b).</p> | Not likely to be at variance <i>as per CPS 8175/1</i> | No |
| Environmental value: significant remnant vegetation and conservation areas | | |
| <p><u>Principle (e):</u> "Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared."</p> <p><u>Assessment:</u> The application area occurs within the Pilbara Interim Biogeographic Regionalisation of Australia (IBRA) bioregion, in which approximately 99% of the pre-European vegetation remains (Government of Western Australia, 2019; GIS Database).</p> <p>The vegetation within the application area has been mapped as Beard vegetation associations 82: Hummock grasslands, low tree steppe; snappy gum over <i>Triodia wiseana</i>; 93: Hummock grasslands, shrub steppe; kanji over soft spinifex; and 619: Medium woodland; river gum (<i>Eucalyptus camaldulensis</i>) (GIS Database).</p> <p>Approximately 99% of the pre-European extent of these vegetation associations remain uncleared at both the state and bioregional level (Government of Western Australia, 2019).</p> | Not at variance <i>as per CPS 8175/1</i> | No |

| Assessment against the clearing principles | Variance level | Is further consideration required? |
|---|--|------------------------------------|
| <p>Given the amount of vegetation remaining in the local area and bioregion, the vegetation proposed to be cleared is not considered to represent a remnant within an extensively cleared area.</p> | | |
| <p>Principle (h): <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.”</i></p> <p>Assessment: Given the distance to the nearest conservation area is approximately 62 kilometres southwest of the application area, the proposed clearing is not likely to have an impact on the environmental values of this conservation area (GIS Database).</p> | <p>Not likely to be at variance <i>as per CPS 8175/1</i></p> | <p>No</p> |
| <p>Environmental value: land and water resources</p> | | |
| <p>Principle (f): <i>“Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.”</i></p> <p>Assessment: Several non-perennial watercourses run through the application area, including the Turner River (GIS Database).</p> <p>Field assessments of the application area identified six vegetation types that may be groundwater dependent vegetation (GDV): vegetation types 4a, 5a, and 5b (MMWC, 2016b); and vegetation types 1f, 3a, and 4a (MMWC, 2016a).</p> <p>Species that are known to indicate GDVs include <i>Eucalyptus victrix</i> and <i>Melaleuca glomerata</i>. One or both of these species occur within the above mentioned vegetation types, in areas where the static ground water level allows for access and utilisation (MMWC, 2016b).</p> <p>In addition, a number of vegetation types that are not considered potential GDVs are growing in association with watercourses: 6a, 6b, and 6c (MMWC, 2016b); 5a and 6a (MMWC, 2016a).</p> <p>Potential impacts to riparian vegetation may be minimised by the continued implementation of a watercourse management condition.</p> | <p>At variance <i>as per CPS 8175/1</i></p> | <p>No</p> |
| <p>Principle (g): <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.”</i></p> <p>Assessment: The application area is mapped within the Macroy, Platform, River, Satirist, and Talga land systems (GIS Database). Approximately 95% of the proposed clearing falls within the Talga and Macroy land systems, which are not prone to erosion (Van Vreeswyk et al., 2004; GIS Database). Very little clearing is proposed within the Platform, River, and Satirist land systems.</p> <p>The Platform and Satirist land systems are generally not prone to erosion (Van Vreeswyk et al., 2004). The River land system is largely stabilised by buffel and spinifex and accelerated erosion is uncommon, however susceptibility to erosion is high or very high if vegetative cover is removed (Van Vreeswyk et al., 2004).</p> <p>The proposed clearing of up to 1,330.1 hectares of native vegetation has the potential to result in land degradation issues, as there are many drainage lines throughout the application area. Potential erosion impacts as a result of the proposed clearing may be minimised by the continued implementation of a staged clearing condition and a watercourse management condition.</p> | <p>May be at variance <i>as per CPS 8175/1</i></p> | <p>No</p> |
| <p>Principle (i): <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.”</i></p> <p>Assessment: Given no permanent watercourses, wetlands, or Public Drinking Water Source Areas (PDWSA) are recorded within the application area, the proposed clearing is unlikely to impact surface or ground water quality.</p> | <p>Not likely to be at variance <i>as per CPS 8175/1</i></p> | <p>No</p> |
| <p>Principle (j): <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.”</i></p> <p>Assessment: The mapped soils and topographic contours in the surrounding area do not indicate the proposed clearing is likely to contribute to increased incidence or intensity of flooding (DPIRD, 2023; GIS Database). Large rainfall events may result in</p> | <p>Not likely to be at variance <i>as per CPS 8175/1</i></p> | <p>No</p> |

| Assessment against the clearing principles | Variance level | Is further consideration required? |
|--|----------------|------------------------------------|
| isolated flooding of non-perennial watercourses, however this is considered typical of the region. | | |

Appendix D. Vegetation condition rating scale

Vegetation condition is a rating given to a defined area of vegetation to categorise and rank disturbance related to human activities. The rating refers to the degree of change in the vegetation structure, density and species present in relation to undisturbed vegetation of the same type. The degree of disturbance impacts upon the vegetation's ability to regenerate. Disturbance at a site can be a cumulative effect from a number of interacting disturbance types.

Considering its location, the scale below was used to measure the condition of the vegetation proposed to be cleared. This scale has been extracted from Trudgen, M.E. (1991) *Vegetation condition scale* in National Trust (WA) 1993 Urban Bushland Policy. National Trust of Australia (WA), Wildflower Society of WA (Inc.), and the Tree Society (Inc.), Perth.

Measuring vegetation condition for the Eremaean and Northern Botanical Provinces (Trudgen, 1991)

| Condition | Description |
|---------------------|--|
| Excellent | Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement. |
| Very good | Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks. |
| Good | More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds. |
| Poor | Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds. |
| Very poor | Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species. |
| Completely degraded | Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs. |

Appendix E. Sources of information

E.1. GIS databases

Publicly available GIS Databases used (sourced from www.data.wa.gov.au):

- 10 Metre Contours (DPIRD-073)
- Contours (DPIRD-073)
- Clearing Regulations – Schedule One Areas (DWER-057)
- DBCA – Lands of Interest (DBCA-012)
- DBCA Legislated Lands and Waters (DBCA-011)
- Directory of Important Wetlands in Australia – Western Australia (DBCA-045)
- Environmentally Sensitive Areas (DWER-046)
- Groundwater Salinity Statewide (DWER-026)
- Hydrographic Catchments – Catchments (DWER-028)
- Hydrography – Inland Waters – Waterlines
- Hydrography, Linear (DWER-031)
- IBRA Vegetation Statistics
- Pre-European Vegetation Statistics
- Interim Ramsar Sites (DBCA-010)
- Regional Parks (DBCA-026)
- Remnant Vegetation, All Areas
- RIWI Act, Groundwater Areas (DWER-034)
- RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037)
- Soil Landscape Mapping – Best Available (DPIRD-027)
- Soil Landscape Mapping – Rangelands (DPIRD-064)
- Soil Landscape Mapping – Western Australia attributed by WA Soil Group (DPIRD-076)
- WA Now Aerial Imagery

Restricted GIS Databases used:

- Threatened Flora (TPFL)
- Threatened Flora (WAHerb)
- Threatened Fauna
- Threatened Ecological Communities and Priority Ecological Communities
- Threatened Ecological Communities and Priority Ecological Communities (Buffers)

E.2. References

- 360 Environmental (2015) PLNB Survey Pilgangoora. Prepared by 360 Environmental, for Pilbara Minerals, November 2015.
- 360 Environmental (2016a) Pilgangoora Baseline Vertebrate Fauna Survey. Prepared by 360 Environmental, for Pilbara Minerals, May 2016.
- 360 Environmental (2016b) PLNB Roost Survey Pilgangoora. Prepared by 360 Environmental, for Pilbara Minerals, February 2016.
- Anstee, S. (1996) Use of External Mound Structures as Indicators of the Presence of the Pebble-mound Mouse, *Pseudomys chapmani*, in Mound Systems. *Wildlife Research* 23, 429-34.
- APM (2022) TSF Options 2 and 5 Pilgangoora Project Biological Survey. Prepared by Animal Plant Mineral Pty Ltd, for Pilbara Minerals Limited, November 2022.
- APM (2023) E 45/2287 Infill Pilgangoora Project Biological Survey. Prepared by Animal Plant Mineral Pty Ltd, for Pilbara Minerals Limited, May 2023.
- Bennelongia (2016) Pilgangoora Project: Level 1 Short-Range Endemic Fauna Assessment. Prepared by Bennelongia Environmental Consultants, for Pilbara Minerals Limited, June 2016.
- Bureau of Meteorology (BoM) (2023) Bureau of Meteorology Website – Climate Data Online, Marble Bar. Bureau of Meteorology. <http://www.bom.gov.au/climate/data/> (Accessed 4 August 2023).
- CALM (2002) A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002. Department of Conservation and Land Management, Western Australia.
- Department of Environment Regulation (DER) (2014) *A guide to the assessment of applications to clear native vegetation*. Perth. Available from: https://www.der.wa.gov.au/images/documents/your-environment/native-vegetation/Guidelines/Guide2_assessment_native_veg.pdf
- Department of Planning, Lands and Heritage (DPLH) (2023) Aboriginal Heritage Inquiry System. Department of Planning, Lands and Heritage. <https://espatial.dplh.wa.gov.au/AHIS/index.html?viewer=AHIS> (Accessed 4 August 2023).
- Department of Primary Industries and Regional Development (DPIRD) (2023) NRInfo Digital Mapping. Department of Primary Industries and Regional Development. Government of Western Australia. URL: <https://dpiird.maps.arcgis.com/apps/webappviewer/index.html?id=662e8cbf2def492381fc915aaf3c6a0f> (Accessed 4 August 2023).
- Department of Water and Environmental Regulation (DWER) (2021) Procedure: Native vegetation clearing permits. Joondalup. Available from: https://dwer.wa.gov.au/sites/default/files/Procedure_Native_vegetation_clearing_permits_v1.pdf
- DPaW (2017) Flora advice received in relation to Clearing Permit CPS 7449/1. Department of Parks and Wildlife, Western Australia, March 2017.
- Ecologia (2017) *Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4) Targeted Flora Survey (L45/430 & L45/413). Prepared by Ecologia Environment, for Pilbara Minerals Limited, June 2017.
- Ecologia (2018) Pilgangoora Lithium Project – Mining Lease M45/1260 Level 1 Fauna and Reconnaissance Flora and Vegetation Assessment. Prepared by Ecologia Environment, for Altura Mining Limited, July 2018.
- Environmental Protection Authority (EPA) (2016) Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment. Available from: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA%20Technical%20Guidance%20-%20Flora%20and%20Vegetation%20survey_Dec13.pdf
- Environmental Protection Authority (EPA) (2016) Technical Guidance – Terrestrial Fauna Surveys. Available from: https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Tech%20guidance-%20Terrestrial%20Fauna%20Surveys-Dec-2016.pdf
- Environmental Protection Authority (EPA) (2020) Technical Guidance – Terrestrial Fauna Surveys. Available from: https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/2020.09.17%20-%20EPA%20Technical%20Guidance%20-%20Vertebrate%20Fauna%20Surveys%20-%20Final.pdf
- Government of Western Australia (2019) 2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions. <https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics>
- MMWC (2015) Pilgangoora Flora, Vegetation and Fauna Assessment of E45/2232 & M45/333. Prepared by MMWC Environmental Pty Ltd, for Pilbara Minerals Limited, November 2015.
- MMWC (2016a) Pilgangoora Access Road Borrow Pits Flora and Vegetation Assessment. Prepared by MMWC Environmental Pty Ltd, for Pilbara Minerals Limited, July 2016.
- MMWC (2016b) Pilgangoora Project Area Flora, Vegetation and Fauna Assessment V2. Prepared by MMWC Environmental Pty Ltd, for Pilbara Minerals Limited, July 2016.
- Natural Area (2014) Flora and Fauna Survey Report – Pilgangoora. Prepared by Natural Area Consulting, for Altura Mining Ltd, February 2014.
- Natural Area (2016) Flora, Vegetation and Fauna Survey Report Pilgangoora Lithium Project V1. Prepared by Natural Area Consulting, for Altura Mining Ltd, June 2016.

- Pilgangoora (2023a) Additional information provided for CPS 8175/2, received August 2023.
- Pilgangoora (2023b) Annual Clearing Report 2022-2023 for CPS 8175/1, received July 2023.
- Pilgangoora (2023c) Clearing permit application form, CPS 8175/2, received April 2023.
- Terrestrial Ecosystems (2020) Northern Quoll survey on mining tenement M45/1266. Prepared by Terrestrial Ecosystems, for Pilbara Minerals Limited, January 2020.
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- Van Vreeswyk, A.M.E., Payne, A.L., Leighton, K.A. and Hennig, P. (2004) An inventory and condition survey of the Pilbara Region, Western Australia. Technical Bulletin No. 92. Department of Agriculture, South Perth, Western Australia.
- Western Australian Herbarium (1998-) FloraBase - the Western Australian Flora. Department of Biodiversity, Conservation and Attractions, Western Australia. <https://florabase.dpaw.wa.gov.au/> (Accessed 17 August 2023).

4. Glossary

Acronyms:

| | |
|-----------------|---|
| BC Act | <i>Biodiversity Conservation Act 2016</i> , Western Australia |
| BoM | Bureau of Meteorology, Australian Government |
| DAA | Department of Aboriginal Affairs, Western Australia (now DPLH) |
| DAFWA | Department of Agriculture and Food, Western Australia (now DPIRD) |
| DCCEEW | Department of Climate Change, Energy, the Environment and Water, Australian Government |
| DBCA | Department of Biodiversity, Conservation and Attractions, Western Australia |
| DER | Department of Environment Regulation, Western Australia (now DWER) |
| DMIRS | Department of Mines, Industry Regulation and Safety, Western Australia |
| DMP | Department of Mines and Petroleum, Western Australia (now DMIRS) |
| DoEE | Department of the Environment and Energy (now DCCEEW) |
| DoW | Department of Water, Western Australia (now DWER) |
| DPaW | Department of Parks and Wildlife, Western Australia (now DBCA) |
| DPIRD | Department of Primary Industries and Regional Development, Western Australia |
| DPLH | Department of Planning, Lands and Heritage, Western Australia |
| DRF | Declared Rare Flora (now known as Threatened Flora) |
| DWER | Department of Water and Environmental Regulation, Western Australia |
| EP Act | <i>Environmental Protection Act 1986</i> , Western Australia |
| EPA | Environmental Protection Authority, Western Australia |
| EPBC Act | <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Federal Act) |
| GIS | Geographical Information System |
| ha | Hectare (10,000 square metres) |
| IBRA | Interim Biogeographic Regionalisation for Australia |
| IUCN | International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union |
| PEC | Priority Ecological Community, Western Australia |
| RIWI Act | <i>Rights in Water and Irrigation Act 1914</i> , Western Australia |
| TEC | Threatened Ecological Community |

Definitions:

{DBCA (2019) Conservation Codes for Western Australian Flora and Fauna. Department of Biodiversity, Conservation and Attractions, Western Australia}:-

T Threatened species:

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species

Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife*

Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN **Endangered species**
Threatened species considered to be “*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*”.

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU **Vulnerable species**
Threatened species considered to be “*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*”.

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

Extinct Species:

EX **Extinct species**
Species where “*there is no reasonable doubt that the last member of the species has died*”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW **Extinct in the wild species**
Species that “*is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species:

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI **Migratory species**
Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

CD **Species of special conservation interest (conservation dependent fauna)**
Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

- OS Other specially protected species**
Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).
Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.
- P Priority species:**
Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.
Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.
Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.
- P1 Priority One - Poorly-known species**
Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
- P2 Priority Two - Poorly-known species**
Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
- P3 Priority Three - Poorly-known species**
Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
- P4 Priority Four - Rare, Near Threatened and other species in need of monitoring**
(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.
(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Principles for clearing native vegetation:

- (a) Native vegetation should not be cleared if it comprises a high level of biological diversity.
- (b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna.
- (c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora.
- (d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.
- (e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.
- (f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

- (g)** Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.
- (h)** Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.
- (i)** Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.
- (j)** Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.