



Clearing Permit Decision Report

1. Application details and outcome

1.1. Permit application details

Permit number:	CPS 9303/1
Permit type:	Purpose permit
Applicant name:	Shire of Dandaragan
Application received:	26 May 2021
Application area:	8.7 hectares
Purpose of clearing:	Gravel extraction
Method of clearing:	Mechanical clearing.
Property:	Lot 11268 on Deposited Plan 182862 (Crown Reserve 35593), Hill River
LGA area:	Shire of Dandaragan
Localities:	Hill River

1.2. Description of clearing activities

The vegetation applied to be cleared for gravel extraction is contained within a single contiguous area (Figure 1, Section 1.5). The application area is approximately 8.7 hectares and adjacent to a previous gravel extraction site permitted under clearing permit CPS 8859/1, and overlapping an area previously permitted under clearing permit CPS 2063/1 that has now expired.

1.3. Decision on application and key considerations

Decision:	Granted
Decision date:	8 November 2021
Decision area:	8.7 hectares of native vegetation as depicted in Section 1.5 (Figure 1).

1.4. Reasons for decision

This clearing permit application was submitted, accepted, assessed and determined in accordance with sections 51E and 51O of the *Environmental Protection Act 1986* (EP Act). The Department of Water and Environmental Regulation (DWER) advertised the application and one submission was received (Appendix B).

In making this decision, the Delegated Officer had regard for the site characteristics (Appendix C), relevant datasets (Appendix J2), the results of relevant flora, vegetation and fauna surveys (Appendix A), the clearing principles set out in Schedule 5 of the EP Act (Appendix E), a revegetation plan, relevant planning instruments and any other matters considered relevant to the assessment (Section 3). The Delegated Officer also took into consideration the purpose of the clearing to obtain a gravel resource for local road upgrades.

The assessment identified that the proposed clearing will result in the following:

- may impact fauna utilising the application area at the time of clearing;
- impact priority flora known to occur within the application area;
- may lead to land degradation in the form of wind erosion; and
- may increase the risk of weeds and dieback impacting an area of land vested for conservation adjacent to the application area.

The Delegated Officer noted that priority flora will be impacted by the proposed clearing. It is considered that the loss of priority flora as a result of the clearing will not impact the conservation status of the taxa present, and will not significantly impact their local or regional occurrence.

After consideration of the available information, as well as the applicants avoidance, minimisation and mitigation measures (Section 3.1), the Delegated Officer has determined that with appropriate management conditions, the proposed clearing is not likely to lead to an unacceptable risk to the environment. The Delegated Officer decided to grant a clearing permit subject to conditions to:

- Avoid, minimise and reduce the impacts and extent of clearing.
- Clearly demarcate clearing areas with temporary fencing prior to clearing to avoid inadvertent impacts to any conservation significant flora taxa.
- Implement stringent weed and dieback management measures to mitigate impacts to adjacent vegetation and the re-establishment of native vegetation in previously cleared areas.
- Minimise active gravel extraction to no more than two hectares in size at any given time to minimise the area susceptible to wind erosion.
- Undertake slow, progressive, one directional clearing to allow terrestrial fauna to move into adjacent habitat ahead of the clearing activity.
- Progressively revegetate all cleared areas within six months of the area no longer being required for the purpose of gravel extraction utilising stored topsoil salvaged from the location to facilitate the re-establishment of locally-provenanced taxa and the re-establishment of habitat that includes foraging habitat for Carnaby's Cockatoo.
- Apply relevant revegetation completion criteria to ensure the values of the immediate vicinity are maintained via comparisons with relevant reference sites.

1.5. Site map

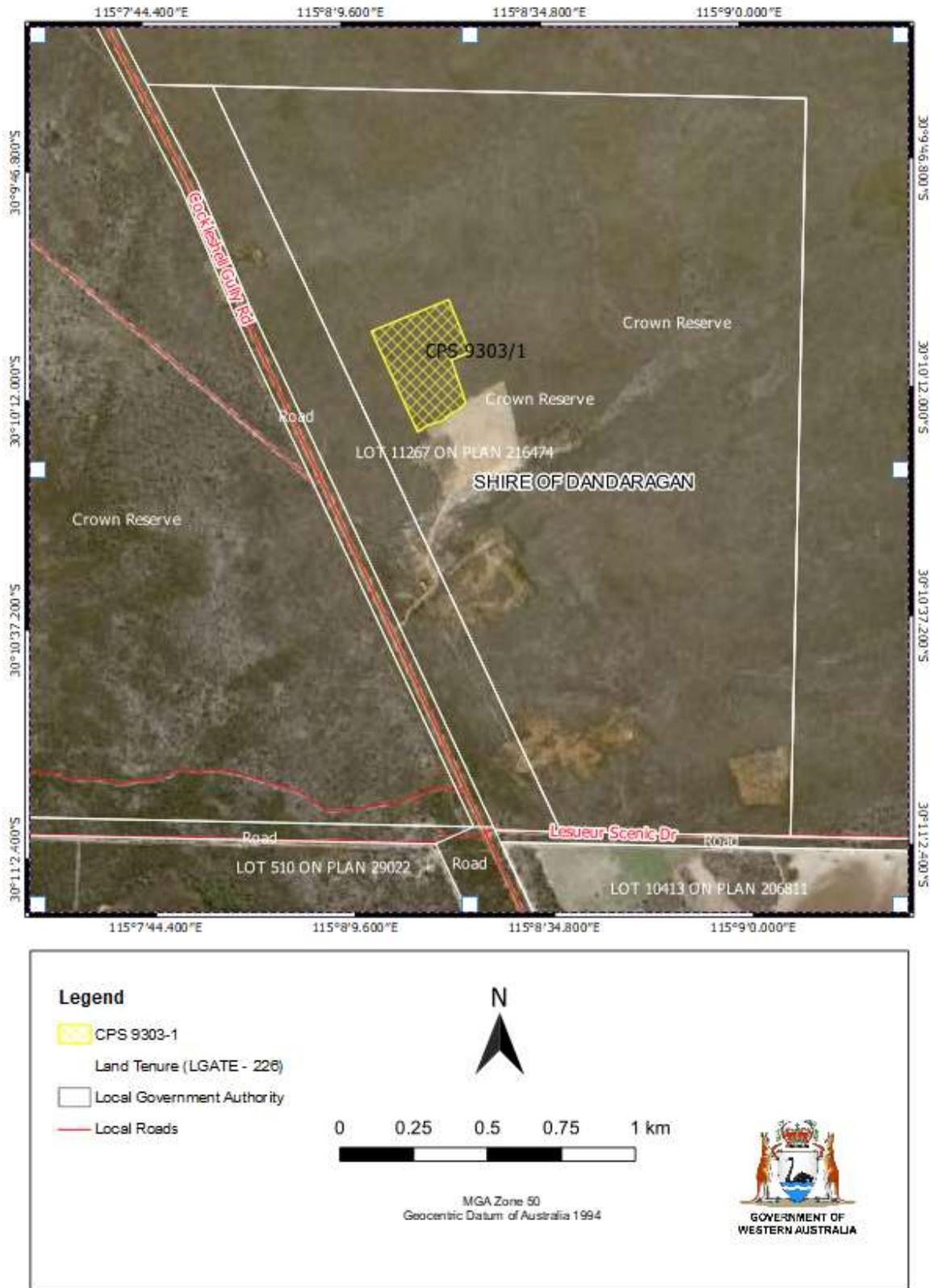


Figure 1: Map of the application area. The area in yellow indicates the areas authorised to be cleared under the granted clearing permit.

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 (Section 1.3), 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 the conservation of biological diversity and ecological integrity

Other legislation of relevance for this assessment include:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Biosecurity and Agriculture Management Act 2007* (BAM Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Conservation and Land Management Act 1984* (CALM Act)

The key guidance documents which inform this assessment are:

- *A guide to the assessment of applications to clear native vegetation* (December 2013)
- *A guide to preparing revegetation plans for clearing permits under Part V of the Environmental Protection Act 1986* (DWER, March 2018)
- *Procedure: Native vegetation clearing permits* (DWER, October 2019)
- Technical guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016)

3. Detailed assessment of application

3.1. Avoidance and mitigation measures

Alternative sources of gravel

The Shire of Dandaragan (the Shire) has a number of gravel leases within the Shire boundaries and typically uses approximately 15,000m³ of gravel per year for ongoing road maintenance and new projects. More gravel than usual was used between late 2018 and early 2020, and more than usual will be used during 2021/2022, due to upgrades to Jurien Road (east) approximately 9.2 kilometres to the south of the application area.

The Shire attempts to source gravel from cleared land. However, this involves identifying areas with sufficient gravel resources, then negotiating with the landowner for permission to access the land to extract the gravel, and payment for the gravel. Figure 2 shows three locations of cleared lands from which the Shire has extracted gravel in the past four years (Areas 1 to 3), along with the R35593 reserve within which the application area under assessment is located (Blue triangle 4). Area 2 was used until the gravel supply was exhausted and Area 3 was used until the farmer refused further access to the land. R35593 (Blue triangle 4) is now the closest source of gravel to the western section of Jurien Road (east) with required works scheduled to commence from September 2021.

Gravel is required for road widening works along the western section of Jurien Road (east). The Shire used the three sources shown on Figure 2 for much of the eastern section of the Jurien Road (east) upgrade works, but was required to use 55,000m³ of gravel extracted from five hectares of clearing under CPS 8859/1 (within R35593) for the last approximately six kilometres of road.

The closest accessible Shire gravel reserve is R35593 within which the CPS 9303/1 application area is situated and the Shire has applied to clear a further 8.7 hectares to provide the approximately 80,000m³ to 90,000m³ of gravel required for the upgrades to 11.2 kilometres of the western section of Jurien Road (east).

Other gravel resources are considered by the Shire to be too far from the road works to be economical, with the next closest (R38029) approximately 24 kilometres to the south-east of the application area immediately adjacent to Coomaloo Nature Reserve, and others up to 70 kilometres distant (Appendix G).

A native vegetation clearing permit granted to the Shire in 2008, for gravel extraction in R35593, permitted the clearing of 13.4 hectares of vegetation (CPS 2063/1). This permit has expired with only 32.8 per cent of the permitted area having been cleared. An additional clearing permit was granted for the clearing of five hectares in the reserve in 2020 (CPS 8859/1), and the current clearing permit application is for proposed clearing of 8.7 hectares of native vegetation in the reserve (CPS 9303/1). The three areas covered by the two approved permits and the current application are shown in Figure 3.



Figure 2: Gravel supply areas on cleared lands (green circles) and R35593 gravel reserve (blue triangle) (Maia and Shire of Dandaragan 2021)

Approximately 38.7 percent of clearing associated with CPS 8859/1 and CPS 9303/1 overlaps the previous (and expired) CPS 2063/1 area. Table 1 summarises clearing applied for and carried out within R35593 under the three granted/applied for clearing permits. If clearing proposed under application CPS 9303/1 is undertaken there will have been 18.1 hectares of clearing and 4.6 hectares more than the clearing originally permitted under CPS 2063/1. This indicates that the Shire only uses gravel from this reserve when required.

Table 1: Areas cleared or proposed to be cleared under permits issued or applied within Crown Reserve R35593 (Maia and Shire of Dandaragan 2021)

Permit / Application	Clearing approved / applied (~ha)	Clearing completed / to be carried out (~ha)	Areas within the CPS 2063/1 permit area (~ha)	Area not cleared within CPS 2063/1 permit area (~ha)	Areas cleared / to be cleared outside of CPS 2063/1 permit area (~ha)
CPS 2063/1 (Expired)	13.4	4.4	4.4		
CPS 8859/1 (Active)	5	5	1.4		3.6
CPS 9303/1 (Application)	8.7	8.7	3.9		4.8
TOTAL	27.1	18.1	9.7	3.8	8.4

The Shire will continue to look for alternative gravel resources in already cleared areas for future works. If more local sources of gravel are found, and the Shire successfully negotiates to extract gravel from them, these alternative sources will be used in preference to R35593. However, the Shire believes it unlikely that many accessible alternative sources will be located and made available to them.

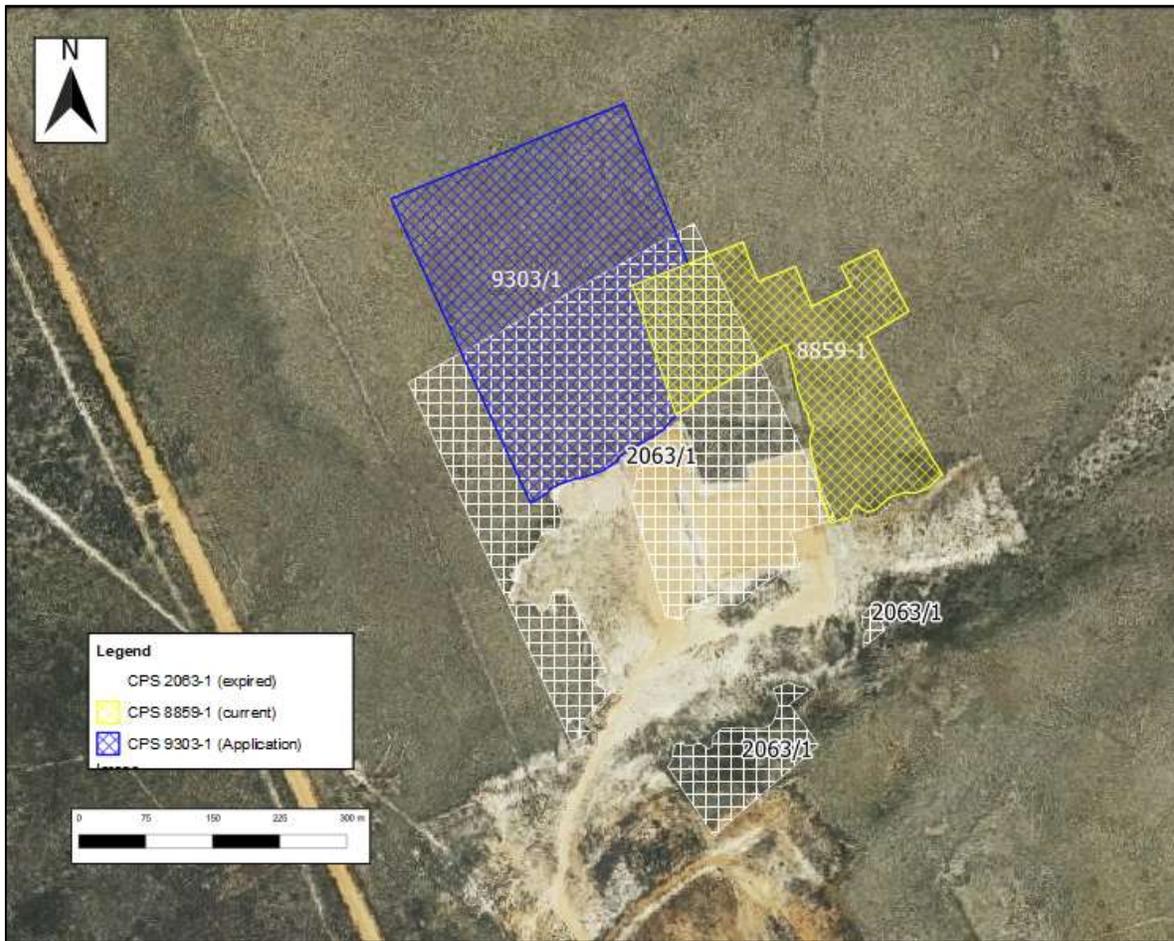


Figure 3: Clearing permits issued (CPS 2063/1 and CPS 8859/1) or under assessment (CPS 9303/1)

Minimisation

Alternative sources of gravel are not close enough to the areas where the extracted gravel is to be used for road widening works along the western section of Jurien Road (east). The application area considered for the proposed clearing is the minimum area required for the quantity of gravel needed for forward-planned road works.

The Shire commissioned Maia (2021a) to undertake a targeted flora survey and desktop fauna assessment over R 35593, the site of the application area. The survey work builds upon previous studies undertaken over R 35593, including Maia (2020a) and Maia (2020b). Flora survey data was used to assess two clearing options. The survey was carried out over a larger 18.38 hectare survey area with two options assessed, with ‘Option 2’ chosen by the Shire to minimise clearing of priority flora species, and to reduce regional and local impacts to priority species, and in particular the one Priority 2 species recorded in the vicinity (*Synaphea lesueurensis*) by avoiding the majority of records. The 8.72 hectare area selected as ‘Option 2’ represents the CPS 9303/1 application area (Figure 1). Further details of the impact assessment are included in Section 3.2.1.

Mitigation

The application area is located within Crown Reserve R35593 which is vested in the Western Australian Conservation and Parks Commission and managed by DBCA. The use of the application area for the purposes of gravel extraction by the Shire has been permitted by DBCA under specific lease conditions (Section 3.3). Gravel Lease 176 (CALM Act Lease no. 176/100) stipulates broad revegetation requirements as well as the implementation of dieback and weed management strategies in accordance with Annexure A of the lease agreement including rates of seeding and/or plantings per hectare.

A site-specific revegetation plan has been submitted by the applicant in support of CPS 9303/1 (Maia 2021b). The Shire will mitigate impacts associated with the proposed vegetation clearing and gravel extraction by revegetating the area once the gravel has been extracted. Vegetation will therefore not be permanently lost from the site and, with time, there should be no net loss of vegetation from the area to be cleared. The revegetation plan of Maia (2021b)

includes the use of quadrat-based data from reference sites assessed in 2019 in the same vegetation type and in the area immediately adjacent to the application area. The data from reference sites were used to generate completion targets and criteria for the revegetation areas developed in conformance with DWER's 'Guide to preparing revegetation plans for clearing permits under Part V of the *Environmental Protection Act 1986*' (March 2018). The revegetation completion targets and criteria of Maia (2021b) are provided in Appendix J. The completion criteria have been developed considering what is likely to be achievable in this relatively dry and moderately diverse area over a five year timeframe. No long-term monitoring has been carried out in the vegetation in the area to determine what the system could achieve over such a relatively short time span (Maia 2021b). No weed species have been recorded in reference sites and the revegetation plan includes criteria for zero weed species recorded in revegetated areas (Appendix J).

In 2020 the Shire contacted the DBCA Moora District Office at Jurien to enquire whether it was feasible and permissible to translocate some of the priority species occurring in the clearing area into revegetated areas. DBCA advised at the time that revegetating the area post-excavation with the stored topsoil would likely be more beneficial for the return of priority taxa into the revegetated areas (B. Pepper *pers. com.* 8 July 2020, in Maia and Shire of Dandaragan 2021).

The Shire will store topsoil from cleared areas for use on areas to be revegetated thereby increasing the likelihood of the return of significant flora species. Extracting the gravel over a relatively short time and then revegetating the area soon after will also reduce the potential for long-term wind and water erosion, reduce the time that piles of topsoil are exposed to weed seeds, and ensure that the seed bank in the topsoil is not old. The revegetation methods used by the Shire will ensure that water drains adequately, infiltrates into the revegetated areas and does not pond.

Areas previously disturbed within 300 metres of the application area have been revegetated by the Shire in the past. No rigorous monitoring data are available, however, areas cleared prior to 2008 appear to be progressing well (Maia and Shire of Dandaragan 2021) (Appendix I). The revegetation plan of Maia (2021b) states that the Shire will engage botanical consultants to carry out a spring assessment in these previously revegetated areas, including for the presence of priority taxa that have previously been recorded in the surrounding areas (see Section 3.2.1). This should indicate the potential for their germination and survivorship in areas to be revegetated. The Shire will liaise with the DBCA in Jurien Bay regarding the results of the assessment, and, if no priority taxa are located in previously revegetated areas the Shire will discuss their re-establishment with the DBCA. Strategies may include the collection of seed from priority flora taxa in the surrounding area, seed pre-treatment and seed sowing, or seedling planting, to return these to the revegetated areas (Maia 2021b).

To minimize the potential for the spread of weeds into a weed-free area the Shire will adopt weed management practices when extracting the gravel, when trucking it from the gravel pit and when carrying out rehabilitation works. Weed control will also be carried out as necessary post-revegetation. No fill will be brought into the area to minimise the risk of weed (and non-provenance species) being introduced. The Shire will implement dieback management measures when undertaking gravel extraction, and when revegetating the area. Access will be from Jurien East Road onto Cockleshell Gully Road and into the gravel pit. There are no known dieback records along Cockleshell Gully Road. There is one disease positive sample point for *Phytophthora arenaria* along Jurien East Road between Indian Ocean Drive and Cockleshell Gully Road. Clearing and extracting activities will be scheduled for low rainfall months and they will not be carried out in wet or muddy conditions. Vehicles will be cleaned before accessing the gravel pit area.

The Shire have demonstrated that efforts have been taken to avoid and minimise potential impacts of the clearing on environmental values, and to mitigate impacts by:

- clearing no more than two hectares at any one time;
- constructing a temporary fence around the perimeter of any approved clearing area prior to any clearing to ensure that any priority flora located close to the boundary of the application area are avoided;
- implementing appropriate weed and dieback management strategies to minimise impacts to surrounding vegetation;
- preparing and committing to a revegetation plan; and
- implementing strategies to facilitate the return of priority flora including storing topsoil from cleared areas for use on areas to be revegetated (thereby increasing the likelihood of the return of priority taxa), on-going monitoring and liaison with the DBCA.

3.2. Assessment of impacts on environmental values

The assessment against the clearing principles (Appendix E) identified that the impacts of the proposed clearing present a potential risk to the biological values of significant flora and vegetation, significant fauna habitat, adjacent lands managed for conservation purposes and land degradation. The consideration of these impacts, and the extent to which they can be managed through conditions applied in line with sections 51H and 51I of the EP Act, is set out below.

3.2.1. Environmental value: biological values (significant vegetation / flora) – Clearing Principles (a) and (c)

Assessment: A targeted flora survey and desktop fauna assessment was undertaken over the application area as well as a broader area immediately surrounding the application area by Maia (2021a). It built upon data obtained by previous surveys in the local area, including immediately adjacent to the application area (Maia 2020a). The Maia (2021a) survey was carried out by two botanists on 25, 26 and 28 October, 2020 with the previous survey undertaken in October 2019. Timing of surveys coincided with the flowering times of threatened, and the majority of priority flora known from the local area.

The vegetation survey (Maia 2021a) indicates the vegetation within the application area is in excellent condition (Keighery 1994) and consists of one vegetation type (Appendix H1) consisting of a mixed heathland described as:

- Low mixed Heathland mainly of *Calothamnus sanguineus*, *Banksia shuttleworthiana* and *Daviesia epiphyllum* with a Sparse Shrubland of *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404) and an Open mixed Sedgeland of *Caustis dioica*, *Mesomelaena pseudostygia* and *Mesomelaena tetragona*.

The vegetation description of Maia (2021a) is consistent with the mapped regional vegetation association 1031 (Shepherd *et al.* 2001), which is described as Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath.

Three significant ecological communities have been mapped regionally within ten kilometres of the application area (Appendix D1). The application area, or areas immediately surrounding, does not contain species vegetation assemblages analogous with any Threatened Ecological Communities (TECs) endorsed by the Western Australia Minister for Environment (Maia 2020a; Maia 2021a), or any Priority Ecological Community (PEC).

The Threatened Species Scientific Committee (TSSC) has identified biodiversity hotspots within Australia with one biodiversity hotspot that includes the local area (Mount Lesueur-Eneabba ID 11) due to its floristic diversity. The application area is located on the Peron Slopes landform of the Lesueur area (Griffin and Burbidge 1990) with a mean species richness within 10 metre by 10 metre quadrats varying from 82.5 species on Sand Heath to 95.3 species on one of the three Laterite Heath vegetation types (Martinick cited in Maia 2021a). Species richness at the three similarly-sized quadrats assessed over the application area by Maia (2021a) was 32, 38 and 41 (with a mean species richness of 37.0). Species richness assessed over the application area was lower than that recorded during other surveys carried out elsewhere on this landform (Maia 2021a).

Flora surveys over Reserve R 35593 (Maia 2020a; Maia 2021a) have not recorded any threatened flora taxa and based on the threatened flora taxa known from the local area, results of the flora and vegetation surveys conducted, and separation distances to known records, the application is unlikely to include, or be necessary for the continued existence of threatened flora.

A broader area of 18.4 hectares was surveyed by Maia (2021a) in addition to the adjacent 6.9 hectares surveyed previously by Maia (2020a). The combined surveys recorded a total of seven priority flora taxa as listed by the Department of Biodiversity, Conservation and Attractions (DBCA) (Table 1). Nine flora taxa were recorded that are endemic to the Lesueur Sandplain subregion, as well as two taxa representing range extensions (Maia 2021a).

In consideration of the broader 18.4 hectare area surveyed, Maia (2021a) undertook an assessment of two options to extend the existing gravel pit (Appendix H2). Option 2 was the preferred option as this option maximises the reduction of regional and local impact to priority species, including the Priority 2 *Synaphea lesueurensis*; with just one (dead) plant impacted by the proposed clearing (Figure 4). Option 2 equates to the CPS 9303/1 application area.

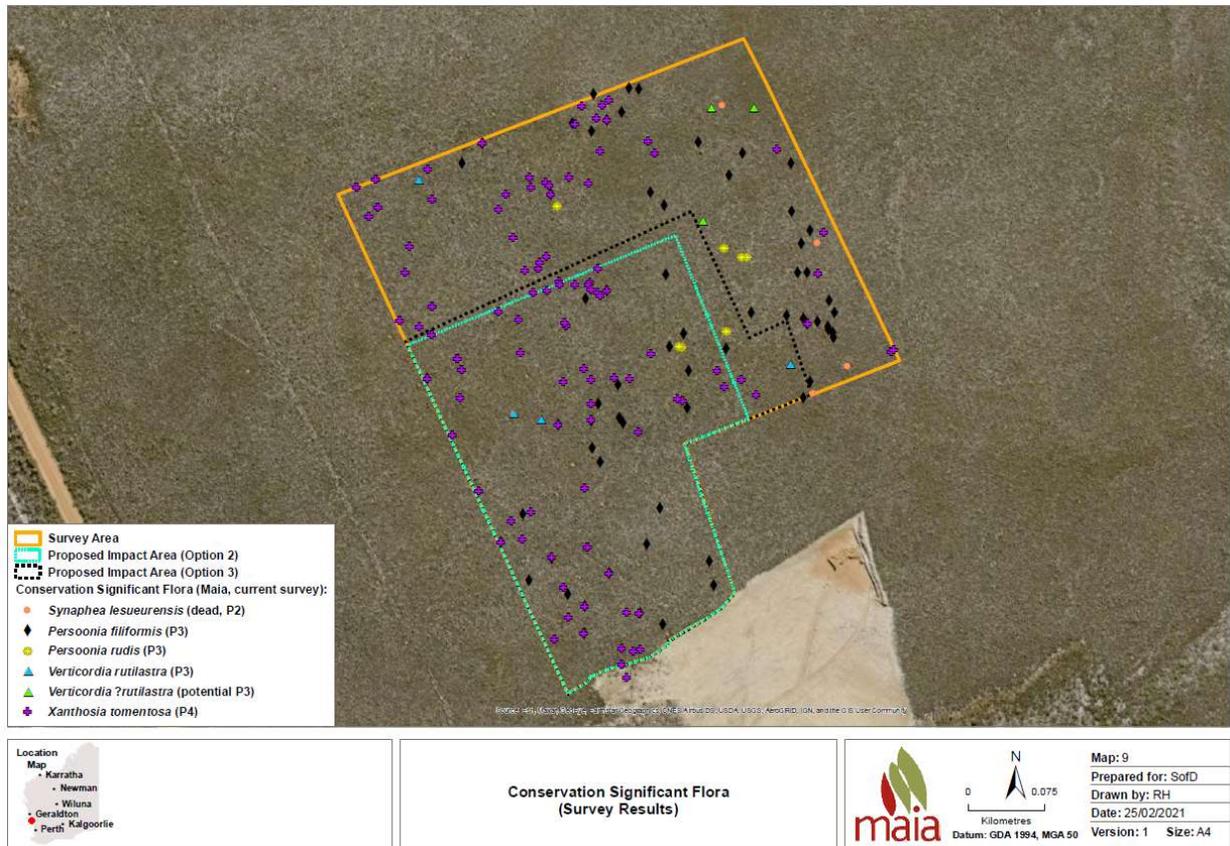


Figure 4: Locations of priority flora taxa recorded by Maia (2021a)

Five priority flora taxa recorded by Maia (2020a) and Maia (2021a) occur within the CPS 9303/1 application area; *Synaphea lesueurensis* (P2) (dead specimens only), *Persoonia filiformis* (P3), *Persoonia rudis* (P3), *Verticordia rutilastra* (P3) and *Xanthosia tomentosa* (P4). An additional two taxa were recorded in adjacent areas but not within the CPS 9303/1 application area (Table 1).

Table 1: Priority flora recorded by Maia (2020a) and Maia (2021a)

Taxon	Status	Maia (2020a) survey area	Maia (2021a) survey area
<i>Synaphea lesueurensis</i>	P2	X	X
<i>Haemodorum loratum</i>	P3	X	
<i>Patersonia argyrea</i>	P3	X	
<i>Persoonia filiformis</i>	P3		X
<i>Persoonia rudis</i>	P3	X	X
<i>Verticordia rutilastra</i>	P3	X	X
<i>Xanthosia tomentosa</i>	P4	X	X

Maia (2020b) undertook an assessment of priority species identified from the application area in terms of both individual plants, and populations, to determine local and regional impacts, as well as an assessment of the relevant protection of the relevant populations within areas protected for conservation at the local scale. Impacts were estimated using all plant records for each species using the number of plants occurring within a ten kilometre radius to address local area impacts. Calculations were undertaken using known plant and population numbers, and population boundaries were defined by buffering plant locations by 500 metres, consistent with the method used by the DBCA (Maia 2021a).

The impact calculations presented are conservative and adopt the precautionary principle in that they consider cumulative impact by combining the clearing of an adjacent area associated with clearing permit CPS 8859/1 with the CPS 9303/1 application area considered here. Areas outside these two impact areas were also surveyed within

a broader survey area of Maia (2021a). The cumulative impacts were assessed by Maia (2021a) utilising publicly-available information and the results of surveys undertaken in the local area. It is likely that more records for these species have been recorded with the information not available (Maia 2021a).

In addition the cumulative impact calculations consider 'one population' for each of the taxa impacted. However, only a part of that population would be impacted with individuals persisting in the broader surveyed area. That is, if the impact calculations were redone post-clearing the number of populations would not have decreased, because plants of each species would still remain in the immediate vicinity of the application area, and there would still be 'one population'. Impact calculations also include dead *Synaphea lesueurensis* plants, an unidentified *Synaphea* sp. plant recorded in the adjacent survey area of Maia (2020a), and unidentified *Verticordia ? rutilastra* plants (See 'notes' for Table 6 in Appendix H2.).

The impact calculations provided the basis of assessing two options for clearing with 'Option 2' chosen by the Shire to minimise clearing of priority flora species.

Results are presented in Appendix H2 (Table 6), and summarised in Table 2 below. The distributions of the five priority species in relation to the application area, and the 10 kilometre radius, are also presented in Appendix H2.

Table 2: Priority flora analysis of impact (Maia 2021a)

Priority flora taxa	Status	Plants		Populations		
		Regional impact (%)	Local impact	Regional impact	Local impact	Local pops. in DBCA lands
<i>Synaphea lesueurensis</i>	P2	0.3	0.3	9.1	12.5	62.5
<i>Persoonia filiformis</i>	P3	11.1	41.7	4.4	25.0	50.0
<i>Persoonia rudis</i>	P3	2.0	4.8	2.0	16.7	66.7
<i>Verticordia rutilastra</i>	P3	3.3	60.8	2.9	11.1	88.9
<i>Xanthosia tomentosa</i>	P4	1.5	4.2	3.1	7.7	76.9

Regional impact estimates on plants for the five priority species range from approximately 0.3 per cent for *Synaphea lesueurensis* (P2) to 11.1 per cent for *Persoonia filiformis* (P3), while regional impact for plant populations ranges from 2.0 per cent for *Persoonia rudis* (P3) to 9.1 per cent for *Synaphea lesueurensis* (P2) (Table 1).

Local area impact on plants based upon a ten kilometre radius of the application area ranges from approximately 0.3 per cent for *Synaphea lesueurensis* (P2) to 60.8 per cent for *Verticordia rutilastra* (P3), while the local area impact for plant populations ranges from 7.7 per cent for *Xanthosia tomentosa* (P4) to 25.0 per cent for *Persoonia filiformis* (P3).

Local impacts are high for *Persoonia filiformis* and *Verticordia rutilastra*. Seventy-seven *Persoonia filiformis* plants were recorded in the broader survey area of which 34 will not be impacted by the proposed clearing. Fifty per cent of the local *Persoonia filiformis* populations are protected within DBCA managed lands. Approximately 11 per cent of all plants known to Maia (2021a), and 4.4 per cent of all populations, would be impacted by the proposed clearing.

Local impacts to *Verticordia rutilastra* are high, predominantly due to one data point within the application area recording 29 individual plants. A maximum of 3.3 per cent of all the *Verticordia rutilastra* plants known to Maia (2021a), and approximately 11 per cent of all populations, would be impacted by the proposed clearing that includes the impacts from the adjacent clearing. Almost 90 per cent of local populations of *Verticordia rutilastra* are protected within DBCA managed lands.

Local and regional impacts to both *Persoonia rudis* and *Xanthosia tomentosa* are relatively low with above 66 per cent of known populations protected within DBCA managed lands.

Nine dead *Synaphea lesueurensis* (P2) plants (only) were recorded in the broader survey area of Maia (2021a). Of these just one of the dead plants will be impacted by the proposed clearing. Although individuals may have perished it is possible that a seed bank or propagules are retained within the soil profile.

Maia Environmental Consultancy have recorded *Synaphea lesueurensis* in the Jurien East Road reserve (Maia 2017) as well as the area surrounding the application area (Maia 2020a), and it is likely that more records occur in similar habitat between these records and in the local area (Maia 2020a). Approximately 62.5 per cent of the currently known local populations of *Synaphea lesueurensis* are protected in DBCA managed lands (Maia 2021a).

Most of the priority species have large distributions (Maia 2021a) (Appendix H2), and given the number of priority plants located in the areas surveyed, and that the vegetation type recorded extends over a large area around and beyond the application area, it is likely that the five priority species recorded occur in similar numbers and densities

in the surrounding vegetation. The application area abuts conservation areas with suitable habitat, and the five priority flora species are likely to extend into these conservation areas. Considering survey intensity, no other significant flora taxa are likely to occur within the application area.

The application area is located within a recognised biodiversity hotspot due to its floristic diversity (Mount Lesueur-Eneabba: ID 11). Species richness assessed over the application area by Maia (2021a) (mean species richness of 37.0) is lower than that recorded by other surveys carried out elsewhere on the equivalent landform and the application area is considered an area of moderate plant species richness (Maia 2021a).

Native vegetation extent within Reserve R35593 will be approximately 88.4 percent after the clearing of 8.72 hectares for the gravel pit expansion. The Shire has committed to the progressive revegetation of cleared areas utilising topsoil salvaged from the cleared areas (Maia and Shire of Dandaragan 2021) with the objective of no long-term loss of vegetation extent. Topsoil will include a seed bank and vegetative propagules of locally-provenanced taxa, and the use of topsoil will increase the likelihood of the re-establishment of conservation significant flora species over previously cleared areas. As standard practice the Shire will also construct a temporary fence around the perimeter of any approved clearing area prior to any clearing to ensure that priority flora located close to the boundary of the application area are avoided.

The application area, and native vegetation in the immediate vicinity, are free of exotic species (weeds), and dieback disease (Maia 2021a). If these conditions can be maintained, combined with revegetation of the area using locally-provenanced taxa, the probability of conservation significant flora (including endemics, those on the edges of their distribution, and priority taxa) recolonising the area through the long-term will increase. Conversely, the lack of exotic flora species, or any presence of dieback disease, increases the vulnerability of the area to these secondary impacts and adjacent areas are susceptible to weed invasion and dieback disease which the clearing process may exacerbate.

Conclusion: For the reasons set out above, and the avoidance and mitigation measures provided by the Shire (Section 3.1), it is considered that the potential impacts of the proposed clearing on significant flora and adjacent habitat can be managed by ensuring that revegetation outcomes reflect the importance of the area to flora of conservation significance, and by implementing strict weed and dieback control to ensure that the dieback-free and weed-free status of the area is maintained.

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

- Clearly demarcate clearing areas with temporary fencing prior to clearing to avoid inadvertent impacts to any conservation significant flora taxa.
- Implement stringent weed and dieback management measures to mitigate impacts to adjacent vegetation and the re-establishment of native vegetation in previously cleared areas.
- Minimise active gravel extraction to no more than two hectares in size at any given time.
- Progressively revegetate all cleared areas within six months of the area no longer being required for the purpose of gravel extraction utilising stored topsoil salvaged from the location to facilitate the re-establishment of locally-provenanced taxa.
- Apply relevant revegetation completion criteria to ensure the values of the immediate vicinity are maintained via comparisons with relevant reference sites.

3.2.2. Environmental value: biological values (significant fauna) – Clearing Principle (b)

Assessment: A vertebrate fauna assessment of the application area was undertaken by Western Wildlife during 2021 (Western Wildlife in Maia 2021a). A site survey was conducted over adjacent areas by Western Wildlife in January 2020 (Western Wildlife in Maia 2020a), and Western Wildlife used vegetation data and photographs collected from the application area by Maia in 2021, along with the previous information (Western Wildlife in Maia 2020a) to inform the vertebrate fauna assessment.

One fauna habitat is present over the application area; Low heathland. Nine frog, 47 reptile, 99 bird, and nine native mammals have been recorded within ten kilometres of the application area, including 11 vertebrate fauna species of conservation significance. Six are shorebirds, seabirds, and waterbirds that are unlikely to be present due to a lack of wetland or shoreline habitat (Appendix D3). The Vulnerable Gilled Slender Blue-tongue Skink (*Cyclodomorphus branchialis*) occurs in semi-arid shrublands on heavy red soils or rocky areas (Wilson and Swan 2010), and is not likely to occur due to lack of suitable habitat (Maia 2021a). The Fork-tailed Swift (*Apus pacificus*) is a migratory bird protected under an international agreement that is an aerial species that may overfly the application area only.

Of the conservation significant fauna identified from the local area the Threatened Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and Malleefowl (*Leipoa ocellata*) have the potential to occur, as well as the Priority 4 Western Brush Wallaby (*Notamacropus irma*) (Western Wildlife in Maia 2021a) (Appendix D3).

The application area is within the known range of the Endangered Carnaby's Cockatoo. Black cockatoo habitat can be considered in terms of breeding, roosting and foraging habitat (DSEWPaC 2012). No large trees associated with breeding or night roosting habitat occur over the application area. However, breeding sites are located within the local area with the closest within six kilometres to the east, and a known night roost is located approximately 9.4 kilometres to the south within the potential foraging distance of Carnaby's Cockatoo (DSEWPaC 2012). Due to the presence of breeding sites and a night roost within the potential foraging distance of Carnaby's Cockatoo, the vegetation present over the application area may represent foraging habitat required to support breeding or roosting Carnaby's Cockatoo populations.

Western Wildlife in Maia (2021a) state that the application area does not lie in vegetation identified as requiring investigation for Carnaby's Cockatoo feeding habitat. This is due, however, to the application area occurring within the Geraldton Sandplains bioregion with Carnaby's Cockatoo feeding habitat mapped only over the Swan Coastal Plain bioregion (Appendix H3), approximately 600 metres to the west of the application area (Appendix H3). Carnaby's Cockatoo foraging habitat is present within the application area, as potential food genera such as *Banksia* and *Hakea* occur, and foraging habitat is likely associated with the vast majority of the remnant vegetation retained in the local area. The vegetation retained in the local area consists of the vegetation associations of Shepherd *et al.* (2001) being broadly analogous with vegetation known to represent black cockatoo foraging habitat; including shrublands and scrub-heath of *Dryandra-Calothamnus* association with *Banksia prionotes* (Vegetation association 1029), mosaics of shrublands and *Hakea* scrub-heath or shrublands and *Dryandra* heath (Vegetation association 1031), and low woodlands of *Banksia attenuata* and *Banksia menziesii* (Vegetation association 1030).

The low heathland of the application area is likely to represent Carnaby's Cockatoo foraging habitat as it includes species that may be used for foraging including *Banksia armata*, *Banksia sclerophylla* and *Hakea prostrata*. Western Wildlife in Maia (2021a) consider the foraging habitat present to be of low value as the vegetation is very low in height, and although proteaceous species are present, they are not the key species such as *Banksia menziesii* or *Banksia prionotes* known to be favoured by Carnaby's Cockatoo which occur in the taller proteaceous shrublands and woodlands in the local area (Western Wildlife in Maia 2021a).

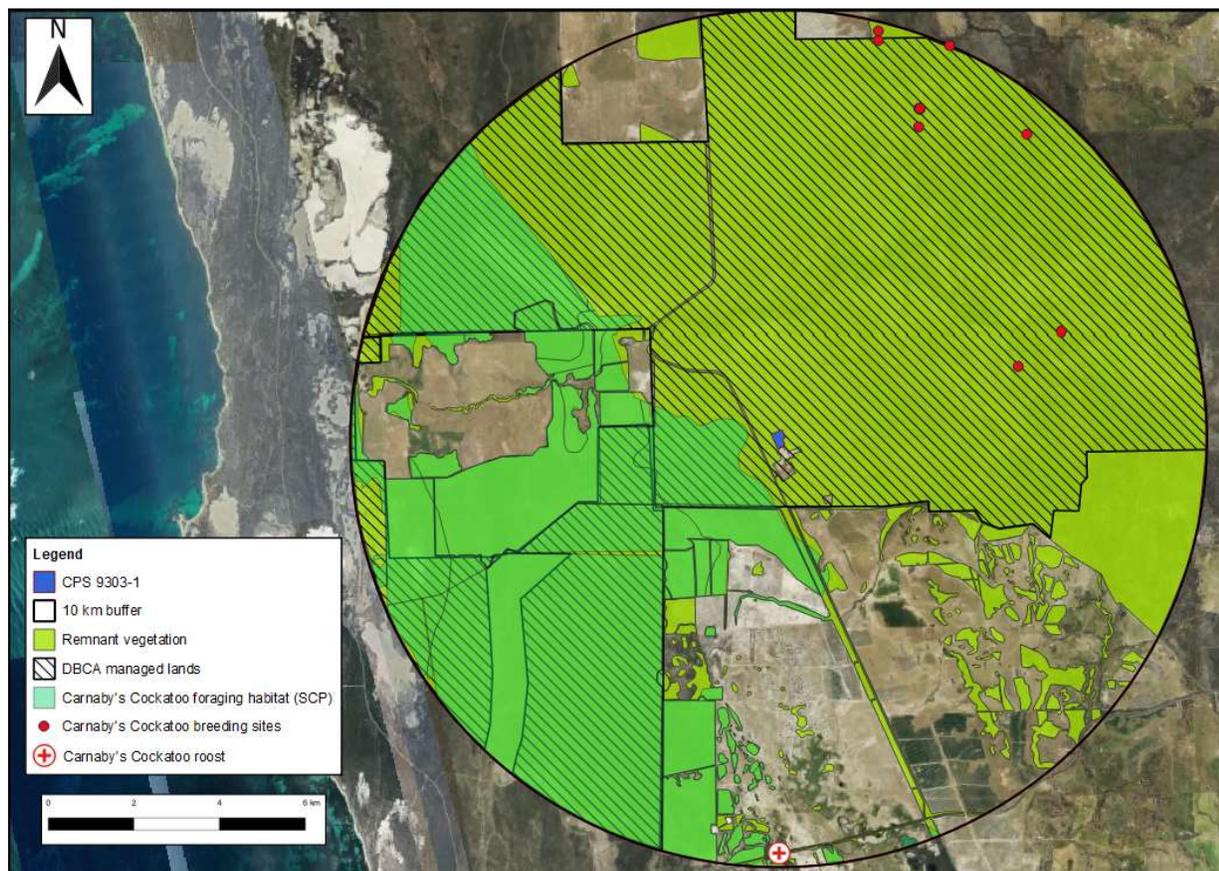


Figure 5: Map of remnant vegetation, DBCA managed lands, and Carnaby's Cockatoo habitat entities in the local area

The Carnaby's Cockatoo foraging habitat present occurs within 12 kilometres of confirmed breeding sites and a known roost, and is potentially used by breeding or roosting black cockatoos. The quality of foraging habitat varies depending upon how black cockatoos use the habitat in a particular location, and the quality of foraging habitat can be assessed in relation to its function within the landscape (Commonwealth of Australia 2017). The application area represents approximately 0.1 percent of the potential foraging habitat protected locally within the conservation estate (that is, 18,280 hectares within 10 kilometres) or approximately 0.007 percent of remnant vegetation within the local area. No evidence of black cockatoo feeding was observed over the application area during the surveys of Western Wildlife in Maia (2020a) and Maia (2021a), and the foraging habitat value is considered low by Western Wildlife in Maia (2021a) due to landscape context, vegetation structure and the particular foraging species present.

The closest known records of the Vulnerable Malleefowl are historical records (from the year 1959) located approximately 4.1 kilometres to the north-west of the application area. Malleefowl are largely confined to mallee eucalypts on sandy soils, shrublands dominated by acacias and woodlands dominated by eucalypts (Benshemesh 2007). Malleefowl may also be found on coastal heath where shrubs produce sufficient leaf litter for use in nest mounds (Benshemesh 2007; DEC 2012). The application area is unlikely to provide breeding habitat, as the vegetation is too low and litter-forming shrublands within which the species constructs its distinctive nesting mounds are absent (Western Wildlife in Maia 2020a). No evidence of the Malleefowl was recorded by Western Wildlife in Maia (2020a) or Maia (2021a). If they still persist in the region they would occur intermittently as foraging visitors, however the likelihood of this is considered low (Western Wildlife in Maia 2021a).

Vegetation within the application area represents habitat for the Priority 4 Western Brush Wallaby (*Notamacropus irma*), with a record within five kilometres of the application area. The species is endemic to the southwest of Western Australia, favouring open forest and woodland, but also occurring seasonally within shrubland (Van Dyck and Strahan, 2008). Home-range size has been estimated at about 9.9 hectares for males and 5.3 hectares for females (Bamford and Bamford 1999), and the application area is likely to represent the home-range of a single individual (Western Wildlife in Maia 2021a). While this represents a loss of habitat, the vegetation within the application area is well represented locally (75 per cent retained), with much of it protected within conservation lands, and revegetation of the area is likely to reinstate habitat. There remains a minor risk for the presence of Western Brush Wallabies within the application area at the time of clearing, however, the application area is surrounded by large tracts of native vegetation and any individual is likely to disperse into surrounding areas at the time of clearing.

Two invertebrate fauna species of conservation significance have been recorded from the local area, both mygalomorph trapdoor spiders. One record of the Priority 1 Kwongan Heath Shield-backed Trapdoor Spider (*Idiosoma kwongan*) is located within 9.5 kilometres of the application area. *Idiosoma kwongan* has an apparent restricted distribution in the southern Geraldton Sandplains bioregion with a known extent of occurrence of approximately 500 km². Rix *et al.* (2018) consider this to be a severe underestimate based on just three data points with relatively large amounts of high quality and poorly-surveyed heathland habitat throughout the region. Rix *et al.* (2018) consider the species data deficient for the purposes of conservation assessment. One record of the Priority 2 Mt Lesueur Heath Shield-backed Trapdoor Spider (*Idiosoma gardneri*) is located within six kilometres of the application area. Just one specimen has ever been collected and due to relatively large amounts of high quality and poorly-surveyed heathland habitat throughout the region Rix *et al.* (2018) consider the species data deficient for the purposes of conservation assessment.

If the Malleefowl persists in the region it is likely to be an occasional foraging visitor, with the application area representing a very small part of a much larger foraging range and the loss of 8.72 hectares of possible foraging habitat is unlikely to have a significant impact on the species (Western Wildlife in Maia 2021a). Similarly, the loss of 8.72 hectares representing one home range of Western Brush Wallaby is unlikely to impact the species at the local scale. Little is known of the two invertebrate trapdoor spiders of conservation significance considered data deficient. The clearing of 8.72 ha of low heathland habitat will result in the loss of all habitat from the cleared area. Populations of all fauna species present are likely to persist in the adjacent extensive areas of habitat. Large areas of contiguous native vegetation have been retained in the local area and proposed clearing is unlikely to result in an increase in habitat fragmentation, and revegetation is likely to reinstate components of the habitat values lost over the long term.

Conclusion: For the reasons set out above, and the avoidance and mitigation measures provided by the Shire (Section 3.1), it is considered that the potential impacts of the proposed clearing on significant fauna and fauna habitat can be managed by ensuring that revegetation outcomes reflect the existing fauna habitat values. Implementing strict weed and dieback control is required to ensure that the dieback-free and weed-free status of the area is maintained, particularly in regard to proteaceous species favoured by Carnaby's Cockatoo.

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

- Implement stringent weed and dieback management measures to mitigate impacts to adjacent vegetation and the re-establishment of native vegetation in previously cleared areas.

- Undertake slow, progressive, one directional clearing to allow terrestrial fauna to move into adjacent habitat ahead of the clearing activity.
- Progressively revegetate all cleared areas within six months of the area no longer being required for the purpose of gravel extraction utilising stored topsoil salvaged from the location to facilitate the re-establishment of habitat that includes foraging habitat for Carnaby's Cockatoo.
- Apply relevant revegetation completion criteria to facilitate the long-term re-establishment of fauna habitat.

3.2.3. Environmental value: conservation areas – Clearing Principle (h)

Assessment: The application area is located within section 5(1) (g) reserve R 35593. Under the CALM Act the Shire has held a lease over R 35593 for the designated purpose of “*gravel resource management, restoration and conservation*” (CALM Act Lease no. 176/100) (Section 3.3). Bordering the northern and eastern boundaries of R 35593 is Lesueur National Park (R 42032), the border of which is approximately 700 metres north and 1,275 metres east of the application area. Bordering the western edge of R 35593 is Nature Reserve R 35594, the border of which is approximately 150 metres west of the application area (Figure 6).

The proposed clearing is unlikely to directly impact the conservation values of the surrounding nature reserves. The access road from Cockleshell Gully Road to the gravel pit area traverses a section of Nature Reserve R35594 (Figure 6). However, the gravel pit has been in use since the late 1970's, and gravel has been extracted from both sides of the access road in the past. No clearing within Nature Reserve R35594 is proposed.

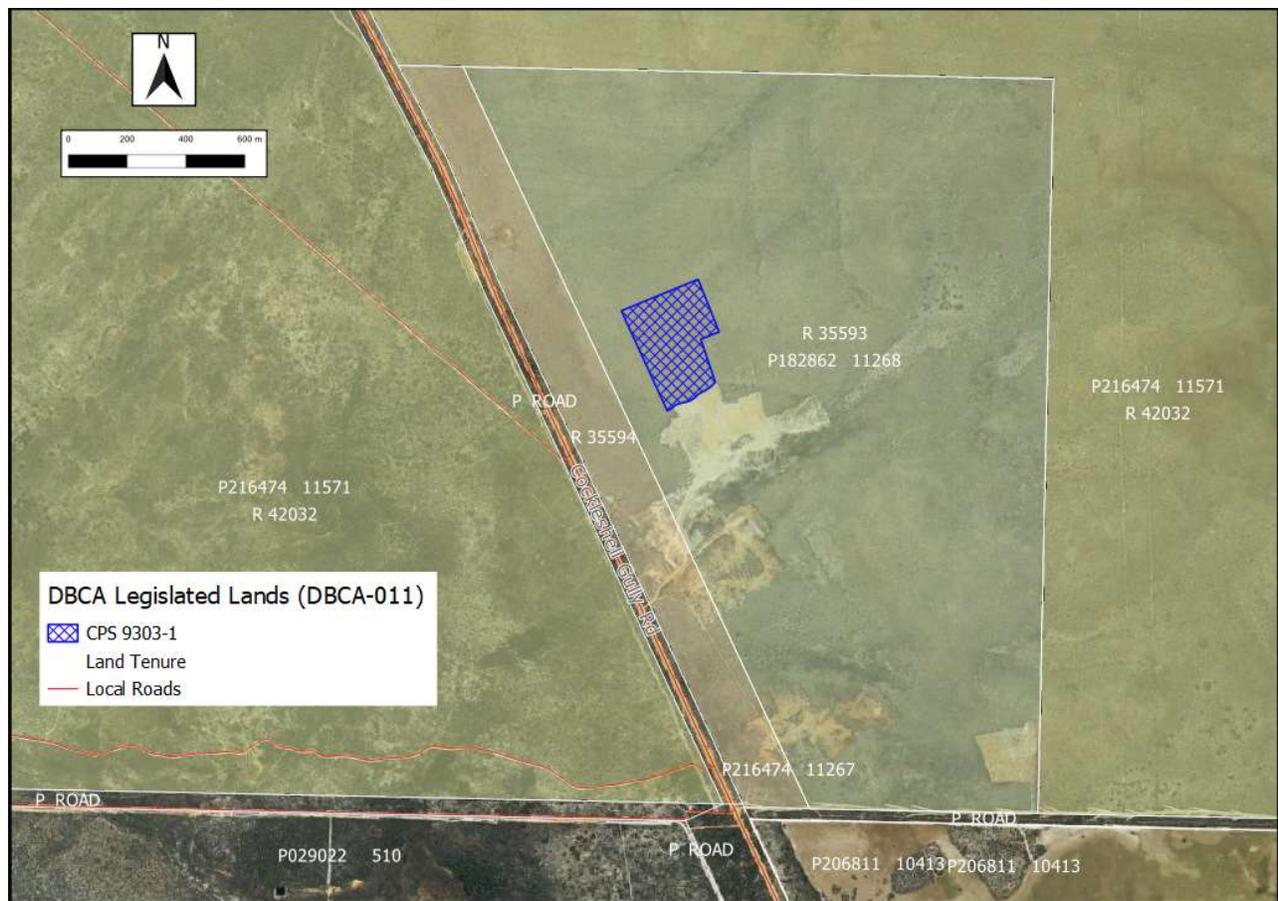


Figure 6: Land tenure in the vicinity of the application area

The greatest risk to adjacent nature reserves, and reserve R 35593 itself, is the introduction of weeds or dieback disease. No exotic flora taxa (weeds) have been recorded within the native vegetation of the application area and immediate surrounds (Maia 2020a and Maia 2021a). Additionally no evidence of dieback disease has been recorded within the native vegetation of the application area and surrounds (Maia 2020a and Maia 2021a) and no known positive *Phytophthora* species points are located within or close to the application area (Maia 2021a). Due to the floristics of the vegetation present, the application area is rated as having high susceptibility to dieback.

Conclusion: For the reasons set out above, and the avoidance and mitigation measures provided by the Shire (Section 3.1), it is considered that the potential impacts of the proposed clearing on conservation areas can be managed by implementing strict weed and dieback control to ensure that the dieback-free and weed-free status of the area is maintained, and ensuring that revegetation outcomes reflect existing values.

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

- Implement stringent weed and dieback management measures to mitigate impacts to adjacent vegetation and the re-establishment of native vegetation in previously cleared areas.
- Progressively revegetate all cleared areas within six months of the area no longer being required for the purpose of gravel extraction utilising stored topsoil salvaged from the location to facilitate the re-establishment of habitat.
- Apply relevant revegetation completion criteria to ensure the values of the immediate vicinity are maintained via comparisons with relevant reference sites.

3.2.4. Environmental value: land degradation – Clearing Principle (g)

Assessment: Land degradation risk has been mapped over the application area in consideration of the soil type occurring over the application area. The area is located within the Peron Slopes landform bounded to the east by the Dandaragan Scarp and to the south and west by the Gingin Scarp. Griffin and Burbidge (1990) describe the Peron Slopes as the western slopes of the Lesueur dissected uplands.

The landform consists of dissected lateritic sandplains with sandy and gravelly soils formed in colluvium weathered *in situ* (Desmond and Chant 2001). Exposed are a complex of laterites, sands and colluvium typical of much of the Arrowsmith region outside of the Lesueur area.

The soil over the application area is mapped as the Yerramullah 2 Subsystem of Schoknecht *et al.* (2004), described as plateau residuals of very gently inclined hillcrest and hillslopes with pale sandy gravels, shallow gravel over duricrust, gravelly pale deep sand, pale and yellow deep sands.

In consideration of the soil type occurring over the application area, the potential for wind erosion over the area is rated as high (DPIRD 2017; Section C1) if not managed appropriately. Based on the scale of proposed clearing, and the Shire's commitment to limit the area exposed at any one time and to progressively revegetate the area post extraction (Section 3.1), the proposed clearing is not likely to cause appreciable land degradation.

Conclusion: For the reasons set out above, and the avoidance and mitigation measures provided by the Shire (Section 3.1), it is considered that the potential for the proposed clearing to contribute to land degradation can be managed by minimising the areas exposed at any one time and progressively revegetating cleared areas.

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

- Minimise active gravel extraction to no more than two hectares in size at any given time to minimise the area susceptible to wind erosion.
- Progressively revegetate all cleared areas within six months of the area no longer being required for the purpose of gravel extraction to facilitate the timely re-establishment of vegetation cover.

3.3. Relevant planning instruments and other matters

The application was advertised on the DWER website for a 21 day public comment period on 10 June 2021. One public submission was received in relation to this application (Appendix B).

The application area is located within Crown Reserve R 35593 vested in the Western Australian Conservation and Parks Commission and managed by the DBCA. Under section 5(1)(g) of the CALM Act the Shire has held a lease over R 35593 for the designated purpose of "*gravel resource management, restoration and conservation*" (CALM Act Lease no. 176/100).

CALM Act Lease no. 176/100 has been prepared by the State Solicitor's Office and is subject to the endorsement of the vesting body for the land; that is, the Western Australian Conservation and Parks Commission. The lease has been renewed on a number of occasions with the current lease extended on 3rd August 2021, renewed for a further term of 20 years (DBCA 2021). Proposed clearing is consistent with the lease agreement. The lease specifies that a maximum area of two hectares be marked out and cleared at any given time followed by rehabilitation, and that dieback and weed management strategies be implemented in accordance with Annexure A of the lease agreement (that is; Guidelines for the management and rehabilitation of basic raw material pits (DEC 2008)).

The Shire has advised DWER that no further local government approvals are required, and that the clearing is consistent with the Shire's Local Planning Scheme.

Proposed clearing is to gain access to gravel reserves to support the road widening of Jurien Road (east) (Maia and Shire of Dandaragan 2021). The proposed clearing required to widen Jurien Road (east) was assessed under a bilateral agreement (CPS 9058/1; EPBC Ref: 2020/8740). The bilateral agreement allows the Commonwealth Minister for the Environment to rely on specified environmental impact assessment processes of Western Australia in assessing actions under the EPBC Act. Approval for CPS 9058/1 was granted by DWER on 17 September 2021.

In respect to Section 43A of the EPBC Act and the continuing use of Reserve R35593 by the Shire, the Shire have had advice from the Department of Agriculture, Water and Environment (DAWE) that authorisation for the action was granted prior to the commencement of the EPBC Act, and that no specific subsequent additional environmental approvals were required to enable the use to continue. DAWE have advised the Shire that prior authorisation for the action existed, and continues to exist, and meets the continued use criteria. Activities undertaken within the scope of the gravel lease therefore do not require referral under the EPBC Act (Shire of Dandaragan 2021). DAWE encourages the Shire to continue to make best efforts to protect the unique environment that supports, endemic and critically endangered flora species, including working with relevant technical experts and the DBCA.

The application is located within the Jurien Groundwater Area (Review) proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act). Groundwater has been mapped over the area at 500 to 1,000 TDS/Mg/L (that is, fresh). There is no requirement for a RIWI Act Licence.

The application area is located within the boundaries of the Yued Native Title Claimant's registered area of interest. The Yued Native Title Claimant and the South West Aboriginal Land and Sea Council were given opportunity to provide comment on the proposed clearing in accordance with section 24KA of the *Native Title Act 1993* (Cth). No responses were received.

No Aboriginal Heritage Places have been identified over the application area. A registered Aboriginal Heritage Place is located approximately 2.75 kilometres south of the application area (Place ID 4624, the Padbury Yam Ground). It is the Permit Holder's responsibility to comply with the *Aboriginal Heritage Act 1972* and to ensure that no Aboriginal sites of significance are damaged through the clearing process.

Appendix A – Information provided by applicant

Information provided by the applicant

Information	Description	Reference
Supporting information	Supporting information for clearing permit application CPS 9303/1 including shape files, lease, and certificate of title.	Shire of Dandaragan (2021)
Flora and vegetation	A reconnaissance and targeted flora and vegetation survey over the application area including priority flora impact assessment.	Maia (2021a)
Vertebrate fauna	A desktop vertebrate fauna survey over the application area based on information provided by (Maia 2021aa).	Western Wildlife in Maia (2021a)
Avoidance, minimisation, and mitigation strategies	Additional avoidance, minimisation, and mitigation strategies including summary of revegetation of previously cleared areas.	Maia and Shire of Dandaragan (2021)
Revegetation	A revegetation plan for the gravel pit on reserve R35593	Maia (2021b)
Lease agreement: DBCA and Shire of Dandaragan	Renewal of <i>Conservation and Land Management Act 1984</i> Lease No. 176/100 - Gravel Resource Management and Conservation – Reserve R35593 - Shire of Dandaragan (5 August 2021)	DBCA (2021)

Relevant information referenced

Information	Description	Reference
Flora and vegetation	A reconnaissance and targeted flora and vegetation survey over areas immediately adjacent to the application area associated with CPS 8859/1.	Maia (2020)
Vertebrate fauna	A reconnaissance vertebrate fauna survey over areas immediately adjacent to the application area associated with CPS 8859/1.	Western Wildlife in Maia (2020)
Avoidance, minimisation, and mitigation strategies	Additional avoidance and mitigation strategies, and impact assessment, in relation to priority flora taxa immediately adjacent to the application area associated with CPS 8859/1.	Maia (2020b)
Flora, vegetation and vertebrate fauna	A level 1 flora, vegetation and vertebrate fauna survey from Jurien Road and Cockleshell Gully Road to Brand Highway.	Maia (2017)

Appendix B –Details of public submissions

Summary of comments	Consideration of comment
Lack of flora and vegetation surveys	
Although many flora surveys of the surrounding area have been conducted no flora survey has been conducted over the application area.	A reconnaissance and targeted flora and vegetation survey has been conducted over the application area by Maia (2021a). (Appendix A; Appendix H)
The area to be cleared is located in a renowned hotspot of biodiversity (Lesueur) and clearing would be at variance with Clearing Principle (a). A flora survey should be mandated before consideration is given to the application.	A flora and vegetation survey was provided prior to the assessment of the application. The CPS 9303/1 assessment considered the location of the application area within the biodiversity hotspot of Mount Lesueur-Eneabba (ID 11). (Section 3.2.1)
NatureMap searches within five kilometres of proposed clearing reveal 59 conservation-significant taxa, including six threatened taxa, two P1, and 19 P2 taxa.	The assessment considered a local area of a ten kilometre radius surrounding the application area. Within this area 13 threatened flora taxa and 79 priority flora taxa have been identified. A reconnaissance and targeted flora and vegetation survey has been conducted over the application area by Maia (2021a), and the immediate surrounds (Maia 2020a). A likelihood of occurrence and impact assessment was provided by Maia (2021a). The CPS 9303/1 assessment considered the survey results and the impact assessment provided by Maia (2020a) (Section 3.2.1).
DBCAs have reliable location records for most threatened flora taxa, however the two threatened orchid taxa (<i>Paracaleana dixonii</i> and <i>Thelymitra stellata</i>) are geophytic and may have possibly been previously unsighted in the near vicinity.	Flora and vegetation surveys have been undertaken over the application area and the immediate surrounds by Maia (2020a) and Maia (2021a). The survey of Maia (2020a) was undertaken by three Botanists during Spring (October) 2019. The survey of Maia (2021a) was undertaken by two Botanists during Spring (October) 2020. Both surveys were undertaken during the flowering period for both these species.
Priority taxa are more poorly known and surveys for these should be required before the application can be assessed.	A reconnaissance and targeted flora and vegetation survey has been conducted over the application area by Maia (2021a) (Appendix A; Appendix H), supplementing an earlier survey by Maia (2020a). Five priority flora taxa occur within the CPS 9303/1 application area, with an additional two taxa recorded in adjacent areas (Section 3.2.1).
Impacts to conservation-significant flora are unspecified (without the provision of a flora and vegetation surveys and analysis).	Two options for proposed clearing were assessed by Maia (2021a) with the preferred option minimising impacts to conservation-significant flora submitted by the applicant (Section 3.2.1). Maia (2021a) provided impact calculations for five priority flora taxa that occur within the application area based on both regional impact and local impact. Results are summarised in Table 2 of Section 3.2.1.
Lack of clearing minimisation	
The application states that the area to be cleared has been chosen to minimise impact to conservation-significant flora. However, no flora survey has been conducted and the statement lacks validity.	Alternative sources for a gravel supply have been assessed by the applicant (Section 3.1). A reconnaissance and targeted flora and vegetation survey has been conducted over the application area by Maia (2021a). Two options for proposed clearing were assessed and impact calculations for five priority flora taxa that occur within the application provided (Section 3.2.1).
A statement of by the applicant states that alternative sources of gravel are <i>less economical</i> . This is not a statement of minimisation and is not a valid reason for clearing natural vegetation when there is likely gravel sources on cleared land within five kilometres of proposed clearing.	Alternative sources for a gravel supply have been assessed by the applicant (Maia and Shire of Dandaragan 2021), and a summary provided in Section 3.1.
Lack of a revegetation plan	

Summary of comments	Consideration of comment
The final land use is stated as <i>revegetated</i> . This statement implies a revegetation plan (that is not supplied) and that there is a reasonable chance of successful revegetation.	A site-specific revegetation plan for the Gravel Pit on reserve R35593 has been provided (Maia 2021b)
The submitter is unaware of any successful revegetation in the area. That the area can be successfully revegetated after gravel extraction is without evidence, and without a plan, and both should be mandated by DWER.	The site-specific revegetation plan for the Gravel Pit on reserve R35593 (Maia 2021b) has been provided and references past revegetation. Revegetation actions and performance indicators will be conditioned within the permit.
Residual impact	
Any residual impacts must be subject to an environmental offset.	Application CPS 9303/1 has been assessed against the ten clearing principles (Section 3; Appendix E). In consideration of avoidance, minimisation and mitigation (revegetation) actions provided by the applicant no residual impact was identified.

Appendix C – Site characteristics

The information provided below describes the key characteristics of the area proposed to be cleared and is based on the best information available to DWER at the time of this assessment. This information was used to inform the assessment of the clearing against the Clearing Principles, contained in Appendix E.

C.1 Site characteristics

Site characteristic	Details
Local context	<p>The application area is part of an expansive tract of native vegetation. It is located wholly within Gravel Reserve R 35593 (Shire of Dandaragan 2021). Reserve R 35593 is bounded by Nature Reserve R 35594 to the west, and Lesueur National Park (R 42032) adjacent to the northern and eastern boundaries.</p> <p>The proposed clearing is located within the Geraldton Sandplains bioregion of Thackway and Cresswell (1995), approximately 215 kilometres north of Perth. Spatial data indicates the local area (10 km radius of the application area) retain approximately 75 per cent of the original native vegetation cover.</p>
Vegetation description (Regional)	<p>The extent, type and status of native vegetation in Western Australia has been assessed by Shepherd <i>et al.</i> (2001) with one vegetation association mapped over the application area. That is:</p> <ul style="list-style-type: none"> Vegetation association 1031 described as - Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath.
Vegetation description (application area)	<p>A vegetation survey (Maia 2021a) indicates the vegetation within the application area consists of one vegetation type (MHL Mixed Heathland) described as:</p> <p>Low mixed Heathland mainly of <i>Calothamnus sanguineus</i>, <i>Banksia shuttleworthiana</i> and <i>Daviesia epiphyllum</i> with a Sparse Shrubland of <i>Xanthorrhoea</i> sp. Lesueur (G.J. Keighery 16404) and an Open mixed Sedgeland of <i>Caustis dioica</i>, <i>Mesomelaena pseudostygia</i> and <i>Mesomelaena tetragona</i>.</p> <p>Survey descriptions and photography of Maia (2021a) is available in Appendix H.</p> <p>The vegetation description of Maia (2021a) is consistent with the mapped vegetation association 1031 (Shepherd <i>et al.</i> 2001).</p>
Vegetation condition	<p>The vegetation survey of Maia (2021a) recorded that the vegetation within the application area is in excellent condition (Keighery 1994). There are several old gravel exploration pits scattered throughout. Native vegetation has mostly regrown in these areas. No weeds were recorded and there was no evidence of dieback or heavy grazing. The Keighery (1994) condition rating scale is provided in Appendix F.</p> <p>Survey descriptions and photography of Maia (2021a) is available in Appendix H.</p>
Conservation areas	<p>The application area is located within section 5(1) (g) reserve R 35593. Under the CALM Act the Shire has held a lease over R 35593 for the designated purpose of “gravel resource management, restoration and conservation” (CALM Act Lease no. 176/100) (see Section 3.3).</p> <p>Bordering the northern and eastern boundaries of R 35593 is Lesueur National Park (R 42032), the border of which is approximately 700 metres north and 1,275 metres east of the application area.</p> <p>Bordering the western edge of R 35593 is Nature Reserve R 35594, the border of which is approximately 150 metres west of the application area.</p>
Ecological linkages	<p>There are no mapped ecological linkages in the local area. Cockleshell Gully Road, approximately 400 metres to the west of the application area, has been designated a conservation value of 7 (medium to high) by the Roadside Conservation Committee.</p>
Climate and Landform	<p>The Geraldton Sandplain bioregion climate can be described as semi-arid Mediterranean climate with 400 millimetre to 500 millimetre annual rainfall (Desmond and Chant 2001).</p> <p>The landform is described as dissected lateritic sandplain on Cretaceous and Jurassic sediments. Bounded in the east by the Dandaragan Scarp and in the south and west by the Gingin Scarp. Sandy and gravelly soils occur formed in colluvium and rock</p>

Site characteristic	Details																																							
	weathered <i>in situ</i> (Desmond and Chant 2001). Griffin and Burbidge (1990) describe the Peron Slopes landform of the Lesueur area as the western slopes of the Lesueur dissected uplands and include the deflated Gingin Scarp. Exposed are a complex of laterites, sands and colluvium typical of much of the Arrowsmith region outside of the Lesueur area.																																							
Soil description	The soil is mapped as the Yerramullah 2 Subsystem (Schoknecht <i>et al.</i> 2004) which is described as plateau residuals, very gently to gently inclined hillcrest and hillslopes; pale sandy gravels, shallow gravel over duricrust, gravelly pale deep sand, pale and yellow deep sands.																																							
Land degradation risk	<p>The Department of Primary Industries and Regional Development (DPIRD), provides a series of soil degradation risk mapping at the sub-system level (DPIRD 2017). The project area is located within one subsystem; the Yerramullah 2 Subsystem of the Yerramullah soil system. The table below summaries the soil degradation risk within the application area. The risk of wind erosion over the application area is high. Acid sulphate soil risk has not been mapped over the application area.</p> <table border="1"> <thead> <tr> <th rowspan="2">Aspect</th> <th colspan="4">Degradation risk</th> </tr> <tr> <th colspan="4">Yerramullah 2 Subsystem</th> </tr> </thead> <tbody> <tr> <td>Wind Erosion</td> <td>H2</td> <td>High</td> <td>>70%</td> <td>of mapped unit has a high to extreme risk</td> </tr> <tr> <td>Waterlogging</td> <td>L1</td> <td>Low</td> <td><3%</td> <td>of mapped unit has a high to extreme risk</td> </tr> <tr> <td>Water Erosion</td> <td>L1</td> <td>Low</td> <td><3%</td> <td>of mapped unit has a high to extreme risk</td> </tr> <tr> <td>Salinity</td> <td>L1</td> <td>Low</td> <td><3%</td> <td>of mapped unit has a high to extreme risk</td> </tr> <tr> <td>Flood Risk</td> <td>L1</td> <td>Low</td> <td><3%</td> <td>of mapped unit has a high to extreme risk</td> </tr> <tr> <td>Phosphorous Export Risk</td> <td>M1</td> <td>Med.</td> <td>10%-30%</td> <td>of mapped unit has a high to extreme risk</td> </tr> </tbody> </table>	Aspect	Degradation risk				Yerramullah 2 Subsystem				Wind Erosion	H2	High	>70%	of mapped unit has a high to extreme risk	Waterlogging	L1	Low	<3%	of mapped unit has a high to extreme risk	Water Erosion	L1	Low	<3%	of mapped unit has a high to extreme risk	Salinity	L1	Low	<3%	of mapped unit has a high to extreme risk	Flood Risk	L1	Low	<3%	of mapped unit has a high to extreme risk	Phosphorous Export Risk	M1	Med.	10%-30%	of mapped unit has a high to extreme risk
Aspect	Degradation risk																																							
	Yerramullah 2 Subsystem																																							
Wind Erosion	H2	High	>70%	of mapped unit has a high to extreme risk																																				
Waterlogging	L1	Low	<3%	of mapped unit has a high to extreme risk																																				
Water Erosion	L1	Low	<3%	of mapped unit has a high to extreme risk																																				
Salinity	L1	Low	<3%	of mapped unit has a high to extreme risk																																				
Flood Risk	L1	Low	<3%	of mapped unit has a high to extreme risk																																				
Phosphorous Export Risk	M1	Med.	10%-30%	of mapped unit has a high to extreme risk																																				
Waterbodies	The desktop assessment and aerial imagery indicated that no geomorphic wetlands occur within, or in the vicinity of, the application area. A minor ephemeral drainage line occurs approximately 300 metres to the south of the application area, and approximately 320 metres to the north of the application area																																							
Hydrogeography	<p>The application area is located within the Arrowsmith Hydrological Zone of Western Australia. The application area:</p> <ul style="list-style-type: none"> • Is located within the Jurien Groundwater Area (Review) proclaimed under the RIWI Act • Is <u>not</u> located within any Surface Water Areas or Irrigation Districts proclaimed under the RIWI Act; • Is <u>not</u> located within any CAWS Act Clearing Control Catchments; and • Is <u>not</u> located within any Public Drinking Water Source Areas. <p>Groundwater has been mapped at 500-1,000 TDS/Mg/L (that is, fresh)</p>																																							

C.2 Vegetation extent

Factor	Pre-European extent (ha)	Current extent (ha)	Extent remaining (%)	Current extent in all DBCA managed lands (ha)	Extent remaining in all DBCA managed lands (prop. of pre-European extent) (%)
IBRA Bioregion					
Geraldton Sandplains (GES)	3,136,038	1,404,424	44.78	568,255	18.12
Vegetation complex					
Association 1031 (in GES)	241,350	83,217	34.48	37,048	15.35
Association 1031 (Total)	269,491	88,668	32.90	37,827	14.04
Local area (10 km)					
Remnant vegetation	32,634	24,654	75.55		

Appendix D – Ecosystem, flora and fauna analysis

D.1 Significant ecosystems

Three significant ecological communities have been mapped regionally within ten kilometres of the application area (Table C3 below). The native vegetation of the application area is not representative of any Threatened Ecological Community (TEC) or Priority Ecological Community (PEC) (Maia 2021a).

Ecological Community	Status (WA)	Closest record (km)	Suitable soil type	Suitable vegetation type	Are surveys adequate
Lesueur-Coomallo Floristic Community M2 (<i>Melaleuca preissiana</i> woodland)	P1	10	No	No	Yes
<i>Petrophile chrysantha</i> low heath on Lesueur dissected uplands (Gp200-170)	P2	6.9	No	No	Yes
Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	P3	0.53	Yes	No	Yes

D.2 Significant flora

D.2.1 Threatened flora

Thirteen threatened flora taxa have been identified from within ten kilometres of the application area (Table D2.1 below). No threatened flora taxa were recorded over the application area (Maia 2021a) or adjacent areas (Maia 2020a; Maia 2021a). With consideration for the site characteristics (Appendix C1), relevant datasets (Appendix K2), and biological survey information (Maia 2017; Maia 2020a; Maia 2020b; Maia 2021a) it is unlikely that threatened flora taxa occur within the application area.

Threatened flora taxa	Status (WA)	Records in local area	Closest record (km)	Suitable soil type	Suitable vegetation type	Are surveys adequate
<i>Grevillea batrachioides</i>	CR	5	4.6	No	Yes	Yes
<i>Grevillea humifusa</i>	CR	1	5.1	No	No	Yes
<i>Hemiandra gardneri</i>	CR	2	4.6	Yes	Yes	Yes
<i>Eucalyptus lateritica</i>	EN	7	4.2	No	No	Yes
<i>Eucalyptus x lateritica</i>	EN	6	4.1	No	No	Yes
<i>Thelymitra stellata</i>	EN	15	3.2	Yes	No	Yes
<i>Banksia catoglypta</i>	VU	1	9.3	No	No	Yes
<i>Eleocharis keigheryi</i>	VU	3	6.6	No	No	Yes
<i>Acacia forrestiana</i>	VU	21	5.3	Yes	No	Yes
<i>Eucalyptus johnsoniana</i>	VU	1	5.7	Yes	Yes	Yes
<i>Eucalyptus suberea</i>	VU	25	3.8	No	No	Yes
<i>Hakea megalosperma</i>	VU	22	4.9	No	Yes	Yes
<i>Paracaleana dixonii</i>	VU	5	4.6	Yes	Yes	Yes

D.2.2 Priority flora

Seventy-nine priority flora taxa have been identified from within ten kilometres of the application area, a sub-set of which have the potential to occur in the habitat of the application area (Table D2.2). Flora surveys over Reserve R 35593 (Maia 2020a; Maia 2021a) have recorded seven priority flora taxa (one Priority 2, five Priority 3 and one Priority 4) of which five (one Priority 2, three Priority 3 and one Priority 4) were recorded over the application area.

Priority flora taxa	Status (WA)	Records in local area	Closest record (km)	Suitable soil type	Suitable vegetation type	Are surveys adequate
<i>Acacia carens</i>	P2	6	4.6	Yes	No	Yes
<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> Cockleshell Gully variant (E.A. Griffin 2039)	P2	4	2.1	Yes	Yes	Yes
<i>Acacia retrorsa</i>	P2	9	0.4	Yes	No	Yes
<i>Boronia scabra</i> subsp. <i>condensata</i>	P2	1	5.9	Yes	Yes	Yes
<i>Daviesia debilior</i> subsp. <i>debilior</i>	P2	2	4.1	Yes	Yes	Yes

<i>Lasiopetalum rutilans</i>	P2	10	1	Yes	No	Yes
<i>Stylidium diplotrichum</i>	P2	5	5.9	Yes	Yes	Yes
<i>Synaphea lesueurensis</i>	P2	13	# * Recorded	Yes	Yes	Yes
<i>Tetralochea remota</i>	P2	6	5.9	Yes	Yes	Yes
<i>Thelymitra pulcherrima</i>	P2	3	4.3	Yes	Yes	Yes
<i>Thysanotus</i> sp. Badgingarra (E.A. Griffin 2511)	P2	1	2.8	Yes	No	Yes
<i>Acacia epacantha</i>	P3	1	7.7	Yes	No	Yes
<i>Allocasuarina grevilleoides</i>	P3	1	4.6	Yes	No	Yes
<i>Banksia kippistiana</i> var. <i>paenepeccata</i>	P3	3	5.7	Yes	Yes	Yes
<i>Calytrix ecalycata</i> subsp. <i>brevis</i>	P3	1	8.9	Yes	Yes	Yes
<i>Daviesia pteroclada</i>	P3	11	3.2	Yes	No	Yes
<i>Guichenotia alba</i>	P3	4	2.8	Yes	Yes	Yes
<i>Haemodorum loratum</i>	P3	6	* Recorded	Yes	Yes	Yes
<i>Hakea longiflora</i>	P3	8	3.4	Yes	Yes	Yes
<i>Hypocalymma gardneri</i>	P3	7	3.4	Yes	No	Yes
<i>Lepidobolus quadratus</i>	P3	5	4.1	Yes	No	Yes
<i>Patersonia argyrea</i>	P3	2	* Recorded	Yes	Yes	Yes
<i>Persoonia filiformis</i>	P3	3	# Recorded	Yes	Yes	Yes
<i>Persoonia rudis</i>	P3	8	# * Recorded	Yes	No	Yes
<i>Stylidium nonscandens</i>	P3		3.4	Yes	No	Yes
<i>Thysanotus anceps</i>	P3	4	4.1	Yes	No	Yes
<i>Verticordia rutilastra</i>	P3	11	# * Recorded	Yes	Yes	Yes
<i>Banksia chamaephyton</i>	P4	1	6	Yes	Yes	Yes
<i>Hakea neurophylla</i>	P4	17	1.4	Yes	Yes	Yes
<i>Thelymitra apiculata</i>	P4	1	4.3	Yes	Yes	Yes
<i>Xanthosia tomentosa</i>	P4	27	# * Recorded	Yes	Yes	Yes

* Recorded by Maia (2021a) within the CPS 9303/1 application area

Recorded by Maia (2020a) immediately adjacent to the CPS 9303/1 application area

D.3 Significant fauna

Eleven vertebrate fauna species of conservation significance and two invertebrate fauna species of conservation significance have been identified from within ten kilometres of the application area (Table D3 below). The application area represents potential habitat for Carnaby's Cockatoo (*Calyptorhynchus latirostris*), the Malleefowl (*Leipoa ocellata*) and the Western Brush Wallaby (*Notamacropus Irma*) (Maia 2020a; Maia 2021a).

Significant fauna		Status (WA)	Records in local area	Closest record (km)	Suitable habitat	Are surveys adequate
Carnaby's Cockatoo	<i>Calyptorhynchus latirostris</i>	EN	76	1.8	Yes	Yes
Malleefowl	<i>Leipoa ocellata</i>	VU	3	4.1	Yes	Yes
Wedge-tailed Shearwater	<i>Ardenna pacifica</i>	MI	1	5.7	No	Yes
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	MI	1	9	No	Yes
Sanderling	<i>Calidris alba</i>	MI	1	5.7	No	Yes
Wood Sandpiper	<i>Tringa glareola</i>	MI	1	9.2	No	Yes
Grey Plover	<i>Pluvialis squatarola</i>	MI	1	5.7	No	Yes
Crested Tern	<i>Thalasseus bergii</i>	MI	1	9.1	No	Yes
Ghost Bat	<i>Macroderma gigas</i>	VU	1	7.7	No	Yes
Western Brush Wallaby	<i>Notamacropus irma</i>	P4	3	4.7	Yes	Yes
Gilled Slender Blue-tongue	<i>Cyclodomorphus branchialis</i>	VU	1	3.9	No	Yes
Kwongan Heath Shield-backed Trapdoor Spider	<i>Idiosoma kwongan</i>	P1		9.2	Yes?	No
Mt Lesueur Shield-backed Trapdoor Spider	<i>Idiosoma gardneri</i>	P2		5.8	Yes?	No

Appendix E – 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 Threatened Species Scientific Committee (TSSC) has identified Biodiversity Hotspots within Australia that include the local area (Mount Lesueur-Eneabba ID 11) due to its floristic diversity. Maia (2021a) recorded 107 species from 31 families and 62 genera within a survey area that included the application area. Flora surveys over Reserve R 35593 (Maia 2020a; Maia 2021a) have recorded seven Priority flora taxa (one Priority 2, five Priority 3 and one Priority 4) of which five (one Priority 2, three Priority 3 and one Priority 4) were recorded over the application area.</p>	May be at variance	Yes Section 3.2.1
<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 application area represents potential habitat for Carnaby’s Cockatoo (<i>Calyptorhynchus latirostris</i>), the Malleefowl (<i>Leipoa ocellata</i>) and the Western Brush Wallaby (<i>Notamacropus Irma</i>) (Maia 2020a; Maia 2021a).</p>	Not likely to be at variance	Yes Section 3.2.2
<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> Thirteen threatened flora taxa have been identified from within ten kilometres of the application area. No threatened flora taxa have been recorded over the application area. Based on flora and vegetation surveys conducted over the application area and surrounding areas (Maia 2020a; Maia 2021a) it is unlikely that threatened flora species occur over the application area (Maia 2020a).</p>	Not at variance	Yes Section 3.2.1
<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> The application area, or areas immediately surrounding, does not contain species assemblages analogous with any TEC’s (Maia 2020a; Maia 2021a; Appendix D1).</p>	Not at variance	No
Environmental values: 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 extend of the native vegetation association 1031 in the local area is consistent with the national objectives and targets for biodiversity conservation in Australia (Commonwealth of Australia 2001) (Appendix C2). Approximately 75.5 per cent remnant vegetation is retained in the local area. Vegetation in the application area is not considered to be part of a significant ecological linkage in the local area.</p>	Not at variance	No
<p><u>Principle (h):</u> “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.”</p> <p><u>Assessment:</u> The application area is located approximately 700 metres north and 1,275 metres east of Lesueur National Park (R 42032), and 350 metres from Nature Reserve R 35594. The application area itself is located within Reserve R 35593 vested in the Western Australian Conservation and Parks Commission, and managed by DBCA.</p>	May be at variance	Yes Section 3.2.3

Assessment against the Clearing Principles	Variance level	Is further consideration required?
Environmental values: land and water resources		
<p><u>Principle (f):</u> <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><u>Assessment:</u> Given there are no defined watercourses, or geomorphic wetlands within the application area, or within the immediate vicinity of the application area, proposed clearing is not likely to impact an environment associated with a watercourse or wetland.</p>	Not at variance	No
<p><u>Principle (g):</u> <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.”</i></p> <p><u>Assessment:</u> The potential for wind erosion over the application area is high if not managed appropriately (Appendix C1).</p>	May be at variance	Yes Section 3.2.4
<p><u>Principle (i):</u> <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><u>Assessment:</u> The absence of waterbodies within the application area, and the shallow depth of clearing required, indicates that the proposed clearing is unlikely to impact surface or groundwater quality.</p>	Not at variance	No
<p><u>Principle (j):</u> <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><u>Assessment:</u> The lack of watercourses in the vicinity of the application area, combined with the permeability of the soils that occur, indicates that proposed clearing is unlikely to cause, or exacerbate, the incidence or intensity of flooding or waterlogging.</p>	Not at variance	No

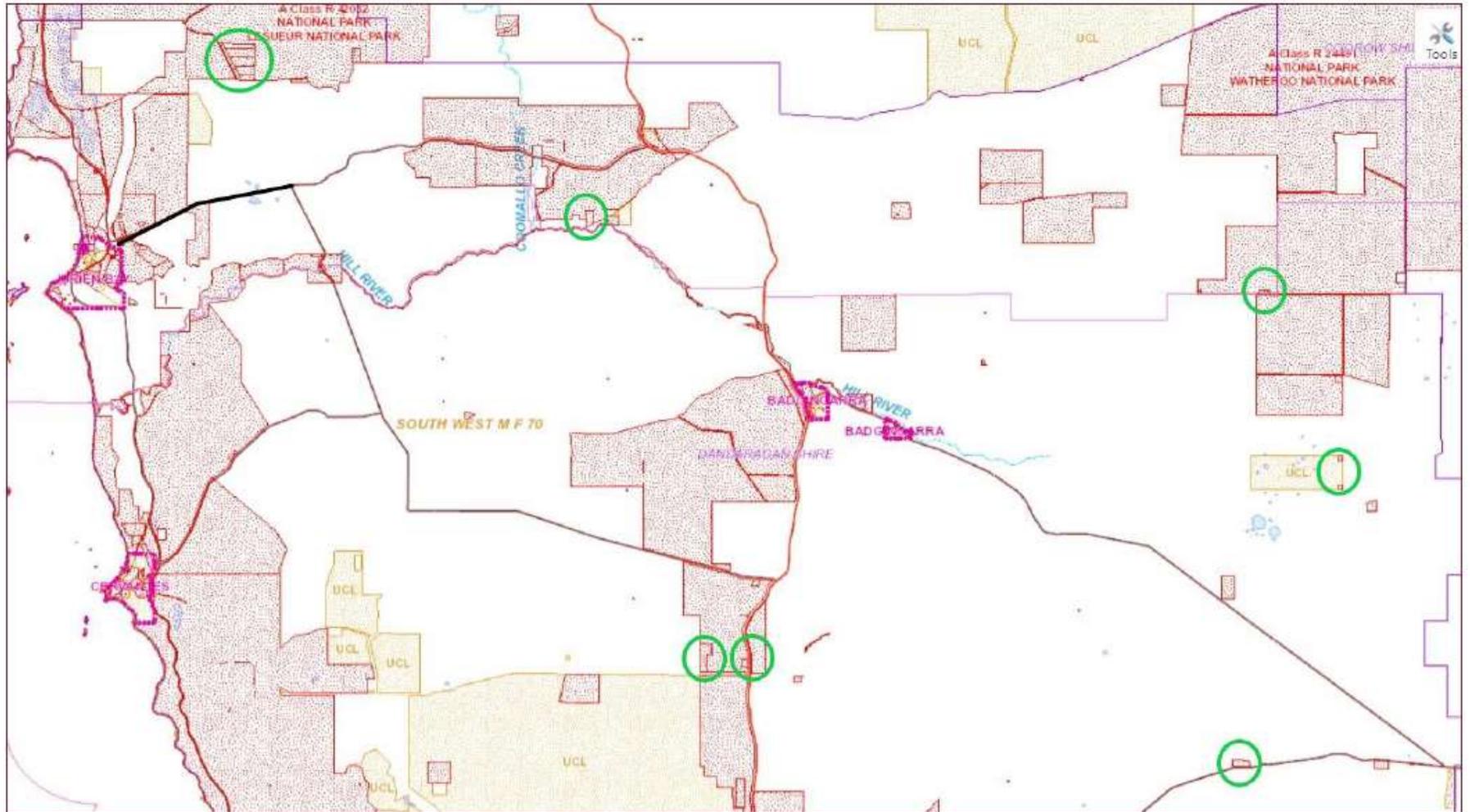
Appendix F – Vegetation condition rating scale

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.

Measuring Vegetation Condition for the South West and Interzone Botanical Province (Keighery, 1994)

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, with disturbance affecting individual species; weeds are non-aggressive species.
Very Good	Vegetation structure altered, with obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and/or grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and/or grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and/or grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Appendix G – Figure: Gravel resources within the Shire of Dandaragan (Maia 2021ab)



Map 1: Gravel Reserves Vested in the Shire of Dandaragan (reserves circled green and Jurien East Road indicated by black line; northwestern circle is Reserve 35593)

Appendix H – Biological survey excerpts

H.1 Vegetation and quadrat data (Maia 2021a)

Shire of Dandaragan: R35593 Gravel Pit, Revegetation Plan



The below information is obtained from the targeted flora, vegetation and vertebrate fauna reconnaissance survey report by Maia (2021a) and associated priority flora impact analysis. Surveys were undertaken over the application area as well as a broader area immediately surrounding the application area.

Vegetation type code (broad floristic formation)	Associated species
<p>Full description</p> <p>Area mapped (ha) (percent of Survey Area)</p>	
<p>MHL (Mixed Heathland)</p> <p>Low mixed Heathland mainly of <i>Calothamnus sanguineus</i>, <i>Banksia shuttleworthiana</i> and <i>Daviesia epiphyllum</i> with a Sparse Shrubland of <i>Xanthorrhoea</i> sp. Lesueur (G.J. Keighery 16404) and an Open mixed Sedgeland of <i>Caustis dioica</i>, <i>Mesomelaena pseudostygia</i> and <i>Mesomelaena tetragona</i>.</p> <p>Covers 18.38 ha (100% of the Survey Area).</p>	<p><i>Allocasuarina microstachya</i>, <i>A. humilis</i>, <i>Babingtonia grandiflora</i>, <i>Banksia tridentata</i>, <i>Eremaea violacea</i> subsp. <i>raphiophylla</i>, <i>Georgeantha hexandra</i>, <i>Hibbertia striata</i>, <i>Isopogon dubius</i>, <i>Scaevola canescens</i>, <i>Stylidium diuroides</i> subsp. <i>paucifoliatum</i>.</p>



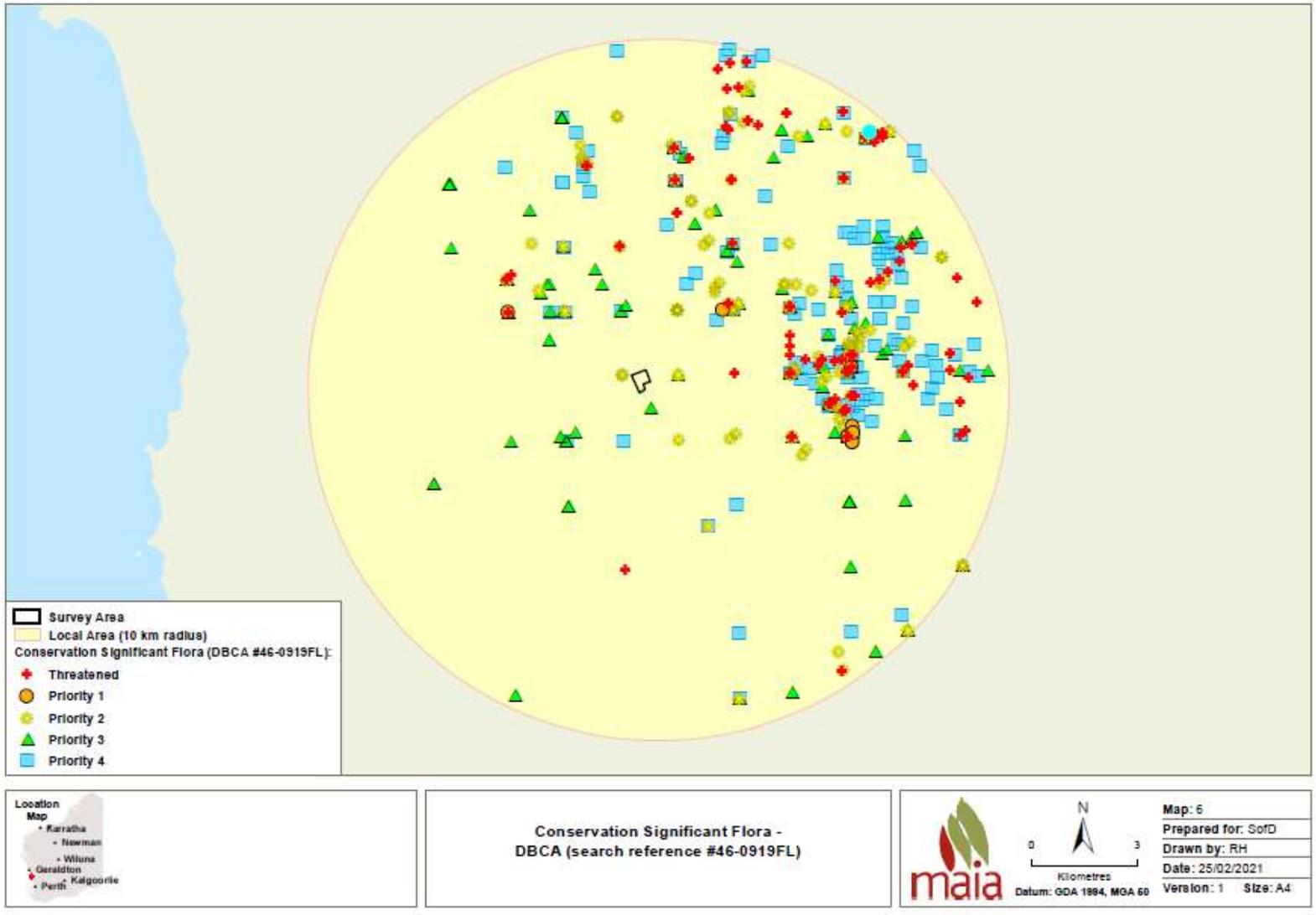
Table 14: Quadrat information and photo points

Quadrat:	GP1	Described by:	Christina Cox and Michael Pezzaniti		Date:	14/10/2019	Photo:
Location (GDA94):	MG450	321143	mE	6660971	mN		
Habitat:	Low rolling hill gentle west facing slope (midslope)						
Soil:	White fine sand loose soil (50%)						
Rocks:	Laterite gravel (10%)						
Mapped as:	MHL						
Vegetation Association:	Open Low Shrubland of <i>Isopogon dubius</i> and <i>Banksia armata</i> var. <i>armata</i> with an Open Sedgeland of <i>Caustis dioica</i> , <i>Mesomelaena pseudostygia</i> with <i>Georgeantha hexandra</i> and Sparse Mid Shrubland of <i>Xanthorrhoea</i> sp. Lesueur (G.J. Keighery 16404)						
Vegetation Condition:	Excellent						
Disturbances:	Feral animals and grazing						
Fire Age:	None evident						
Species:	<i>Acacia acutaria</i> , <i>Allocasuarina microstachya</i> , <i>Anigozanthos humilis</i> subsp. <i>humilis</i> , <i>Astroloma glaucescens</i> , <i>Babingtonia grandiflora</i> , <i>Banksia armata</i> var. <i>armata</i> , <i>Banksia bipinnatifida</i> subsp. <i>bipinnatifida</i> , <i>Banksia dallanneyi</i> subsp. <i>dallanneyi</i> var. <i>dallanneyi</i> , <i>Banksia micrantha</i> , <i>Calothamnus sanguineus</i> , <i>Caustis dioica</i> , <i>Chorizema aciculare</i> subsp. <i>laxum</i> , <i>Conostylis aurea</i> , <i>Conostylis</i> sp. Indet., <i>Darwinia sanguinea</i> , <i>Daviesia incrassata</i> subsp. <i>incrassata</i> , <i>Diplolaena ferruginea</i> , <i>Eremaea violacea</i> subsp. <i>raphiophylla</i> , <i>Gastrolobium ?retusum</i> , <i>Georgeantha hexandra</i> , <i>Haemodorum loratum</i> (P3), <i>Haemodorum venosum</i> , <i>Hakea ?prostrata</i> , <i>Hakea auriculata</i> , <i>Hakea neospathulata</i> , <i>Hibbertia aurea</i> , <i>Isopogon dubius</i> , <i>Isopogon inconspicuus</i> , <i>Lambertia multiflora</i> var. <i>multiflora</i> , <i>Leptospermum spinescens</i> , <i>Melaleuca trichophylla</i> , <i>Mesomelaena pseudostygia</i> , <i>Petrophile brevifolia</i> subsp. <i>brevifolia</i> , <i>Scaevola canescens</i> , <i>Schoenus</i> aff. <i>pleiostemoneus</i> EAG 1991, <i>Stylidium cygnorum</i> , <i>Stylidium diuroides</i> subsp. <i>paucifoliatum</i> , <i>Xanthorrhoea</i> sp. Lesueur (G.J. Keighery 16404), <i>Xanthosia tomentosa</i> (P4)						
Quadrat:	GP2	Described by:	Christina Cox and Michael Pezzaniti		Date:	14/10/2019	Photo:
Location (GDA94):	MG450	321103	mE	6660834	mN		
Habitat:	Low rolling hill gentle west facing slope (midslope)						
Soil:	White fine sand loose soil (50%)						
Rocks:	No rocks						
Mapped as:	MHL						
Vegetation Association:	Open Low Shrubland of <i>Isopogon dubius</i> and <i>Banksia sclerophylla</i> with an Open Sedgeland of <i>Caustis dioica</i> , <i>Mesomelaena pseudostygia</i> with <i>Georgeantha hexandra</i> and Sparse Mid Shrubland of <i>Xanthorrhoea</i> sp. Lesueur (G.J. Keighery 16404)						
Vegetation Condition:	Excellent						
Disturbances:	Feral animals and grazing						
Fire Age:	None evident						
Species:	<i>Allocasuarina humilis</i> , <i>Allocasuarina microstachya</i> , <i>Astroloma glaucescens</i> , <i>Babingtonia grandiflora</i> , <i>Banksia armata</i> var. <i>armata</i> , <i>Banksia micrantha</i> , <i>Banksia sclerophylla</i> , <i>Banksia tridentata</i> , <i>Calothamnus sanguineus</i> , <i>Calectasia narragara</i> , <i>Caustis dioica</i> , <i>Conostylis</i> sp. Indet., <i>Dampiera spicigera</i> , <i>Daviesia epiphyllum</i> , <i>Daviesia nudiflora</i> subsp. <i>nudiflora</i> , <i>Eremaea violacea</i> subsp. <i>raphiophylla</i> , <i>Eucalyptus todtiana</i> , <i>Gastrolobium abovatum</i> , <i>Georgeantha hexandra</i> , <i>Grevillea synapheae</i> subsp. <i>pachyphylla</i> , <i>Haemodorum loratum</i> (P3), <i>Hakea auriculata</i> , <i>Hakea conchifolia</i> , <i>Hakea flabellifolia</i> , <i>Hakea incrassata</i> , <i>Hibbertia aurea</i> , <i>Isopogon dubius</i> , <i>Isopogon inconspicuus</i> , <i>Mesomelaena pseudostygia</i> , <i>Orianthera spermacocae</i> , <i>Petrophile brevifolia</i> subsp. <i>brevifolia</i> , <i>Petrophile macrostachya</i> , <i>Pimelea sulphurea</i> , <i>Scaevola canescens</i> , <i>Schoenus</i> aff. <i>pleiostemoneus</i> EAG 1991, <i>Stylidium cygnorum</i> , <i>Tetralix octandra</i> , <i>Thysanotus patersonii</i> , <i>Verticordia pennigera</i> , <i>Xanthorrhoea</i> sp. Lesueur (G.J. Keighery 16404)						

Quadrat:	GP3	Described by:	Christina Cox and Michael Pezaraniti		Date:	14/10/2019	Photo:
Location (GDA94):	MGA50	321003	mE	6661078	mN		
Habitat:	Low rolling hill gentle west facing slope (midslope)						
Soil:	White fine sand loose soil (50%)						
Rocks:	Laterite gravel (5%)						
Mapped as:	MHL						
Vegetation Association:	Open Low Shrubland of <i>Allocasuarina microstachya</i> , <i>Banksia armata</i> var. <i>armata</i> and <i>Isopogon dubius</i> with an Open Sedgeland of <i>Caustis dioica</i> and <i>Mesomelaena pseudostygia</i> with <i>Georgeantha hexandra</i> and Isolated Shrubs of <i>Xanthorrhoea</i> sp. Lesueur (G.J. Keighery 16404)						
Vegetation Condition:	Excellent						
Disturbances:	Kangaroo scats in plot						
Fire Age:	None evident						
Species:	<p><i>Acacia auronitens</i>, <i>Allocasuarina humilis</i>, <i>Allocasuarina microstachya</i>, <i>Astroloma glaucescens</i>, <i>Banksia armata</i> var. <i>armata</i>, <i>Banksia dallanneyi</i> var. <i>dallanneyi</i>, <i>Banksia micrantha</i>, <i>Banksia shuttleworthiana</i>, <i>Calothamnus sanguineus</i>, <i>Caustis dioica</i>, <i>Chordifex sinuosus</i>, <i>Charizema aciculare</i> subsp. <i>laxum</i>, <i>Conostylis aurea</i>, <i>Cristonia biloba</i> subsp. <i>biloba</i>, <i>Cryptandra</i> sp., <i>Daviesia epiphyllum</i>, <i>Daviesia nudiflora</i> subsp. <i>nudiflora</i>, <i>Diplolaena ferruginea</i>, <i>Georgeantha hexandra</i>, <i>Grevillea synapheae</i> subsp. <i>pachyphylla</i>, <i>Hakea incrassata</i>, <i>Hakea neospathulata</i>, <i>Hibbertia aurea</i>, <i>Isopogon dubius</i>, <i>Isopogon inconspicuus</i>, <i>Leptospermum spinescens</i>, <i>Melaleuca trichophylla</i>, <i>Mesomelaena pseudostygia</i>, <i>Orientera spermacocoea</i>, <i>Petrophile brevifolia</i> subsp. <i>brevifolia</i>, <i>Pimelea sulphurea</i>, <i>Platysace xerophila</i>, <i>Scaevola canescens</i>, <i>Schoenus</i> aff. <i>pleiastemoneus</i> EAG 1991, <i>Stylidium diuroides</i> subsp. <i>diuroides</i>, <i>Synaphea lesueurensis</i> (P2), <i>Verticordia pennigera</i>, <i>Xanthorrhoea</i> sp. Lesueur (G.J. Keighery 16404)</p>						
Photo points:							
							

Note: photograph on left = northwest photo point location shown on Map 5 (Section 11), photograph on right = central/eastern photo point location shown on Map 5 (Section 11).

H.2 Priority flora analysis





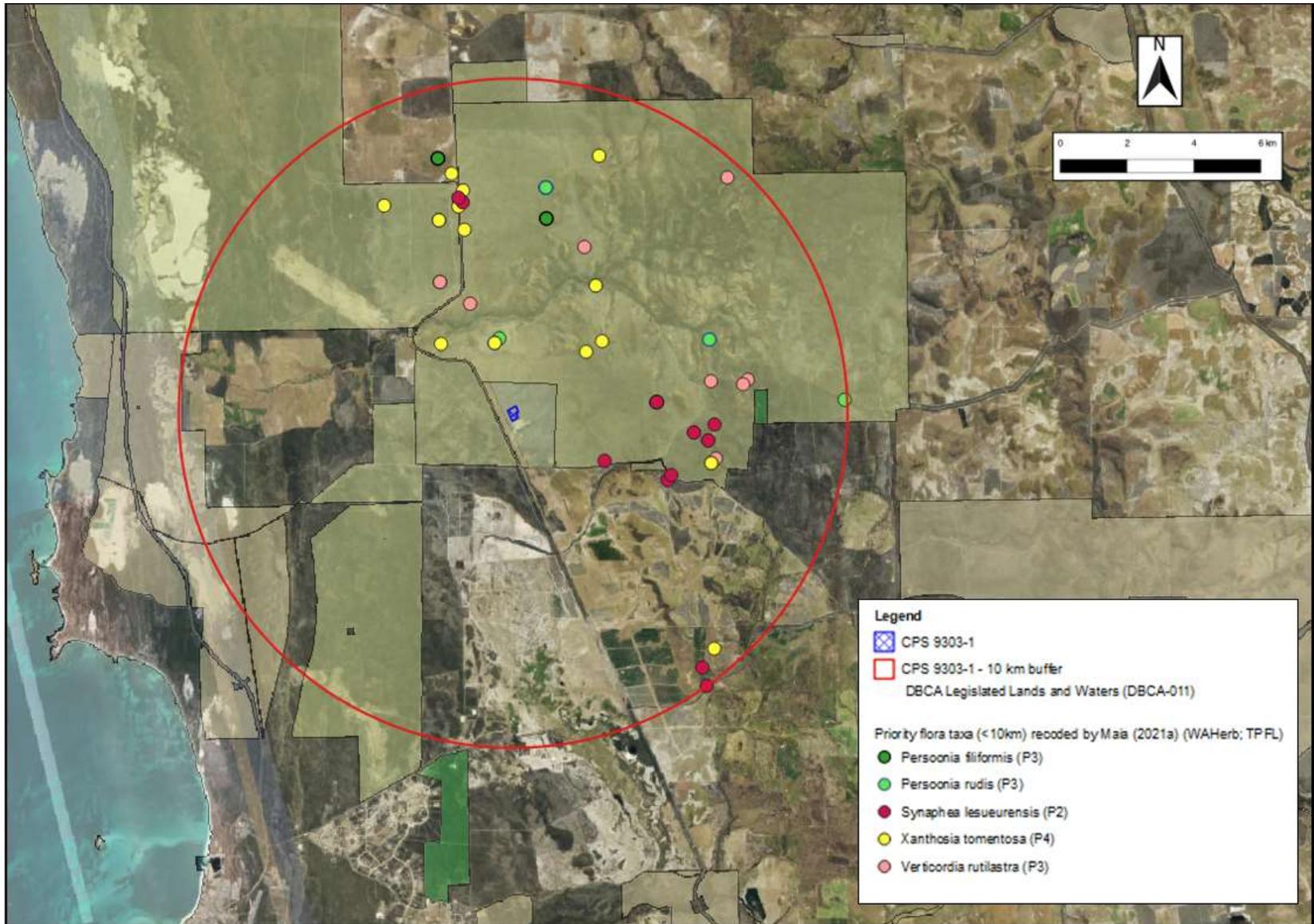
- Survey Area
 Proposed Impact Area (Option 2)
 Proposed Impact Area (Option 3)
 Conservation Significant Flora (Maia, current survey):
● *Synaphea lesueurensis* (dead, P2)
◆ *Persoonia filiformis* (P3)
● *Persoonia rudis* (P3)
▲ *Verticordia rutilastra* (P3)
▲ *Verticordia ?rutilastra* (potential P3)
✕ *Xanthosia tomentosa* (P4)



Conservation Significant Flora (Survey Results)

Datum: GDA 1994, MGA 50

Map: 9
Prepared for: SofD
Drawn by: RH
Date: 25/02/2021
Version: 1 Size: A4



Records of Priority flora taxa within 10 kilometres of the application area that were recorded by Maia (2021a) (WAHerb; TPFL)

Table 6: Known records for and distribution of conservation significant flora species recorded in the Survey Area

Species	Rank	Plants						Populations						
		WA (regional area) records known to Maia (#)	Local area records (#)	Current 2020 gravel pit survey area records (#)	Option 2 PCA records (#)	Regional impact from Option 2 PCA (%)	Local area impact from Option 2 PCA (%)	WA (regional) pops. known to Maia (#)	Local area pops. (#)	Current 2020 gravel pit survey area pops. (#)	Option 2 PCA pops. (#)	Regional impact from Option 2 PCA (%)	Local area impact from Option 2 PCA (%)	Local area populations protected in DBCA Legislated Lands and Waters (IUCN I-IV only) (%)
<i>Synaphea lesueurensis</i>	P2	356	343	9	1	0.28	0.29	11	8	1	1	9.09	12.50	62.50
<i>Synaphea</i> sp. Indet.	Potential CSF	0	0	0	0	0	0	1	1	0	0	0	0	0
<i>Synaphea lesueurensis</i> (live and dead) and <i>S.</i> sp. Indet.	P2	356	343	9	1	0.28	0.29	11	8	1	1	9.09	12.50	62.50
<i>Persoonia filiformis</i>	P3	315	84	77	35	11.11	41.67	23	4	1	1	4.35	25.00	50.00
<i>Persoonia rudis</i>	P3	99	42	20	2	2.02	4.76	49	6	1	1	2.04	16.67	66.67
<i>Verticordia rutilastra</i>	P3	943	48	34	31	3.29	64.58	34	9	1	1	2.94	11.11	88.89
<i>Verticordia ? rutilastra</i>	?P3	3	3	3	0	0	0	1	1	1	0	0	0	0
<i>Verticordia rutilastra</i> and <i>V. ? rutilastra</i>	P3	946	51	37	31	3.28	60.78	34	9	1	1	2.94	11.11	88.89
<i>Xanthosia tomentosa</i>	P4	4,857	1,803	154	75	1.54	4.16	32	13	1	1	3.13	7.69	76.92

Note:

Column 1: *Synaphea* sp. Indet. is likely another record for *Synaphea lesueurensis* and, using the Precautionary Principle, has been included in the impact calculations, as have the dead *Synaphea lesueurensis* plants located in the current Survey Area. Similarly, *Verticordia ? rutilastra* located in the Survey Area has been combined with *Verticordia rutilastra* for these impact calculations.

Column 2: = P2, P3, P4 = Priority 2, 3 and 4 species.

Column 3: = Includes FloraBase (WAH, 1998-), NatureMap (DBCA, 2007-), TPFL and WAHERB records (DBCA searches carried out for Shire of Dandaragan - search references #46-0919FL and #12-0416FL) as well as records from Maia's database (including those from the adjacent gravel pit area surveyed in spring 2019).

Column 4: Local area records = the number of plants known to Maia and occurring within 10 km of the centre of the proposed clearing area (PCA).

Column 5: Records from the current Survey Area.

Column 6: Two clearing area options were investigated by the Shire and Option 2, a smaller area with lower impacts, has been chosen.

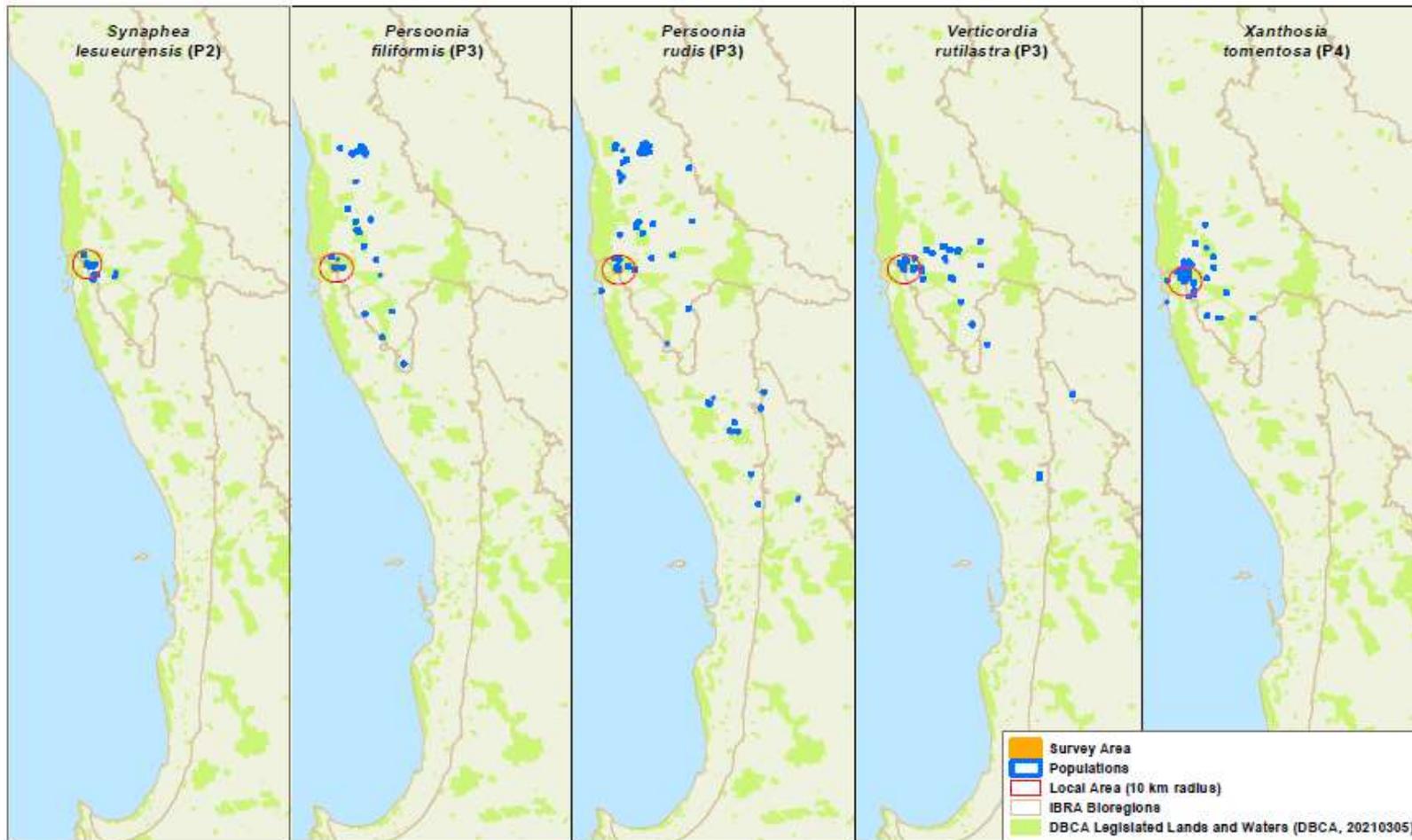
Columns 7 and 8: Impact to *Synaphea lesueurensis*, *Verticordia rutilastra* and *Xanthosia tomentosa* from clearing approved under CPS 8859-1 in an adjacent gravel pit area has been included in these calculations.

Columns 9 to 12: Populations defined using DBCA's method i.e., plant locations were buffered by 500 m and discrete populations (those where there was no overlap) were counted.

Column 15: Number of populations within IUCN I-IV DBCA Legislated Lands and Waters (DBCA, 2017).

Verticordia rutilastra: At one location 29 *V. rutilastra* plants were recorded; however, both *V. rutilastra* (P3) and *V. nobilis* (not significant) occurred in the Survey Area and close to one another and it is likely that some of the 29 plants were *V. nobilis* and not *V. rutilastra*. Adopting the precautionary principle, the 29 plants have been listed as *V. rutilastra*.

Distribution of Priority flora recorded over the application area



Distribution of Conservation Significant Flora in WA

maia

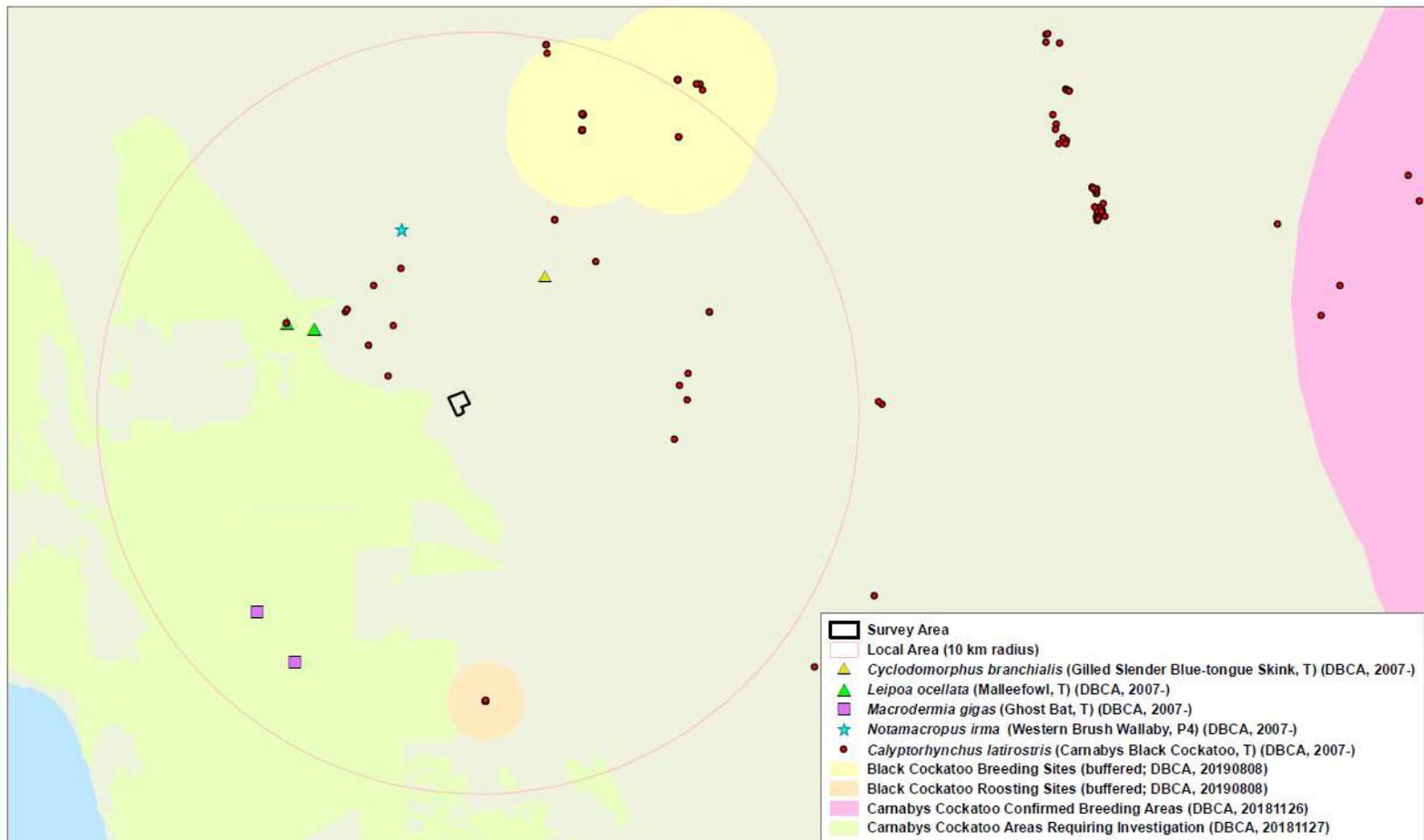
Datum: GDA 1994, MGA 60

0 50
Kilometres

N

Map: 10
Prepared for: SoFD
Drawn by: RH
Date: 17/03/2021
Version: 1 Size: A4

H.3 Significant fauna (Maia 2021a)



Conservation Significant Fauna -
DBCA and NatureMap Records



Map: 7
Prepared for: SofD
Drawn by: RH
Date: 25/02/2020
Version: 1 Size: A4

Appendix I – Past clearing and revegetation in Crown Reserve 35593

Table 2: Past clearing and revegetation in Reserve 35593

Google Earth Imagery of Gravel Extraction Area June 2006 to August 2018



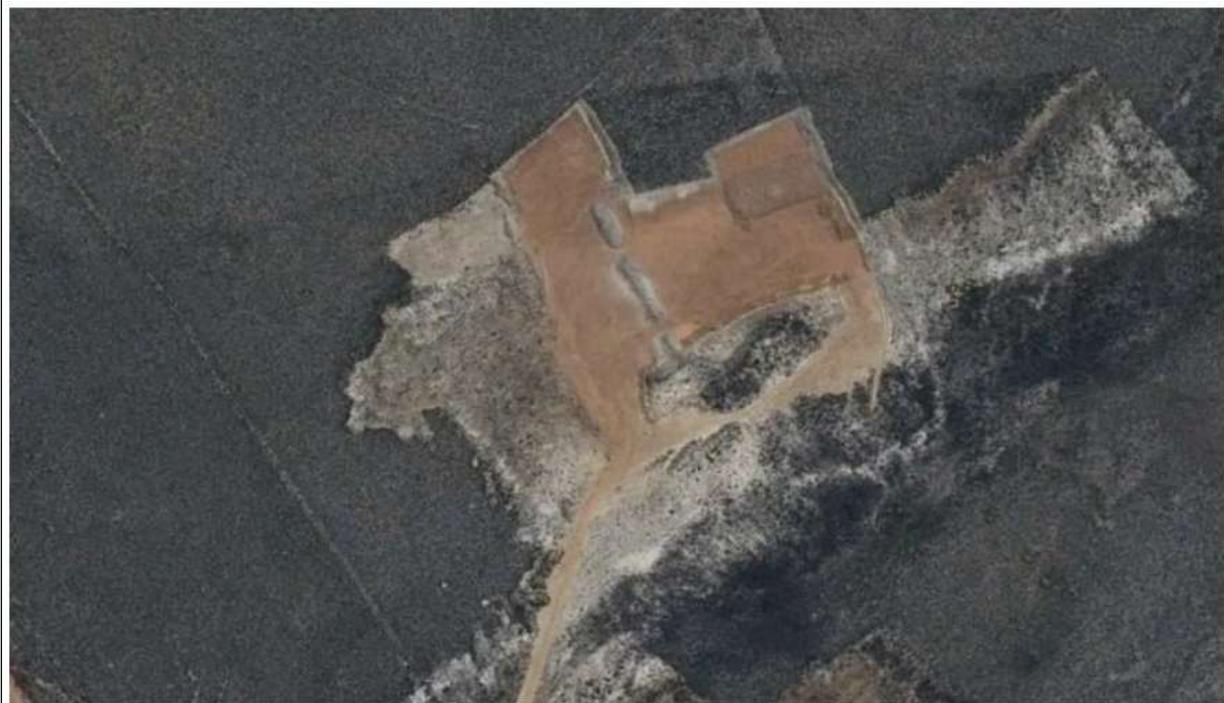
Google Earth Imagery, June 2006



Google Earth Imagery, March 2011 (a fire appears to have affected large sections of the surrounding area)



Google Earth Imagery, October 2013



Google Earth Imagery, October 2015



Google Earth Imagery, August 2018

Appendix J – Revegetation Plan completion targets and criteria (Maia 2021b)

Criterion	Baseline Floristic Data	Completion Targets	Completion Criteria
A (i)	Site species richness is 68 (there were no weed species).	Minimum of 60% of native species returned, based on reference sites.	Forty-one species based on a minimum of 60% of native species returned.
A (ii)	Species richness at the three 10 m x 10 m reference site quadrats was 32, 38 and 41 with an average of 37.	Minimum of 60% of native species returned, based on reference sites.	A minimum of 22 native species should be recorded from revegetation area sites.
A (iii)	One dominant tree-like species was recorded in the quadrats - <i>Xanthorrhoea</i> sp. Lesueur.	Return dominant tree species present at reference sites.	<i>Xanthorrhoea</i> sp. Lesueur should be recorded in the revegetation area sites.
A (iv)	Shrub species richness is 44.	Minimum of 60% of native species returned, based on reference sites.	The revegetation area sites need to have a minimum of 26 shrub species.
B (i)	The common tree-like monocot species is <i>Xanthorrhoea</i> sp. Lesueur (383 stems/ha).	Minimum of 60% of stems/ha for dominant tree species returned, based on reference sites.	The revegetation area needs a minimum of 230 <i>Xanthorrhoea</i> sp. Lesueur stems/ha.
B (ii)	Counts from the three reference site quadrats assessed, resulted in 3,416 stems / ha of the dominant shrub genera (<i>Melaleuca</i> , <i>Isopogon</i> , <i>Allocasuarina</i> and <i>Banksia</i>).	Minimum of 60% of stems/ha counted for dominant shrub genera returned, based on reference sites.	The revegetation area needs a minimum of a combined 2,050 stems / ha for <i>Melaleuca</i> <i>Isopogon</i> <i>Allocasuarina</i> and <i>Banksia</i> species.
C	Average percentage cover at the reference sites is 1% for herbs and 4% for sedges. The average cover for all herbs and sedges is 5%. No grasses were recorded in the reference sites.	Minimum of the overall average of 2% for total herb and sedges percentage cover returned based on reference sites.	The revegetation area needs a minimum of 2% cover for herbs and sedges.
D (i)	No weed species were recorded in the quadrats.	Weed cover should be no greater than that at the reference sites.	The revegetation sites should have 0% weed cover.
D (iii)	No declared weeds are present.	Managed as required by the Biosecurity and Agriculture Management Regulations 2013.	No declared weeds.
E	The bare ground average for the reference sites is 50%.	No more than 10% greater than in the reference sites.	Revegetation site average bare ground is to be no more than 60%, based on the average for the quadrats.

Appendix K – References and databases

K.1 References

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K.2 GIS databases

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

- 10 Metre Contours (DPIRD-073)
- Aboriginal Heritage Places (DPLH-001)
- Aboriginal Heritage Places (DPLH-001)
- Cadastre (LGATE-218)
- Cadastre Address (LGATE-002)
- Contours (DPIRD-073)
- 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)
- Flood Risk (DPIRD-007)
- Groundwater Salinity Statewide (DWER-026)
- Hydrography – Inland Waters – Waterlines
- Hydrological Zones of Western Australia (DPIRD-069)
- IBRA Vegetation Statistics
- Imagery
- Local Planning Scheme – Zones and Reserves (DPLH-071)
- Native Title (ILUA) (LGATE-067)
- Pre-European Vegetation Statistics
- Remnant Vegetation, All Areas
- Native Vegetation Extent (DPIRD-005)
- Public Drinking Water Source Areas (DWER-033)
- Ramsar Sites (DBCA-010)
- RIWI Act, Groundwater Areas (DWER-034)
- RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037)

- Soil Landscape Land Quality – Flood Risk (DPIRD-007)
- Soil Landscape Land Quality – Phosphorus Export Risk (DPIRD-010)
- Soil Landscape Land Quality – Subsurface Acidification Risk (DPIRD-011)
- Soil Landscape Land Quality – Water Erosion Risk (DPIRD-013)
- Soil Landscape Land Quality – Water Repellence Risk (DPIRD-014)
- Soil Landscape Land Quality – Waterlogging Risk (DPIRD-015)
- Soil Landscape Land Quality – Wind Erosion Risk (DPIRD-016)
- Soil Landscape Mapping – Best Available
- Soil Landscape Mapping – Systems
- Wheatbelt Wetlands Stage 1 (DBCA-021)

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)