



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

PERMIT DETAILS

Area Permit Number: CPS 9856/1
File Number: DWERVT10838
Duration of Permit: From 18 December 2022 to 18 December 2029

PERMIT HOLDER

City of Joondalup

LAND ON WHICH CLEARING IS TO BE DONE

Lot 14054 on Deposited Plan 220953, Craigie

AUTHORISED ACTIVITY

The permit holder must not clear more than 0.005 hectares of *native vegetation* within the area cross-hatched yellow in Figure 1 of Schedule 1.

CONDITIONS

1. Period during which clearing is authorised

The permit holder must not clear any *native vegetation* after 18 December 2024.

2. Avoid, minimise, and reduce impacts and extent of clearing

In determining the *native vegetation* authorised to be cleared under this permit, the permit holder must apply the following principles, set out in descending order of preference:

- (a) avoid the clearing of *native vegetation*;
- (b) minimise the amount of *native vegetation* to be cleared; and
- (c) reduce the impact of clearing on any environmental value.

3. Weed and dieback management

When undertaking any clearing authorised under this permit, the permit holder must take the following measures to minimise the risk of introduction and spread of *weeds* and *dieback*:

- (a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
- (b) ensure that no known *dieback* or *weed*-affected soil, *mulch*, *fill*, or other material is brought into the area to be cleared; and
- (c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

4. **Revegetation (Bush Forever mitigation)**

- (a) The permit holder shall establish and maintain a minimum of 0.01 hectares of *native vegetation* within the areas cross-hatched red in Figure 2 of Schedule 1 in accordance with the following conditions:
 - (i) ensuring only *local provenance* seeds and propagating material are used to *revegetate* and *rehabilitate*
 - (ii) the *revegetation* shall be established and maintained to an average planting density of four stems per square metre;
 - (iii) the *revegetation* composition shall include vegetation resistant to wind erosion;
 - (iv) undertake weed control activities on an 'as needs' basis to ensure success of *revegetation*;
 - (v) the *revegetation* is to commence before 30 June 2023.
- (b) Within 24 months of undertaking *revegetation* in accordance with condition 4(a) of this permit, the permit holder must:
 - (i) determine the species composition, structure and density of the *revegetation*; and
 - (ii) where, in the opinion of an *environmental specialist*, the composition, structure and density determined under condition 4(b)(i) of this permit will not result in a similar composition, structure and density to that set out in condition 4(a) of this permit, the permit holder must undertake additional *planting* or *direct seeding* of native vegetation to achieve this outcome.

5. **Fauna management - direction of clearing**

The permit holder shall conduct clearing in a slow progressive manner towards adjacent *native vegetation* to allow fauna to move into adjacent *native vegetation* ahead of the clearing activity.

6. **Records that must be kept**

The permit holder must maintain records relating to the listed relevant matters in accordance with the specifications detailed in Table 1.

Table 1: Records that must be kept

No.	Relevant matter	Specifications
1.	In relation to the authorised clearing activities generally	<ul style="list-style-type: none"> (a) the species composition, structure, and density of the cleared area; (b) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings; (c) the date that the area was cleared; (d) the direction that clearing was undertaken; (e) the size of the area cleared (in hectares); (f) actions taken to avoid, minimise, and reduce the impacts and extent of clearing in accordance with condition 2 of this permit; and (g) actions taken to minimise the risk of the introduction and spread of <i>weeds</i> and <i>dieback</i> in accordance with condition 3 of this permit.
2.	In relation to the required <i>revegetation</i> activities generally	<ul style="list-style-type: none"> (a) the species composition, structure, and density of the cleared area; (b) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994/2020 (GDA94/20), expressing the geographical coordinates in Eastings and Northings; (c) a copy of the <i>environmental specialist's</i> report; (d) a description of the <i>revegetation</i> activities undertaken; and (e) any remedial actions required to be undertaken.

7. Reporting

The permit holder must provide to the *CEO* the records required under condition 6 of this permit when requested by the *CEO*.

DEFINITIONS

In this permit, the terms in Table 2 have the meanings defined.

Table 2: Definitions

Term	Definition
CEO	Chief Executive Officer of the department responsible for the administration of the clearing provisions under the <i>Environmental Protection Act 1986</i> .
clearing	has the meaning given under section 3(1) of the EP Act.
condition	a condition to which this clearing permit is subject under section 51H of the EP Act.
fill	means material used to increase the ground level, or to fill a depression.
dieback	means the effect of <i>Phytophthora</i> species on native vegetation.
direct seeding	means a method of re-establishing vegetation through the establishment of a seed bed and the introduction of seeds of the desired plant species.
department	means the department established under section 35 of the <i>Public Sector Management Act 1994</i> (WA) and designated as responsible for the administration of the EP Act, which includes Part V Division 3.
environmental specialist	means a person who holds a tertiary qualification in environmental science or equivalent, and has experience relevant to the type of environmental advice that an environmental specialist is required to provide under this permit, or who is approved by the CEO as a suitable environmental specialist
EP Act	<i>Environmental Protection Act 1986</i> (WA)
local provenance	means native vegetation seeds and propagating material from natural sources within 25 kilometres and the same Interim Biogeographic Regionalisation for Australia (IBRA) subregion of the area cleared.
mulch	means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation.
native vegetation	has the meaning given under section 3(1) and section 51A of the EP Act.
planting	means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species.
regeneration	means re-establishment of vegetation from in situ seed banks and propagating material (such as lignotubers, bulbs, rhizomes) contained either within the topsoil or seed-bearing mulch.
revegetation	means the re-establishment of a cover of local provenance native

Term	Definition
	vegetation in an area using methods such as natural regeneration, direct seeding and/or planting, so that the species composition, structure and density is similar to pre-clearing vegetation types in that area.
weed/s	<p>means any plant –</p> <ul style="list-style-type: none"> (a) that is a declared pest under section 22 of the <i>Biosecurity and Agriculture Management Act 2007</i>; or (b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or (c) not indigenous to the area concerned.

END OF CONDITIONS



Mathew Gannaway
MANAGER
NATIVE VEGETATION REGULATION

*Officer delegated under Section 20
of the Environmental Protection Act 1986*

24 November 2022

SCHEDULE 1

The boundary of the area authorised to be cleared is shown in the map below (Figure 1) and the following map shows the area in which revegetation will occur (Figure 2).

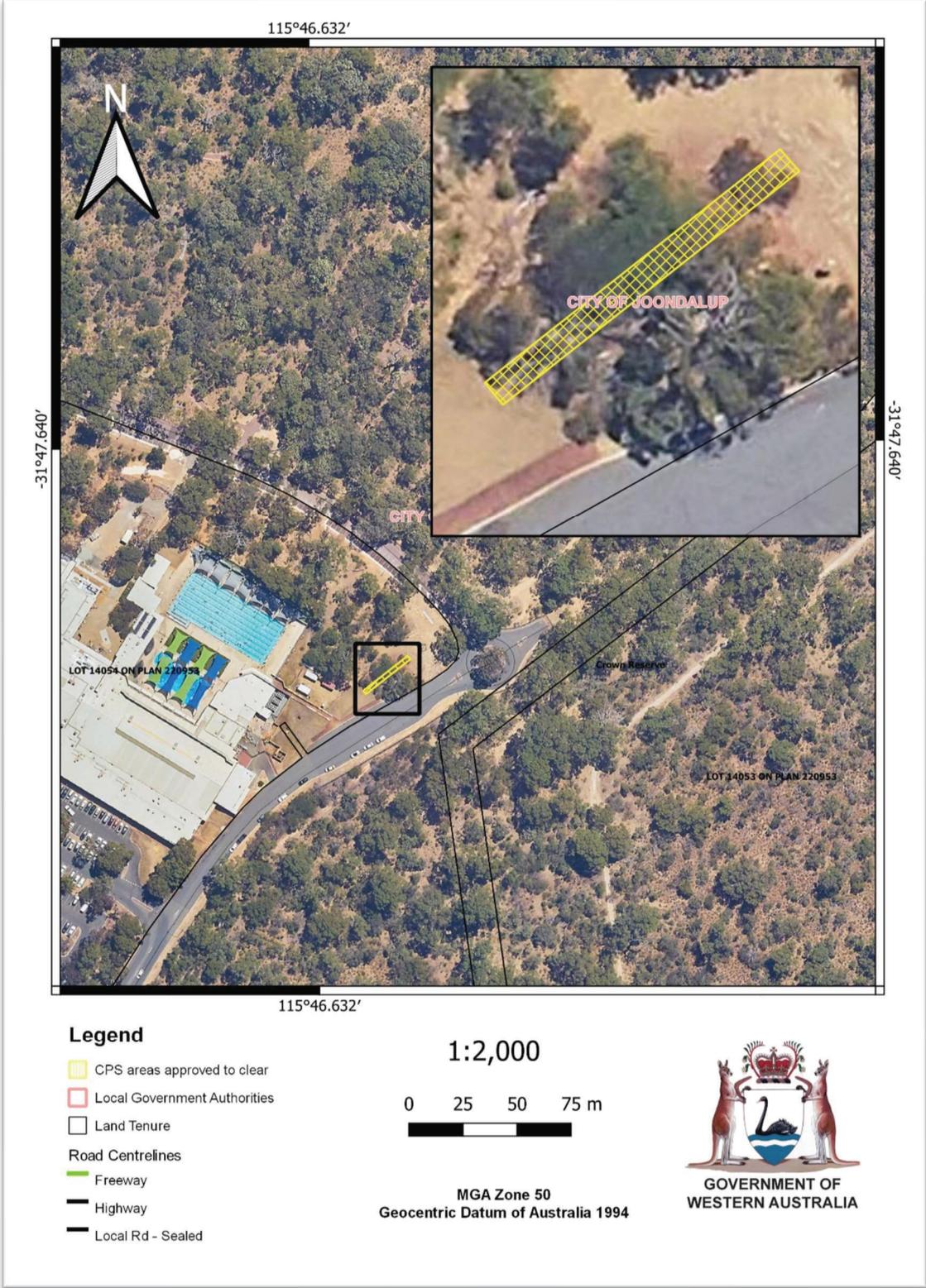
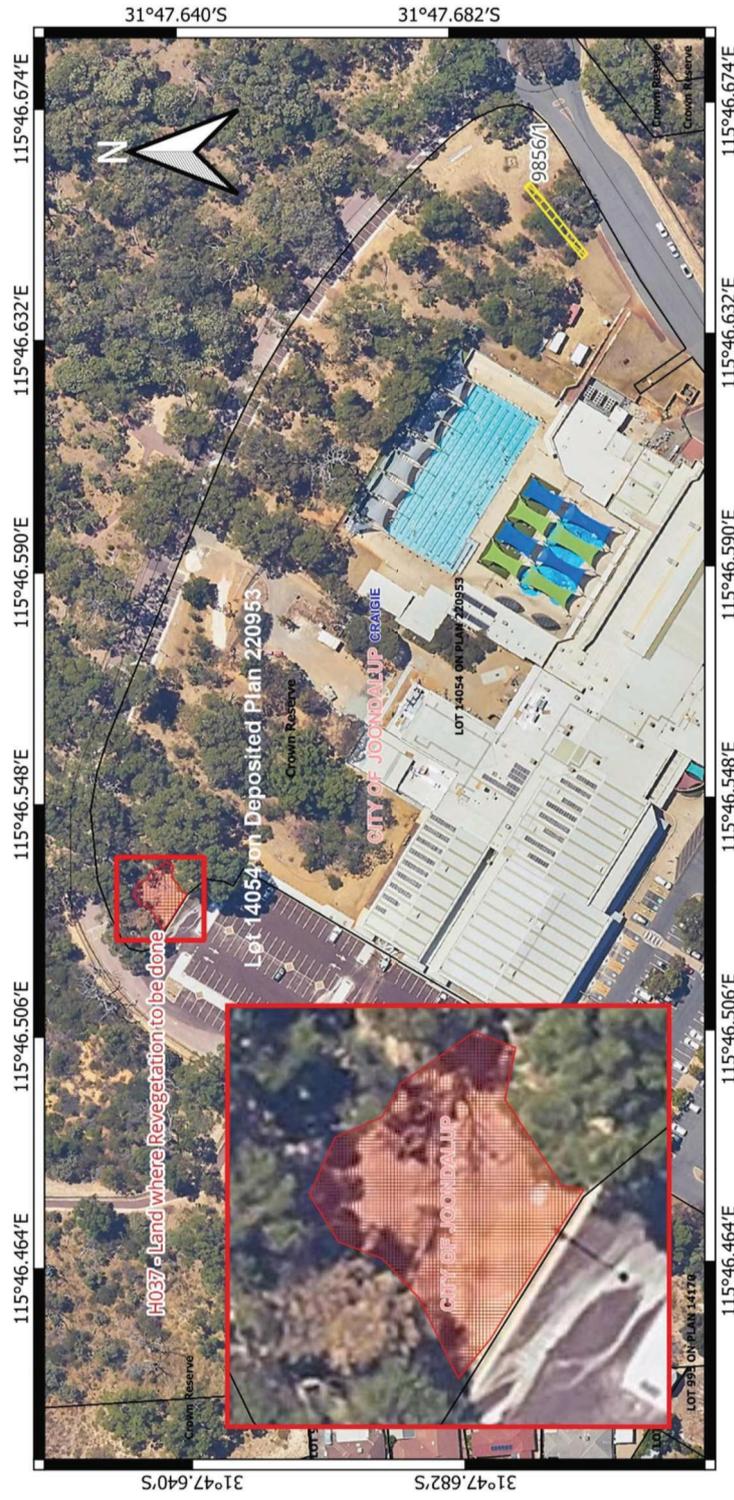


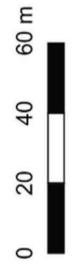
Figure 1: Map of the boundary of the area within which clearing may occur.



Legend

-  CPS subject to conditions
-  CPS areas approved to clear
-  Land Tenure
-  Local Government Authorities
-  Road Centralines
-  Main Roads
-  Local Rd - Sealed

1:1,500



MGA Zone 50
Geocentric Datum of Australia 1994



Figure 2: Map of the boundary of the area within which revegetation will occur.



Clearing Permit Decision Report

1 Application details and outcome

1.1. Permit application details

Permit number:	CPS 9856/1
Permit type:	Area permit
Applicant name:	City of Joondalup
Application received:	18 August 2022
Application area:	0.005 hectares of native vegetation
Purpose of clearing:	Installation of a new water pipeline
Method of clearing:	Mechanical
Property:	Lot 14054 on Deposited Plan 220953
Location (LGA area/s):	City of Joondalup
Localities (suburb/s):	Craigie

1.2. Description of clearing activities

The application is to clear an area of 0.005 hectares within Lot 14054 on Deposited Plan 220953, Craigie, to allow for the installation of a new underground groundwater pipeline, which will provide geothermal heated water for waterbodies at Craigie Leisure Centre (see Figure 1, Section 1.5).

Within the clearing area three *Xanthorrhoea preissii* (grass trees) ranging in size (approx. 0.5m to 1.5m), four *Acacia* plants (*Acacia cyclops* and *Acacia saligna*) ranging in size (approx. 1m to 3m), one *Banksia attenuata* (slender *Banksia*) that is 4m in height and one *Allocasuarina fraseriana* (sheoak) of >15m in height will be required to be cleared. There were also several scattered dead banksia remnants within the application area. There were no native herbs or groundcovers identified during the site visit, this layer is comprised of a variety of weed species (City of Joondalup, 2022a).

The final land use will remain as MRS zoning Parks and Recreation. The area will have an underground groundwater pipeline and be maintained free of vegetation (City of Joondalup, 2022a).

1.3. Decision on application

Decision:	Granted
Decision date:	24 November 2022
Decision area:	0.005 hectares of native vegetation, as depicted in Section 1.5.

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 for 21 days and one submission was received. Consideration of matters raised in the public submission is summarised in Appendix B.

In making this decision, the Delegated Officer had regard for the site characteristics (see Appendix C), relevant datasets (see Appendix G.1), the clearing principles set out in Schedule 5 of the EP Act (see Appendix D), relevant

planning instruments and any other matters considered relevant to the assessment (see Section 3.3). The Delegated Officer also took into consideration that the proposed clearing will enable the use of a geothermal system to heat the aquatic facility on the property which reduces energy consumption and saves 933 tonnes of greenhouse gas emissions each year.

The assessment identified that the proposed clearing will result in the loss of vegetation that:

- is suitable habitat for black cockatoo and quenda
- has the potential to introduce and spread weeds and dieback into adjacent vegetation, which could impact on the quality of the adjacent vegetation and its habitat values
- is wholly located within a conservation area (Bush Forever area 303)
- is located within the boundaries of the Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region (Banksia Woodlands) Threatened Ecological Community (TEC) which may compromise the values of these areas.

To mitigate the loss of 0.005 hectares of native vegetation that is located within Bush Forever, an area of approximately 0.01 hectares within the property will be revegetated to reinstate similar vegetation to that lost as a part of the clearing proposal.

The minimal amount of native vegetation that is to be cleared is not considered to provide significant habitat for black cockatoos or quenda and is not likely to significantly reduce the occurrence of the Banksia Woodlands TEC. Furthermore, that area required to be revegetated will mitigate the impacts to the above-mentioned environmental values.

After consideration of the available information, the Delegated Officer determined that the impacts of the proposed clearing are unlikely to have any long-term adverse impacts on the environment, and that management practices conditioned on the permit will mitigate any potential impacts. The Delegated Officer decided to grant a clearing permit subject to conditions including to:

- avoid, minimise and reduce the impacts and extent of clearing
- take steps to minimise the risk of the introduction and spread of weeds and dieback
- slow, directional clearing to allow fauna to escape into adjacent areas of vegetation
- revegetate 0.01 hectares of land within Lot 14054 in alignment with Bush Forever requirements set out in State Planning Policy 2.8..



Clearing Permit Decision Report

1.5. Site map

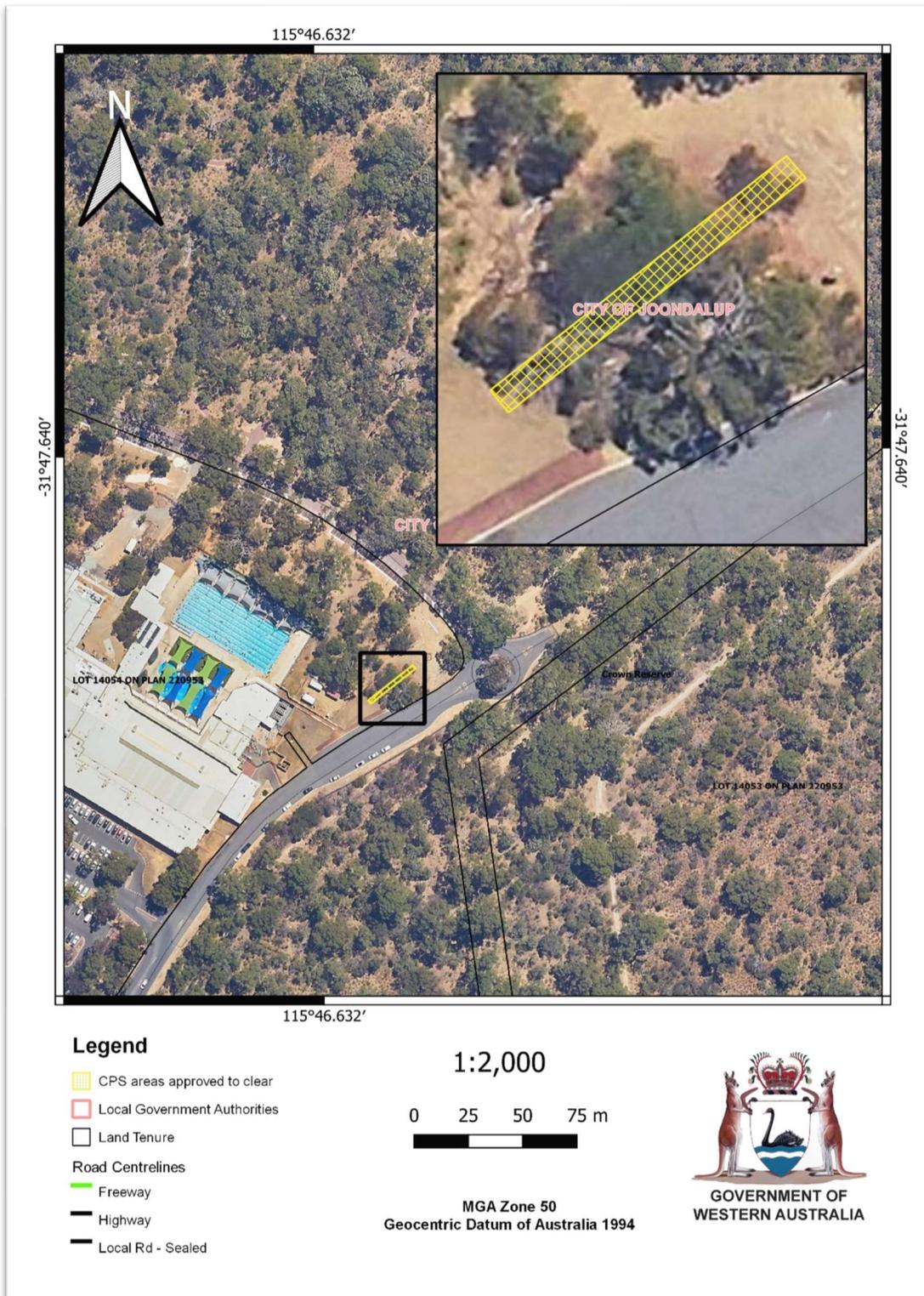


Figure 1: Map of the application area CPS 9856/1. The area crosshatched yellow indicates the area authorised to be cleared under the granted clearing permit CPS 9856/1.



Clearing Permit Decision Report

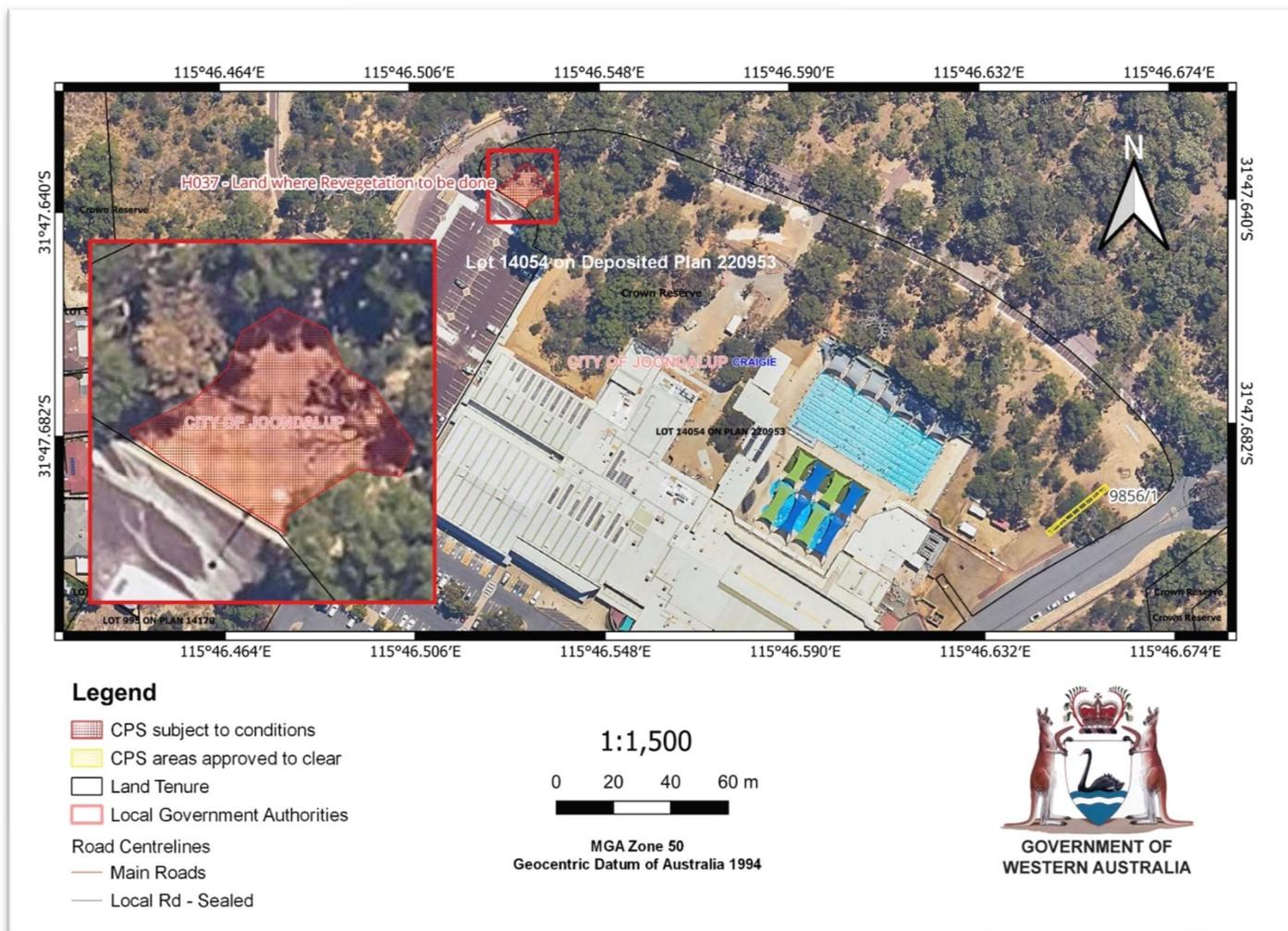


Figure 2: Map of Lot 14054 on Deposited Plan 220953. The area crosshatched red indicates the area subject to conditions of revegetation outlined in clearing permit CPS 9856/1.



Clearing Permit Decision Report

2 Legislative context

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

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

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

Other legislation of relevance for this assessment include:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Conservation and Land Management Act 1984* (WA) (CALM Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Planning and Development Act 2005* (WA) (P&D Act)
- *Rights in Water and Irrigation Act 1914* (RIWI Act)

The key guidance documents which inform this assessment are:

- *A guide to the assessment of applications to clear native vegetation* (DER, December 2013)
- *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

Avoidance

Evidence was submitted by the City of Joondalup (the City), demonstrating that several avoidance and mitigation measures have been taken.

The City has been working with a Hydrogeological Consultant and a Water Engineering Consultant since 2019 in anticipation of these required works. Through this process, the consultants examined a number of options and strategies, including a new geothermal bore, utilising alternative heating systems / energy sources, as well as exploring different strategies to refurbish the existing infrastructure (City of Joondalup, 2022a). The City has investigated other alternative options for the pipeline installation, including an above ground and underground pipeline. An above ground pipeline was not deemed to be feasible as clearing of native vegetation would still be required and the pipeline would be subject to greater threats of vandalism, safety issues, damage risks and increased costs, as shown in Figure 3. An underground pipeline was not deemed to be practical due to the risks from striking subsurface materials, damage risks and environmental risks, as shown in Figure 4 (City of Joondalup, 2022b).

The City and contractors (Melchor) have minimised clearing of vegetation with careful and considered selection of the location and alignment of the pipeline. Melchor assessed two pipeline alignment options, selecting the route which required less native vegetation (0.005 hectares) to be removed. In particular, the site access and works centre around existing open turf areas, where there is no native understorey (see Figure 1).

In addition, the actual clearing will be undertaken by the City's Tree Services team or contractors, who are highly experienced in vegetation management and removal. City staff and contractors will ensure implementation of its Pathogen Hygiene Procedure during the vegetation removal works to prevent the spread of pathogens or weeds (Figure 5).

Measures will be taken during clearing to ensure that the surrounding plant species will not be impacted, including *Eucalyptus gomphocephala* (tuart), *Allocasuarina fraseriana* (sheoak), *Eucalyptus todtiana* (coastal blackbutt), *Banksia grandis* (bull *Banksia*), *Callitris preissii* (Rottnest Island pine), and *Hibbertia cuneiformis*. The City's Arborist has also reviewed and provided input into the vegetation removal to mitigate any impacts to surrounding vegetation and support the successful translocation of three grass trees. The dead fallen wood will be moved to adjacent bushland patches to continue to provide habitat for fauna (City of Joondalup, 2022b).

The City's Principal Environmental Project Officer visited the site proposed for clearing of native vegetation on 4 July 2022 to conduct an environmental assessment. The site visit confirmed that the proposed pipeline location will impact a small section of native bushland that is in a degraded condition, consistent with Keighery rating scale for vegetation condition (see Appendix E) (City of Joondalup, 2022b).

Mitigation

The Department recommended the revegetation of 0.01 hectares within Lot 14054 on Deposited Plan 220953, Craigie, with species that resemble those being impacted to address impacts to Bush Forever (DWER, 2022).

The City proposes that revegetation is conducted in June 2023 within Lot 14054 on Deposited Plan 220953 in an area of 0.01 hectares using native plant seedlings and local provenance seed from Craigie Bushland. Pathogen hygiene protocols will be adhered to prior to entering and leaving the site. The revegetation completion targets and criteria is detailed in Table 1, Appendix F. A list of species and quantities proposed to be used in the revegetation is detailed in Table 2, Appendix F.

Moreover, the three grass trees proposed to be cleared will be translocated and replanted for City landscaping and the dead fallen wood will be moved to adjacent bushland patches to continue to provide habitat for fauna.

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

3.2. Assessment of impacts on environmental values

In assessing the application, the Delegated Officer has had regard for the site characteristics (see Appendix C) and the extent to which the impacts of the proposed clearing present a risk to biological, conservation, or land and water resource values.

The assessment against the clearing principles (see Appendix D) identified that the impacts of the proposed clearing present a risk to biological values (fauna and ecological communities), and significant remnant vegetation and conservation areas. 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. Biological values (ecological communities) - Clearing Principles (a and d)

Assessment

According to available databases, two state-listed priority ecological communities (PECs) are mapped within the application area; the 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' (Tuart Woodlands) PEC and the 'Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region' (Banksia Woodlands) PEC. Both communities are also federally listed TECs under the EPBC Act.

The application area is within a broader remnant that has a part in maintaining connectivity between remnants in the local area and is within one of a number of 'Gnangara Mound' ecological linkages that are mapped within the local area. It is also mapped within Perth Regional Ecological Linkage (LINK_ID 25), which identifies regional ecological linkages that broadly represent a link between patches of remnant vegetation judged to be of regional significance. The removal of 0.005 hectares will not sever or impact the functionality of the ecological linkage.

There are three *Xanthorrhoea preissii* (grass trees) ranging in size (approx. 0.5 to 1.5 metres), four *Acacia* plants (*Acacia cyclops* and *Acacia saligna*) ranging in size (approx. one to three metres), one *Banksia attenuata* (slender Banksia) that is four metres in height and one *Allocasuarina fraseriana* (sheoak) of >15m in height within the application area. There were also several dead fallen over native trees along the alignment which are potential providing habitat for local fauna species. There were no native herbs or groundcovers identified during the site visit, as this layer was comprised of a variety of weed species (City of Joondalup, 2022b).

The surrounding plant species that are representative of the mapped TEC/PECs, included *Eucalyptus gomphocephala* (tuart), *Allocasuarina fraseriana* (sheoak), *Eucalyptus todtiana* (coastal Blackbutt), *Banksia grandis* (bull Banksia), *Callitris preissii* (Rottnest Island pine), and *Hibbertia cuneiformis*, will not be impacted by the clearing (City of Joondalup, 2022b).

The proposed clearing occurs on the edge of large patches of Tuart Woodlands TEC and Banksia Woodlands TEC. The removal of 0.005 hectares will not significantly reduce the occurrence of the abovementioned TECs, nor result in a significant residual impact.

Conclusion

For the reasons set out above, it is considered that the impact of the proposed clearing is unlikely to be significant. Through revegetation measures committed to manage impacts to Bush Forever, any impacts to the TECs will be mitigated.

Conditions

To address the above impacts, the applicant will be required to take hygiene steps to minimise the risk of the introduction and spread of weeds and dieback.

3.2.2. Biological values (fauna) - Clearing Principle (b)

Assessment

A total of six endangered, nine vulnerable, ten priority, one 'conservation dependent', one 'other specially protected' fauna, and 13 fauna protected under an international agreement, have been recorded in the local area. In forming a view on the likelihood of these species occurring within the application area, the preferred habitat types and typical home ranges of these species and their recorded proximity to the application area were considered, along with the type and condition of the vegetation within the application area. Available data sources indicate some of the avian fauna species located within the local area, have habitat preferences likely to be represented within the application area. It is considered the following species may occur:

- *Zanda latirostris* (Carnaby's cockatoo), which is listed as endangered under the BC Act and the Commonwealth EPBC Act.
- *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo), which is listed as vulnerable under the BC Act and the Commonwealth EPBC Act.

An additional species has been recorded within the local area: *Isodon fusciventer* (quenda, southwestern brown bandicoot) (priority four).

Black cockatoos – endangered/vulnerable

The application area and its local area (10 kilometre radius from the application area) is mapped as Carnaby's cockatoo distribution, and in addition, the eastern half of the local area is also mapped as forest red-tailed black cockatoo core distribution. Available databases indicate that there are 38 black cockatoo roost records within the local area and 23 white-tailed black cockatoo breeding sites. The local area also has an approximately 11 percent coverage of suitable feeding habitat for black cockatoo in the Swan Coastal Plain. No hollows were found within the trees proposed to be cleared (City of Joondalup, 2022b).

Foraging habitat

Critical foraging habitat for black cockatoo species includes foraging material that is within an approximate six to 12 kilometre radius of a nesting site and within six kilometres of a night roosting site. The preferred foraging habitat for each of the species is described below (DAWE, 2022):

- Carnaby's cockatoo – Native shrubland, kwongan heathland and woodland on seeds, flowers and nectar of native proteaceous plant species (*Banksia* spp., *Hakea* spp. and *Grevillea* spp.), as well as *Callistemon* spp. and Marri. Also seeds of introduced species including *Pinus* spp., *Erodium* spp., wild radish, canola, almonds, macadamia and pecan nuts; insects and insect larvae; occasionally apples and persimmons; and liquidambar.
- Forest red-tailed black cockatoo – Primarily seeds of jarrah and marri in woodlands and forest, and edges of Karri forests, including Wandoo and Blackbutt. Forages on *Allocasuarina* cones, fruits of *Persoonia longifolia* (snottygobble) and *C. haematoxylon* (mountain marri). Other less important foods include Blackbutt, Bullich, *Allocasuarina fraseriana*, *Hakea* spp., Tuart, *E. decipiens* (redheart moit) and *E. lehmanni* (bushy yate). Also, some introduced eucalypts such as *E. camaldulensis* (river red gum) and *E. grandis* (rose gum). On the Swan Coastal Plain, often feeds on introduced *Melia azedarach* (cape lilac), *E. caesia*, *E. erythrocorys*, Lemon-scented Gum and *Harpephyllum caffrum* (kaffir plum).

When cross-referencing the preferred foraging habitat to the vegetation proposed to be cleared, both Carnaby's and forest red-tailed black cockatoos may utilise the *Allocasuarina* cones, as well as the seeds, flowers and nectar of the slender *Banksia* (DAWE, 2022). Taking into consideration that the City are proposing to only clear one of each of these tree species, are revegetating at a ration of 2:1 on the same property, and the fact that it is unlikely that these trees provide a critical food source, noting the adjacent conservation bushland providing them with a more suitable habitat, it is unlikely that the clearing will have a significant residual impact on black cockatoos.

***Isodon fusciventer* (south-western brown bandicoot/quenda) - Priority 4**

This species typically prefers dense understorey (DBCA, 2017). The nearest record is approximately 0.11 kilometres from the application area, with 171 records in the local area. Noting the proximity of the nearest record and evidence of quenda digging at the site (Figure 9) (City of Joondalup, 2002a), this species is likely to utilise the application area while moving through the landscape. Given the absence of significant understorey vegetation, the application area is not likely to contain essential habitat for quenda, especially noting the available adjacent conservation bushland which is a much more suitable habitat for the species.

Conclusion

Significant habitat refers to the resources (breeding, resting and feeding), connectivity or habitat area for a species or community that is critical for its survival. Noting the extent and purpose of the proposed clearing and its location within a broader remnant, and the City of Joondalup's agreed revegetation plan of a 2:1 ratio within the same property (resulting in no net impact to fauna habitat once established), it is considered that the application area is unlikely to be significant for the survival of indigenous fauna or be necessary for the maintenance of significant habitat (Table 1 and 2, Figure 2).

Whilst the application area does not comprise of significant habitat for fauna, there is the potential for individuals to be present at the time of clearing. Slow, directional clearing to allow the movement of fauna that may be present at the time of clearing into adjacent vegetation will mitigate any impacts to fauna.

It is considered that potential impacts to adjacent vegetation can be managed by undertaking steps to minimise the risk of the introduction and spread of weeds and dieback.

Conditions

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

- Revegetation of 0.01 hectares of native vegetation within Lot 14054 that includes black cockatoo foraging habitat
- Slow directional clearing to allow fauna to move into adjacent vegetation ahead of the clearing activity will minimise impact to individuals
- Take hygiene steps to minimise the risk of the introduction and spread of weeds and dieback.

3.2.3. Environmental value (significant remnant vegetation) - Clearing Principle (e)

Assessment

The national objectives and targets for biodiversity conservation in Australia has a target to prevent clearance of ecological communities with an extent below 30 per cent of that present pre-1750, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia, 2001). The Environmental Protection Authority (EPA) recognises the Perth Metropolitan Region to be a constrained area, within which a minimum 10 per cent representation threshold for ecological communities is recommended (EPA, 2008).

The mapped Vegetation Complex has less than 30 per cent of its pre-European extent remaining (at 23.49 per cent), and is considered to be under-represented. The local area retains approximately 13.71 per cent of its pre-European native vegetation cover and is considered to be extensively cleared. However, noting the application area is located within a constrained area, and the minimal area of clearing required, it is not considered to be a significant remnant within an extensively cleared landscape.

Conclusion

Noting the extent and purpose of the proposed clearing, its location within a broader remnant, and the City's proposed revegetation plan within the property on a 2:1 ratio (resulting in no net impact to vegetation once established), it is considered that the impact of the proposed clearing is unlikely to sever connectivity within the surrounding bushland and does not constitute a significant residual impact (Table 1 and 2, Figure 2).

Condition

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

- Avoid and minimise native vegetation clearing
- Take hygiene steps to minimise the risk of the introduction and spread of weeds and dieback

3.2.4. Environmental value (conservation areas) - Clearing Principle (h)

Assessment

The application area is wholly located within Bush Forever site 303. State Planning Policy 2.8 *Bushland Policy for the Perth Metropolitan Region* sets out that proposals and decision-making in respect of Bush Forever areas should support a general presumption against the clearing of regionally significant bushland or other degrading activities, except where a proposal or decision is consistent with the overall purpose and intent of the existing Crown reserve or can be reasonably justified with regard to wider environmental, social, economic or recreational needs (clause 5.1.2.1(i)(e)). The Policy also sets out that unavoidable adverse impacts on regionally significant bushland within a Bush Forever area should be offset at a ratio of at least 1:1 in habitat hectares.

With regard for the extent of the proposed clearing, and the composition and condition of the vegetation proposed to be cleared, and the City's proposed 2:1 revegetation of an unused portion of the property (resulting in no net impact to the Bush Forever area once established), it is considered that the proposed clearing is unlikely to have a significant environmental impact on Bush Forever site 303 and is unlikely to sever connectivity within the bushland corridor (Table 1 and 2, Figure 2). On this basis it is considered that the proposed clearing does not constitute a significant residual impact, and that an offset is not required. It is considered that revegetation of the portion of the property will mitigate impacts to the Bush Forever area consistent with State Planning Policy 2.8.

There is potential that the proposed clearing activities could result in the introduction or spread of weeds and dieback into adjacent vegetation, which could impact on its habitat quality and connectivity.

Conclusion

It is considered that potential impacts to adjacent vegetation can be managed by undertaking steps to minimise the risk of the introduction and spread of weeds and dieback. It is also considered that impacts to Bush Forever site 303 can be addressed through revegetation of the unused area of the property.

Condition

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

- Avoid and minimise native vegetation clearing
- Take hygiene steps to minimise the risk of the introduction and spread of weeds and dieback.
- Revegetation of 0.01 hectares of native vegetation within Lot 14054 to mitigate impacts to Bush Forever.

3.3. Relevant planning instruments and other matters

The City are required to hold a groundwater licence under the *RIWI Act* to abstract water to undertake their proposed land use. The Delegated Officer was provided with evidence that the City have been issued and have a current groundwater licence to abstract water on Lot 14054 Whitfords Avenue, Craigie, under the RIWI Act. Lot 14054 on Deposited Plan 220953 is vested by management order to the City of Joondalup. The application area is zoned 'Parks and Recreation' under the City of Joondalup Local Planning Strategy (2017) and 'Parks and Recreation' under the City of Joondalup Local Planning Scheme No. 3 (2018; amended 2019). Crown Reserve R32858 has the purpose of 'Parks and Recreation'. This project is a part of the City's Geothermal Revitalisation Project to allow the continued operation of the City's geothermal system.

Several Aboriginal sites of significance have been mapped within the application area. It is the permit holder's responsibility to comply with the *Aboriginal Heritage Act 1972 (WA)* and ensure that no Aboriginal Sites of Significance are damaged through the clearing process.

End

Appendix A. Additional information provided by applicant

Summary of comments	Consideration of comment
The City of Joondalup provided a revegetation plan (City of Joondalup, 2022b).	Environmental value (conservation areas) - Clearing Principles (h), in Section 3.2.4 of this report. The Delegated Officer considers the City of Joondalup has adequately provided revegetation measures to mitigate impacts to Bush Forever. Further information contained in Environmental value (conservation areas) - Clearing Principles (h), in Section 3.2.4 of this report.
The City of Joondalup provided other options they considered when deciding on the water pipeline location, structure and construction materials (City of Joondalup, 2022b).	See The Delegated Officer considered the City of Joondalup has adequately considered the avoidance of native vegetation. Further information contained in Avoidance and Mitigation measures in Section 3.1 of this report.

Appendix B. Details of public submission

Summary of comments	Consideration of comment
Inadequate avoidance measures.	The Delegated Officer was satisfied that the City of Joondalup has made a reasonable effort to avoid and minimise potential impacts of the proposed clearing on environmental values. These avoidance measures are detailed in Section 3.1 of this report.
Impacts to Bush Forever site.	The assessment and decision report considers the application area's location within Bush Forever site 303. A detailed assessment is covered in Section 3.2.4. The City of Joondalup will mitigate the loss of the native vegetation by revegetating an area double the size of the area they are clearing (i.e. they are clearing 0.005 hectares and will be revegetating 0.01 hectares), which is consistent with guidance for Bush Forever mitigation in State Planning Policy 2.8. Also see Figure 2, and Tables 1 and 2, Appendix F, for further details on revegetation plan.
Disagreed with Vegetation Condition rating.	The condition rating of Degraded, according to the Keighery vegetation rating scale (Appendix E) was proved to be correct for the current condition of the 0.005 hectares of land proposed to be cleared. See Appendix E for the full Keighery condition rating scale.
Environmental management plan and procedures not publicly available.	The City requested the Craigie Bushland Flora Survey and Vegetation Condition Assessment be kept confidential on the grounds of protecting the locations of threatened and conservation significant communities and species being provided.
Questioned that a <i>Banksia</i> was located within the pipeline alignment, however, it was not included in the application.	The City included a <i>Banksia attenuata</i> (slender <i>Banksia</i>) that is 4m in height in their Clearing Application. The Delegated Officer has taking this into consideration when assessment the application and making the decision to grant the permit.
Noted fallen dead wood that will need to be moved, not included in application, which are likely to provide habitat for fauna and should be included in application.	The City did include this in their Clearing Application and will be moving this wood to the adjacent bushland, whilst taking weed and dieback precautions, to enable them to continue acting as potential fauna habitat.
Investigation of alternative options of partial above ground pipeline not evident, seeing pipeline material is HDPE, requiring no digging and very minimal disturbance to the native vegetation.	Evidence for investigation of alternative options has been provided and is covered in Section 3.1 Avoidance and Mitigation of this report.

Summary of comments	Consideration of comment
No statement that site will be revegetated or rehabilitated as required for Bush forever site.	Revegetation plan provided by the City and detailed in Section 3.1 Avoidance and Mitigation of this report, as well as Figure 2, Tables 1 and 2 or Appendix F.
Application not supported	Acknowledged

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 D.

C.1. Site characteristics

Characteristic	Details
Local context	The area proposed to be cleared is a 0.005 hectare area of native vegetation in the intensive land use zone of Western Australia. It is adjacent to a 31.9 hectare conservation bushland (land_id – 3344802) wrapping around the Lot to the west, north and east of Lot 14054 on Deposited Plan 220953. The land adjacent to the south is zoned freehold land and utilised by the Metropolitan Cemeteries Board, where it is also mapped as Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region and a large portion of the bushland has been retained. Beyond these bushlands, the area is largely residential zoned.
Ecological linkage	The area proposed to be cleared is located within the Gnangara Mound Ecological Linkage - Bush Forever associated with Conceptual Linkage (OBJECTID – 136), which stretches over a 162 hectare area. The application area is also located within an area zoned as a Perth Regional Ecological Linkage (LINK_ID 25).
Conservation areas	The application area is located within Bush Forever Site 303.
Vegetation description	The mapped vegetation complex within the proposed areas to be cleared is Karrakatta Complex-Central and South – 49, which is described as vegetation ranging from woodland of <i>Eucalyptus marginata</i> (jarrah) - <i>Allocasuarina fraseriana</i> (sheoak) - Predominantly open forest of <i>Eucalyptus gomphocephala</i> (tuart) - <i>Eucalyptus marginata</i> (jarrah) - <i>Corymbia calophylla</i> (marri) and woodland of <i>Eucalyptus marginata</i> (jarrah) - Banksia species (Heddl, 1980). Aerial imagery indicates the local area (10 kilometre radius from the centre of the area proposed to be cleared) retains approximately 13.71 per cent of the pre-European extent (Government of Western Australia, 2019a). Photographs supplied by the City of Joondalup indicate the vegetation within the proposed clearing area reflects the Karrakatta Complex-Central and South – 49 vegetation complex. Representative photos are available in Appendix F.
Vegetation condition	Photographs supplied by the City of Joondalup indicate the vegetation within the proposed clearing area is in Degraded (Keighery, 1994) condition. The full Keighery (1994) condition rating scale is provided in Appendix E. Representative photos are available in Appendix F.
Climate and landform	The application area occurs on gently undulating to flat topography and has a mean annual maximum temperature of 24.8°C and a mean annual minimum temperature of 12.9°C. The mean annual rainfall is 800 millimetres and the annual evapotranspiration rate is 700 millimetres.
Soil description	The soil is mapped as 211Sp__Ky - Karrakatta Sand Yellow Phase Low hilly to gently undulating terrain. Yellow sand over limestone at 1-2 m. <i>Banksia spp.</i> woodland with scattered emergent <i>Eucalyptus gomphocephala</i> and <i>E. marginata</i> and a dense shrub layer (DPIRD, 2019).

Characteristic	Details
Land degradation risk	Please see Land Degradation Table in Section C.6.
Waterbodies	The desktop assessment and aerial imagery indicated that the application area does not transect any watercourses or wetlands. The closest watercourses are several perennial lakes within the Pinnaroo Valley Memorial Park, which occur approximately 350 metres south of the application area, separated by road infrastructures. The closest wetlands classified as Conservation Category Wetlands – Geomorphic Wetlands, Swan Coastal Plan, are the Beenyup Swamp, Joondalup Lake and Wallubuenup Swamp, occurring approximately 2.17 kilometres east, 2.29 kilometres north-east and 2.59 kilometres east and of the application area, respectively, separated by road and residential infrastructure.
Hydrogeography	The application area is mapped within the Perth Groundwater Area, proclaimed under the <i>Rights in Water and Irrigation Act 1914</i> (the RIWI Act), and the Perth Coastal and Gwelup Underground Water Pollution Control Area, a Priority three Public Drinking Water Source Area (PDWSA) proclaimed under the <i>Metropolitan Water Supply Sewerage and Drainage Act 1909</i> . The City have obtained the appropriate licence, under the RIWI Act, to abstract groundwater on the property. The application area is within the 'Coastal Plain' hydrological zone, and the 'Coastal' hydrographic catchment. Groundwater salinity within the application area is mapped at 500 to 1000 milligrams per litre total dissolved solids.
Flora	According to available databases a total of nine conservation listed flora species have been recorded within the local area, comprising one Priority one (P1) flora, two Priority two (P2) flora, four Priority three (P3) flora, one Priority four (P4) flora, and one threatened flora (Western Australian Herbarium, 1998-). None of these existing records occur within the application area, with the closest record being an occurrence of <i>Jacksonia sericea</i> (P4) approximately 2.11 kilometres from the application area. None of the species proposed to be cleared a considered conservation significant flora.
Ecological communities	According to available mapping, the area proposed to be cleared is located within two TECs. The entire application area is mapped with the Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and forests of the Swan Coastal Plain ecological community, listed as Critically Endangered under the Commonwealth EPBC Act. Fifteen percent of the application area is also mapped as Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region, as listed as Endangered under the Commonwealth EPBC Act.
Fauna	The desktop assessment identified that a total of 41 threatened or priority fauna species have been recorded within the local area, including 31 threatened fauna species, ten priority fauna species (DBCA, 2007-). The closest and most abundantly recorded threatened fauna species in the local area is the <i>Zanda latirostris</i> (Carnaby's black cockatoo) (EN) with 895 recorded sightings, the closest being approximately 160 metres from the application area. Priority listed fauna recorded in the most abundance within local area is the <i>Isoodon fusciventer</i> (quenda) (P4) with 171 records and the <i>Synemon gratiosa</i> (graceful sunmoth) (P4), with 130 records. Lot 14054 on Deposited Plan 220953 is directly adjacent to the Craigie Bushland, a major conservation area permanently fenced and utilised for quenda monitoring program. The area proposed to be cleared is located within the mapped area for vagrant <i>Calyptorhynchus banksii naso</i> (forest red-tailed black cockatoo) distribution, which is listed as Vulnerable under the BC Act and the Commonwealth EPBC Act. Both the application area and its local area (10 kilometre radius of the application area) is mapped as Carnaby's black cockatoo distribution, which are listed as Endangered under the BC Act and the Commonwealth EPBC Act. A total of 38 black cockatoo roosts have been recorded within the local area and 23 white-tailed black cockatoo breeding sites. Approximately 11 percent of the local area has been mapped as suitable feeding habitat for black cockatoo in the Swan Coastal Plain.

C.2. Vegetation extent

	Pre-European extent (ha)	Current extent (ha)	Extent remaining (%)	Current extent in all DBCA managed land (ha)	Current proportion (%) of pre-European extent in all DBCA managed land
IBRA bioregion**					
Swan Coastal Plain - Spearwood_6	56,343.01	13,362.25	23.72	5,322.03	9.45
Swan Coast Plain (Hedde) Vegetation Associations in IBRA Bioregion*					
Karrakatta Complex-Central and South - 49	53,080.99	12,467.20	23.49	4,282.73	8.07
Local area					
10km radius	23,543.43	3,228.19	13.71	-	-

*Government of Western Australia (2019a)

**Government of Western Australia (2019b)

C.3. Land degradation risk table

Risk categories	211Sp_Ky - Karrakatta Sand Yellow Phase
Wind erosion	H2: >70% of map unit has a high to extreme wind erosion risk
Water erosion	L1: <3% of map unit has a high to extreme water erosion risk
Water logging	L1: <3% of map unit has a moderate to very high waterlogging risk
Water Repellence	L2: 3-10% of map unit has a high water repellence risk
Sub-surface Acidification	H2: >70% of map unit has a high subsurface acidification risk or is presently acid
Phosphorous export	L2: 3-10% of map unit has a high to extreme phosphorus export risk
Salinity	L1: 30-50% of map unit has a moderate to high salinity risk or is presently saline
Flooding	L1: <3% of the map unit has a moderate to high flood risk

Appendix D. 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></p> <p>The area proposed to be cleared does not contain regionally significant flora, fauna or assemblages of plants.</p> <p>The area proposed to be cleared is mapped as 'Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and forests of the Swan Coastal Plain' a state listed PEC and also partially mapped as the 'Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region' also listed as a state priority three PEC. Both communities are federally listed TECs under the EPBC Act.</p>	May be at variance	Yes <i>Refer to Section 3.2.1, above.</i>

Assessment against the clearing principles	Variance level	Is further consideration required?
<p><u>Principle (b):</u> <i>“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.”</i></p> <p><u>Assessment:</u></p> <p>The area proposed to be cleared contains limited potential foraging habitat for conservation significant fauna.</p>	May be at variance	Yes <i>Refer to Section 3.2.2, above.</i>
<p><u>Principle (c):</u> <i>“Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora.”</i></p> <p><u>Assessment:</u></p> <p>The area proposed to be cleared is unlikely to contain habitat for threatened flora.</p>	Not at variance	No
<p><u>Principle (d):</u> <i>“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.”</i></p> <p><u>Assessment:</u></p> <p>The area proposed to be cleared contains species commensurate with a TEC mapped adjacent to the application area.</p>	May be at variance	Yes <i>Refer to Section 3.2.1, above.</i>
Environmental value: significant remnant vegetation and conservation areas		
<p><u>Principle (e):</u> <i>“Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.”</i></p> <p><u>Assessment:</u></p> <p>The extent of the mapped vegetation type is inconsistent with the national objectives and targets for biodiversity conservation in Australia.</p>	May be at variance	Yes <i>Refer to Section 3.2.3, above.</i>
<p><u>Principle (h):</u> <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.”</i></p> <p><u>Assessment:</u></p> <p>The application area is wholly located within Bush Forever area 303 (encompassing Craigie Bushland Reserve, as well as the bushland strip along the western side of the Mitchell Freeway from Whitfords Avenue to just south of Ocean Reef Road).</p>	May be at variance	Yes <i>Refer to Section 3.2.4, above.</i>
Environmental value: 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></p> <p>Given no water courses or wetlands are recorded within the application area, the proposed clearing is not growing in association with an environment associated with a watercourse or wetland. The proposed clearing is unlikely to impact on- or off-site hydrology and water quality.</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></p> <p>The mapped soils are not susceptible to water erosion, nutrient export or salinity, however, mapped as highly susceptible to wind erosion. Noting the size and location of the application area and the current condition of the</p>	Not likely to be at variance	No

Assessment against the clearing principles	Variance level	Is further consideration required?
vegetation, the proposed clearing is not likely to have an appreciable impact on land degradation.		
<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></p> <p>Given the application area is within a priority three Public Drinking Water Sources Area and the Perth Groundwater Area, the proposed clearing may impact surface or ground water quality.</p> <p>To mitigate any issue arising, the City of Joondalup have gained a groundwater licence under the RIWI Act. The end land use is compatible with a priority three Public Drinking Water Sources Area under the RIWI Act.</p>	Not likely to be 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></p> <p>The mapped soils and topographic contours in the surrounding area do not indicate the proposed clearing is likely to contribute to increased incidence or intensity of flooding.</p> <p>Given no wetlands or watercourses are recorded within the application area, the proposed clearing is unlikely to contribute to waterlogging.</p>	Not at variance	No

Appendix E. Vegetation condition rating scale

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

Considering its location, the scale below was used to measure the condition of the vegetation proposed to be cleared. This scale has been extracted from Keighery, B.J. (1994) *Bushland Plant Survey: A Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc). Nedlands, Western Australia.

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.

Condition	Description
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.



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Appendix F. Photographs of the vegetation and supporting information excerpts

The option to construct the geothermal supply and return piping at ground level between the production bore and the pool/heating plantroom, specifically in the area of native vegetation ("bush") has been reviewed and considered by the installing Contractor. Due to the anticipated risk to the public, environment and operation of the Leisure centre of installing above ground pipelines, Meichor does not recommend this methodology of construction for the following reasons.

1. Clearing required to lay, support and install the pipeline.

In accordance with Australian Standards (AS2033:2008) for the installation of polyethylene piping systems (of which HDPE – High density polyethylene is considered part-of) above ground installation of pressured piping will require lateral supports every 1 meter based on the size of pipe required to be installed - refer to Table 6.1. In addition the controls conduits required for operation of the geothermal system (also to transect this area of bush) would require horizontal supports nominally every 25 to 50 centimetres. The installation of such support systems would typically still require compaction of the ground to provide suitable compression support to prevent bending/sagging of the pipeline and clearing of the native bush area.

2. Additional infrastructure required

Piping containing heated fluid are generally subject to greater infrastructure requirements - to install, support and restrain these piping systems. As hot geothermal water is the primary supply medium in the case of Craigie Leisure Centre, the installation would require heavy duty piping insulation, cladding, support blocks and thrust blocks to mitigate against reduction in operational performances, thermal expansion and ground settlement issues. While these support and insulation systems can be installed, it is expected that the cost of installation would be in the order of between \$75,000 to \$100,000.

3. Risk to the Leisure Centre's operations & the public.

Above ground pipelines are typically subject to greater threats of vandalism which can have catastrophic consequences to safety of the public and the centre's operations. Damage to the geothermal pipelines at Craigie Leisure Centre can result in a high pressure jet of hot geothermal water being released and injuring members of the public. Buried installations typically avoid this issue as the pipelines are installed at a depth which provides protection.

In addition, an above ground installation would expose the pipelines to other various forms of risk such as traffic damage or bush-fire damage – noting several instances where service vehicles have driven across the proposed pipe route and historical evidence of bushfires in the region (Josh – Grace, please confirm), in a situation where the geothermal pipelines are damaged, the shut-down time associated with repairing the damage can be in the order of several weeks which will have significant impact to the Leisure centre patronage and operations.

Thus, as a duty of care to the public and in consideration for the local environmental habitat, a buried ground installation of the geothermal pipes is recommended.

Figure 3: Excerpt from response letter to DWER's request for further information (City of Joondalup, 2022b).



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Please find following our response for the reasons why Horizontal Directional Drilling is not our preferred method of installing underground pipe and conduit. Melchor advised that HDD was not practical previously as it has several technical issues and risks, they are as follows:

- The soil we would be tunnelling into could consist of different soil types and densities that could affect the feasibility of carrying out HDD. If we struck gravel the process would have to be aborted and further construction measures would have to be put in place and therefore significant unanticipated costs could arise.
- When carrying out HDD the drilling, the contractor may strike subsurface surprises causing costly construction changes.
- During the HDD process, damage to pipelines been installed can occur. HDD places extreme demands and stresses on the installed pipeline.
- There are also environmental issues that can occur, such as Frac-out, which is the condition where drilling mud is released through into the surrounding sand and travels toward the surface.
- Not likely to happen but a failed borehole would be the biggest nightmare, resulting in heavy financial losses. A failed borehole can be caused by loss in drilling fluid circulation, obstructions, Hydrolock and problems with line and grade
- Collapse of trench could potential happen due to the pipe only installed at 600mm
- From experience I do not recommend the use of this method as I have witnessed in shallow trenches, cave in's, the pipe installed has filled with sand and gravel, which has travelled through the system causing damage to filter systems, pumps, strainers, and has blocked control and balance valves

Figure 4: Excerpt from response letter to DWER's request for further information (City of Joondalup, 2002b).

City of Joondalup Staff and Contractors Pathogen Hygiene Procedure

All City staff and contractors are responsible for avoiding the spread of pathogens to protect the natural environment. This procedure is in accordance with the City of Joondalup *Pathogen Management Plan* and applies to City parks, urban landscaping areas and natural areas.

Clean-down procedures should be undertaken when conducting

- Works that disturb soil
- Tree pruning

Clean-down procedures consist of the following steps

1. Before entering the site, clean footwear, clothing, tools, equipment and vehicle to remove all soil and plant materials.
2. Conduct site activities.
3. Brush-down footwear, clothing, tools, equipment and vehicles within the site compound area or in the immediate vicinity of construction works to remove all soil and plant materials.
4. Exit the site.

Note: A vehicle washdown bay is available for use at the City of Joondalup Works Operation Centre. Contact your City representative for access.

General pathogen hygiene principles for on-site activities:

Parks and Urban Landscaping Areas

- In pathogen identified areas, avoid pruning trees during wet conditions where possible.
- Avoid damaging the trunk of trees when mowing or trimming.
- When walking on site, remain on paths and avoid bushland or vegetated areas where possible and/or practical.
- If accessing site with a vehicle, remain on formalised tracks or areas demarcated for vehicle access.
- Avoid water draining into bushland and vegetated areas.

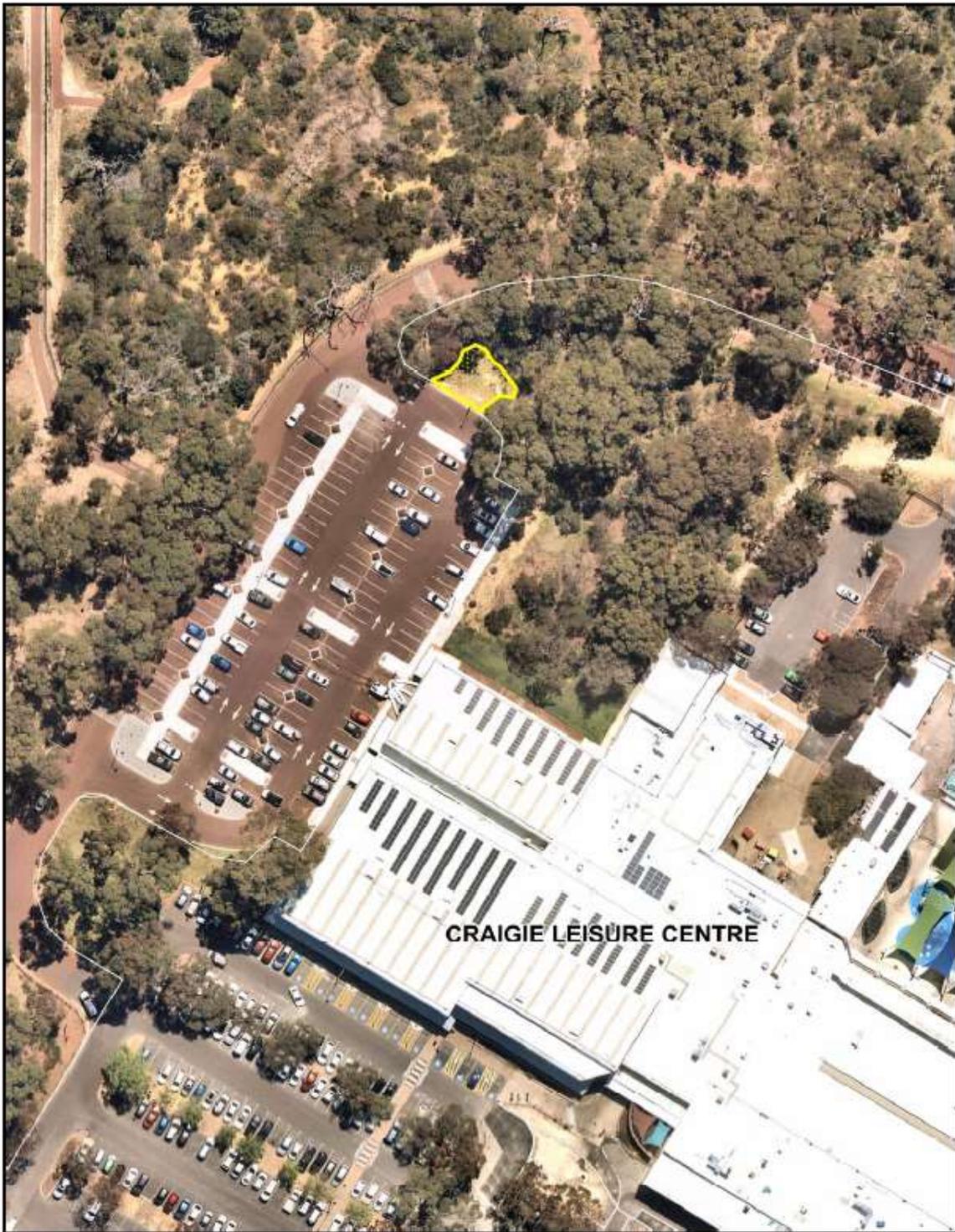
- Use mulch that is certified pathogen free to the relevant Australian Standard (AS4454) and source plants from nurseries compliant with Nursery Industry Accreditation Scheme Australia (NIASA), where possible.

Natural Areas Bushland

- Works should commence in non-pathogen identified areas first and in known or suspected pathogen identified areas last.
- Avoid conducting works and accessing site in wet conditions, where possible.
- If accessing site with a vehicle, remain on formalised tracks or areas demarcated for vehicle access.
- When walking on site, remain on paths and avoid bushland or vegetated areas where possible and/or practical.
- In pathogen identified area, avoid pruning trees during wet conditions, where possible.
- Minimise water use in bushland and vegetated areas.
- Avoid water draining into bushland and vegetated areas.
- Use mulch that is certified pathogen free to the relevant Australian Standard (AS4454) and source plants from nurseries compliant with Nursery Industry Accreditation Scheme Australia (NIASA), where possible.

For any queries, please contact the Environmental Development Coordinator or email enviro@joondalup.wa.gov.au.

Figure 5: City of Joondalup Pathogen Hygiene Procedure utilised when undertaking clearing Bush Forever mitigation measures (City of Joondalup, 2022b).



 90 Boas Ave, Joondalup WA 6027 PO Box 21, Joondalup WA 6919 Ph: 08 9400 4000 Fax: 08 9300 1353 info@joondalup.wa.gov.au www.joondalup.wa.gov.au	N 	 Revegetation Area	<h3>Craigie Bushland Revegetation</h3>
		Scale (A4): 1 : 1000 Date: 15/11/2022 Compiled: A.Gilbert	
		File: Craigie_Bushland_Revegetation.wor Folder: E:\GIS Projects\Parks\Craigie Bushland\Revegetation	
		<small>DISCLAIMER: While every care is taken to ensure the accuracy of this data, the City of Joondalup makes no representations or warranties about its accuracy, completeness or suitability for any particular purpose and disclaims all liability for all expenses, losses, damages, and costs which you might incur as a result of the data being inaccurate or incomplete in any way and for any reason.</small>	

Figure 6: CPS 9856/1 Bush Forever mitigation revegetation location, within Lot 14054 on Deposited Plan 220953, Craigie (City of Joondalup, 2022c).



 90 Boas Ave, Joondalup WA 6027 PO Box 21, Joondalup WA 6919 Ph: 08 9400 4000 Fax: 08 9300 1383 info@joondalup.wa.gov.au www.joondalup.wa.gov.au	N 	 Revegetation Area	<h3>Craigie Bushland Revegetation</h3>		
		Scale (A4): 1 : 150		Date: 15/11/2022	Compiled: A.Gilbert
		File: Craigie_Bushland_Revegetation.wor			
		Folder: E:\GIS Projects\Parks\Craigie Bushland\Revegetation			
<small>DISCLAIMER: While every care is taken to ensure the accuracy of this data, the City of Joondalup makes no representations or warranties about its accuracy, completeness or suitability for any particular purpose and disclaims all liability for all expenses, losses, damages, and costs which you might incur as a result of the data being inaccurate or incomplete in any way and for any reason.</small>					

Figure 7: Zoomed in mapped CPS 9856/1 Bush Forever mitigation revegetation location, within Lot 14054 on Deposited Plan 220953, Craigie (City of Joondalup, 2022c).



Figure 8: Photo of *Acacia cyclops* situated on the northern section of the remnant native vegetation patch (clearing permit area) (City of Joondalup, 2022a).



Figure 9: Photo of the ground cover, comprising of weed species, within the clearing permit area. The species include Rose Pelargonium, Yellow Soldiers, and other Grassy Weeds (City of Joondalup, 2022a).



Figure 10: Recent Quenda diggings observed within the clearing permit area (City of Joondalup, 2022a).



Figure 11: *Xanthorrhoea preissii* (grass tree) marked for clearing within the clearing permit area (City of Joondalup, 2022a).



Figure 12: Slender Banksia (*Banksia attenuata*) within the clearing permit area (City of Joondalup, 2022a).



Figure 13: Small *Xanthorrhoea preissii* (grass tree) (left), large *Xanthorrhoea preissii* (grass tree) and *Acacia saligna* (right) within the clearing permit area (City of Joondalup, 2022a).



Figure 14: *Allocasuarina fraseriana* (sheoak) within the clearing permit area, photos from the south of the pipeline route looking north (City of Joondalup, 2022a).



Figure 15: Rotational 360 degree view of the *Allocasuarina fraseriana* (sheoak) within the clearing permit area to demonstrate the only mature tree impacted does not have any nesting hollows (City of Joondalup, 2022a).



Figure 16: General image of the clearing permit area with fallen habitat trees (dead) (City of Joondalup, 2022a).



Figure 17: General view of the native vegetation patch from the north looking south (City of Joondalup, 2022a).



Figure 18: General view of the native vegetation patch from the south looking north (City of Joondalup, 2022a).



Figure 19: General view of the native vegetation patch from the road to the east. (City of Joondalup, 2022a).



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Table 1: Revegetation completion targets and criteria to occur on Lot 14054 on Deposited Plan 220953.

Measure	Completion targets	Completion criteria	Monitoring
Native diversity	Minimum of 60% of native species returned	Total revegetation to include a diversity of a minimum of 12 native species	Native diversity will be counted annually in years 2 and 3
Weed density	Weed cover at the site is 10% or less (minor non-competitive weeds)	Weed cover is to be 10% or less of minor non-competitive weeds	Weed cover percentage will be assessed annually in years 2 and 3
Native density	Survival rate of 1 plant / m ²	A survival rate of 1 plant / m ² is to be achieved after 3 years. All planted species that have not survived will be replanted within 12 months and monitored for a further 2 years.	The number of surviving plants will be counted annually in years 2 and 3. Further monitoring will be conducted as if replantings are required.
Watering	Watering of tubestock over summer months	Watering to be conducted 5 times in summer months each year for 3 years	Watering of tubestock to be conducted 5 times in years 1, 2 and 3
Weed control	Quarterly weed control events with the first event to be undertaken prior to planting	Weed control events to be conducted quarterly each year for 3 years	Quarterly weed control events to be conducted in years 1, 2 and 3

Table 2: List of species proposed to be planted for revegetation

Species List for Craigie Bushland Revegetation	Quantity
<i>Acacia lasiocarpa</i>	5
<i>Acacia pulchella</i>	10
<i>Banksia attenuata</i>	10
<i>Banksia grandis</i>	5
<i>Bossiaea eriocarpa</i>	5
<i>Daviesia divaricata</i>	10
<i>Daviesia nudiflora</i>	10
<i>Gastrolobium capitatum</i>	10
<i>Gompholobium tomentosum</i>	10
<i>Hovea pungens</i>	10
<i>Stirlingia latifolia</i>	5
<i>Xanthorrhoea preissii</i>	10
Total	100



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Appendix G. Sources of information

G.1. 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
- Public Drinking Water Source Areas (DWER-033)
- Ramsar Sites (DBCA-010)
- Regional Parks (DBCA-026)
- Remnant Vegetation, All Areas
- RIWI Act, Groundwater Areas (DWER-034)
- RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037)
- Soil Landscape 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

Restricted GIS Databases used:

- ICMS (Incident Complaints Management System) – Points and Polygons
- Threatened Flora (TPFL)
- Threatened Flora (WAHerb)
- Threatened Fauna
- Threatened Ecological Communities and Priority Ecological Communities
- Threatened Ecological Communities and Priority Ecological Communities (Buffers)

G.2. References

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