GOVERNMENT OF
WESTERN AUSTRALIA

CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 9731/1
Permit Holder:	City of Gosnells
Duration of Permit:	From 29 August 2022 to 29 August 2027

The permit holder is authorised to clear *native vegetation* subject to the following conditions of this permit.

PART I – CLEARING AUTHORISED

1. Clearing authorised (purpose)

The permit holder is authorised to clear *native vegetation* for the purpose of reducing the size of the stand of *Typha orientalis*.

2. Land on which clearing is to be done

Lot 4118 on Plan 219412, Gosnells

3. Clearing authorised

The permit holder must not clear more than 0.22 hectares of *native vegetation* within the area cross-hatched yellow in Figure 1 of Schedule 1.

4. Period during which clearing is authorised

The permit holder must not clear any *native vegetation* after 28 August 2027.

PART II – MANAGEMENT CONDITIONS

5. 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.

6. 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.

7. Directional clearing

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

8. Fauna Management

(a) The permit holder must inspect the area authorised to be cleared under this permit prior to works commencing and for the duration of *clearing* for any native fauna that may be present.

(b) Where fauna have been identified under *condition* 8(a), works must cease until the fauna have escaped into adjacent habitat ahead of the *clearing* activity or translocated into adjacent *native vegetation*.

9. Weed Management – Chemical

The permit holder must only undertake spot spraying of Roundup Biactive solution during the driest period of the year, between November to March, and during *calm conditions*. The wetland water level must not be in contact with the area being spot sprayed.

PART III - RECORD KEEPING AND REPORTING

10. 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	(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;

No.	Relevant matter	Specifications
		(d) the direction that the *clearing* occurred, (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* 5; (g) actions taken to minimise the risk of the introduction and spread of *weeds* and *dieback* in accordance with *condition* 6; (h) fauna management actions taken in accordance with *condition* 8; and (i) the chemical weed control management actions in accordance with *condition* 9.

11. Reporting

The permit holder must provide to the *CEO* the records required under *condition* 10 of this permit when requested by the *CEO*.

DEFINITIONS

In this permit, the terms in Table 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 *Environmental Protection Act 1986*.
calm condition	a weather condition when no air motion (wind) is detected.
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.
dieback	means the effect of *Phytophthora* species on *native vegetation*.
EP Act	*Environmental Protection Act 1986* (WA)
fill	means material used to increase the ground level, or to fill a depression.
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.
weeds	means any plant – (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or (b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness

Term	Definition
	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

5 August 2022

Schedule 1

Plan 9731/1

The boundary of the area authorised to be cleared is shown in the map below (Figure 1).

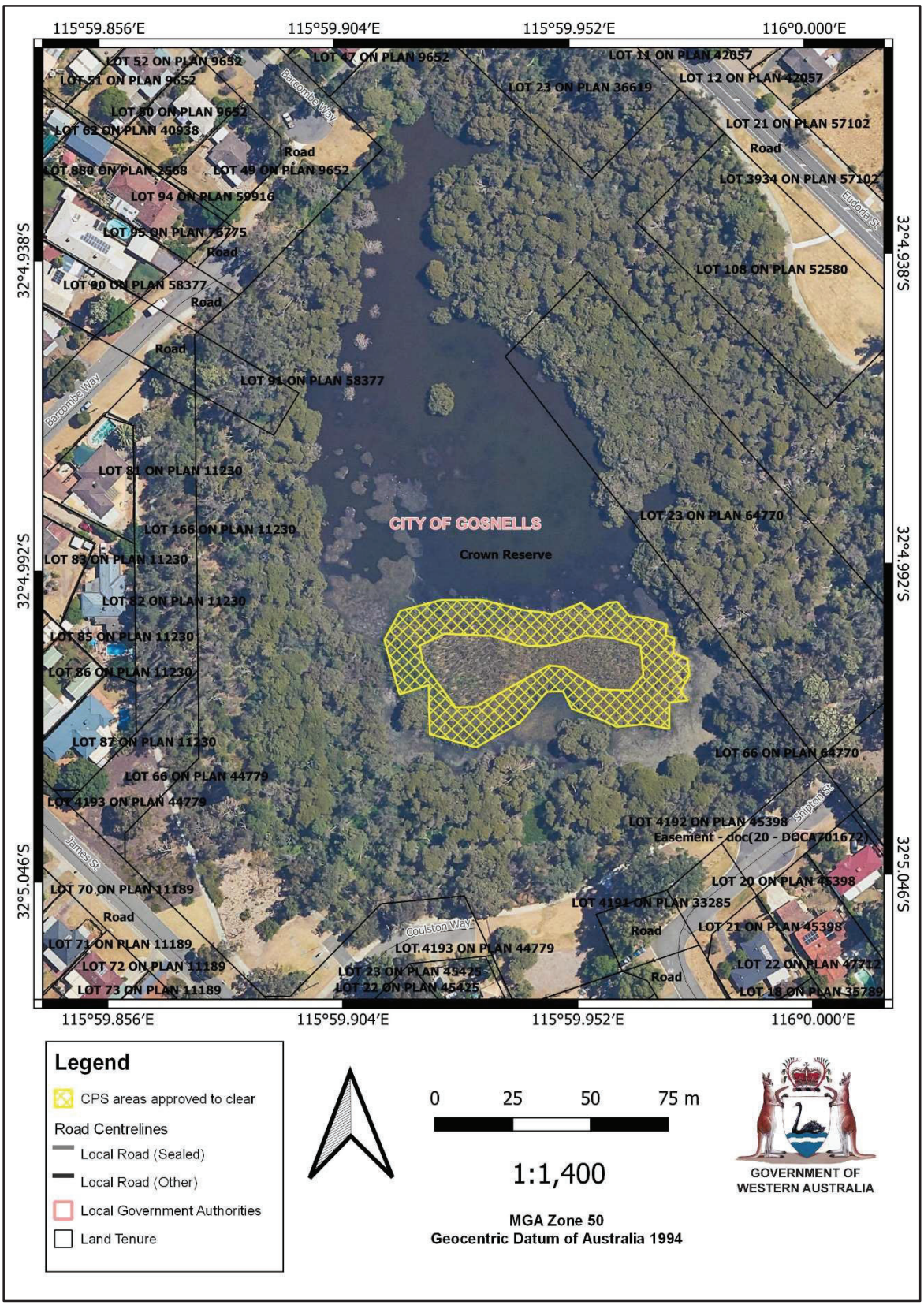

Figure 1: Map of the boundary of the area within which *clearing* may occur

Government of Western Australia
Department of Water and Environmental Regulation

Clearing Permit Decision Report

1 Application details and outcome

1.1. Permit application details

Permit number:	CPS 9731/1
Permit type:	Purpose permit
Applicant name:	City of Gosnells
Application received:	9 May 2022
Application area:	0.22 hectares of native vegetation
Purpose of clearing:	Reducing the size of the stand of *Typha orientalis*
Method of clearing:	Mechanical/Chemical
Property:	Lot 4118 on Plan 219412, Gosnells
Location (LGA area/s):	Gosnells
Localities (suburb/s):	City of Gosnells

1.2. Description of clearing activities

This application is for the targeted removal of robust herbaceous reeds, commonly known as Typha species: *Typha orientalis*, occurring in Southern Lake at Mary Carroll wetlands (Section 1.5, Figure 1).

The applicant has proposed to implement the methods below:

- Mechanical clearing of Typha through use of brush cutters, slashing using sickle blades, and removal by hand.
- Herbicide control using Roundup Biactive (City of Gosnells, 2022a).

The applicant noted that this stand of *T. orientalis* has previously been managed to reduce its spread. Management has involved containing the stand to an area of 0.1 – 0.2 hectares. The stand has never been fully cleared, as it provides habitat for a variety of native species. The purpose of the proposed clearing is the reduce the size of the stand of *T. orientalis* from its current size of 0.3 hectares to 0.1 hectares, to reduce the risk of it transforming the wetland ecosystem of the lake. This activity is proposed as an on-going management activity for the duration of the permit (City of Gosnells, 2022a).

1.3. Decision on application

Decision:	Granted
Decision date:	5 August 2022
Decision area:	0.22 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 no public submissions were received.

In making this decision, the Delegated Officer had regard for the site characteristics (Appendix A), relevant datasets (Appendix E), the clearing principles set out in Schedule 5 of the EP Act (Appendix B), relevant planning instruments and any other matters considered relevant to the assessment (Section 3.3). The Delegated Officer also took into consideration the purpose of the clearing, to remove Typha, an invasive native species capable of aggressive invasions that can transform ecosystems unless it is actively managed (Western Australian Herbarium, 1998-).

The assessment identified that the proposed clearing may result in:

- Potential removal/disturbance of nesting habitat for Priority 4 *Oxyura australis* (blue billed duck) and 24 threatened or priority migratory bird species that frequent the area.
- Potential incidental short-term impacts in the form of land degradation of wind and water erosion.
- Potential incidental short-term and unknown long-term impacts to adjacent fauna and flora resulting from the use of Roundup Bi-active (Glyphosate).

It is not expected that the removal of Typha, in order to maintain the functionality of the wetlands, will result in significant impacts to environmental values within the application area.

After consideration of the available information, as well as the applicant's avoidance and mitigation measures (Section 3.1), the Delegated Officer decided to grant a clearing permit subject to the following requirements conditioned on the clearing permit, to manage and address the impacts of clearing:

- Avoid and minimise measures to reduce the impacts of clearing.
- Take hygiene steps to minimise the risk of the introduction and spread of weeds and dieback.
- Pre-clearing site inspections prior to works commencing and ongoing during works for any fauna that may be present. If found and are not able to escape into adjacent habitat, the City of Gosnells is to cease works until the identified fauna has been translocated.
- Undertake slow, progressive one directional clearing to allow terrestrial and avian fauna to move into adjacent habitat ahead of the clearing activity.
- Undertake application of Glyphosate during the driest period of the year, when the water level is low enough to not be in contact with the remnants of Typha and during calm conditions. Every effort must be made to keep the herbicide out of the water, by applying the Glyphosate when the wind is calm and directing to the individual stalks, to avoid any risk to the surrounding ecosystem.

1.5. Site map

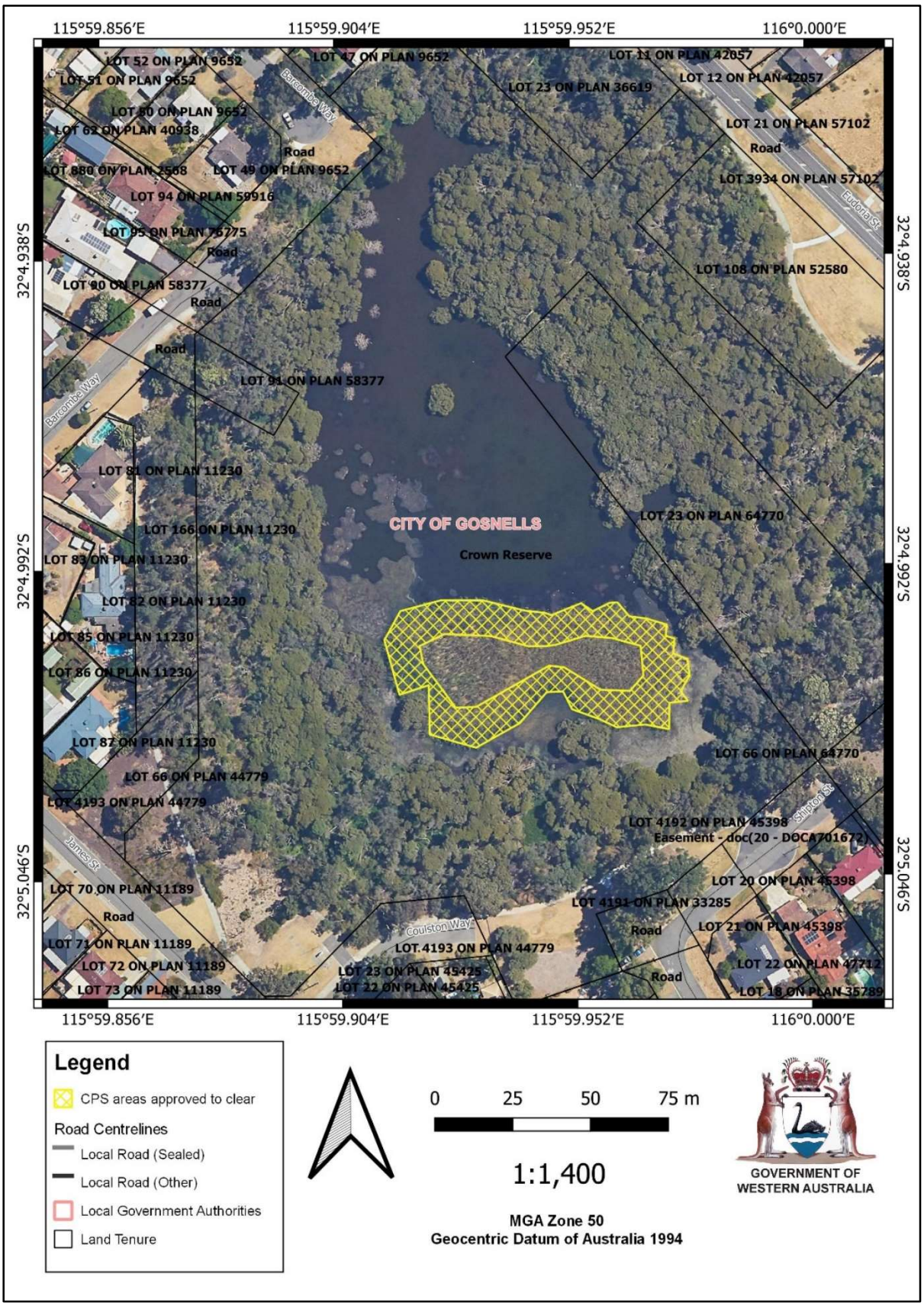

Figure 1: Map of the application area CPS 9731/1. Areas crosshatched yellow indicates the areas authorised to be cleared under the granted clearing permit.

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 (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)
- *Soil and Land Conservation Act 1945* (WA).

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)

3 Detailed assessment of application

3.1. Avoidance and mitigation measures

The applicant has proposed methods of *T. orientalis* removal. Methods include:

- Mechanical clearing of *T. orientalis* through use of brush cutters, slashing using sickle blades, and removal by hand.
- Strategic removal of *T. orientalis* to aid in protecting and enhancing the ecosystem values of the wetlands.
- Herbicide control using Roundup Biactive (Glyphosate). Methodology will be used in an environmentally sensitive manner using best practice management, which will include chemical control only being used when the wetland is dry, and during favourable weather conditions (no rain, and low wind) (City of Gosnells, 2022a).

The management of Typha at Mary Carroll Wetlands will form part of the environmental management of the reserve by the City of Gosnells through City staff, contractors, and in partnership with the Armadale Gosnells Landcare Group, and Friends of Mary Carroll Wetlands (Ecoscape, 2015). According to the Concept Plan, written by Ecoscape (2015), the City of Gosnells in association with the Friends of Mary Carroll Park (FoMCP) will undertake a removal and revegetation program to remove nominated areas of Typha species north of the boardwalk structure. Appropriate local species and tree species will be planted through the revegetation program. The City of Gosnells in association with the FoMCP will manage the existing Typha species to south of the boardwalk structure (Ecoscape, 2015).

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

3.2. Assessment of impacts on environmental values

In assessing the application, the Delegated Officer has had regard for the site characteristics (Appendix A) 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 (Appendix B) identified that the impacts of the proposed clearing may present a risk to fauna, flora, and land and water resources. 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 (Biodiversity) - Clearing Principle (a)

Assessment

According to available datasets, none of the 76 priority flora found within the local area (10 kilometre radius of application area) were recorded within the application area. As the proposed clearing will only target Typha, it is unlikely any conservation significant flora will be negatively impacted during removal, due to the nature of the clearing.

Typha is capable of aggressive invasions that can transform ecosystems unless it is actively managed (Western Australian Herbarium, 1998-). Without management, Typha can develop quickly into a monoculture and cover an entire waterbody. Dense stands of Typha will be controlled by cutting the stalks and treating the regrowth three weeks after slashing, using Roundup Biactive (Glyphosate), as specified on Florabase (Western Australian Herbarium, 1998-). Glyphosate is a general herbicide and has the potential to impact adjacent fauna and flora, and the short-term and long-term impact on aquatic wildlife from Glyphosate use is not entirely clear (DBCA, 2019). Advice received from the City of Gosnells informed DWER that the southern waterbody completely dries every year. Typically, the driest months are February through April/early May. In high rainfall years (such as experienced in winter 2021) the southern waterbody will dry out in March rather than February (City of Gosnells, 2022b).

The applicant has advised chemical control will only be used when the wetland is completely dry, and during favourable weather conditions (no rain, and low wind). Potential impacts to fauna habitat will be discussed in the section 3.2.2 below.

Conclusion
Based on the above assessment, the proposed clearing is unlikely to result in a significant loss in biodiversity or impact significant populations of priority flora. Suitable habitat for fauna species is unlikely to be significantly impacted by the proposed clearing.

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

- Undertake application of Glyphosate during the driest period of the year, when the water level is at its lowest and during calm wind conditions. Every effort must be made to keep the herbicide out of the water, by applying the Glyphosate directly to the individual stalks, to avoid any risk to the surrounding ecosystem.

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

Assessment
According to available databases, two threatened/priority fauna have been recorded within the application area, five threatened fauna species have been recorded within the Mary Carroll Wetlands and another 45 threatened fauna species have been recorded in the local area (10 kilometre radius of application area). Black cockatoo's, consisting of *Zanda latirostris* (previously *Calyptorhynchus latirostris*) (Carnaby's cockatoo), *Zanda Calyptorhynchus* (previously *Calyptorhynchus baudinii*) (Baudin's cockatoo) (*Calyptorhynchus baudinii*) and *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo), do not utilise Typha or other sedges as foraging, nesting, or roosting habitat. Given that the proposed clearing will only involve the clearing of Typha, it is unlikely to impact on black cockatoo habitat. Due to the density of Typha and presence of water, a range of other native fauna species may be present at the time of the clearing activity.

***Isoodon fusciventer* (quenda, southwestern brown bandicoot) (P4)**
This Priority 4 mammal has been recorded 0.04 kilometres from the application area and is often associated with wetlands on the Swan Coastal Plain. Populations are known to inhabit jarrah and wandoo forests and are usually associated with watercourses. The quenda's home range can extend from one to seven hectares, depending upon the density of individuals in an area, and the locality. Individuals are usually solitary, though overlap in home ranges has been recorded for some individuals (DEC, 2012). Quenda are unlikely to inhabit the application area at the time of clearing, as they do not use Typha stands as a breeding or feeding habitat.

***Phascogale tapoatafa wambenger* (south-western brush-tailed phascogale, wambenger) (V/CD)**
This vulnerable/conservation dependent mammal species has been recorded 0.04 kilometres from the application area, within the Banksia Dominated Woodlands of the Swan Coastal Plain. In the southwest, brush-tailed phascogales are known to inhabit Jarrah forests and spend the daytime inside tree hollows (DBCA, 2017). The record adjacent to the application area is within the Banksia Woodland habitat surrounding the Mary Carroll Wetlands. Phascogales are unlikely to inhabit the application area at the time of clearing, as they do not use Typha stands as breeding or feeding habitat.

***Oxyura australis* (blue-billed duck) (P4)**
This species is a wetland bird species and has been recorded 0.35 kilometres from the application area, within the northern waterbody of the Mary Carroll Wetlands. Blue billed ducks are known to breed from August to March, mostly between October to January (DBCA, 2021). Breeding habitat is typically secluded densely vegetated situations, with the nest constructed in Typha beds or other vegetation, in permanent water. Nests are usually constructed from dead Typha leaves and sometimes thinly lined with down (Birdlife Australia, 2022). The records for blue billed duck

associated with Mary Carroll Wetlands may utilise the lakes as foraging habitat, as they are almost wholly aquatic, and are seldom seen on land (Birdlife Australia, 2022).

Westralunio carteri (Carter's freshwater mussel) (VU)
This vulnerable invertebrate mussel species has been recorded 0.37 kilometres from the application area, within the northern waterbody of the Mary Carroll Wetlands. This species inhabits sandy/muddy sediments of freshwater lakes, rivers and streams; usually associated with woody debris and overhanging riparian vegetation (often flooded gum, *Melaleuca* sp. or *Casuarina* sp.); will retreat to shallow pools or damp mud with moist leaf litter in times of drought, but survival limited by dissolved oxygen, moisture, temperature (TSSC, 2018) and salinity levels (Klunzinger et al, 2015). As this species lives relies on the waterbody for survival and the clearing will take place when the water levels are clear of the Typha stands, the clearing is unlikely to inhabit the application area at the time of clearing.

Available datasets also indicate that other wetland or shore bird species recorded in the local area, may range through the application area and utilising the area as feeding habitat. These include: the migratory species *Tringa nebularia* (green shank), *Calidris acuminata* (sharp-tailed sandpiper), *Tringa glareola* (wood sandpiper), *Tringa stagnatilis* (marsh sandpiper), *Actitis hypoleucos* (common Sandpiper), *Thalasseus bergii* (crested tern), *Calidris ruficollis* (red-necked stint), *Plegadis falcinellus* (Glossy ibis), *Calidris subminuta* (long-toed Stint), *Glareola maldivarum* (oriental pratincole), *Calidris melanotos* (pectoral sandpiper), *Limosa limosa* (Black-tailed godwit), *Pluvialis squatarola* (grey plover), *Limosa lapponica* (Bar-tailed godwit), *Philomachus pugnax* (ruff (reeve)), *Pluvialis fulva* (Pacific golden plover), *Charadrius dubius* (little ringed plover), *Apus pacificus* (fork-tailed swift), as well as Critically Endangered *Calidris ferruginea* (curlew sandpiper) and *Calidris tenuirostris* (great knot), Endangered *Botaurus poiciloptilus* (Australasian bittern) and *Calidris canutus* (red knot) and Vulnerable *Charadrius leschenaultia* (greater sand plover, large sand plover) and *Thalassarche chrysostoma* (grey-headed albatross). The Mary Carroll Wetlands are known to be a major bird sanctuary important for migratory birds: listed as “must see” by Birds Australia (Ecoscape, 2015). These species do not depend exclusively on foraging in habitats prone to Typha infestation. However, as mentioned on the Western Australian Herbarium Florabase website, the management of Typha may impact on waterbird roosting sites and habitat (Western Australian Herbarium, 1998-). It is possible some of these bird species may be present at the time of clearing.

Advice was sort from DWER Water Science as to whether any threatened or protected native fish species had been found within the Mary Carroll Wetlands. Due to sampling being narrowed to rivers and permanent lakes, this wetland is yet to be sampled. Water Science Branch advised that due to this wetland virtually drying out in summer, it is unlikely to contain any native fish. The three closest wetlands, similar to the Mary Carroll Wetlands, only contained feral fish - *Gambusia holbrooki* and the fourth (west) contained gambusia and goldfish. The Canning River (northeast) had five native fish species, smooth marron, gilgie, and two feral fish species, however, this is very different habitat so it would not be expected that these would reflect the aquatic community within in the Mary Carroll Wetlands (DWER, 2022d).

Conclusion
Based on the above assessment, the application area comprising of Typha stands may provide breeding habitat and a source of nest building material for blue billed duck. There is a high probability that other migratory wetland or shore bird species may utilise the habitat. However, clearing of the Typha habitat is not likely to be significant. Slow, directional clearing, pre-clearance surveys and conducting works when the water level is at its lowest, will mitigate potential impacts to any individuals that may be present at the time of clearing.

Roundup Biactive being applied at the low water level and directly to the Typha is unlikely to have a detrimental effect on the wetland ecology.

Conditions
To address the above impacts, the following management measures will be required as conditions on the clearing permit, in areas comprising of dense stands of Typha:

- Pre-clearing site inspections prior to works commencing and ongoing during works for any fauna that may be present. If found and are not able to escape into adjacent habitat, the City of Gosnells is to cease works until the identified fauna has been translocated.
- Undertake slow, progressive one directional clearing to allow terrestrial, reptilian, amphibian and avian fauna potentially inhabiting the area to move into adjacent habitats ahead of the clearing activity.
- Undertake application of Glyphosate during the driest period of the year, when the water level is at its lowest and during calm wind conditions. Every effort must be taken to keep the herbicide out of the water, by applying the Glyphosate directly to the individual stalks, to avoid any risk to the surrounding ecosystem.

3.2.3. Environmental value: (land and water resources) - Clearing Principles (f, g and i)

Assessment

The application area includes a portion of the Mary Carroll Wetlands, which is a portion of the Bush Forever Regional Scheme - Site number 124. It is also a part of the Conservation Category - Swan Coastal Plain Geomorphic Wetland (UFI – 7968) lake system. The proposed clearing is for the purpose of controlling the occurrence of Typha due to its invasive nature and adverse impacts on wetlands, in the absence of management. Given the above, the proposed clearing is not likely to result in any long-term impact to the ecological values of the wetland within the application area.

Considering the nature of the proposed clearing activities, the most likely land degradation impacts anticipated to result from the proposed clearing would be wind erosion of the exposed ground. However, the applicant is only proposing to clear a small area in proportion to the surrounding vegetation coverage and strategically zoned to not expose one large area (Figure 1), so the risk of soil erosion within the application area is relatively low. The remaining 0.1 hectares of Typha in the centre of the application area (outside of the application footprint) will assist in maintaining the stability of the embankment.

The removal of Typha has the potential to increase sedimentation and turbidity in wetlands within the application area, thereby possibly impacting surface water quality. Due to the small scale of the clearing and the time of the year it will be occurring (low water levels), it is not likely to cause long-term deterioration in the quality of surface water. The applicant is also proposing to plant native sedges and rushes in area of clearing, further reducing the risk of land erosion and subsequent loss in water quality.

According to available data sets, the Mary Carroll Wetlands are situated in an area that represents a high to moderate risk of encountering acid sulphate soils. Advice from Contaminated Sites (DWER, 2022b) determined the methods proposed to be used by the City of Gosnells to control and thin Typha, represents methods with low to no risk of acid sulphate soil disturbance.

Conclusion

The proposed clearing is not likely to significantly impact riparian vegetation and is expected to enhance riparian and wetland habitats, within the application area in the long term. Typha removal methods provided by the applicant are considered sufficient to prevent appreciable land degradation. The small scale of the clearing is unlikely to result in the deterioration in the quality of surface or underground water.

Conditions

Nil management conditions required.

3.3. Relevant planning instruments and other matters

The DBCA (2019) advised that the use of Glyphosate can be contentious near human populations and that the short-term and long-term impact on aquatic wildlife from Glyphosate use is not entirely clear. Within Australia, the regulation of pesticides is undertaken by the Australian Pesticides and Veterinary Medicine Authority. There are legal penalties in place for using pesticides outside of label directions. The applicant is advised to ensure their use of Glyphosate, in the form of Roundup Biactive during this clearing activity, complies with all legal requirements concerning the use of this pesticide. Furthermore, applying the Glyphosate when the wind is calm and directing the spray carefully to each individual stalk will mitigate potential risk to adjacent vegetation and fauna.

The application area falls within the Perth Groundwater Area (UFI - 35), as proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act). Advice from Regulatory Services in DWER determined that a water licence or permit would not be required to undertake the clearing proposed (DWER, 2022c).

The application area is located within the Whadjuk People Indigenous Land Use Agreement - WI2017/015 boundary under Native Title (Indigenous Land Use Agreements (LGATE-067). There are no Aboriginal Heritage sites of significance located within the boundaries of the area. There are six registered Aboriginal Heritage sites within approximately 1.3 kilometres of 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.

Correspondence was received by the Department of Planning, Lands and Heritage (DPLH) in support of the clearing of Typha. DPLH advised that the reduction of Typha forms part of the environmental management measures undertaken by the City of Gosnells, in partnership with a Landcare Group and Friends of Mary Carroll wetlands to reduce the native, but highly invasive species. The stand has previously been partly cleared to reduce its spread and needs to be repeated. DPLH understand that the works will enhance the ecosystem values of the Conservation

Category wetland. As such, DPLH's Land Use Planning Policy team are in support of the proposed clearing (DPLH, 2022).

End

Appendix A: Site characteristics

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

A.1. Site characteristics

Characteristic	Details
Local context	The proposed clearing is for the targeted removal of robust herbaceous reeds, commonly known as Typha species: *Typha orientalis*, occurring in southern lake at Mary Carroll wetlands in the City of Gosnells. Spatial data indicates the local area (10 kilometre radius from the centre of the area proposed to be cleared) retains approximately 30.2 per cent of the original native vegetation cover.
Ecological linkage	The application area is not mapped as forming an ecological linkage. The proposed clearing will not sever or impact an ecological linkage.
Conservation areas	The application area is within a Bush Forever Site (Site No. - 124) and within the Swan Coastal - DBCA District Boundary (DBCA-023). The Mary Carroll Wetlands, in which the application area lies within, is mapped as a Conservation Category Wetland of the Swan Coastal Plain. Additional local conservation areas include: • Canning River - DBCA Legislated Lands and Waters (DBCA-011) lays approximately 1.24 kilometres east of the application area. • Banyowla Regional Park (DBCA-026) lays approximately 2.21 kilometres east of the application area.
Vegetation description	According to available data sets the vegetation in application area is mapped as: • Forrestfield Complex - 29 - Vegetation ranges from open forest of *Corymbia calophylla* (marri) - *Eucalyptus wandoo* (wandoo) - *Eucalyptus marginata* (jarrah) to open forest of *Eucalyptus marginata* (jarrah) - *Corymbia calophylla* (marri) - *Allocasuarina fraseriana* (sheoak) - *Banksia* species. Fringing woodland of *Eucalyptus rudis* (flooded Gum) in the gullies that dissect this landform. (Shepherd et al, 2001). • *Typha orientalis* - native to Western Australia. Capable of aggressive invasion that can transform wetland ecosystems unless actively managed. Flowers are monoecious (individual flowers are either male or female, however both sexes can be found on the same plant) and are wind pollinated. Seedlings can flower after six months. Plants senesce in late summer after flowering. New shoots that are produced in autumn grow slowly over winter. Maximum above ground growth occurs during months of higher temperatures and long photoperiods, whereas productivity of roots and rhizomes is highest during low temperatures and short photoperiods. Loses more organic matter in sites subject to seasonal wet/dry hydrological cycles compared to permanently inundated sites. There can be marked differences in ecotypes (Western Australian Herbarium, 1998-). Swan Coastal Plain vegetation complexes as described and mapped by Heddle et al. (1980) as updated by Webb et al. (2016). The mapped vegetation within the local area, retains approximately 30.2 per cent of the original extent (Government of Western Australia, 2019).
Vegetation condition	The applicant has not provided information regarding the condition of the native vegetation within the application area. From analysing aerial imagery of the area and photographs from the Mary Carroll Concept Plan (Ecoscape, 2015), it appears the vegetation is in very good (Keighery 1994) to degraded (Keighery 1994) condition. The full Keighery (1994) condition rating scale is provided in Appendix C.

<table>
<tr><th>Characteristic</th><th>Details</th></tr>
<tr><td>Climate</td><td>The climate is classified as Mediterranean, with dry, hot summers and cool, wet winters.
average rainfall (over the past 29 years) is 736.4 mm pa, with the majority falling between May and August.
average maximum temperature ranges from 18.7 degrees centigrade in July to 33.1 degrees centigrade in January.
the highest recorded maximum being 46 degrees centigrade
average minimum temperatures range from 8.8 degrees centigrade in July to 18.8 degrees centigrade in February.
the lowest recorded minimum being 0.5 degrees centigrade (BOM 2021).</td></tr>
<tr><td>Soil description and landform</td><td>The application area is located within the Pinjarra system, which extends from Perth to Capel. It consists of the poorly drained coastal plain with variable alluvial and aeolian soils. Variable vegetation includes jarrah, marri, wandoo, paperbark sheoaks and rudis. It is located on the soil sub-system of Wilyabrup Valleys (EnvGeol Sp2 Phase - 213Pj__Sp2) which contains peat-rich sand - fine to medium-grained quartz sand with much brown to black organic material, grades to peat, of lacustrine origin (Schoknecht et al., 2004).</td></tr>
<tr><td>Land degradation risk</td><td>The soil types mapped within the application area have a high variability of risk.
<table>
<tr><th>Risk categories</th><th>Application Area</th></tr>
<tr><td>Wind erosion</td><td>H2: >70% of map unit has a high to extreme wind erosion risk</td></tr>
<tr><td>Water erosion</td><td>H2: >70% of map unit has a high to extreme water erosion risk</td></tr>
<tr><td>Water logging</td><td>H2: >70% of map unit has a moderate to very high waterlogging risk</td></tr>
<tr><td>Water Repellence</td><td>L1: <3% of map unit has a high water repellence risk</td></tr>
<tr><td>Sub-surface Acidification</td><td>H2: >70% of map unit has a high subsurface acidification risk or is presently acid</td></tr>
<tr><td>Phosphorous export</td><td>H2: >70% of map unit has a high to extreme phosphorus export risk</td></tr>
<tr><td>Salinity</td><td>L1: 30-50% of map unit has a moderate to high salinity risk or is presently saline</td></tr>
<tr><td>Flooding</td><td>H2: >70% of the map unit has a moderate to high flood risk</td></tr>
<tr><td>ASS</td><td>High to moderate risk of ASS occurring within 3 metres of natural soil surface</td></tr>
</table></td></tr>
<tr><td>Waterbodies</td><td>The application area comprises a portion of the southern waterbody of the Mary Carroll Wetlands, classified as a Conservation Category Wetland (Geomorphic Wetlands of the Swan Coastal Plain). According to available databases, there are numerous ‘unknown’ Conservation, Resource Enhancement and Multiple Use Category lakes, palusplains, rivers, sumplands, damplands and artificial lakes within the local area.</td></tr>
<tr><td>Hydrogeography</td><td>The application area falls within the Groundwater Water Area (UFI – 35) proclaimed under the RIWI Act 1914 (DWER-034). It is also within the Coastal Plain Hydrological Zone – which occupies the western portion of the Perth Basin. Major aquifers: Leederville, Yarragadee &</td></tr>
</table>

Characteristic	Details
	Cockleshell Gully Fms. The eastern Yoganup Fm, is a major recharge area; discharge to the Indian Ocean. According to the Groundwater Salinity Statewide (DWER-026) dataset, the application area has a salinity reading of between 500 – 1000mg/L.
Flora	According to available datasets, two Threatened and seven Priority Flora have been recorded within the boundary of the Mary Carroll Wetland, 0.04 kilometres from the application area. Of these nine species, only four are commonly known to occur within wetlands or near waterbodies. These include *Aponogeton hexatepalus* (P1), *Calytrix breviseta* subsp. *breviseta* (CR), *Cyanothamnus tenuis* (P4) *and Halgania corymbose* (P3). There are a total of 100 different Threatened and Priority Flora species recorded in the local area (10 kilometres from the application area). Of these only *Bolboschoenus fluviatilis* is known to be associated with Typha, however, the nearest record is 6.26 kilometres from the application area.
Ecological communities	The threatened ecological community (TEC), Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region, Endangered under the EPBC Act, is mapped adjacent to the application area. Noting the clearing is only targeting Typha, impacts to this ecological community is not considered significant.
Fauna	A total of 52 conservation significant fauna are recorded in the local area. The nearest record is for *Isoodon fusciventer* (quenda, southwestern brown bandicoot) and *Phascogale tapoatafa wambenger* (south-western brush-tailed phascogale, wambenger) which have been recorded 0.04 kilometres east of the application area. Black cockatoo habitat within the local area includes: • One white tailed black cockatoo breeding site has been recorded within the local area approximately 5.67 kilometres east of the application area. • A total of 45 black cockatoo roosts sites. The nearest is 0.54 kilometres north-east of the application area. • Approximately 90 percent of all remnant vegetation in the local area, is mapped as cockatoo feeding habitat. Habitat suitability analysis is provided in table A.3 for threatened species recorded in the local area.

A.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	7,903,991.45	7,898,973.24	99.94	496,367.56	6.28
Vegetation complex*					
Forrestfield Complex - 29	22,812.92	2,803.36	12.29	381.57	1.67
Remnant vegetation*					
Remnant vegetation mapped within 10 km	31,660	9,564	30.2	-	-

*Government of Western Australia (2019a)

	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

**Government of Western Australia (2019b)

A.3. Fauna analysis table

Species name	Conservation status	Suitable habitat features? [Y/N]	Suitable vegetation type? [Y/N]	Distance of closest record to application area (km)	Number of known records (total)	Are surveys adequate to identify? [Y, N, N/A]
Isoodon fusciventer (quenda, southwestern brown bandicoot)	P4	Y	Y	0.04	603	N
Phascogale tapoatafa wambenger (south-western brush-tailed phascogale, wambenger)	CD	Y	Y	0.04	22	N
Calyptorhynchus latirostris (Carnaby's cockatoo)	EN	N	N	0.24	1764	N/A
Tringa nebularia (common greenshank, greenshank)	MI	Y	Y	0.33	39	N/A
Oxyura australis (blue-billed duck)	P4	Y	Y	0.35	56	N
Westralunio carteri (Carter's freshwater mussel)	VU	Y	Y	0.37	50	N
Calyptorhynchus banksii naso (forest red-tailed black cockatoo)	VU	N	N	0.45	105	N/A
Idiosoma sigillatum (Swan Coastal Plain shield-backed trapdoor spider)	P3	Y	Y	1.25	15	N/A
Ctenotus ora (coastal plains skink)	P3	Y	Y	1.44	1	N/A
Dasyurus geoffroii (chuditch, western quoll)	VU	N	N	1.81	24	N/A
Falco peregrinus (peregrine falcon)	OS	Y	Y	1.84	24	N/A
Calyptorhynchus sp. 'white-tailed black cockatoo' (white-tailed black cockatoo)	EN	N	N	2.32	124	N/A
Acanthophis antarcticus (southern death adder)	P3	Y	Y	3.53	14	N/A
Calyptorhynchus baudinii (Baudin's cockatoo)	EN	N	N	3.57	198	N/A
Hydromys chrysogaster (water-rat, rakali)	P4	Y	Y	4.01	11	N/A
Notamacropus irma (western brush wallaby)	P4	N	N	4.36	15	N/A
Thalassarche chrysostoma (grey-headed albatross)	VU	Y	Y	5.44	1	N/A
Calidris acuminata (sharp-tailed sandpiper)	MI	Y	Y	5.50	10	N/A
Ctenotus delli (Dell's skink, Darling Range southwest ctenotus)	P4	N	N	5.89	1	N/A
Leioproctus douglasiellus (a short-tongued bee)	EN	N	N	6.39	5	N/A
Setonix brachyurus (quokka)	VU	N	N	6.50	12	N/A
Actitis hypoleucos (common sandpiper)	MI	Y	Y	6.56	1	N/A
Tringa glareola (wood sandpiper)	MI	Y	Y	6.56	5	N/A
Tringa stagnatilis (marsh sandpiper, little greenshank)	MI	Y	Y	6.56	2	N/A
Myrmecobius fasciatus (Numbat, walpurti)	EN	N	N	6.96	8	N/A
Glossurocolletes bilobatus (a short-tongued bee (southwest))	P2	N	N	6.98	1	N/A
Ierista lineata (Perth slider, lined skink)	P3	Y	Y	7.20	12	N/A
Bettongia penicillata ogilbyi (woylie, brush-tailed bettong)	CR	N	N	7.43	2	N/A
Botaurus poiciloptilus (Australasian bittern)	EN	N	N	7.59	7	N/A
Calidris canutus (red knot)	EN	N	N	7.59	2	N/A
Calidris ferruginea (curlew sandpiper)	CR	Y	Y	7.59	10	N/A
Calidris melanotos (pectoral sandpiper)	MI	Y	Y	7.59	3	N/A

Species name	Conservation status	Suitable habitat features? [Y/N]	Suitable vegetation type? [Y/N]	Distance of closest record to application area (km)	Number of known records (total)	Are surveys adequate to identify? [Y, N, N/A]
Calidris ruficollis (red-necked stint)	MI	Y	Y	7.59	13	N/A
Calidris subminuta (long-toed Stint)	MI	Y	Y	7.59	7	N/A
Calidris tenuirostris (great knot)	CR	Y	Y	7.59	1	N/A
Charadrius dubius (little ringed plover)	MI	Y	Y	7.59	1	N/A
Charadrius leschenaultii (greater sand plover, large sand plover)	VU	Y	Y	7.59	2	N/A
Elanus scriptus (letter-winged kite)	P4	N	N	7.59	1	N/A
Glareola maldivarum (oriental pratincole)	MI	Y	Y	7.59	6	N/A
Limosa lapponica (bar-tailed godwit)	MI	Y	Y	7.59	2	N/A
Limosa limosa (black-tailed godwit)	MI	Y	Y	7.59	3	N/A
Philomachus pugnax (ruff (reeve))	MI	Y	Y	7.59	2	N/A
Plegadis falcinellus (glossy ibis)	MI	Y	Y	7.59	11	N/A
Pluvialis fulva (pacific golden plover)	MI	Y	Y	7.59	2	N/A
Pluvialis squatarola (grey plover)	MI	Y	Y	7.59	3	N/A
Thalasseus bergii (crested tern)	MI	Y	Y	7.59	29	N/A
Austroconops mcmillani (McMillan's biting midge (Swan Coastal Plain))	P2	Y	Y	7.70	1	N/A
Kawaniphila pachomai (grey vernal katydid (southwest))	P1	Y	Y	7.80	1	N/A
Neopasiphae simplicior (a short-tongued bee)	EN	N	N	7.82	7	N/A
Apus pacificus (fork-tailed swift)	MI	Y	Y	8.04	2	N/A
Leioproctus contrarius (a short-tongued bee)	P3	N	N	8.59	2	N/A
Neelaps calonotos (black-striped snake, black-striped burrowing snake)	P3	N	N	9.23	7	N/A

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

Appendix B. Assessment against the clearing principles

Assessment against the clearing principles	Variance level	Is further consideration required?
Environmental value: biological values		
Principle (a): *"Native vegetation should not be cleared if it comprises a high level of biodiversity."* Assessment: The application area may contain suitable habitat and soils for a number of conservation significant fauna. Given the strategic placement of the application area, and that it comprises solely of Typha, it is not anticipated that the proposed clearing will significantly impact fauna habitat or conservation significant assemblages of plants.	May be at variance	Yes *Refer to Section 3.2.1, above*.
Principle (b): *"Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna."* Assessment: The area proposed to be cleared may contain foraging, breeding and/or suitable habitat for conservation significant fauna.	May be at variance	Yes *Refer to Section 3.2.2, above.*
Principle (c): *"Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora."* Assessment: Of the 24 threatened flora species recorded in the local area none have been typically associated with *Typha* spp. Therefore, the proposed clearing is unlikely to impact flora species listed under the BC Act.	Not likely to be at variance	No
Principle (d): *"Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community."* Assessment: According to available spatial data, the area proposed to be cleared is directly adjacent to the TEC, Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region. However, the presence of Typha would indicate that soil hydrological conditions within application area are not suitable for the above TEC. Therefore, the targeted removal of Typha is unlikely the impact the adjacent Banksia Woodland.	Not likely to be at variance	No
Environmental value: significant remnant vegetation and conservation areas		
Principle (e): *"Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared."* Assessment: The extent of the mapped remanent native vegetation in the local area represents 30.2 percent of its, original extent. This is consistent with the national objectives and targets for biodiversity conservation in Australia. 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-European settlement, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia, 2001). Considering the targeted nature of Typha removal, the proposed clearing is unlikely to further degrade any vegetation remnant of native vegetation in an area.	Not at variance	No

Assessment against the clearing principles	Variance level	Is further consideration required?
Principle (h): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area."* Assessment: The application area is within a Bush Forever Site. Given the purpose of the proposed clearing is to improve wetland habitat of the Mary Carroll Wetlands (City of Gosnells, 2022a), it is not likely to have a detrimental impact on the environmental values of the reserve.	Not likely to be at variance	No
Environmental value: land and water resources		
Principle (f): *"Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland."* Assessment: The proposed clearing is growing in association with a wetland. Typha forms a natural component of native wetland and watercourse vegetation. However, Typha can dominate wetland ecosystems. Given the nature of the proposed clearing, it is unlikely to significantly impact the Mary Carroll Wetlands.	At variance	Yes *Refer to Section 3.2.3 above.*
Principle (g): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation."* Assessment: The mapped soil unit, the Wilyabrup Valleys System - peat-rich sand, is highly susceptible to wind/water erosion, waterlogging, sub-surface acidification, Phosphorus export and flooding (greater than 70 percent). The Mary Carroll Wetlands are situated in an area that represents a high to moderate risk of encountering acid sulphate soils within 3 metres of natural soil surface. The clearing method proposed is not likely to have an appreciable impact on land degradation, as it will not be disturbing the soil at such depths.	Not likely to be at variance	Yes *Refer to Section 3.2.3 above*
Principle (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."* Assessment: The removal of Typha may increase water turbidity, short term. As the removal will occur when the water level is at its lowest, this will not likely be a significant issue.	May be at variance	Yes *Refer to Section 3.2.3, above.*
Principle (j): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding."* Assessment: The targeted removal of Typha during clearing is not likely to contribute to an increase in the incidence or intensity of flooding.	Not at variance	No

Appendix C. 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.
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 D. Photographs of Mary Carroll Wetlands

Figure 2: Photos from the Mary Carroll Concept Plan 2015 (Ecoscape, 2015)

Figure 3: Photo of the *Typha orientalis* at the southern end of Mary Carroll Wetlands, taken on 27 April 2022 (City of Gosnells, 2022a).

Appendix E. Sources of information

E.1. GIS databases

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

- 10 Metre Contours (DPIRD-073)
- 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)
- Offsets Register – Offsets (DWER-078)
- 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
- Wheatbelt Wetlands Stage 1 (DBCA-021)

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)

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