



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 9241/1
Permit Holder:	Water Corporation
Duration of Permit:	From 18 August 2021 to 18 August 2026

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 irrigated agriculture, associated infrastructure and access tracks.

2. Land on which clearing is to be done

Lot 1502 on Deposited Plan 75036, Roebuck.

3. Clearing authorised

The permit holder must not clear more than 31 hectares of native vegetation within the area cross-hatched yellow in Figure 1 of Schedule 1.

PART II – MANAGEMENT CONDITIONS

4. 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.

5. 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*:

- (a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
- (b) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

6. Directional clearing

The permit holder must:

- (a) conduct clearing authorised under this permit in one direction towards adjacent native vegetation; and
- (b) allow a reasonable time for fauna present within the area being cleared to move into adjacent native vegetation ahead of the clearing activity.

7. Wind erosion management

The permit holder must ensure that the planting of Rhodes grass within the area cross-hatched yellow in Figure 1 of Schedule 1 occurs within three months of the clearing authorised under this permit being undertaken.

8. Fauna management

- (a) Immediately prior to undertaking any clearing authorised under this permit, the permit holder shall engage a *fauna specialist* to undertake clearance surveys for the greater bilby (*Macrotis lagotis*) within the area cross-hatched yellow in Figure 1 of Schedule 1, using transects spaced at a maximum 100 metres apart, to identify and inspect (if present) greater bilby burrows for signs of use.
- (b) Where evidence of recent burrow use by greater bilbies is identified under condition 8(a) of this permit, the permit holder shall:
 - (i) engage a *fauna specialist* to flag the location of the burrow/s showing signs of recent use;
 - (ii) not clear within ten metres of the flagged burrow/s;
 - (iii) engage a *fauna specialist* to monitor with cameras, the flagged burrow/s for a maximum of five days, or until such time that greater bilbies have been observed to independently move on from the burrow/s; and
 - (iv) immediately prior to clearing, engage a *fauna specialist* to re-inspect any flagged burrow/s for the presence of greater bilbies.
- (c) If greater bilbies are identified utilising any flagged burrow/s under condition 8(b)(iv) of this permit, the permit holder shall engage a *fauna specialist* to remove and relocate the identified greater bilbies to an area of *suitable habitat*, in accordance with a fauna licence pursuant to Section 28 of the *Biodiversity Conservation Regulations 2018*.
- (d) Where active greater bilby burrows are identified under condition 8(a) of this permit, and/or greater bilbies are relocated under condition 8(c) of this permit, the permit holder shall include the following in a report submitted to the *CEO*:
 - (i) The location of any active greater bilby burrows identified, using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (ii) a description of the camera monitoring measures undertaken under condition 8(b)(iii) of this permit;
 - (iii) the date and time that greater bilbies were recorded as independently moving from a flagged burrow;
 - (iv) the gender of each greater bilby captured under condition 8(c) of this permit;
 - (v) the location of any greater bilbies captured, using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;

- (vi) the date, time, vegetation type and weather conditions at each location where greater bilbies were captured under condition 8(d)(v) of this permit;
- (vii) the scientific name and gender of each greater bilby relocated under condition 8(c) of this permit;
- (viii) the location of any greater bilbies relocated, using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
- (ix) the date, time, vegetation type and weather conditions at each location where greater bilbies are relocated under condition 8(d)(viii) of this permit;
- (x) the name of the *fauna specialist* that relocated fauna under condition 8(c) of this permit; and
- (xi) a copy of the fauna licence authorising the relocation of fauna under condition 8(c) of this permit.

PART III - RECORD KEEPING AND REPORTING

9. 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 GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings; (c) the date that the area was cleared; (d) the size of the area cleared (in hectares); (e) actions taken to avoid, minimise, and reduce the impacts and extent of clearing in accordance with condition 4; (f) actions taken to minimise the risk of the introduction and spread of weeds in accordance with condition 5; (g) actions undertaken in accordance with condition 6; (h) actions undertaken in accordance with condition 7; (i) actions undertaken in accordance with condition 8; (j) a report detailing the date and methods of the clearance survey undertaken in accordance with condition 8.

10. Reporting

- (a) The permit Holder must provide to the *CEO* on or before 30 June of each year, a written report:
 - (i) of records required under condition 9 of this permit; and
 - (ii) concerning activities done by the permit holder under this permit between 1 January to 31 December of the preceding calendar year.
- (b) If no clearing authorised under this permit has been undertaken, a written report confirming that no clearing under this permit has been undertaken, must be provided to the *CEO* on or before 30 June of each year.

- (c) Prior to 20 May 2026, the permit holder must provide to the *CEO* a written report of records required under condition 9 of this permit where these records have not already been provided under condition 10(a) of this permit.

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 <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.
fauna specialist	means a person who holds a tertiary qualification specialising in environmental science or equivalent, and has a minimum of 2 years work experience in fauna identification and surveys of fauna native to the region being inspected or surveyed, or who is approved by the CEO as a suitable fauna specialist for the bioregion, and who holds a valid fauna licence issued under the <i>Biodiversity Conservation Act 2016</i> .
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.
EP Act	<i>Environmental Protection Act 1986</i> (WA)
native vegetation	has the meaning given under section 3(1) and section 51A of the EP Act.
suitable habitat	means habitat known to support <i>Macrotis lagotis</i> within the known current distribution of the species
weeds	means any plant – <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



Meenu Vitarana
A/MANAGER

NATIVE VEGETATION REGULATION

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

26 July 2021

SCHEDULE 1

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

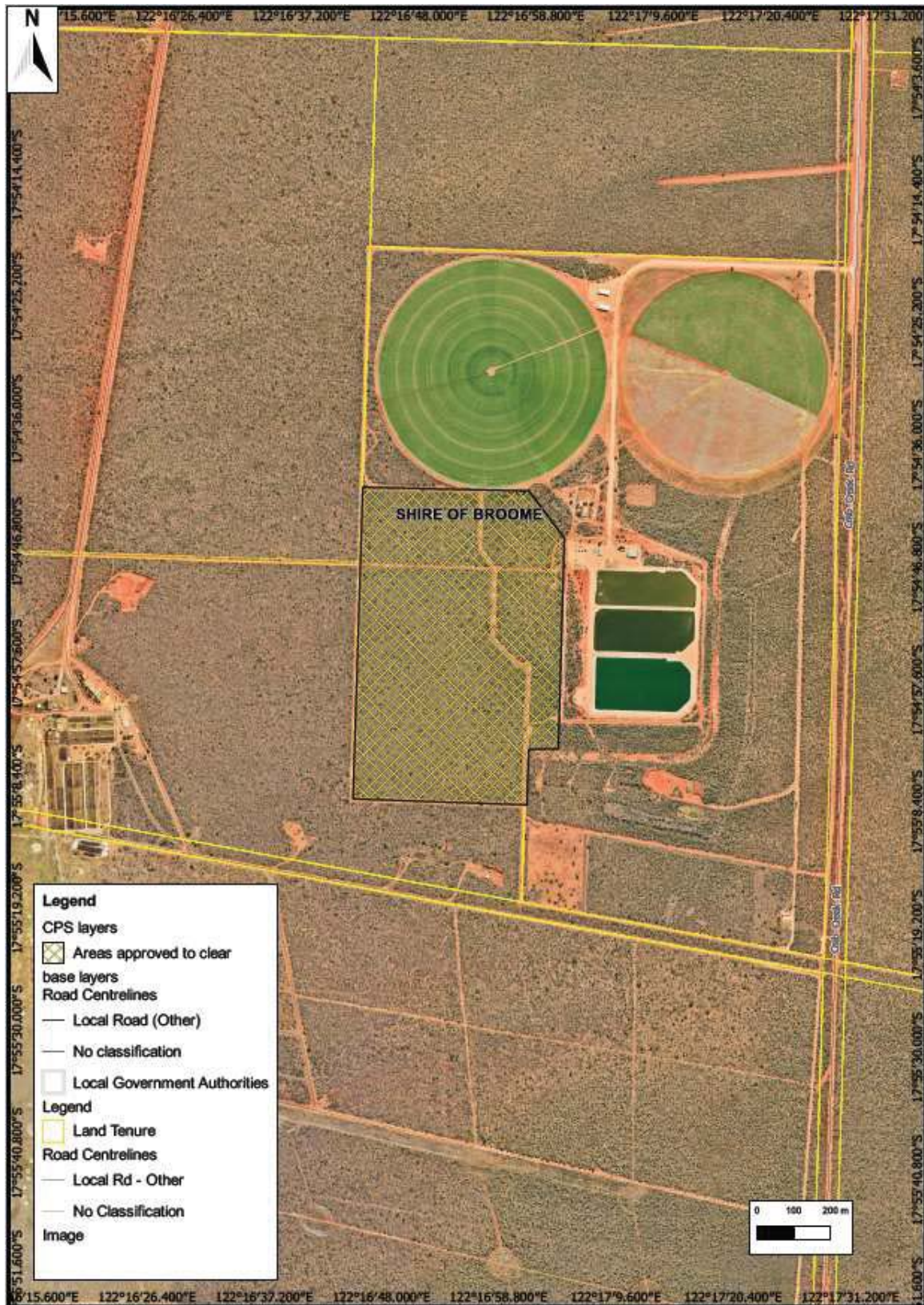


Figure 1: Boundary of the area (cross-hatched yellow) within which clearing may occur.



Clearing Permit Decision Report

1 Application details and outcome

1.1. Permit application details

Permit number:	CPS 9241/1
Permit type:	Purpose permit
Applicant name:	Water Corporation
Application received:	18 March 2021
Application area:	31 hectares
Purpose of clearing:	Irrigated agriculture
Method of clearing:	Mechanical
Property:	Lot 1502 on Deposited Plan 75036
Location (LGA area/s):	Shire of Broome
Localities (suburb/s):	Roebuck

1.2. Description of clearing activities

Water Corporation proposes to clear 31 hectares of native vegetation for a pivot irrigation system, to support management of disposing treated water from the Broome North Wastewater Treatment Plant. The applicant proposes to grow Rhodes Grass (*Chloris gayana*) crops to uptake the irrigated wastewater nutrients. The pivot has a diameter of 550 metres which will require a 30 metre wide annular area outside the irrigation area for harvester/plant manoeuvrability and fire mitigation.

It is noted that upgrades to the Broome North Wastewater Treatment Plant are required to enable treatment of all Broome's wastewater given the closure of the Broome South plant to protect Roebuck Bay.

The application area is around four kilometres east of Broome townsite. It is immediately west of the Broome North Wastewater Treatment Plant, is bordered to the north by existing pivot irrigation (also uses treated water for irrigation) and is bordered south and west by remnant native vegetation. The larger remnant occurs within a highly vegetated landscape.

Decision:	Granted
Decision date:	26 July 2021
Decision area:	31 hectares of native vegetation as depicted in Section 1.5, below.

1.3. Reasons for decision

This application was 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 undertaking their assessment and in accordance with section 51O of the EP Act, the Delegated Officer considered the site characteristics (see Appendix A), the Clearing Principles in Schedule 5 of the EP Act (see

Appendix B), relevant planning instruments and other matters (see Section 3), the findings of biological surveys (see Appendix D), as well as relevant datasets available at the time of the assessment (see Appendix E).

The Delegated Officer has determined that the proposed clearing of 31 hectares of pindan shrubland, is unlikely to result in significant residual environmental impacts, noting that biological surveys did not identify any priority or threatened flora, fauna, or ecological communities.

However, the proposed clearing may result in the following:

- direct impacts to fauna (including the greater bilby) utilising the site during the time of clearing
- the potential introduction and spread of weeds into adjacent native vegetation
- minor wind erosion

After considering the available information, the Delegated Officer determined that the following requirements will be conditioned on the clearing permit to manage and address the potential impacts of clearing:

- avoid and minimise measures to reduce the impacts and extent of clearing
- take hygiene steps to minimise the risk of the introduction and spread of weeds
- construction must occur within three months of clearing to minimise wind erosion risks
- undertake slow, progressive one directional clearing to allow terrestrial fauna to move into adjacent habitat ahead of the clearing activity
- pre-clearance surveys to identify greater bilby within the application area, and the relocation of any individuals recorded.

Given the above management condition requirements, the Delegated Officer determined that the proposed clearing is unlikely to lead to an unacceptable risk to the environment.

1.4. Site map

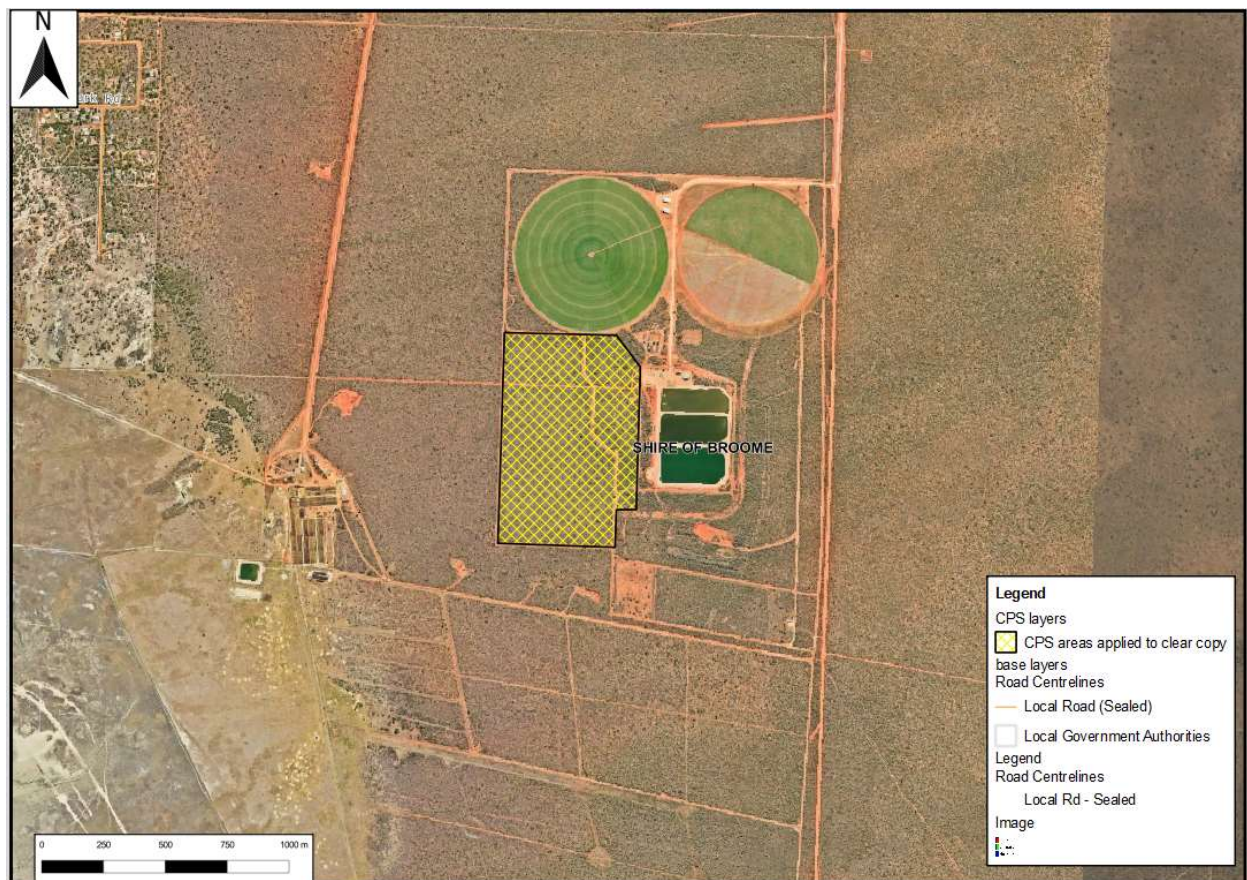


Figure 1. Map of application area

The area cross-hatched yellow indicates the area authorised to clear 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 polluter pays principle
- the principle of the conservation of biological diversity and ecological integrity.

Other legislation of relevance for this assessment include:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Planning and Development Act 2005* (WA) (P&D 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)
- technical guidance – *Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA, 2016)

3 Detailed assessment of application

3.1. Avoidance and mitigation measures

The applicant has advised that the amount (hectares) of clearing necessary to construct the pivot irrigation system is based on nutrient and water uptake of treated wastewater by harvestable pasture crops. Therefore the proposed clearing area will allow for sufficient Rhodes Grass to be grown to uptake all nutrients from the treated wastewater, and is therefore required (GHD, 2020).

3.2. Assessment of impacts on environmental values

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

The assessment identified that the clearing presents a risk to flora and fauna values, and that these required further consideration. The consideration of impacts to these values, and the extent to which they can be managed through conditions applied in line with sections 51H and 51I of the EP Act, is set out below.

3.2.1. Environmental value: Biodiversity values (flora) – Clearing Principles (a) and (c)

Threatened and Priority Flora

Based on the mapped vegetation, soil and landform types, the application area provides potentially suitable habitat for the following nine conservation listed flora species:

- *Seringia exastia* – Threatened (Endangered)
- *Jacquemontia* sp. Broome (A.A. Mitchell 3028) (Priority 1)
- *Polymeria* sp. Broome (K.F. Kenneally 9759) (Priority 3)
- *Terminalia kumpaja* (Priority 3)
- *Acacia monticola x tumida* var. *kulparn* (Priority 3)
- *Aphyllodium glossocarpum* (Priority 3)
- *Glycine pindanica* (Priority 3)
- *Seringia katatona* (Priority 3)
- *Bonamia oblongifolia* (Priority 3)

The application area was subject to a targeted flora and vegetation survey (the Flora Survey) by GHD in May 2019, which covered a larger survey area of 148 hectares. GHD took an additional likelihood of occurrence assessment post field survey for all conservation listed flora species known from the local area. The Flora Survey identified that

two species were likely to occur in the application area, given habitat suitability and presence of nearby known records (GHD, 2020):

- *Jacquemontia* sp. Broome (A.A. Mitchell 3028) (Priority 1) is a creeping herb that grows to around 0.3 metres (Western Australian Herbarium, 1998-), known from seven records.
- *Polymeria* sp. Broome (K.F. Kenneally 9759) (Priority 3) is a prostrate sprawling herb (Western Australian Herbarium, 1998-), known from six records.

The Flora Survey did not identify any threatened or priority listed flora species (GHD, 2020).

DWER notes that the Flora Survey was undertaken during May, which is outside of the optimum survey period for the Dampierland Bioregion, (January to March). However, the Flora Survey notes that the survey timing is acceptable as it is just outside the optimal survey time and most flora species could be identified during this time (GHD, 2020).

Further supplementary information from GHD noted that “*Jacquemontia* sp. Broome (A.A. Mitchell 3028) was in flower and detectable at the time of the survey and recorded in a nearby survey area... [and] other common *Polymeria* sp were identified and recorded from flowering material. *Polymeria* sp. Broome (K.F. Kenneally 9759) would be detectable at the time of the survey” (GHD, 2020a).

The application area provides suitable habitat for one threatened flora species, being *Seringia exastia*. The flora survey did not identify this species. The Flora Survey timing was within the flowering time of this species, which begins flowering in late April (Western Australian Herbarium, 1998-).

Weed risks to biodiversity

The Flora Survey identified ten introduced flora species within the larger survey area, attributed to nearby historical clearing and soil movement (GHD, 2020). None of the identified weed species are listed as Declared pest plants under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) and/or a Weeds of National Significance (WoNS).

The proposed clearing will increase the risk of weeds spreading into adjacent areas of native vegetation.

Conclusion

Based on the above assessment, and findings of the Flora Survey, the proposed clearing is unlikely to impact on any threatened or priority flora species. However, the proposed clearing may increase the risk of weeds spreading into adjacent native vegetation, noting that numerous non-native species were recorded in the Flora Survey.

Outcome

To address the potential spread of weeds into adjacent native vegetation, the clearing permit contains a condition that requires the applicant to undertake weed hygiene management measures.

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

Fauna Habitat and Suitability

The application area was subject to a Fauna Assessment undertaken by GHD in May 2019, which covered a larger survey area of 148 hectares encompassing the application area. The Fauna Assessment identified that the application comprises red sandy loam pindan plain supporting tall mixed *Acacia* shrubland, with occasional emergent *Corymbia*, over a midstorey of mixed *Acacia* and other low shrubs, over mixed tussock grasses and low forbs, with occasional patches of soft-spined *Triodia* hummocks (GHD, 2020). The Fauna Assessment notes there is around 5 to 10 per cent of bare ground over most of the application area due to a high density of ground cover vegetation, leaf litter and other fallen dead vegetation (GHD, 2020).

The following conservation significant fauna species (state listing shown below) have been identified as potentially occurring within the application area:

- greater bilby (*Macrotis lagotis*) (vulnerable)
- peregrine falcon (*Falco peregrinus*) (other specially protected fauna)
- grey falcon (*Falco hypoleucos*) (vulnerable)
- gouldian finch (*Erythrura gouldiae*) (endangered)

- barn swallow (*Hirundo rustica*) (protected under international agreement)
- Dampierland burrowing snake (*Simoselaps minimus*) (priority two)

This assumption is based on the habitat requirements, distribution, mapped vegetation types and condition of the vegetation, and findings of the Fauna Assessment (GHD, 2020).

Greater bilby

The greater bilby is known from four records within 40 kilometres of the application area and largely occupies three major vegetation types; open tussock grassland on uplands and hills, mulga woodland or shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas (Department of the Environment and Energy, 2016). The distribution of the greater bilby is highly fragmented in Western Australia (Pavey, 2006).

This species is known to occur locally based on previous records with active burrows recorded around 400 metres north of the survey area and foraging evidence recorded adjacent to the east of the survey area along Crab Creek Road (GHD, 2020). The application area provides suitable foraging and potential burrowing habitat for this species.

The Fauna Assessment did not identify evidence of greater bilby activity (footprints, foraging holes, burrows or scats) within the survey area. Assessment methods included the installation of a motion camera for four nights (GHD, 2020).

While this species was not identified within the application area, it may transiently occur on site given the proximity of known records, high mobility of the species and habitat suitability of the application area.

Peregrine falcon, grey falcon and barn swallow

These species are all known from records in the local area (50 kilometre radius). Suitable breeding habitat for these species was not identified within the application area, however the pindan shrubland within the application area provides suitable foraging habitat for these species and they may occur on an occasional basis.

The Fauna Assessment did not identify any evidence of these species (GHD, 2020).

The local area contains extensive areas of native vegetation which are likely to provide habitat of similar foraging value for these species. Noting the lack of suitable breeding habitat within the application area for these species, and that they are highly mobile and have large home ranges, the proposed clearing is not likely to impact on significant habitat for these species.

Dampierland burrowing snake

This species is a small fossorial snake known only from the Dampierland Bioregion. This species is poorly known and has been previously recorded within coastal dunes and sandy junctions between dunes and adjacent *Acacia* shrublands (GHD, 2020). The closest record of this species is around four kilometres north of the survey area (GHD, 2020).

The Fauna Assessment did not identify evidence of this species (GHD, 2020).

Noting the extent of available habitat in the local area, and that the application area does not comprise coastal dunes, the proposed clearing is not likely to impact on significant habitat for this species.

Gouldian finch

This species inhabits open woodlands that are dominated by *Eucalyptus* trees and support a ground cover of Sorghum and other grasses (GHD, 2020). Core habitat for this species comprises favoured annual and perennial grasses, a nearby source of surface water and, in the breeding season, unburnt hollow-bearing *Eucalyptus* trees (GHD, 2020).

The Fauna Assessment did not identify evidence of this species (GHD, 2020).

The application area does not contain suitable breeding habitat for this species, or a nearby source of water, so its use of the application area would be limited to foraging on an occasional basis. Therefore, the proposed clearing is not likely to impact on significant habitat for this species.

Other Species

Several species of non-conservation listed fauna were also identified within the larger 148 hectare survey area (GHD, 2020). Noting the presence of extensive surrounding native vegetation in the region, the application area is unlikely to impact on significant habitat for these species, however, the clearing activities may result in fauna deaths should they occur on site at the time of clearing.

Conclusion

Based on the above assessment, the proposed clearing is unlikely to impact on significant habitat for any conservation listed fauna species. However, the proposed clearing may result in fauna fatalities should they occur within the application area at the time of clearing.

Outcome

To address the above impacts, the clearing permit contains conditions that require the applicant to undertake the following management measures:

- slow directional clearing to allow fauna to move into adjacent vegetation ahead of the clearing activity
- identify, remove (if present), and relocate (if necessary) greater bilby from the application area to an area of suitable habitat

3.3. Relevant planning instruments and other matters

Development Approval

Water Corporation proposes to clear 31 hectares of native vegetation for irrigated agriculture, to support management of disposing treated water from the Broome North Wastewater Treatment Plant (BNWTP). The applicant proposes to grow Rhodes Grass (*Chloris gayana*) crops to uptake the nutrients of the wastewater.

The Application Area is zoned as 'Public Purposes – Wastewater Treatment Plant'. Water Corporation advised that no development approval is required for the proposed irrigated agriculture as the works occur on Water Corporation managed land, which is the subject of a previously endorsed strategy during the last upgrade of Broome North.

Works Approvals

The BNWTP was constructed in 2011 under the former Department of Environment and Conservation Works Approval W4531/2009/1 issued under Part V of the *Environmental Protection Act 1986*. The Works Approval included a primary treatment pond with an anaerobic digestion pit (Pond 1), a secondary maturation pond (Pond 2) and a third treated wastewater storage pond. The BNWTP was constructed in the middle of a 200 hectare site and allows for multiple phases of development (DWER, 2021).

The above Works Approval included the provision for treated wastewater discharges to land for the irrigation (with treated wastewater) of Rhodes grass cropping areas, and a native vegetation seedling area. The first irrigation area (Phase 1) was completed in 2012, approximately 14 months after the first operating Licence was granted for the site. The site currently has two Rhodes Grass pivot irrigation areas (Pivot 1 and Pivot 2) and a seedling irrigation area operated by The Mamabulanjin Aboriginal Corporation (DWER, 2021). These areas are immediately north of the current clearing permit application area.

Water Corporation submitted an additional works approval application on 3 August 2020 to upgrade the existing BNWTP (W6451/2020/1). DWER issued the Works Approval on 23 April 2021. The application sought to increase wastewater treatment capacity at the premises and specifically (DWER, 2021):

- reconfigure Ponds 1 and 2, including the installation of a deep anaerobic zone within Pond 2
- install three new rotary screens at the inlet into the wastewater treatment plant
- construct of a new sludge dewatering system
- construct a new Rhodes grass pivot irrigation system (Pivot 3) (the current application area); and
- change the associated wastewater conveyance infrastructure.

It is acknowledged that upgrades to BNWTP are required to enable treatment of all of Broome's wastewater, given the closure of the Broome South Water Resource Recovery Facility to protect Roebuck Bay.

The Works Approval notes that following measures are required to reduce the risk of treated wastewater impacting the surrounding environment (DWER, 2021):

- irrigation is managed to not occur immediately before, during or after periods of rainfall
- harvested Rhodes grass is transported offsite for use as hay
- the applicant is required to undertake monthly monitoring of the quality of wastewater applied to the irrigation areas and includes nutrients TDS, TSS, BOD, *E. coli*, oil and grease and a limited suite of metals.
- nitrogen and phosphorus cumulative loading to the irrigation areas is required to be monitored and the data submitted as part of annual environmental reports

The applicant also has an approved nutrient and irrigation management plan.

The Works Approval Decision Report notes that with the construction of a third pivot irrigation system (current application area) it is considered there will be a sufficient area of Rhodes grass available to remove all nutrients from the irrigated wastewater (DWER, 2021).

The Works Approval notes that to date, groundwater monitoring has not shown a change to nutrient concentrations in groundwater, when compared to up gradient and preconstruction groundwater conditions (DWER, 2021).

It is considered that impacts associated with the end land use, including potential run-off and sedimentation into the closest mapped wetlands and watercourses on site, have been addressed through DWER's conditional Works Approval.

RIWI Act Approvals

The applicant holds two existing groundwater licenses over this site:

- Groundwater licence GWL205749 is for the abstraction of 100,000 kilolitres per annum. Abstraction is licensed from the Broome, Roebuck, Canning – Broome groundwater resource for earthwork and construction purposes to facilitate the construction of new wastewater treatment ponds. This short-term licence was issued 15 April 2021 and expires on 31 May 2023.
- Groundwater licence GWL168987 is for the abstraction of 120,000 kilolitres per annum. Abstraction is licensed from the Broome, Roebuck, Canning – Broome aquifer for irrigation for commercial purposes and product processing washdown purposes. A component of this groundwater licence is used together with treated wastewater to irrigate pasture crops.

Water Corporation is advised that the application of treated wastewater for fodder crops within this area must meet criteria outlined within the Department's Water Quality Protection Note No. 22: Irrigation with Nutrient Rich Wastewater.

Aboriginal heritage

There are no Aboriginal Sites of Significance mapped within the application area.

End

Appendix A. Site characteristics

A.1. Site characteristics

Characteristic	Details
Local context	<p>The project area is located approximately 2300km north of Perth and approximately 12km northwest of the Broome town centre.</p> <p>The application area is immediately west of the Broome North Wastewater Treatment Plant, bordered to the north by existing pivot irrigation (also uses treated water for irrigation), and is bordered south and west by remnant native vegetation. The larger remnant occurs within a highly vegetated landscape.</p>
Climate and Landform	<p>The survey area is situated in the Northern Botanical Province of WA, within the Dampierland bioregion and Pindanland sub-region as described by the Interim Biogeographic Regionalisation of Australia (IBRA).</p> <p>The Pindanland sub-region is in the western part of the Dampierland bioregion and is the coastal, north-western margin of the Canning Basin. The sub-region comprises the sandplains of the Dampier Peninsula and the western part of Dampier land including the hinterland of Eighty Mile Beach. The sub-region supports vegetation primarily described as Pindan.</p> <p>The application area is within the Wanganut Land System with the landform described as low-lying sandplain and dunefields with through-going drainage, pinda.</p> <p>The Broome area has a tropical climate and is characterised by hot wet summers (December to March) and a dry season (April to November). Rainfall is generally received during the summer via unpredictable tropical downpours and cyclonic low pressure systems.</p>
Vegetation description and condition	<p>The Flora Survey indicates that the application area comprises the following vegetation type (GHD, 2020): VT1 - <i>Acacia plectocarpa</i>, <i>Acacia plectocarpa</i> subsp. <i>plectocarpa</i>, <i>Acacia tumida</i> var. <i>kulparn</i> and <i>Hakea macrocarpa</i> shrubland with scattered <i>Corymbia confertiflora</i>, <i>Corymbia zygomphylla</i> and <i>Corymbia greeniana</i> trees over <i>Dolichandrone occidentalis</i> and <i>Bauhinia cunninghamii</i> sparse shrubland over <i>Acacia adoxa</i> var. <i>subglabra</i>, <i>Corchorus sidoides</i> subsp. <i>sidoides</i> and <i>Dodonaea hispidula</i> var. <i>arida</i> sparse shrubland over <i>Aristida latifolia</i>, <i>Chrysopogon pallidus</i> and <i>Whiteochloa cymbiformisa</i> tussock grassland over <i>Triodia caelestialis</i> sparse hummock grassland on Pindan red sand loam.</p> <p>The full survey descriptions and maps are available online.</p> <p>Broad scale (1:1,000,000) pre-European vegetation mapping indicates there is one vegetation association within the application area (Shepherd et al, 2001):</p> <ul style="list-style-type: none"> • Shrublands, pindan; <i>Acacia tumida</i> shrubland with grey box [<i>Eucalyptus tectifera</i>] and cabbage gum [<i>Corymbia flavescens</i>] medium woodland over ribbon grass [<i>Chrysopogon</i> spp.] and curly spinifex (association 750) <p>The application area is largely representative of this vegetation association.</p> <p>The Flora Survey identified that the vegetation under application is in excellent (Trudgen, 1991) condition. The vegetation structure is intact with limited signs of cattle activity (GHD, 2020).</p> <p>The full Trudgen (1991) condition rating scale, with a description of each condition, is provided in Appendix C.</p>

Characteristic	Details
Soil description	The application area is within the Wanganut Land System which is described as Sandplain and dunefields with through-going drainage comprising sandplain, mainly in the upper parts, with stable dunefields, low lying sandplain, and scattered pans and depressions; sparse to moderately dense branching drainage pattern; relief up to 9 m. (DPIRD, 2017).
Conservation areas	The closest conservation area is Yawuru Birragun Conservation Park (C class reserve) located around 1.4 km west of the application area.
Ecological linkage	The application area is not mapped as an ecological linkage and is not considered to provide significant landscape linkage values.
Land degradation risk	<p>The application area is relatively flat and comprises areas of Pindan sand and sandy loam soils.</p> <p>Noting the high permeability of these soil types the risk of water erosion is low. Groundwater salinity is mapped at between 500-1000 milligrams per litre total dissolved solids. This level is considered marginal, and the risk of salinity is also considered low.</p> <p>Sandy soils are prone to wind erosion and there is a moderate risk of wind erosion associated with the proposed clearing.</p>
Waterbodies	<p>There are no natural watercourses or wetlands within the application area.</p> <p>The closest wetlands and watercourses to the application area include –</p> <ul style="list-style-type: none"> • An area subject to inundation located 850 m south west • Dampier Creek located around 2.8 km southwest • Roebuck Bay is located around 7 km south of the survey area. • Willie Creek Wetlands located around 14 km northwest
Flora	<p>According to available datasets, there are records of 17 priority flora species within the local area (50 km radius). These are presented below in section B.3. Of these, a likelihood of analysis identified two Priority flora species that may occur in the application area, based on habitat suitability and proximity of the site to known records. These are described in Section 3.2.2.</p> <p><i>Seringia exastia</i> is the closest known record of threatened flora to the application area, located 12 kilometres south west.</p> <p><i>Jacquemontia sp. Broome (A.A. Mitchell 3028)</i> is the closest known record of priority flora to the application area, located around 900 metres north east.</p> <p>A Flora survey did not identify any threatened or priority flora species within the application area (GHD, 2020).</p>
Ecological communities	<p>The closest threatened or priority ecological community (TEC or PEC) to the application area is Kimberley Vegetation Association 73 (Priority 3), located around 1 km west.</p> <p>The closest TEC to the application area is the Species-rich faunal community of the intertidal mudflats of Roebuck Bay (Vulnerable), located around 2 km south west. The application area is within the larger 5km buffer afforded to this TEC.</p> <p>The application area is not considered to be representative of these TEC/PECs.</p>

Characteristic	Details
Fauna	<p>According to available datasets, there are records of 105 conservation listed fauna species within the local area. Of these, a likelihood of analysis identified six species that may occur within the application area based on habitat suitability, as presented in section B.4 below</p> <p>A Fauna Assessment did not identify evidence of conservation listed species within the application area (GHD, 2020).</p>

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*					
Dampierland	8,345,178	8,315,458	99.6	142,055	1.7
Vegetation association					
750	1,229,182	1,225,280	99.7	34,199	2.78
Local area					
50km radius (considering coastal watermark)	196,300	191,000	97.3	-	-

*Government of Western Australia (2019)

A.3. Flora records table

The below table shows threatened and priority flora recorded within the local area, with likelihood of occurrence based on habitat suitability, flora survey findings and proximity to known records.

Priority Flora

Species name	Conservation status (state listing)	Number of known records in the local area (10km radius)	Suitable habitat present	Likelihood of occurrence	Is the Flora Survey adequate to identify?	Did Flora Survey identify?
<i>Acacia monticola x tumida</i> var. <i>kulparn</i>	3	8	Potential	Unlikely	Yes	No
<i>Aphyllodium glossocarpum</i>	3	2	Potential	Unlikely	Yes	No
<i>Aphyllodium parvifolium</i>	1	1	No	Unlikely	Yes	No
<i>Bonamia oblongifolia</i>	3	3	Potential	Unlikely	Yes	No
<i>Corymbia paractia</i>	1	27	No	Unlikely	Yes	No
<i>Fuirena incrassata</i>	3	1	No	Unlikely	Yes	No
<i>Glycine pindanica</i>	3	17	Potential	Unlikely	Yes	No
<i>Gomphrena pusilla</i>	2	10	No	Unlikely	Yes	No
<i>Goodenia byrnesii</i>	3	1	No	Unlikely	Yes	No
<i>Jacquemontia</i> sp. Broome (A.A. Mitchell 3028)	1	7	Yes	Likely	Yes	No

Species name	Conservation status (state listing)	Number of known records in the local area (10km radius)	Suitable habitat present	Likelihood of occurrence	Is the Flora Survey adequate to identify?	Did Flora Survey identify?
<i>Lophostemon grandiflorus</i> subsp. <i>grandiflorus</i>	3	3	No	Unlikely	Yes	No
<i>Nymphoides beaglensis</i>	3	1	No	Unlikely	Yes	No
<i>Pittosporum moluccanum</i>	4	10	No	Unlikely	Yes	No
<i>Polymeria</i> sp. Broome (K.F. Kenneally 9759)	3	4	Yes	Likely	Yes	No
<i>Seringia exastia</i>	Endangered	15	Potential	Unlikely	Yes	No
<i>Seringia katatona</i>	3	4	Potential	Unlikely	Yes	No
<i>Terminalia kumpaja</i>	3	5	Potential	Unlikely	Yes	No
<i>Thespidium basiflorum</i>	1	2	No	Unlikely	Yes	No

A.4. Fauna records table

The below table shows conservation listed fauna previously recorded in the local area (50 kilometre radius) that may occur within the application area based on the presence of suitable habitat.

Species name	Conservation status (state listing)	Did surveys identify?	Suitable habitat present
Bilby (<i>Macrotis lagotis</i>)	Vulnerable	No	Yes – suitable foraging and burrowing habitat
Peregrine falcon (<i>Falco peregrinus</i>)	Other specially protected fauna	No	Yes - suitably foraging habitat only
Grey falcon (<i>Falco hypoleucos</i>)	Vulnerable	No	Yes - suitably foraging habitat only
Gouldian finch (<i>Erythrura gouldiae</i>)	Endangered	No	Yes - suitably foraging habitat only
Barn swallow (<i>Hirundo rustica</i>)	Protected under international agreement	No	Yes - suitably foraging habitat only
Dampierland burrowing snake (<i>Simoselaps minimus</i>)	Priority 2	No	Yes

Appendix B. Assessment against the clearing principles

Assessment against the clearing principles	Variance level	Is further consideration required?
Environmental value: biodiversity values		
<p><u>Principle (a):</u> <i>“Native vegetation should not be cleared if it comprises a high level of biodiversity.”</i></p> <p>Flora and fauna surveys did not identify any threatened or priority flora or fauna or ecological communities within the application area (GHD, 2020).</p> <p>Ninety two flora taxa (including subspecies and varieties) representing 38 families and 79 genera were recorded from the larger survey (GHD, 2020). Based on described quadrats, species diversity ranged from 33 to 36 (average 34) taxa per 2500m². Dominant families recorded from the survey area included (GHD, 2020):</p> <ul style="list-style-type: none"> • Fabaceae (17 taxa) • Poaceae (19 taxa) • Malvaceae (7 taxa) <p>The application area is likely to have a similar level of biodiversity to surrounding areas of remnant native vegetation, noting an absence of threatened or priority flora and ecological communities and lack of unique fauna habitat or wetland values.</p>	Not likely to be at variance	Yes <i>Refer to Section 3.2.1, above.</i>
<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 application area contains suitable habitat for six species of conservation listed fauna. None of these species were identified within the application area.</p> <p>Noting the above and the extent of equally suitable habitat for these species within the local area, the application area is not likely to contain significant habitat for these species.</p>	Not likely to be at variance	Yes <i>Refer to Section 3.2.1, 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 application area provides suitable habitat for one threatened flora species, <i>Seringia exastia</i>.</p> <p>The Flora Survey did not identify this species (GHD, 2020). The survey timing was within the flowering time of this species (Western Australian Herbarium, 1998-).</p>	Not likely to be at variance	Yes <i>Refer to Section 3.2.1, above.</i>
<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>According to available datasets, and flora surveys of the application area, the vegetation within the application area is not representative of any known state listed threatened ecological communities.</p>	Not likely to be at variance	No

Assessment against the clearing principles	Variance level	Is further consideration required?
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 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).</p> <p>As shown in Appendix A.2, the mapped vegetation type, Bioregion and local area all retain much greater than the 30 per cent threshold. Therefore, the application area is not within an extensively cleared area.</p>	Not at variance	No
<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>Given the distance to the nearest conservation areas, the proposed clearing is not likely to impact on the environmental values of any conservation areas.</p>	Not likely to be at variance	No
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>There are no wetlands or watercourses mapped within the application area. The proposed clearing is not likely to impact on the closest water feature (seasonally inundated area 850 m west associated with Dampier Creek).</p> <p>Flora surveys did not identify any riparian vegetation within the application area (GHD, 2020).</p>	Not likely to be 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>Mapping indicates that the application area contains sandy soils, which have an increased risk of wind erosion. Wind erosion is not expected to be significant given that the application area is bordered by remnant native vegetation to the south and west.</p> <p>To further minimise the risk of wind erosion the applicant will be required to commence construction within three months of clearing, to reduce the exposure of bare sandy soils.</p>	May be at variance	No
<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>There are no wetlands or watercourses mapped within the application area. The proposed clearing is not likely to impact on the closest water feature</p>	Not likely to be at variance	No

Assessment against the clearing principles	Variance level	Is further consideration required?
<p>(area subject to inundation) which is located around 850 m from the application area.</p> <p>Noting the distance and extent of vegetation between the application area and the closest wetland/watercourse, the proposed clearing is unlikely to result in surface water quality impacts through sedimentation or otherwise.</p> <p>Groundwater salinity levels are marginal, and there is not expected to be any surface expression of salinity due to clearing.</p>		
<p><u>Principle (j):</u> <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.”</i></p> <p><u>Assessment:</u> The mapped soils are highly permeable, and noting the lack of hydrological features on site, and relatively flat topography, the proposed clearing is not likely to exacerbate flooding.</p>	Not likely to be 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 within the application area. This scale has been extracted from Trudgen, M.E. (1991) *Vegetation condition scale* in National Trust (WA) 1993 Urban Bushland Policy.

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

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

Appendix D. Biological survey information excerpts / photographs of the vegetation / DWER site inspection report

Survey Methods

Targeted Flora and Vegetation Assessment (GHD, 2020) -

A GHD Senior Botanist undertook a detailed targeted flora and vegetation survey of the larger 148 hectare survey area encompassing the application area. The survey was undertaken from 29 April - 5 May 2019. The field survey was undertaken to identify and describe the dominant vegetation types, assess vegetation condition, and identify and record flora taxa present at the time of survey (GHD, 2020).

Field survey methods involved quadrat sampling and traversing the survey area by foot. Photo reference sites were conducted along the survey area to describe the vegetation and physical features. Three quadrats and one relevé were conducted within the survey area (GHD, 2020).

Systematic transects for conservation significant flora were undertaken throughout the survey area (GHD, 2020).

The survey methodology employed was undertaken with reference to the EPA Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (GHD, 2020).

Fauna Assessment (GHD, 2020) –

A GHD senior zoologist undertook a Level 1 fauna (reconnaissance) and targeted assessment of the larger 148 hectare survey area encompassing the application area. The assessment was undertaken from 4 - 8 May 2019 (GHD, 2020). The survey area was traversed by foot to identify and describe the dominant fauna habitat types and condition present and record fauna species within the survey area (GHD, 2020). An assessment of the presence and likelihood of conservation significant fauna and their habitats occurring within the survey area was also undertaken (GHD, 2020).

The survey methodology employed was undertaken with reference to (GHD, 2020):

- EPA Technical Guidance – Sampling methods for Terrestrial Vertebrate Fauna Surveys, Perth, Environmental Protection Authority.
- EPA Technical Guidance –Terrestrial Fauna Surveys, Perth, Environmental Protection Authority.

The Fauna Assessment included a greater bilby plot assessment of the survey area to detect burrows of resident animals (GHD, 2020). The survey area was traversed on foot for evidence of greater bilby activity. Searching was carried out with assistance from Traditional Owners (GHD, 2020). Personnel walked transects at a width of 20 - 30 metres apart providing adequate on-ground coverage to target this species. Opportunistic fauna searches were conducted throughout the survey area for all other conservation significant fauna species (GHD, 2020).



Figure 2. Site photograph of the application area showing representative vegetation (GHD, 2020).



Figure 3. Vegetation condition mapping over the survey area (GHD, 2020).

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)
- Cadastre (LGATE-218)
- Cadastre Address (LGATE-002)
- Consanguineous Wetlands Suites (DBCA-020)
- DBCA – Lands of Interest (DBCA-012)
- DBCA Legislated Lands and Waters (DBCA-011)
- Directory of Important Wetlands in Australia – Western Australia (DBCA-045)
- Environmentally Sensitive Areas (DWER-046)
- Groundwater Salinity Statewide (DWER-026)
- 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
- Ramsar Sites (DBCA-010)
- Remnant Vegetation, All Areas
- Soil Landscape Mapping – Best Available
- Soil Landscape Mapping – Systems
- Soil Landscape Land Quality – Flood Risk (DPIRD-007)
- Soil Landscape Land Quality – Wind Erosion Risk (DPIRD-016)
- Soil Landscape Land Quality – Water Erosion Risk (DPIRD-013)
- Soil Landscape Land Quality – Waterlogging Risk (DPIRD-015)
- Soil Landscape Land Quality – Water Repellence Risk (DPIRD-014)
- Soil Landscape Land Quality – Subsurface Acidification Risk (DPIRD-011)
- Soil Landscape Land Quality – Phosphorus Export Risk (DPIRD-010)
- RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037)
- RIWI Act, Groundwater Areas (DWER-034)

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

E.2. References

Commonwealth of Australia (2001) National Objectives and Targets for Biodiversity Conservation 2001-2005, Canberra.

Department of Primary Industries and Regional Development (DPIRD) (2019). *NRInfo Digital Mapping*. Department of Primary Industries and Regional Development. Government of Western Australia. URL: <https://maps.agric.wa.gov.au/nrm-info/> (accessed June 2021).

Department of the Environment and Energy (DotEE) (2016). *Macrotis lagotis* in Species Profile and Threats Database, Department of the Environment, Canberra.

Department of Water and Environmental Regulation (DWER) (2021). Works Approval W6451/2020/1. Issued 23 April 2021.

GHD (2020) Flora and Fauna Survey – Area 3. Broome North WWTP. Prepared for the Water Corporation.

GHD (2020a) Supplementary flora and fauna survey information regarding survey limitations, to support Clearing Permit Application CPS 9241/1 (DWER Ref A2022035).

Government of Western Australia. (2019) *2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of March 2019*. WA Department of Biodiversity, Conservation and Attractions. <https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics>

Pavey, C. (2006) National Recovery Plan for the Greater Bilby *Macrotis lagotis*. Northern Territory Department of Natural Resources, Environment and the Arts.

Shepherd, D.P., Beeston, G.R. and Hopkins, A.J.M. (2001) *Native Vegetation in Western Australia, Extent, Type and Status*. Resource Management Technical Report 249. Department of Agriculture, Western Australia.

Trudgen, M.E. (1991) *Vegetation condition scale* in National Trust (WA) 1993 Urban Bushland Policy. National Trust of Australia (WA), Wildflower Society of WA (Inc.), and the Tree Society (Inc.), Perth.

Western Australian Herbarium (1998-). *FloraBase - the Western Australian Flora*. DBCA, Western Australia. <https://florabase.dpaw.wa.gov.au/> (Accessed June 2021).