Decision Report

Application to amend works approval

Part V Division 3 of the *Environmental Protection Act 1986*

Works approval number	L9111/2018/1
Applicant	City of Kalamunda
DWER file number	DER2017/002141-1
Premises	Walliston Transfer Station 155 Lawnbrook Road West Walliston WA 6076 Part of Lot 5 on Diagram 14851 as defined in Schedule 1 of the Licence.
Date of report	12 June 2020
Proposed decision	Granted

Table of Contents

1. Definitions

Key terms relevant to this decision report and their associated definitions are listed in **Table 1**.

Table 1: Definitions

Term	Definition
Applicant	City of Kalamunda
Category / categories	Categories of prescribed premises as set out in Schedule 1 of the EP Regulations.
Decision Report	refers to this document.
Delegated Officer	An officer delegated under section 20 of the EP Act.
Department	The department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation As of 1 July 2017, the Department of Environment Regulation (DER), the Office of the Environmental Protection Authority (OEPA) and the Department of Water (DoW) amalgamated to form the Department of Water and Environmental Regulation (DWER). DWER was established under section 35 of the *Public Sector Management Act 1994* and is responsible for the administration of the *Environmental Protection Act 1986* along with other legislation.
Emission	has the same meaning given to that term under the EP Act.
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
Middle Helena Catchment Strategy	Middle Helena Catchment Area Land Use and Water Management Strategy (2010)
Noise Regulations	*Environmental Protection (Noise) Regulations 1997* (WA)
Occupier	has the same meaning given to that term under the EP Act.
Prescribed premises	This has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report
Risk Event	As described in *Guidance Statement: Risk Assessment*
WQPN 25	Water Quality Protection Note 25

2. Overview of Premises

2.1 Classification of Premises

Table 2: Classification of premises and assessed design capacity

Category	Description	Assessed production or design capacity or throughput
Category 57	Used tyre storage (general): premises (other than premises within category 56) on which used tyres are stored.	150 tyres at any one time
Category 62	Solid waste depot: premises on which waste is stored, or sorted, pending final disposal or re-use.	30,000 tonnes per annual period

2.2 Description of proposed activity

The Premises was historically used as an unlined landfill site until 1978-79. The historical landfill area is now covered with a mixture of subsoil, inert fill and gravel of varying depths.

In December 1978 the Premises was converted into a waste transfer station and has been operating as a transfer station since this time. The Premises was constructed without a Works Approval and no works are required to operate the premises. Therefore, the City of Kalamunda (the Applicant) is seeking to have the current activities licenced. The Applicant is also proposing some minor improvements to the current site laying including a new access road, resurfacing of the drop-off area and installing a surface water management system. These will be included as works under the licence.

The Premises consists of a community drop-off area where a variety of wastes including cardboard and paper, glass, oils and residual mixed refuse, and a designated open area for storage of green wastes, mixed C&D waste, scrap metals, tyres and beds and mattresses. The designated open area is located on top of the historical landfill cell.

The Premises is situated on part of Lot 5 on Diagram 14851, with the remaining portion of the lot containing the Kalamunda Pistol Club, and a powerline easement. Within the portion of the Lot occupied by the transfer station there is a telecommunications station which is excluded from the Premises.

The Premises is open to the public Thursday to Sunday between 8:00 am to 3:30 pm (closing at 2:30 pm on Fridays). Operations may occur at the premises from 7:00 am to 5:00 pm Monday to Saturday, with some reduced low noise operations occurring on Sundays from 9:00 am to 5:00 pm. The Premises is closed on all public holidays and days when a total fire ban is declared

The documents and information used in this assessment are listed below:

- Licence Application Form, including attachments and figures;
- Environmental Assessment and Management Plan;
- Environmental Noise Impact Assessment;
- Noise Management Plan;
- Black Cockatoo Habitat Assessment;
- Summary of Licence Holder comments dated 16 September 2019; and
- Email clarification of area to be cleared dated 19 December 2019.

The infrastructure and equipment are outlined in Table 3 below and the site layout is shown in Figure 1.

Table 3: Proposed infrastructure and equipment

Ref	Infrastructure or Equipment	Site Layout Plan reference (Figure 1)
1	Site fencing or walling	Not depicted
2	Sealed road surfaces	Not depicted
3	Community drop off area	Western Portion of Premises
4	Waste storage bins	The areas marked 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 27 and 29
5	White goods storage area	The area marked 32
6	Oil Storage tanks/IBCs	The area marked 15
7	Fire extinguishers	Not depicted
8	Water tank	Not depicted
9	Water cart	Not depicted
10	Surface water system	Area cross-hatched in blue
11	Signage	Not depicted

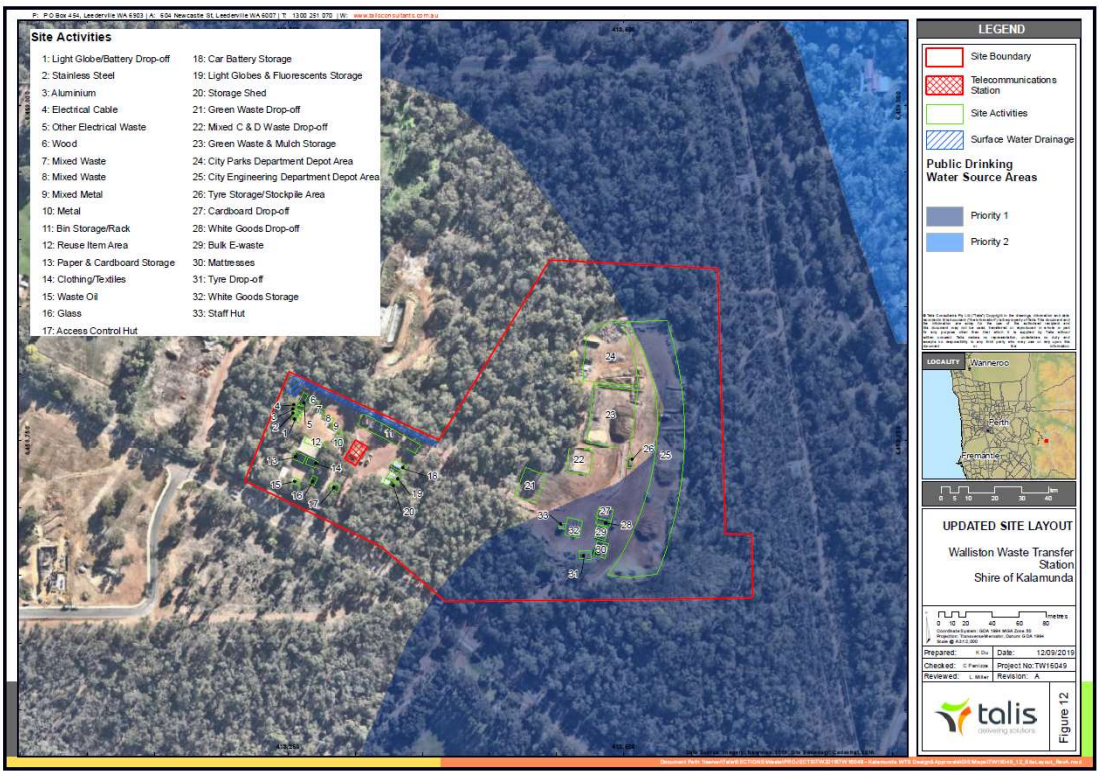

Figure 1: Site Layout Plan including proximity to Public Drinking Water Source Areas (PDWSA)

As part of these proposed activities occur within the P1 Public Drinking Water Source Area (PDWSA), the *Middle Helena Catchment Area Land Use and Water Management Strategy (2010)* (Middle Helena Catchment Strategy) and the *Water Quality Protection Note no. 25 Land use compatibility tables for PDWSAs (2016)* (WQPN 25) apply to the assessment of risk related to the activities. The Premises was in operation as a landfill prior to the 1972 gazettal of the catchment area, and therefore the premises may be considered under these documents as a pre-existing, incompatible land use.

DWER has consulted with the Applicant as to whether these activities can be moved outside of the P1 PDWSA, however due to space restrictions the Applicant has advised that this is not possible. Therefore, DWER will assess the current configuration of the operations in relation to risks to water quality as identified in the Middle Helena Catchment Strategy and the WQPN 25. Any changes or intensification of the activities in the P1 PDWSA in future would be subject to further assessment of risk. DWER notes that in accordance with the Middle Helena Catchment Strategy and WQPN 25 any change or intensification of the actives is likely to be considered as incompatible with designation of the land as a PDWSA.

DWER notes that in accordance with the above documents, if the staff hub contains septic toilet facilities, these should be upgraded to an aerobic treatment unit (ATU) at the next available opportunity. As the ancillary infrastructure at the premises is not regulated by Part V Licensing under the EP Act, this note is for information purposes only.

3. Planning Approval

The Applicant is also the relevant planning authority for this facility. The Applicant has advised that the facility is considered a public work which is subject to Public Works Exemption under the *Planning and Development Act 2005*.

4. Occupancy

The Applicant has provided a Certificate of Title naming the Shire of Kalamunda as the occupier of the Premises.

5. Contaminated Sites

The Premises is classified under the *Contaminated Sites Act 2003* as 'Possibly Contaminated – Investigation Required' due to the historic use as a landfill.

6. Clearing

The Application includes a request to clear 0.15 hectares of native vegetation within the Premises, to facilitate the construction of a new access road.

DWER has assessed the request for a clearing permit as part of the licence application. The clearing of no more than 0.15 hectares of native vegetation has been authorised by this licence and the detailed assessment for clearing is included in Appendix 2.

To allow for the appeals process outlined by section 101A of the EP Act, the licence will not commence, and therefore the clearing will not be permitted, until 30 days from the date of issue.

7. Emission sources, receptors and pathways

7.1 Emissions

The potential for emissions to impact on sensitive receptors has been assessed in accordance with the Department's Risk Framework. The key emissions during premises operation, and

minor construction works which have been considered in this report are **odour, noise, dust, leachate, windblown waste, vermin and fire (smoke)** from activities including acceptance, storage, handling and removal of wastes and vehicle movements.

The Applicant has proposed measures to assist in controlling these emissions, where necessary. The control measures are outlined in Section 7.4 below and have been considered when undertaking the risk assessment detailed in Section 8.

7.2 Environmental Receptors and Aspects

Risk is assessed as a combination of emission sources, the proximity and sensitivity of receptors to those emission sources and any pathways that can allow the emission to reach and potentially harm the receptor. Table 4 below provides a summary of human and environmental receptors in proximity to the premises which have a potential to be impacted from site activities, and the risk assessment in Section 8 considers these receptors in the context of emissions and potential pathways.

Table 4: Distance to receptors

Human receptors	**Distance from activity or prescribed premises**
Users of Kalamunda Rifle Range	Adjacent to the north
Mulching property (A1 Walliston Tree Services)	Adjacent to the west
Users of Alan Anderson Park	Approximately 30 m south
Subdivision with potential future residential receptors	Approximately 30 m south
Nearest residential receptor	Approximately 200 m south west
Residential development (suburb of Bickley)	Approximately 300 m east
Environmental receptors	**Distance from activity / prescribed premises**
Groundwater	Inferred to be 14 m-32 m below ground level P1 PDWSA within the Premises
Resource Enhancement Wetland	Approximately 1 km to the north west of the premises
Multiple Use Wetland	1.38 km southwest of the site

7.3 Pathways

Based on the potential emissions, the premises topography, geology, hydrogeology and meteorology have been considered as potential pathways. These pathways have been considered in the risk assessment table in Section 8.

Topography

The highest elevation on the lot is in the southeast section, at approximately 336 m Australian Height Datum (AHD). The lot slopes away in all directions (shown in Figure 2), with the northern corner of the lot being the lowest elevation at 318 m AHD. Therefore, surface water in the majority of the operational areas is likely to flow in a northerly, or westerly direction

away from the P1 PDWSA (shown in Figure 1).

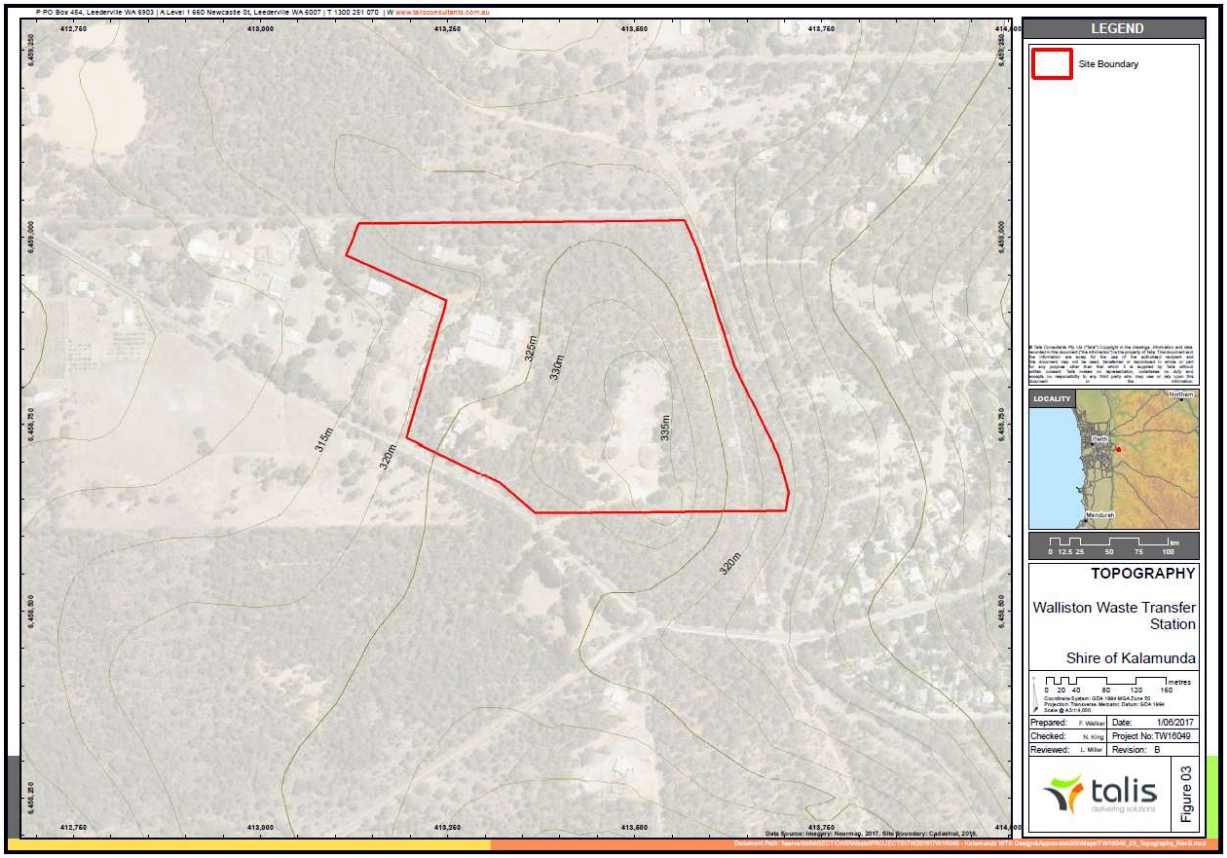

Figure 2: Topography of Lot 5

Geology

The Premises surficial geology consists of predominately laterite (weathered gneiss) with some areas of gravel (loose fine sand). The permeability of the soil profile has not been tested, however, based on the typical descriptions of these units in this area these soil types are considered to be slightly permeable.

Hydrogeology

The Applicant has reviewed groundwater bores in close proximity to the Premises, and based on data from these groundwater bores has inferred that groundwater is located 14 m-32 m below ground level. The Premises is located on a water shed and so any groundwater at the premises is likely to flow either west to the Canning River catchment (as shown in Figure 3), or east into the Lower Swan catchment. The Lower Swan Catchment contains the P1 PDWSA as discussed above and the watershed is marked by the eastern edge of the PDWSA (shown on Figure 1).

The majority of operations occur to the west of the premises and therefore, should contamination of groundwater result from operation on the premises, the most likely receptor impacted is the Canning River and tributaries. Some operations occur in the eastern part of the premises and there is also a potential for the Lower Swan/PDWSA to be impacted.

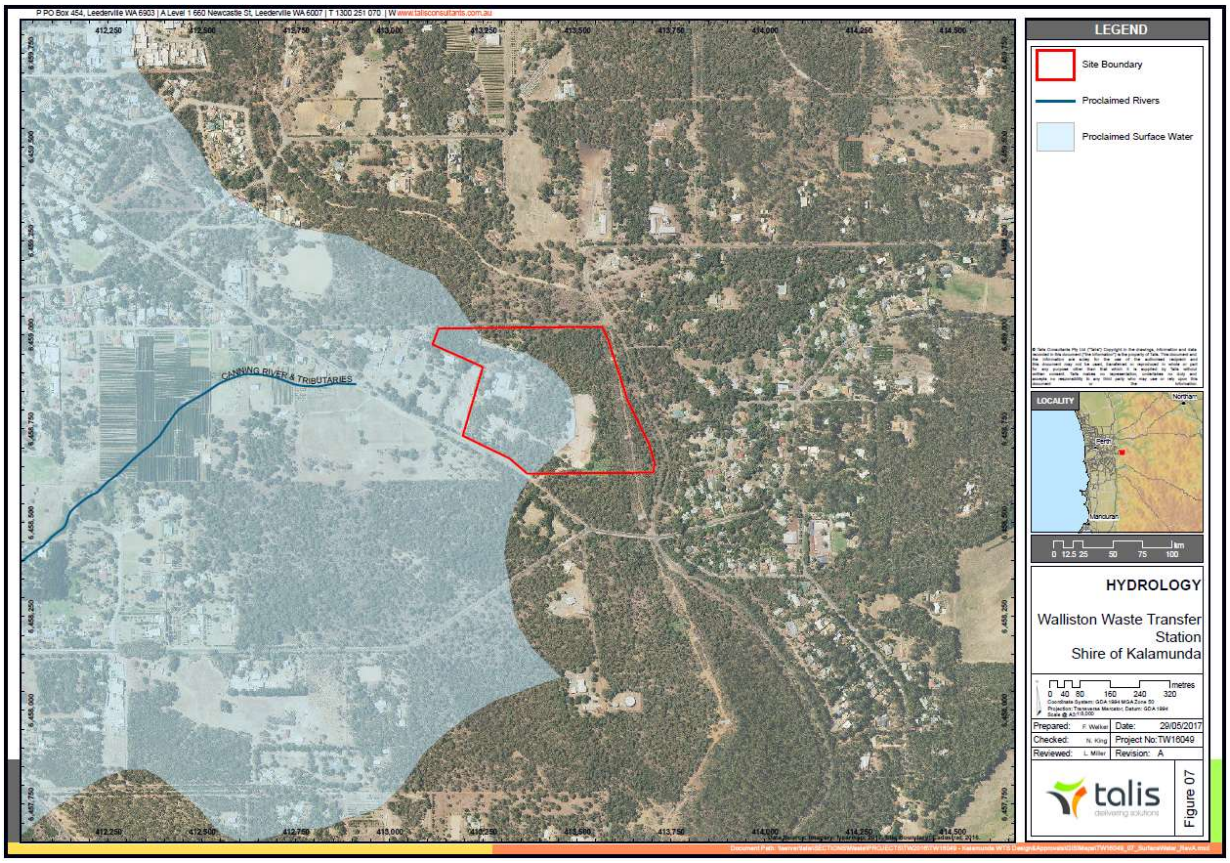

Figure 3: Hydrology of Lot 5

Meteorology

Using information available on the Bureau of Meteorology's website, the closest available weather station of climate data is Bickely (Site number 009240). Based on the climate data for Bickley station (February 1994 to August 2019), the prevailing wind direction is easterly in the morning and westerly in the afternoon.

7.4 Applicant controls

The Applicant has proposed the following management measures/controls as part of the application:

Table 5: Summary of emissions and applicant controls

Emission (as identified above)	Source	Proposed controls
Odour	Acceptance of waste	The majority of waste is moved offsite within 2-3 weeks. Odour levels are continuously monitored by staff. Vehicles delivering odourous waste streams are required to be covered.

Emission (as identified above)	Source	Proposed controls
Noise	Acceptance of waste, site operations	Waste acceptance and operation of machinery is limited to operating hours. All trucks and mobile equipment are fitted with broadband noise reversing alarms. Vehicles are restricted to a maximum speed of 15 km/hr. Materials will be unloaded slowly from the lowest height possible. Equipment and machinery will be maintained in good working order.
Dust	Acceptance of waste	A water cart will be utilised when necessary. Vehicles are restricted to a maximum speed of 15 km/hr. All main tracks and loading areas will be sealed and maintained. The applicant is proposing to construct a new access road which will be sealed.
Leachate	Storage of waste (including greenwaste) Stormwater coming into contact with wastes	The majority of waste acceptance and storage areas are on a sealed hardstand. The majority of wastes accepted into the P1 PDWSA are either removed daily, moved on a daily basis to a more permanent storage location outside the P1 PDWSA and/or removed off-site within a week. Uncontaminated stormwater will be diverted away from waste storage areas. Any stormwater that comes in contact with waste will be treated as leachate. Leachate is collected onsite and removed off-site as necessary. The majority of wastes are handled and stored in designated hard-stand areas and/or within hook lift bins. The Applicant is proposing works to the surface water management system to improve these controls.
Windblown waste	Acceptance and storage of waste	Regular litter collections All vehicles carrying waste will be covered A 1.8 m fence is present on site and will be monitored and maintained on a regular basis
Vermin	Storage of wastes	Regular litter collections All vehicles carrying waste will be covered A 1.8 m fence is present on site and will be monitored and maintained on a regular basis Inspections and professional services to manage vermin

Emission (as identified above)	Source	Proposed controls
Fire (Smoke)	Fire within the premises resulting in combustion of tyres or other materials.	The Premises is closed on total fire ban days as set by Department of Fire and Emergency Services (DFES) Fire extinguishers are located in clearly marked locations A 20,000 L water tank with pump and hose is located in the general waste area A 1.8 m fence is present on site and will be monitored and maintained on a regular basis to prevent unauthorised access. Tyres are stored in accordance with *Department of Fire and Emergency Services Guidance Note: GN02 Bulk Storage of Rubber Tyres including Shredded and Crumbed Tyres,* specifically 18 m from any combustible materials or walls, 6 m from any non-combustible materials or walls, maximum height of 3.7 m and area of 60 m^2 for the stockpile of whole tyres, and a maximum of four individual tyre stockpiles will be grouped with a minimum separation distance of 2 m between the stockpiles. Tyres are removed from the Premises every three to four weeks.
Asbestos	Acceptance of waste	No asbestos is accepted.

8. Risk assessment

The identification of the sources, pathways and receptors to determine Risk Events are set out in Table 6 below. Risk ratings have been assessed for each key emission source and take into account potential source-pathway-receptor linkages. The mitigation measures / controls proposed by the Applicant have been considered in determining the risk rating. Emissions during construction and operation have been assessed separately to allow clear delineation of activity phases.

The conditions in the issued Licence, as outlined in Table 6, have been determined in accordance with the *Guidance Statement: Setting Conditions*.

8.2 Risk assessment – operation

Table 6: Identification of emissions, pathway and receptors

Risk Event				Consequence rating[1]	Likelihood rating[1]	Risk[1]	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/Activities*	**Potential emissions**	**Potential receptors, pathway and impact**	**Applicant controls**					
Acceptance, storage, handling and removal of wastes including tyres and green waste. Vehicle movements.	Odour	Transported via air causing health and amenity impacts to Human receptors (see table 4)	See table 5	Minor	Possible	Medium	Odour emissions may cause low level impacts to amenity at some time, particularly close receptors within 30 m of the Premises. No odour complaints have been received by DWER.	Conditions include the Applicant's proposed controls for waste acceptance and requirements to cover vehicles delivering or removing waste.
	Noise	Transported via air causing health and amenity impacts to Human receptors (see table 4)	See table 5	Minor	Possible	Medium	Noise emissions may cause low level impacts to amenity at some time particularly close receptors within 30 m of the Premises. Noise modelling indicates that Noise Regulations are likely to be met. No noise complaints have been received by DWER.	Conditions include the Applicant's proposed controls of limiting timber and green waste processing hours and requiring signage that restricts vehicle limits to 15 km/hr.

Risk Event				Consequence rating[1]	Likelihood rating[1]	Risk[1]	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/Activities*	**Potential emissions**	**Potential receptors, pathway and impact**	**Applicant controls**					
Acceptance, storage, handling and removal of wastes including tyres and green waste.	Dust	Transported via air causing health and amenity impacts to Human receptors (see table 4)	See table 5	Minor	Possible	Medium	Dust emissions may cause low level impacts to amenity at some time particularly close receptors within 30 m of the Premises. No dust complaints have been received by DWER.	Conditions include the Applicant's proposed controls of requiring signage that restricts vehicle limits to 15 km/hr, requiring all main tracks and loading areas to be sealed and maintained, requiring a water cart to be available on-site, and requiring the new access road be sealed.
	Leachate from spills, contaminated stormwater or washwater in the event of a fire.	Transported via seepage to groundwater (Lower Swan/P1 PDWSA catchment) causing degradation to groundwater quality	See table 5	Severe	Unlikely	High	Leachate impacts to a P1 PDWSA may cause short term impact to an area of high conservation value. Based on the Applicant's controls, and the hydrology of the Premises, impacts will probably not occur in most circumstances	Conditions include the Applicant's proposed controls of a requirement to maintain a stormwater collection system which directs uncontaminated stormwater away from waste storage areas, requirement to handle and store the majority of wastes on designated hardstand areas and/or within bins, and a requirement to remove any fire wash waters immediately. The works requested by the Applicant to the hardstand and surface water system will be
		Transported via seepage to groundwater (Canning River catchment) causing degradation to groundwater quality	See table 5	Moderate	Unlikely	Medium	Leachate impacts to groundwater may cause specific consequence criteria to be at risk of not being met. Based on the Applicant's controls impacts will probably not occur in most circumstances	

Risk Event				Consequence rating[1]	Likelihood rating[1]	Risk[1]	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/Activities*	**Potential emissions**	**Potential receptors, pathway and impact**	**Applicant controls**					
Acceptance, storage, handling and removal of wastes including tyres and green waste.		Overland flow to Wetlands 1 km north and 1.38 km south west causing degradation to surface water quality	See table 5	Minor	Rare	Low	The Delegated Officer does not consider that stormwater impacted by leachate will travel this distance to reach these receptors at concentrations that are likely to cause impact	permitted on the licence with conditions regarding their design and construction requirements. An additional requirement imposed by DWER to install a hardstand floor for the white good storage area and remove white goods daily is considered necessary due to the location of this storage area in the P1 PDWSA (Its noted in response to the Draft Instrument the Applicant has chosen to move the white goods storage area outside of the P1 PDWSA – refer to information in Section 9 below)
	Windblown Waste	Transport via air causing amenity impacts to Human receptors (see table 4)	See table 5	Minor	Unlikely	Medium	Windblown waste may cause low level impacts to amenity. Based on the Applicant's controls impacts will probably not occur in most circumstances	Conditions include the applicant's proposed controls of regularly inspecting for and returning litter, requiring vehicles delivering waste to be covered, and a 1.8 m fence to be maintained as located in Figure 3 of Schedule 1 of the Licence.

Risk Event				Consequence rating[1]	Likelihood rating[1]	Risk[1]	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/Activities*	**Potential emissions**	**Potential receptors, pathway and impact**	**Applicant controls**					
	Vermin	Direct contact causing health and amenity impacts to Human receptors (see table 4)	See table 5	Minor	Unlikely	Medium	Vermin may cause low level impacts to health and amenity. Based on the Applicant's controls impacts will probably not occur in most circumstances	Conditions include the applicant's proposed controls of regularly inspecting for vermin, vehicles delivering waste to be covered, and a 1.8 m fence to be maintained as located in Figure 3 of Schedule 1 of the Licence.
Acceptance, storage, handling and removal of wastes including tyres and green waste.	Fire (smoke)	Transported via air causing health and amenity impacts to Human receptors (see table 4)	See table 5	Major	Rare	Medium	Fire (smoke) may cause high level impacts to amenity. Based on the Applicant's controls impacts will only occur in exceptional circumstances.	Conditions include the applicant's proposed controls for fire extinguishers and a 20,000 L water tank with pump located in the general waste area, a 1.8 m fence to be and maintained, tyre storage and regular removal requirements.
	Asbestos	Direct contact causing impacts to Human receptors (see table 4)	No asbestos is accepted at the Premises	Severe	Rare	High	Asbestos may cause high level health impacts to humans, however as asbestos is not accepted at the Premises this event may only occur in exceptional circumstances.	Conditions include a requirement to have signage that states no asbestos which replicates the Applicant's proposed control that no asbestos is to be accepted.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the Department's Guidance Statement: Risk Assessments (February 2017)

9. Consultation

The Applicant was provided with draft copies of the Licence and Decision report on 18 February 2020. The Applicant provided comments on the drafts to DWER on 29 May 2020. The Applicants comments are summarised in full in Table 12 of Appendix 1.

In response to the draft documents, the Applicant has advised that the white goods storage area will be moved out of the P1 PDWSA and that white goods will now be stored within the community drop off area. This area is required to have an impermeable hardstand installed which is consistent with previous requirements for white goods storage. The site layout has undergone minor modification with the relocation of the white goods storage area, with the new layout depicted in Figure 4 below.

Applicant proposed changes to Premises construction and operation will be reflected in the final Licence.

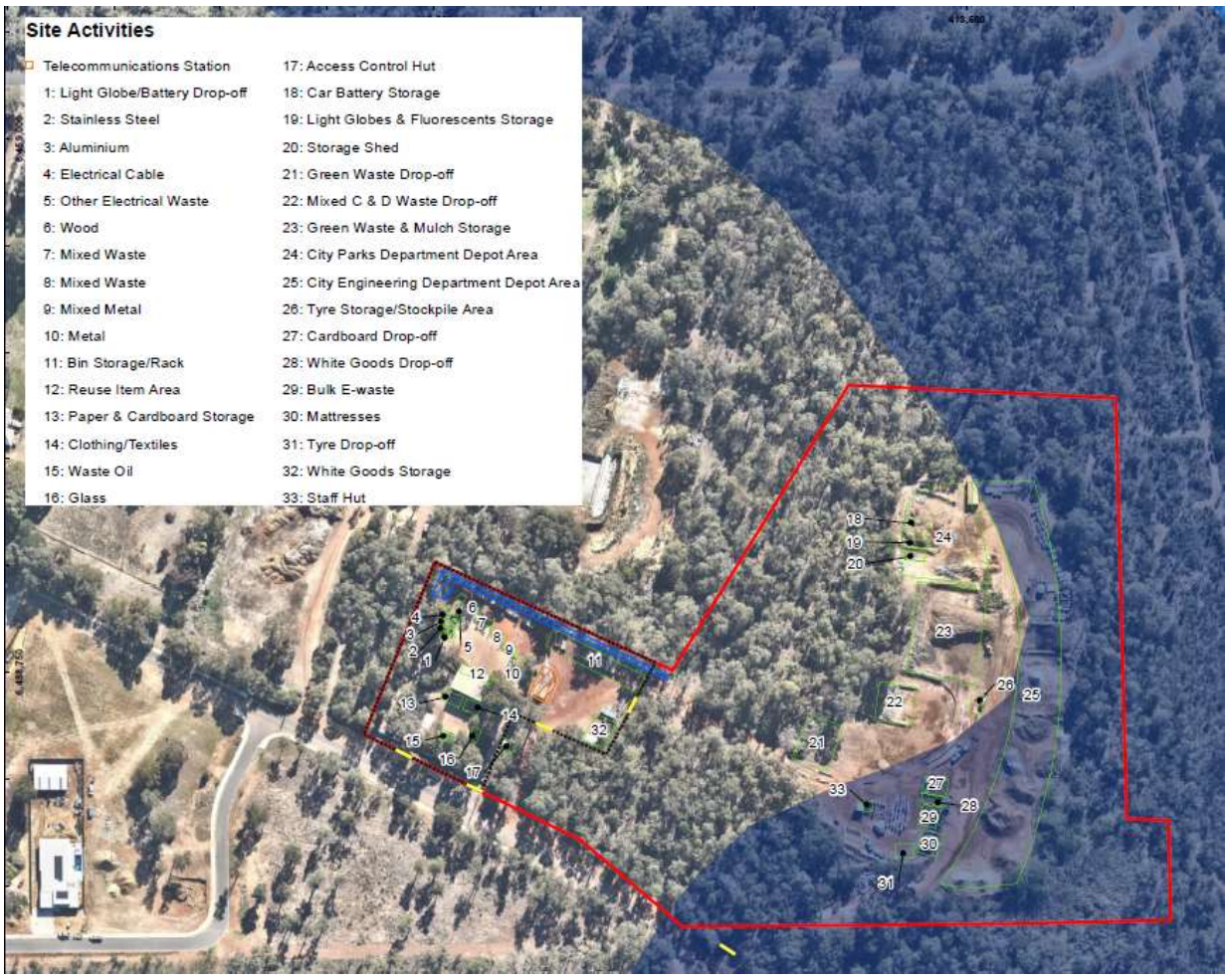

Figure 4: Updated Premises layout

10. Conclusion

Based on the assessment in this decision report, the Delegated Officer has determined that a licence will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Tracey Hassell

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Tracey Hassell
A/ MANAGER WASTE INDUSTRIES
REGULATORY SERVICES
INDUSTRY REGULATION

An officer delegated by the CEO under section 20 of the EP Act

Appendix 1: Summary of Consultation

Table 10: Comments received during assessment

Method	Comments received	DWER response
Application advertised on DWER website (22/01/2018)	None received	N/A
Applicant referred draft documents (18 February 2020)	The requested timeframe of 1 July 2020 for the completion of construction works is unachievable due to the significant financial implications associated with the current COVID 19 economic climate. The City requests the timeframe is extended to June 2021 to allow for the completion of detailed design, procurement and construction for up to 50% of the proposed infrastructure, prioritising the sites surface water management and sealed surfacing within the community recycling area. The remaining 50% of infrastructure being complete by June 2023 when the City has the remaining budget to complete the works.	The Delegated Officer notes the financial implications of COVID 19 on the Applicant and considers an extension of the date for the completion of all construction works to be acceptable. Condition wording has been updated to reflect timeframe extension to 30 June 2023 for the completion of all works.
	The City proposes to upgrade this area with a sealed surface (i.e. asphalt, bitumen) in lieu of a hardstand. Therefore, a permeability requirement no longer needs to be specified.	Condition wording changed to require the hardstand for a portion of the community recycling area to be sealed with asphalt or bitumen in line with the Applicants comments. Permeability requirement has been removed.

Method	Comments received	DWER response
	The City proposes to move the white goods storage area to the western side of the site onto a sealed surface. The surface water from this area will be collected and managed through the sites stormwater management as per Licence Condition 1 in Table 1. Therefore, a permeability requirement no longer needs to be specified.	The Delegated Officer notes that the newly proposed area for white goods storage is outside of the Priority 1 PDWSA and will now be sealed with asphalt or bitumen. The new location is therefore considered to be an acceptable alternative. The white goods storage area has been incorporated into conditions specifying construction requirements for the community drop-off area to reflect new location. New updated Premises layout included to replace Figure previously provided.
	The new access road will be sealed progressively. All dust management measures will continue to be implemented.	Comments noted – condition wording unchanged.
	The City is unable to enclose the site Premises with a perimeter fence in its entirety. All existing fencing, including along the southern boundary of the Site facing Lawnbrook Road, will be maintained and a new gate will be installed following the construction of the new community site access road. The existing fence consists of a 1.8 m high chain-link fence and all entry/exit points are gated. All other management measures will be undertaken, ensuing that the risk of windblown litter remains 'Medium' as per DWER's risk assessment. It is requested that all mentions of a 'perimeter' fence be removed from the DRAFT Licence documentation.	The Delegated Officer considers that the placement of the existing 1.8 m high fencing, combined with the Applicants proposed windblown waste controls, will be adequate to prevent the spread of windblown litter arising from prescribed activities. Reference to 'perimeter' fencing will be removed as requested. Reference to 'walling' removed from condition wording as the Applicant has indicated no additional construction work will occur at the perimeter of the Premises - only the existing fencing will be referenced.

Method	Comments received	DWER response
	The location of the sealed road surfaces has been slightly amended and a new site layout has been provided for reference. The City requests that Figure 3 in Schedule 1 of the Licence be replaced with this updated layout.	Comments noted – Figure 3 of Schedule 1 of the Licence has been replaced as requested.
	The community drop-off area as depicted in Schedule 1 – Figure 3 will now have a sealed surface (i.e. asphalt, bitumen) in lieu of a hardstand. Therefore, a permeability requirement no longer needs to be specified.	Condition wording changed to require the community drop-off area to be sealed with asphalt or bitumen in line with the Applicants comments. Permeability requirement has been removed.
	All waste storage bins onsite are in good condition and consolidate waste. Any waste storage bins that do not comply with the DRAFT Licence requirements will be upgraded by the City accordingly. Figure 2 in Schedule 1 has been updated to relocation of the white goods storage area and has been provided in this response. The City requests that Figure 2 in Schedule 1 be replaced with the Figure provided.	Comments noted – Figure 2 of Schedule 1 of the Licence has been replaced as requested.
	The white goods storage area has been relocated to an area of the site that will have a sealed surface (i.e. asphalt, bitumen) in lieu of a handstand. Therefore, a permeability requirement no longer needs to be specified.	Condition wording changed to require the white goods storage area to be sealed with asphalt or bitumen in line with the Applicants comments. Permeability requirement has been removed.

Method	Comments received	DWER response
	All waste storage bins onsite are in good condition to contain and consolidate waste. In addition, all stormwater will be diverted away from waste storage areas. Therefore, there is no need to contain any contaminated stormwater on the Premises. A detailed design and feasibility assessment for the surface management system infrastructure is currently being undertaken. The City is investigating two options that will at a minimum be capable of directing uncontaminated stormwater away from the waste storage areas and into the environment in a controlled manner. The first option proposes a network of drainage pipework that will tie into the regional drainage system for transfer of surface water offsite. The other option consists of the installation of underground infiltration cells in which the captured surface water will permeate into the ground under the site. Drawings provided show the indicative locations of surface water management system, which will be confirmed following the detailed design and feasibility assessment.	The Delegated Officer notes that the construction specifications for the surface water management system are yet to be finalised, but that proposed specifications do not accommodate the retention of potentially contaminated stormwater. As the Applicant proposes to store the majority of accepted wastes within bins, the Delegated Officer considers that there is minor potential for small quantities of potentially contaminated stormwater to be generated which will be mainly contained within bins of waste. As such, the requirement for the surface water management system to retain contaminated stormwater on the Premises has been removed from Licence conditions. Condition 11 has been added to the Licence requiring the Applicant to take all practicable measures to prevent stormwater run-off becoming contaminated by Premises operations. In this regard, any potentially contaminated stormwater identified within waste storage bins must not be allowed to enter the surface water management system. Condition numbering throughout the Licence has been updated.
	Signage is currently in place onsite. However, the City has ordered a new sign for the site community entrance, which will contain all the information as required in the DRAFT Licence.	Comments noted – condition wording will not be changed based on the Applicants notification that a sign containing all of the information required by the currently condition wording has been ordered for the Premises.

Method	Comments received	DWER response
	Premises boundary coordinates have been provided.	Noted – coordinates have been included in the Licence.

Appendix 2: Clearing assessment

Government of Western Australia
Department of Water and Environmental Regulation

Assessment Report

1. Application details

1.1. Permit application details

Permit application No.: 8733/1
Permit type: Works Approval / Licence Assessment

1.2. Applicant details

Applicant's name: City of Kalamunda

1.3. Property details

Property: Lot 5 on Deposited Plan 14851, Walliston
Local Government Authority: Kalamunda, City of
Localities: Walliston

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
0.15	-	Mechanical Removal	Waste disposal/management

1.5. Site Information

Clearing Description

The application is to clear 0.15 hectares of native vegetation within Lot 5 on Deposited Plan 1485, Walliston, for the purpose of improvement works at the existing Walliston Waste Transfer Station. The City of Kalamunda propose to clear native vegetation to construct a new access road to the site (Figure 1).

Vegetation Description

The application area is mapped as the Dwellingup (D2) vegetation complex. This complex is described as open forest of *Eucalyptus marginata* subsp. *marginata-Corymbia calophylla* on lateritic uplands in subhumid and semiarid zones (Mattiske and Havel, 1998).

Vegetation Condition

Vegetation condition has been assessed using the vegetation condition scale developed by Keighery (1994). All references to vegetation condition throughout this assessment therefore reference this scale.

Based on photographs provided by the applicant and aerial imagery, the application area is considered to range from good (Keighery, 1994) to very good (Keighery, 1994) condition. Keighery (1994) vegetation condition ratings are defined as follows:

- Pristine: Pristine or nearly so, no obvious signs of disturbance.
- Excellent: Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
- Very Good: Vegetation structure altered; obvious signs of disturbance.
- Good: Vegetation structure significantly altered by very obvious signs of multiple disturbance; retains basic structure or ability to regenerate.
- Degraded: Basic vegetation structure severely impacted by disturbance; scope for regeneration but not to a state approaching Good condition without intensive management.
- Completely Degraded: The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

The Walliston Waste Transfer site has been described by Talis (2017) as comprising a moderate amount of vegetation consisting of mainly ground strata and a mature canopy with little to no sub-canopy or understorey, and anticipated to be of little ecological value.

Soil type

Two soil types have been mapped within the application area. Dwellingup 1 Phase (255DpDW1) is described as crests and gently inclined (<10%) terrain dominated by lateritic duricrust and very shallow gravelly brownish sands, pale brown sands and earthy sands (Department of Primary Industries and Regional Development (DPIRD), 2019). Dwellingup 2 Phase (255DpDW2) is described as very gently to gently undulating terrain (<10%) with well drained, shallow to moderately deep gravelly brownish sands, pale brown sands and earthy sands overlying lateritic duricrust (DPIRD, 2019). The majority of the application area is situated within Dwellingup 1 Phase.

Comment

The local area is defined as a 10 kilometre radius measured from the perimeter of the application area. The vegetation condition and description was determined via information and photos of the application area provided by the applicant (Talis, 2017), and databases available at the time of assessment.

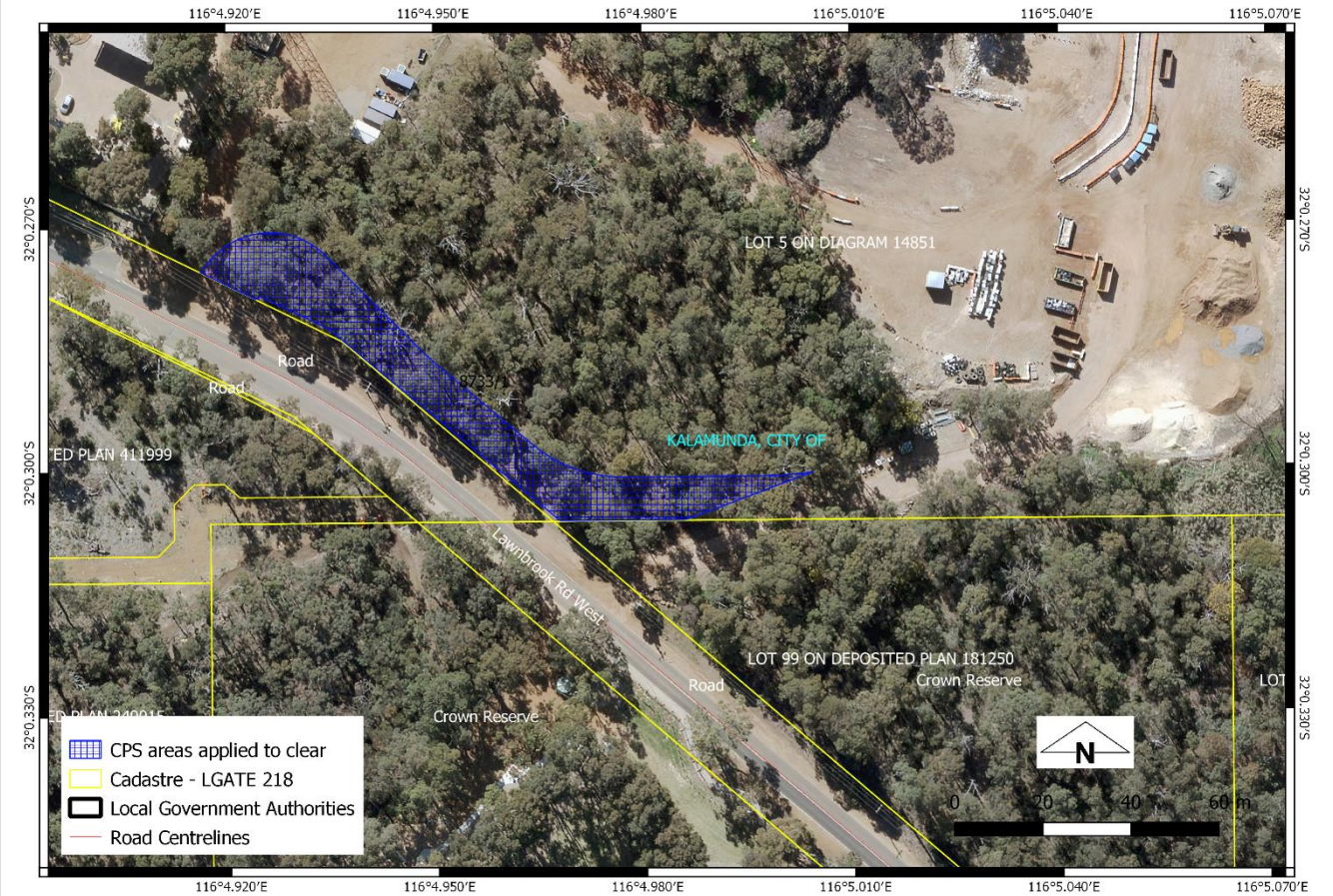

Figure 1: Area applied to clear

2. Avoidance and minimisation

No avoidance and minimisation measures have been proposed.

3. Assessment of application against clearing principles

According to available databases, eight fauna species listed as threatened under the *Biodiversity Conservation Act 2016* (BC Act) within the *Wildlife Conservation (Specially Protected Fauna) Notice 2018,* six fauna species protected under international agreement, one specially protected fauna species, one species of special interest and eight priority fauna species have been recorded within the local area (DBCA, 2007-). Six of these species (one mammal, four birds and one invertebrate) are associated wetland habitats and rivers. These habitat types do not occur within the application area and therefore it is not likely for the proposed clearing to impact habitat for these species.

The application area is located within the known distribution for Carnaby's cockatoo (*Calyptorhynchus latirostris*), Baudin's cockatoo (*Calyptorhynchus baudinii*) and forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*), collectively known as black cockatoos (Commonwealth of Australia, 2012). The vegetation within the application area comprises suitable breeding and foraging habitat for three black cockatoos (Natural Area, 2019). Based on available database fauna records, and vegetation type and structure mapped within the application area, suitable habitat for chuditch (*Dasyurus geoffroii*), quenda (*Isoodon fusciventer*), numbat (*Myrmecobius fasciatus*) and quokka (*Setonix brachyurus*) may be present.

Black cockatoos breed in large hollow-bearing trees, generally within woodlands or forests or in isolated trees (Commonwealth of Australia, 2012). These species nest in hollows in live or dead trees of karri, marri, wandoo, tuart, salmon gum, jarrah, flooded gum, York gum, powder bark, bullich and blackbutt (Commonwealth of Australia, 2012). Breeding habitat is described as trees of species known to support breeding within the range of black cockatoos, which either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow. For most tree species, suitable DBH is 500 millimetres (Commonwealth of Australia, 2012).

A targeted black cockatoo assessment undertaken by Natural Area (2019) identified 21 trees with a DBH greater than 500 millimetres throughout the application area, comprising 10 Jarrah (*Eucalyptus marginata*) and 11 Marri (*Corymbia calophylla*) trees (Natural Area, 2019). One *Eucalyptus marginata* tree was deceased and another contained six hollows (Natural Area, 2019). Four of these hollows were not of a suitable size to be utilised by black cockatoos, however were being used by striated pardalote (*Pardalotus striatus*) and European honey bees (*Apis mellifera*) (Natural Area, 2019). Two hollows were identified to be of a suitable size to be utilised by black cockatoos, however, one was occupied by galahs (*Eolophus roseicapillus*) and the other did not show signs of any occupancy (Natural Area, 2019). Whilst only two of the hollows within the application area were currently of a suitable size for use by black cockatoos, the four smaller hollows could develop overtime to be suitable for use by black cockatoos. A fauna management condition will mitigate the potential impacts to black cockatoos.

Black cockatoos forage on the seeds, flowers and nectar of native proteaceous plant species (e.g. *Banksia*, *Hakea* and *Grevillea* species), eucalypts and *Callistemon* species. These species also forage on seeds of introduced species (e.g. *Pinus* and *Erodium* species, canola and almonds), insects and insect larvae (Commonwealth of Australia, 2012). No signs of black cockatoo activity were observed during targeted black cockatoo site assessment. In particular, there were no visual sightings of black cockatoos, no calls were heard, and there were no signs of feeding observed within the application area (Natural Area, 2019). Whilst foraging habitat is present within the application area, the application area is part of a larger remnant that likely contains suitable foraging habitat in the same or better condition. The closest known breeding tree is approximately nine kilometres away. Noting there was no evidence of feeding during the targeted assessment and the relatively small clearing area of 0.15 hectares, given there is suitable foraging habitat present within the application area and known breeding trees within nine kilometres, the vegetation may comprise significant habitat for black cockatoos. The proposed clearing may be at variance to principle (b). Fauna management conditions will mitigate any potential direct or indirect impacts to fauna.

According to available databases, 18 threatened flora species, five Priority 1, five Priority 2, 28 Priority 3, 14 Priority 4 flora species, and one flora species presumed to be extinct have been recorded within the local area (Western Australian Herbarium, 1998-). Based on the soil and vegetation types mapped within the application area, two conservation significant flora species have the potential to occur. One record of Priority 3 species, *Amanita fibrillopes,* was recorded more than nine kilometres from the application area in 1978. The closest record of *Darwinia apiculata*, listed as threatened by the Department of Biodiversity, Conservation and Attractions (DBCA), is 4.3 kilometres from the application area. Within the local area, *Darwinia apiculata* has been recorded within habitat comprising laterite, brown loam, grey sand clay over granite, ridges, gentle slope, moist hilltops and organic litter (WA Herbarium, 1998-). These habitat characteristics are generally not associated with those found within the application area.

Photographs provided by the applicant show the vegetation is considered to be in good (Keighery, 1994) to very good (Keighery, 1994) condition. Talis (2017) describes the Walliston Waste Transfer Station site as comprising a moderate amount of existing vegetation, consisting mainly of ground strata and a mature canopy, with little to no sub-canopy or understorey, and anticipated to be of little ecological value (Talis, 2017). The likelihood assessment for conservation significant flora provided by the applicant determined that the conservation significant flora species considered in the assessment are unlikely to be present within the application area (Talis, 2017). Given above, the soil and vegetation types mapped, the habitat and distribution of the flora species identified within the local area, and the relatively small proposed clearing area of 0.15 hectares, the proposed clearing within the application area is not likely to result in significant impacts to conservation significant flora. Weed and hygiene management practices will assist in mitigating impacts to vegetation located adjacent to the application area.

No Threatened Ecological Communities (TEC) or Priority Ecological Communities (PEC) have been mapped within the application area. The closest mapped conservation significant ecological community is listed as a Priority 4 PEC by DBCA known as 'Central Northern Darling Scarp Granite Shrubland Community', and located approximately 4.5 kilometres west from the application area. The vegetation within the application area is not considered to be representative of this community.

The national objectives and targets for biodiversity conservation in Australia has a target to prevent clearance of ecological communities with an extent below 30 per cent of that present pre-1750, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia, 2001). The local area surrounding the application area retains 63.1 per cent native vegetation. The mapped Dwellingup D2 vegetation complex retains 85.5 per cent native vegetation (Government of Western Australia, 2018).

No watercourses or wetland are mapped within the application area. The closest watercourse to the application area is a resource enhancement dampland geomorphic wetland of the Swan Coastal Plain, located approximately 1.05 kilometres from the application area. Given this, the relatively small clearing area proposed and that the clearing occurs within a larger remnant that ranges in condition from good (Keighery, 1994) to very good (Keighery, 1994), the proposed clearing is not likely to deteriorate ground water or surface water quality, cause or exacerbate land degradation or exacerbate the intensity of flooding or salinity.

The closest conservation area to the application area is an area of Crown Freehold Department Managed land, located approximately 60 metres south west and across Lawnbrook Road West from the application area. The disturbance caused by the proposed clearing may increase the risk of weeds and dieback being introduced into areas of remnant vegetation adjacent. Weed and dieback management practices will assist in mitigating this risk.

Given the above, the proposed clearing may be at variance with clearing principle (b) and not likely to be at variance with the remaining clearing principles.

4. Recommendation

Recommendation

An assessment of the environmental impacts of the proposed clearing has been undertaken in accordance with DWER's Regulatory Principles, taking into consideration the clearing principles contained in Schedule 5 of the *Environmental Protection Act 1986* (EP Act). Noting the assessment against the clearing principles above, the proposed clearing is determined to may be at variance with principle (b), and is not likely to be at variance with the remaining principles. Section 62(1) of the EP Act provides for conditions to be placed on a works approval to prevent, control, abate or mitigate pollution or environmental harm. Recommended conditions are as follows:

1. Clearing authorised

The works approval holder shall not clear more than 0.15 hectares of native vegetation within the area cross-hatched yellow on attached Plan 8733/1.

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

In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:

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

3. Dieback and weed control

When undertaking any clearing or other activity authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of *weeds* and *dieback*:

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

4. Fauna management – direction of clearing

The Permit Holder shall conduct clearing in a slow progressive manner towards surrounding remnant vegetation to allow fauna to escape the clearing activity.

5. Fauna management – breeding habitat

a) Prior to undertaking any clearing authorised under this Permit:
   i. the area cross-hatched yellow on attached Plan 8733/1 shall be inspected by a fauna specialist who shall identify black cockatoo breeding trees; and
   ii. each black cockatoo breeding tree identified shall be inspected by a fauna specialist for evidence of current or past breeding use by Carnaby's cockatoo (*Calyptorhynchus latirostris*), Baudin's cockatoo (*Calyptorhynchus baudinii*) and forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*).
b) Where a black cockatoo breeding tree(s) with evidence of current breeding use by Carnaby's cockatoo, Baudin's cockatoo or forest red-tailed black cockatoo is identified and cannot be avoided that tree(s) shall be monitored by a fauna specialist to determine when it is no longer in use for that breeding season.
c) Any black cockatoo breeding tree(s) with evidence of current breeding use by Carnaby's cockatoo, Baudin's cockatoo or forest red-tailed black cockatoo shall not be cleared whilst it is in use for that breeding season as determined by the fauna specialist under condition 5(b) of this Permit.
d) Where a black cockatoo breeding tree(s) with evidence of past breeding use by Carnaby's cockatoo, Baudin's cockatoo or forest red-tailed black cockatoo is identified and cannot be avoided that tree(s) shall only be cleared:
   i. outside the black cockatoo breeding season; or
   ii. later the same day of the inspection required by condition 5(a)(ii) of this Permit; or
   iii. later the same day of a repeat inspection undertaken by a fauna specialist if that inspection does not identify evidence of current breeding use.
e) For each black cockatoo breeding tree with evidence of current or past breeding use by Carnaby's cockatoo, Baudin's cockatoo or forest red-tailed black cockatoo identified, that cannot be avoided the Permit Holder shall install an artificial black cockatoo nest hollow.
f) Each artificial black cockatoo nest hollow required by condition 5(e) of this Permit must be installed prior to commencement of the next black cockatoo breeding season following clearing of the related black cockatoo breeding tree.
g) The artificial black cockatoo nest hollow(s) required by condition 5(e) of this Permit must:
   i. be installed within the area cross-hatched red on attached Plan 8733/1 being a portion of Lot 5 on Deposited Plan 14851;
   ii. be designed and placed in accordance with the guidelines provided in Schedule 1 to this Permit; and
   iii. be monitored and maintained in accordance with the guidelines provided in Schedule 2 to this Permit, for a period of at least ten years.

6. Records must be kept

The Permit Holder must maintain the following records for activities done in pursuant to this Permit:

a. In relation to the clearing of native vegetation authorised under this Permit:
   i. 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;

ii. the date that the area was cleared;
iii. the size of the area cleared (in hectares);
iv. actions taken to avoid, minimise and reduce the impacts and extent of clearing in accordance with condition 2 of the Permit;
v. actions taken to minimise the risk of the introduction and spread of *weeds* and *dieback* in accordance with condition 3 of the Permit; and
vi. actions taken in accordance with condition 4 of this Permit.

b. In relation to fauna management pursuant to condition 5 of this Permit:
(i) the date each artificial black cockatoo nest hollows were installed;
(ii) the location of each artificial black cockatoo nest hollow installed, recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
(iii) a photo of each artificial black cockatoo nest hollow installed;
(iv) the dates each artificial black cockatoo nest hollow installed was monitored;
(v) a description of the monitoring methodology employed for each artificial black cockatoo nest hollow installed;
(vi) a description of the monitoring observations for each artificial black cockatoo nest hollow installed;
(vii) the date(s) each artificial black cockatoo nest hollow installed was maintained; and
(viii) a description of the maintenance activities undertaken for each artificial black cockatoo nest hollow installed.

7. 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 6 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 was undertaken between 1 January to 31 December of the preceding calendar, a written report confirming that no clearing under this permit has been carried out, must be provided to the *CEO* on or before 30 June of each year.

c. Prior to 13 January 2030, the Permit Holder must provide to the *CEO* a written report of records required under condition 6 of this Permit where these records have not already been provided under condition 7(a) of this Permit.

Definitions

The following meanings are given to terms used in this Permit:

black cockatoo breeding tree*(s) means trees that have a diameter, measured at 1.5 metres from the base of the tree, of 50 centimetres or greater.*

CEO means the Chief Executive Officer of the Department responsible for the administration of the clearing provisions under the *Environmental Protection Act 1986*;

condition *means the rating given to native vegetation using the Keighery scale and refers to the degree of change in the structure, density, and species present in the particular vegetation in comparison to undisturbed vegetation of the same type.*

dieback means the effect of Phytophthora species on native vegetation;

fill means material used to increase the ground level, or fill a hollow;

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;

weed*/s* means any plant –

a. that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*;
b. published in a Department of Biodiversity, Conservation and Attractions Regional Weed Rankings Summary, regardless of ranking; or not indigenous to the area concerned.
c. not indigenous to the area concerned.

Samara Rogers
MANAGER
NATIVE VEGETATION REGULATION

Officer delegated under Section 20 of the Environmental Protection Act 1986

13 January 2020

5. References

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

Commonwealth of Australia (2012) EPBC Act referral guidelines for three threatened black cockatoo species. Department of Sustainability, Environment, Water, Populations and Communities, Canberra.

Department of Biodiversity, Conservation and Attractions (DBCA) (2007-) NatureMap: Mapping Western Australia's Biodiversity. Department of Parks and Wildlife. URL: http://naturemap.dpaw.wa.gov.au/. Accessed August 2019

DBCA (2019) Brush Tailed Phascogale Fact Sheet. https://library.dbca.wa.gov.au/static/FullTextFiles/071549.pdf Accessed September 2019

DBCA (2019) Fauna Profile Chuditch Dasyurus geoffroii. https://www.dpaw.wa.gov.au/images/documents/plants-animals/animals/animal_profiles/chuditch_fauna_profile.pdf (a(cessed December 2019.

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 November 2019).

Government of Western Australia (2018) 2017 South West Vegetation Complex Statistics. Current as of October 2017. WA Department of Parks and Wildlife, Perth.

Keighery, B.J. (1994) Bushland Plant Survey: A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc). Nedlands, Western Australia.

Mattiske, E.M. and Havel, J.J. (1998) Vegetation Complexes of the South-west Forest Region of Western Australia. Maps and report prepared as part of the Regional Forest Agreement, Western Australia for the Department of Conservation and Land Management and Environment Australia.

Natural Area Holdings Pty Ltd (Natural Area) (2019) Walliston Waste Transfer Station Black Cockatoo Habitat Assessment. City of Kalamunda. DWER Ref A1852117

Roadside Conservation Committee (RCC) (2015) Roadside Vegetation and Conservation Values in the Shire of Kalamunda. July 2015.

Talis (2017) Environmental Assessment and Management Plan. Walliston Transfer Station. Prepared for City of Kalamunda November 2017. DWER Ref A1606777

WA Herbarium (1998-) FloraBase - The Western Australian Flora. Department of Parks and Wildlife. http://florabase.dpaw.wa.gov.au/ (accessed November 2019).

GIS databases:

- CPS Areas applied to clear
- NatureMap (conservation significant fauna)
- DAFWA Subsystems
- Soils of WA
- Vegetation Complexes
- Managed Tenure
- Environmentally Sensitive Areas
- TPFL Data November 2019
- WAHerb Data November 2019
- Aboriginal Sites Register
- IBRA Vegetation WA
- WA TECPEC
- Land Degradation Hazards

Plan 8733/1

Legend

- CPS subject to conditions
- CPS areas approved to clear
- Local Government Authorities
- Road Centrelines
- Cadastre - LGATE 218

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Officer delegated under section 20 of the Environmental Protection Act 1986

GOVERNMENT OF WESTERN AUSTRALIA






birdlife AUSTRALIA

WATER CORPORATION

WESTERN AUSTRALIAN museum

How to design and place artificial hollows for Carnaby's cockatoo

Artificial hollows can be used to help conserve the threatened Carnaby's cockatoo by enabling the cockatoos to breed in areas where natural hollows are limited.

A wide variety of artificial hollow designs have been used with mixed success. Evidence suggests that, while the hollow must meet some basic requirements, other factors such as proximity to existing breeding areas may be more important in determining the success of artificial hollows. Before using this information sheet to construct or install an artificial hollow, you should refer to the criteria listed in the separate information sheet; *When to use artificial hollows for Carnaby's cockatoo*.

This information sheet contains broad guidelines for the design and placement of artificial hollows for Carnaby's cockatoo.

Below are three examples of successful artificial hollows used by Carnaby's cockatoo for nesting. Artificial hollows made from a natural log with cut side entrance (left), white industrial pipe with top entrance (centre) and natural log with natural side entrance (right).



Photos by Christine Groom (left and right) and Rick Dawson (centre)

Walls

The walls of the artificial hollow need to be constructed from a material that is;

- Durable enough to withstand exposure to elements for an extended period of time (i.e. 20+ years).
- Able to simulate the thermal properties of a natural tree hollow.
- Not less than 380 mm in internal diameter.
- Preferably 1.2 m deep overall and 1m deep to top of substrate/nesting material.

Successful artificial hollows have been constructed from sections of salvaged natural hollow, black and white industrial pipe. When using non-natural materials care must be taken to ensure there are no toxic residues and that the materials are safe to ingest.

Base

The base of the artificial hollow must be;

- Able to support the adult and nestling(s).
- Durable enough to last the life of the nest.
- Free draining.
- At least 380 mm in diameter.
- Covered with 200 mm of sterile, dry, free draining material such as charcoal, hardwood woodchips or wood debris.

  Do not use:

  - Saw dust or fibre products that will retain moisture.

Example materials that could be used for artificial hollow bases include heavy duty stainless steel, galvanised or treated metal (e.g. Zincalume ®), thick hardwood timber slab or marine ply (not chipboard or MDF). The base material must be cut to size to fit internally with sharp or rough edges ground away or curled inwards and fixed securely to the walls.

Carnaby's cockatoo eggs in an artificial hollow.
Photo by Rick Dawson

Entrance

The entrance of the artificial hollow must;

- Have a diameter of at least 270 mm).
- Preferably be top entry which will minimise use by non-target species.

Top entry hollows are unattractive to nest competitors such as feral bees, galahs and corellas. Side entry hollows have been successful in areas where feral bees are not a problem and where galahs and corellas are deterred.

Ladder

For artificial hollows made of non-natural materials, or of processed boards, it is necessary to provide a ladder to enable the birds to climb in and out of the hollow easily.

The ladder must be;

- Securely mounted to the inside of the hollow.
- Made from an open heavy wire mesh such as WeldMesh™ with mesh size of 30 - 50 mm, or heavy chain.

Do not use:

- A material that the birds can chew.
- Galvanized because the birds may grip or chew the ladder and ingest harmful compounds.

If using mesh for the ladder, the width will depend on the curvature of the nest walls. A minimum width of about 60 - 100 mm is recommended.

Sacrificial chewing posts

For artificial hollows made of non-natural materials, or of processed boards, it is necessary to provide sacrificial chewing posts. The birds chew material to prepare a dry base on which to lay their egg(s).

The sacrificial chewing posts must:

- Be made of untreated hardwood such as jarrah, marri or wandoo
- Be thick enough to satisfy the birds' needs between maintenance visits.
- Extend beyond the top of the hollow as an aid to see whether the nest is being used.
- Be placed on the inside of the hollow.
- Be attached in such a way that they are easy to replace e.g. hook over the top of hollow or can slide in/out of a pair of U bolts fitted to the side of the hollow.

It is recommended that at least two posts are provided. Posts 70 x 50 mm have been used, but require replacing at least every second breeding season when the nest is active. Birds do vary in their chewing habits and therefore the frequency at which the chewing posts require replacement will also vary.

Bottom of an artificial hollow showing ladder that is fixed to the wall and a chewed sacrificial post which is 200 mm from the floor.

Photo by Rick Dawson

Mountings

The artificial hollows must be mounted such that:

- The fixings used will last the duration of the nest e.g. galvanized bracket or chain fixed with galvanized coach screws.
- It is secured by more than one anchor for security and stability.
- It is positioned vertically or near vertically.

Placement

Sites should be chosen within current breeding areas and where they can be monitored, but preferably not conspicuous to the general public. It is important that artificial hollows are placed where they will be accessible for future monitoring and maintenance. For more detail refer to the separate information sheet; *When to use artificial hollows for Carnaby's cockatoo*.

The height at which artificial hollows should be placed is variable. The average height of natural hollows in dominant tree species in the area is a good guide. Natural hollows used by Carnaby's cockatoos have been recorded as low as 2 m above the ground. If located on private property the hollows can be placed lower to the ground so they are accessible by ladder or a rope and pulley system can be used. Where public access is possible artificial hollows should be placed at least 7 m high (i.e. higher than most ladders) and on the side of the tree away from public view to reduce the chance of interference or poaching.

Carnaby's cockatoo show no preference for aspect of natural hollows, however, it may still be beneficial to place artificial hollows facing away from prevailing weather and where they receive the most shade and protection.

Artificial hollows to be placed in trees require:

- Accessibility of the tree for a vehicle, elevated work platform or cherry picker.
- A section of trunk 2-3 m long suitable for attaching the hollow

If necessary, artificial hollows may be placed on poles, but this may result in excessive exposure to sun during very hot weather. When erected on poles there should be"

- A hinge at the bottom of the pole that can be secured when the pole is in the upright position.
- Access for a vehicle to assist raising the pole.

Safety

Care needs to be taken when placing artificial hollows to ensure safety is considered at all times. Artificial hollows are heavy and require lifting and manoeuvring into position up to 7 m above the ground.

Maintenance and monitoring

Once artificial hollows have been placed they require monitoring and maintenance to ensure they continue to be useful for nesting by Carnaby's cockatoo. It is important to monitor artificial hollows to determine use by Carnaby's cockatoo, other native species as well as pest species. By undertaking monitoring the success of the design and placement of artificial hollows can be determined and areas for improvement identified for future placement of artificial hollows.

Monitoring can also assess whether any maintenance is required. Without regular maintenance artificial hollows are unlikely to achieve their objective (that is, they will fail to provide nesting opportunities for threatened cockatoos). Therefore it is important to continue a regime of regular maintenance while the artificial hollow is required. It may be several (to many) decades until a natural replacement hollow is available.

For further advice on monitoring and maintenance of artificial hollows please refer to the separate information sheet; *How to monitor and maintain artificial hollows for Carnaby's cockatoo*.

Carnaby's cockatoo female prospecting an artificial hollow.
Photo by Rick Dawson

Example fixing for artificial hollow
Photo by Christine Groom

Acknowledgements

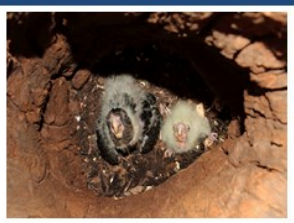
This information sheet is a joint initiative of Birdlife Australia, the Western Australian Museum and the Department of Parks and Wildlife. Many individuals have contributed to its preparation. Special acknowledgement is made for the contributions of Ron Johnstone from the WA Museum, Alan Elliott from the Serpentine-Jarrahdale Land care Centre and Denis Saunders. This updated version was compiled by Rick Dawson Department of Parks and Wildlife).

Other information sheets in the series: Artificial hollows for Carnaby's cockatoo

- *How to design and place artificial hollows for Carnaby's cockatoo*
- *How to monitor and maintain artificial hollows for Carnaby's cockatoo*

Information sheets available on the *Saving Carnaby's cockatoo* webpage:
http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals/208-saving-carnaby-s-cockatoo



How to monitor and maintain artificial hollows for Carnaby's cockatoo

It is important to monitor and maintain artificial hollows after they have been erected. Monitoring ensures that the effectiveness of the artificial hollow can be determined. It also means that problems with pest species or any maintenance requirements can be identified and resolved.

Without regular maintenance, artificial hollows are likely to fail to achieve their objective (that is, they will fail to provide nesting opportunities for threatened cockatoos). Therefore it is important to continue a regime of regular maintenance while the artificial hollow is required. It may be several (to many) decades until a natural replacement hollow is available.

Monitoring should be undertaken in order to detect:

- Use by Carnaby's cockatoo
- Maintenance requirements
- Use by other native species
- Use by pest species (e.g. feral bees, galahs, corellas etc.)

Carnaby's cockatoo female prospecting an artificial hollow.
Photo by Rick Dawson

How do I monitor artificial hollows?

Before undertaking monitoring of artificial hollows for Carnaby's cockatoo it is recommended that you seek advice from BirdLife Australia, the WA Museum or the Department of Parks and Wildlife. It is also important to contact Parks and Wildlife, Wildlife Licensing Section, to determine if a scientific licence is required (wildlifelicensing@dpaw.wa.gov.au).

Monitoring artificial hollows requires keen observation and naturalist skills. It is often not possible to observe evidence of breeding directly (i.e. nestlings or eggs) and inferences must be made based on observation. There are many techniques available to monitor artificial hollows. A combination of several is likely to achieve the best results.

Looking for signs of use

Cobwebs covering the entrance to the hollow will indicate that the hollow has not been used recently. This would also apply to other light debris that may have fallen to cover the opening partially. Signs of recent use or interest in the hollow include evidence of chewing.

Observing parent behaviour around the hollow

The behaviour of parent birds around a hollow will indicate an approximate age of young in the nest.

Parent behaviour	Approximate age/stage of young
Prospecting for hollow	Unborn
Male only seen out of hollow	Egg or very young nestling (< 3 - 4 weeks)
Both parents seen entering/exiting the hollow	Nestling(s) have hatched (> 3 - 4 weeks)

Observing feeding flocks

Flocks of all male birds indicate that the females are incubating eggs. When flocks are mixed it suggests the birds have either not laid yet or that the nestlings have hatched and no longer require brooding (approximately 3 - 4 weeks old).

Tapping

When females are sitting on eggs they will usually respond to tapping at the base of their tree (or pole) by appearing at the entrance or flying from the hollow opening. This is not a guarantee of breeding activity, but an indication that it is possibly occurring in the hollow.

Observing insect activity around nest

The faecal matter produced by nestlings in a nest attracts insects, especially flies and ants. The type and number of these insects will help indicate how old any nestlings present may be. Factors such as temperature and humidity will also affect insect activity and so observations of insect activity should only be used as supporting evidence for other indications of age/use. Blowflies around a nest usually indicate that a death has occurred.

Listening for nestlings

With experience it is possible to determine if one or two nestlings are present and a broad estimate of age based on the type and loudness of noises they make.

Looking inside the nest

This can be achieved either with the aid of a telescopic pole and camera or mirror, or with the use of a ladder or other climbing equipment. This method can obtain the most detailed monitoring information for artificial hollows. However it is also the most time consuming and difficult to organise. Special equipment is likely to be needed depending on the height and positioning of artificial hollows. There are also safety issues associated with ladder or rope climbing options to reach nests to undertake observations.

How often should I monitor artificial hollows?

The minimum frequency of monitoring and the techniques used will be determined by the aims of the monitoring and the resources available. It is important to limit disturbance to breeding birds and this should be considered when determining the techniques used and frequency.

How do I maintain artificial hollows?

Artificial hollows require maintenance to ensure they continue to have the greatest chance of them being used by Carnaby's cockatoos. Periodic maintenance checks should be undertaken at least every two years, preferably annually. These checks should be undertaken prior to the breeding season which is between July and January with breeding occurring later in this period in southern areas. It is important to maintain a regime of regular maintenance as long as the artificial hollow is required. It may take several (to many) decades until a natural replacement hollow is available.

Maintenance checks should assess the following as a minimum:

- Condition of chewing posts (if present)
- Condition of attachment points
- Condition of hollow bases
- Stability of tree or pole used to mount the artificial hollow

Artificial hollow base needing repair.
Photo by Christine Groom

Repairing hollows

Any problems identified during maintenance checks should be addressed, and any repairs required done, as soon as possible. If breeding is currently occurring, maintenance may need to be delayed if it is likely to disturb the parents or nestling. Likely maintenance needs include replacement of chewing posts (frequently) or nest bases (occasionally) and repairing of any cracks (infrequently). Maintenance concerns regarding the security of attachment points or the stability of the tree or pole should be addressed as a priority for safety reasons.

For artificial hollows known to be used, spare chewing posts should be taken into the field when undertaking maintenance checks.

Monitoring of artificial hollows:

Monitoring aim	Frequency of visits	Monitoring techniques
To determine possible use by Carnaby's cockatoo	At least once during peak breeding season (i.e. between September and December)	• Observing behaviour of adults around hollow • Tapping to see if female will flush from hollow (best undertaken between 10am and 3pm when females most likely to be sitting) • Listening for nestlings • Looking for evidence of chewing • Looking inside nest
To confirm use by Carnaby's cockatoo	At least two visits during peak breeding season (i.e. between September and December)	To observe at least two of the following: • Breeding behaviour of adults around hollow or evidence of chewing • Female flushed from hollow • Noises from nestlings in hollow Or to observe: • Nestlings or eggs in nest
To determine nesting success by Carnaby's cockatoo	The more visits, the better. Preferably fortnightly visits between July and December. As a minimum, at least 3 visits spread throughout breeding season.	• Looking inside nest to observe eggs or nestlings.
To determine use by any species	As often as possible.	• Inspection from ground as a minimum. • Looking inside nest for detailed observations.
To determine maintenance requirements	At least every two years and preferably annually if hollow fitted with sacrificial chewing posts, can be longer if without.	• A basic maintenance check can be undertaken from the ground. A ladder or elevated work platform will be required for a comprehensive check and to replace sacrificial chewing posts

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Other information sheets in the series: Artificial hollows for Carnaby's cockatoo

- *How to design and place artificial hollows for Carnaby's cockatoo*
- *How to monitor and maintain artificial hollows for Carnaby's cockatoo*

Information sheets available on the *Saving Carnaby's cockatoo* webpage:
http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals/208-saving-carnaby-s-cockatoo