

VEGETATION AND FAUNA ASSESSMENT HELENA EAST AND SOUTHERN EMBANKMENT

1. FLORA AND VEGETATION STUDY

1.1 Methodology

A flora and vegetation survey of the site comprising the Helena East Precinct and Southern Embankment was conducted by Ms Gabriela Martinez, a qualified botanist from ATA Environmental, on 1 December 2005. The survey was undertaken to identify the vegetation values within the subject area of the Helena East PER (Figure 1). Whilst not part of the PER subject area, the survey also included the proposed MIA Containment Area (see Figure 2 of PER).

The survey focused on the Southern Embankment as this was the only portion of the subject area containing remnant vegetation, apart from planted trees within the Helena East Precinct and some remnant flooded gums in the proposed MIA Containment Area.

The major vegetation types and associated flora were surveyed and delineated using a 1:1500 colour aerial photograph. The vegetation was described and mapped according to the structure and species composition of the dominant stratum using the system adopted in Bush Forever (2000).

Detailed recordings were undertaken at several locations, selected on the basis of the local variation in vegetation structure and floristic composition. Selective opportunistic collecting was also undertaken at additional sites in plant communities of similar structure and floristic composition.

1.2 Survey Limitations

It must be acknowledged that there are survey limitations and limitations in the methodology. The survey was not conducted in spring; hence many annuals and herbs would not have been recorded. As a result the survey methodology does not comply with the EPA's Guidelines for flora surveys as outlined in the EPA Guidance Statement No.51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004).

There was no quadrat data collected during the flora and vegetation survey conducted by ATA Environmental on the 1 December 2005 as only a Level 1 Reconnaissance survey was conducted. This type of survey is recommended in the EPA Guidance Statement No.51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* for areas of <1ha which will be impacted upon. The Southern Embankment of the Helena East Precinct is approximately 0.8ha and therefore is classified as having a low scale impact.

There was no Conservation and Land Management (CALM) Declared Rare Flora (DRF) or Priority searches undertaken for the study area.

1.3 Vegetation Complex

The vegetation of the study area is mapped by Heddle *et al.*, (1980) as the Swan Complex. The Swan Vegetation Complex is representative of Fringing Woodlands of *Eucalyptus rudis* and *Melaleuca raphiophylla* with localised occurrence of Low Open Forest of *Casuarina obesa* and *Melaleuca cuticularis*.

The adequate representation of vegetation complexes within conservation reserves has been recently addressed for the Perth Metropolitan Region (PMR) under Bush Forever (Government of Western Australia, 2000). Bush Forever identified areas of regionally significant vegetation and proposes that these areas should be conserved and managed to provide a comprehensive representation of the original biological diversity of the Swan Coastal Plain portion of the PMR. Under Bush Forever, the principal criteria for identification of regionally significant areas includes the protection of at least 10% of each of the original vegetation complexes represented within the Swan Coastal Plain, as well as threatened ecological communities, floristic communities and verified conservation category wetlands associated with bushland. The Bush Forever project adopted 'at least 10%' criteria for the protection of ecological communities in the Perth Metropolitan Region to apply to 'constrained urban environments'.

A target of 10% reservation of each vegetation complex may be used as a basis for determining appropriate recommendations for conservation of selected areas of bushland in the PMR which form part of a constrained environment.

At a regional scale, the Fringing Woodlands of *Eucalyptus rudis* and *Melaleuca raphiophylla* with localised occurrence of Low Open Forest of *Casuarina obesa* and *Melaleuca cuticularis* meets the 10% criterion for protection within conservation reserves with 11% of its original extent currently reserved in the conservation estate.

A site visit conducted by ATA Environmental on the 1 December 2005 found that the remaining vegetation in the subject area is representative of the Swan Complex. However, although it is representative of the Swan Complex, it is highly degraded.

1.4 Vegetation Types

Vegetation types are vegetation units that can be described and mapped at a finer level than the vegetation complexes.

Three vegetation types associated with the study area were identified and described during the site visit on the 1 December 2005.

Note - *Denotes introduced species

ErW

Woodland to 14m dominated by Flooded Gum (*Eucalyptus rudis*) with occasional Swamp Paperbark (*Melaleuca raphiophylla*) over a Closed Heath to 1.5m dominated by Castor Oil Plant (**Ricinus communis*), Narrowleaf Cottonbush (**Gomphocarpus fruticosus*), Blackberry (**Rubus ulmifolius*) with occasional Giant Reed (**Arundo donax*) over introduced grasses dominated by Wild Oat (**Avena fatua*), Perennial Veldt Grass (**Ehrharta calycina*), Kikuyu Grass (**Pennisetum clandestinum*) on sandy loamy soils. This vegetation type occurs along most of the Southern Embankment of the site. There was evidence of heavy disturbance associated with this vegetation type and according to the Bush Forever (2000) the condition was considered to be Degraded (Figure 1).

Cg

Closed Grassland dominated by Wild Oat, Perennial Veldt Grass, Couch (**Cynodon dactylon*) and Birdwood grass (**Cenchrus setigerus*) with scattered Castor Oil Plant and Blackberry. There was evidence of heavy disturbance associated with this vegetation type and the condition was considered to be Completely Degraded (Figure 1).

Ps

Planted species of Jacaranda tree (**Jacaranda mimosaeifolia*), **Lophostemon grandiflorus* subsp. *riparius*, Marri (*Corymbia calophylla*), Fuchsia grevillea (*Grevillea bipinnatifida*), New Zealand Christmas tree (**Metrosideros excelsa*) and Orange Wattle (*Acacia saligna*) on sandy soils. These species were found within the Helena East Precinct and are in a Completely Degraded condition (Figure 1).

1.5 Vegetation Condition

The condition of the vegetation was assessed according to the system devised by Keighery and described in Bush Forever (Government of Western Australia, 2000). Keighery's condition rating scale ranges from Pristine (which the vegetation exhibits no visible signs of disturbance) to Completely Degraded (where the vegetation structure is no longer intact and without native plant species). Vegetation condition for the Helena East Precinct is mapped in Figure 1 and ranges from Degraded to Completely Degraded (which is in the lower range of the scale).

A description of the vegetation condition ratings are outlined below.

Excellent (2)

Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. This condition rating corresponds to the Very Good rating that was used to rate condition prior to the Bush Forever Strategy.

Very Good (3)

Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

Good (4)

Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate to it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing. This condition rating corresponds with the Poor rating that was used to rate condition prior to the Bush Forever Strategy.

Degraded (5)

Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing. This condition rating corresponds with the Very Poor rating that was used to rate condition prior to the Bush Forever Strategy.

Completely Degraded (6)

The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising of weed or crop species with isolated native trees or shrubs.

1.6 Flora

A total of 35 plant species were recorded from the Helena East Precinct from the December 2005 survey. The total includes 14 Monocotyledons and 21 Dicotyledons. The flora assessment was undertaken on 1 December 2005, a time when the majority of ephemeral species such as lilies and orchids could not have been identified. A full list of flora species recorded from the subject area is provided in Attachment A.

Of the 35 plant species recorded, 7 (20%) were native and 28 (80%) were introduced or non-endemic planted species. Families with the highest representation of taxa were the Poaceae (Grass family - 12 taxa; 12 introduced), the Asteraceae (Daisy family – 3 taxa; 3 introduced) and the Myrtaceae (Eucalyptus family – 5 taxa; 3 native, 2 introduced).

Significant Flora

Given the degraded condition of the subject area it is unlikely to support any significant flora.

No Declared Rare Flora, Priority Flora or Commonwealth listed species were recorded from subject area.

Environmental Weeds

Declared Plants are defined as “Pest plants targeted for legislative control...which have, or could have, serious economic, environmental or social impact” (Department of Agriculture Western Australia, 2005). It follows that only certain species of plants are classed as Declared Plants and are only Declared Plants in certain areas. For example, Blackberry exists as a Declared Plant in some southwest regions of Western Australia but not anywhere else in the State.

A total of 28 species of introduced or non-endemic species were recorded with **Ricinus communis*, **Ehrharta calycina*, **Avena fatua*, **Rubus ulmifolius* and **Fumaria capreolata* being the most widespread. All areas investigated during the flora survey in December 2005 had weeds present as scattered or moderate to high densities.

Echium plantagineum (Paterson’s Curse) was also recorded in large numbers throughout the survey area. Paterson’s Curse, Conservation Control Code P1, is a Declared Plant throughout the whole of the state (Table 1).

TABLE 1
CATEGORIES OF DECLARED PLANT SPECIES IN WESTERN AUSTRALIA
(Agriculture and Related Resources Protection Act, 1976)

Standard Control Code	Category
P1 Prohibits movement	The movement of plants or their seeds is prohibited within the State. This Prohibits the movement of contaminated machinery and produce including livestock and fodder.
P2 Aim is to eradicate infestation	Treat all plants to destroy and prevent propagation each year until no plant remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery.
P3 Aims to control infestation by reducing area and/or density of infestation	The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set all plants:- <ul style="list-style-type: none"> • Within 100m inside of the boundaries of the infestation. • Within 50m of roads and high-water mark on waterways. • Within 50m of sheds, stockyards and houses. Treatment must be done prior to seed set each year. Of the remaining infested area:- <ul style="list-style-type: none"> • Where plant density is 1-10 per hectare treat 100% of infestation. • Where plant density is 11-100 per hectare treat 50% of infestation. • Where plant density is 101-1000 per hectare treat 10% of infestation. Properties with less than 2 ha of infestation must treat the entire infestation.

Standard Control Code	Category
	Additional areas must be ordered to be treated.
<p data-bbox="371 367 405 394">P4</p> <p data-bbox="244 432 531 551">Aims to prevent infestation spreading beyond existing boundaries of infestation</p>	<p data-bbox="544 306 1415 394">The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and or machinery.</p> <p data-bbox="544 400 1059 427">Treat to destroy and prevent seed set all plants:-</p> <ul data-bbox="544 434 1265 517" style="list-style-type: none"> <li data-bbox="544 434 1265 461">• Within 100m inside of the boundaries of the infested property. <li data-bbox="544 468 1198 495">• Within 50m of roads and highwater mark on waterways. <li data-bbox="544 501 1075 528">• Within 50m of sheds, stockyards and houses. <p data-bbox="544 535 1377 607">Treatment must be done prior to seed set each year. Properties with less than 2ha of infestation must treat the entire infestation. Additional areas may be ordered to be treated</p>
<p data-bbox="268 674 507 701">Special requirements</p>	<p data-bbox="544 613 1415 734">In the case of P4 infestations where they continue across property boundaries there is no requirement to treat the relevant part of the property boundaries as long as the boundaries of the infestation as a whole are treated. There must be agreement between neighbours in relation to the treatment of these areas.</p>
<p data-bbox="371 741 405 768">P5</p>	<p data-bbox="544 741 1046 766">Additional areas must be ordered to be treated.</p>

1.7 Wetlands

According to the *Geomorphic Wetlands Swan Coastal Plain Dataset* provided by the Department of Environment (DoE) the Southern Embankment of the subject area abuts a Conservation Category Wetland (Floodplain) (UFI 13628). A Floodplain is a seasonally inundated flat.

The DoE Position Statement defines a Conservation Category Wetland (CCW) as wetland which supports a high level of ecological attributes and functions. They are considered the highest priority wetlands. The management objective for a CCW is for the preservation of wetland attributes and functions through various mechanisms including:

- Reservation in national parks, crown reserves and State owned land;
- Protection under Environmental Protection Policies; and
- Wetland covenanting by landowners.

These are the most valuable wetlands and the DoE (formally Water and Rivers Commission) will oppose any activity that may lead to further loss or degradation.

Some wetlands on the Swan Coastal Plain have statutory protection under the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*. This environmental protection policy (EPP) effectively prohibits the filling, mining, pollution or changing of drainage into or out of wetlands without assessment and approval by the Environmental Protection Authority and approved by the Minister of the Environment. The CCW which abuts the Southern Embankment of the subject area is not covered by the Lakes EPP and is also not included in the *Revised Draft Environmental Protection (Swan Coastal Plain Wetlands) Policy 2004* which will supersede the Lakes EPP when it is finally gazetted. Floodplain, River, Creek and estuarine CCWs were not considered for addition to the Draft.

The Bush Forever (2000) maps Bush Forever Sites and also shows Conservation Category Wetlands and 'other native vegetation'. The vegetation on the Southern Embankment of the subject area (Figure 1) is not listed as regionally significant in Bush Forever (2000).

2. SIGNIFICANT FAUNA STUDY

2.1 Methodology

A search of the Department of Conservation and Land Management's (CALM's) Threatened Fauna database and the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* online database was undertaken to identify potential scheduled and threatened vertebrate species in the Helena East area (Table 2). The search area was bounded by latitude 31.86 to 31.96°S and longitude 115.95 to 116.06°E. A site visit was conducted by Dr Jessica Oates on 23 January 2006 to verify the desktop survey and examine the area for available fauna habitats.

TABLE 2
SIGNIFICANT FAUNA SPECIES UNDER COMMONWEALTH OR STATE GOVERNMENT ACTS AND LISTED AS POTENTIALLY OCCURRING IN THE MIDLAND AREA

Species	Status under Commonwealth Environment Protection and Biodiversity Act	Status under Wildlife Conservation Act Schedule (S) / Priority (P)	Comment
Carnaby's Black-Cockatoo <i>Calyptrorhynchus latirostris</i>	Endangered	Schedule 1	Species <i>may</i> utilise the area for feeding purposes but is <i>unlikely</i> to utilise the area for breeding
Chuditch; Western Quoll <i>Dasyurus geoffroii</i>	Vulnerable	Schedule 1	Species or species habitat <i>unlikely</i> to occur within the area
Baudin's Black-Cockatoo <i>Calyptrorhynchus baudinii</i>	Vulnerable	Schedule 1	Species <i>may</i> utilise the area for feeding purposes but is <i>unlikely</i> to utilise the area for breeding
Forest Red-tailed Black Cockatoo <i>Calyptrorhynchus banksii naso</i>		Schedule 1	Species <i>may</i> utilise the area for feeding purposes but is <i>unlikely</i> to utilise the area for breeding
Peregrine Falcon <i>Falco peregrinus</i>		Schedule 4	Species <i>occurs</i> within the region but is <i>unlikely</i> to rely on the site
Carpet Python <i>Morelia spilota imbricata</i>		Schedule 4	Species or species habitat <i>unlikely</i> to occur within the area
Barking Owl <i>Ninox connivens connivens</i>		Priority 2	Species or species habitat <i>may</i> occur within the project area
Masked Owl <i>Tyto novaehollandiae novaehollandiae</i>		Priority 3	Species or species habitat <i>may</i> occur within the project area
Southern Brush-tailed Phascogale <i>Phascogale tapaotafa tapaotafa</i>		Priority 3	Species or species habitat <i>unlikely</i> to occur within the area

Species	Status under Commonwealth Environment Protection and Biodiversity Act	Status under Wildlife Conservation Act Schedule (S) / Priority (P)	Comment
Western Brush Wallaby <i>Macropus irma</i>		Priority 4	Species or species habitat <i>unlikely</i> to occur within the area
Water Rat; Rakali <i>Hydromys chrysogaster</i>		Priority 4	Species or species habitat <i>may</i> occur within the area
Quenda, Southern Brown Bandicoot <i>Isodon obesulus fusciventer</i>		Priority 5	Species or species habitat <i>unlikely</i> to occur within the area
Cattle Egret <i>Ardea ibis</i>	Migratory		Species <i>occurs</i> within the region but is <i>unlikely</i> to rely on the site
Great Egret <i>Ardea alba</i>	Migratory		Species <i>occurs</i> within the region but is <i>unlikely</i> to rely on the site
Rainbow Bee-eater <i>Merops ornatus</i>	Migratory		Species <i>occurs</i> within the region but is <i>unlikely</i> to rely on the site
Fork-tailed Swift <i>Apus pacificus</i>	Migratory		Species <i>occurs</i> within the region but is <i>unlikely</i> to rely on the site

2.2 Vertebrate Species Potentially Occurring within the Amendment Area Identified as Being of National Environmental Significance Under the EPBC Act 1999

Three threatened species of fauna and four Migratory species that have national environmental significance under the *Environment Protection and Biodiversity Conservation Act* (EPBC) 1999 were identified in the searches. Carnaby's Black-Cockatoo, *Calyptorhynchus latirostris* is listed as 'Endangered' and the Chuditch, *Dasyurus geoffroii* and Baudin's Black-Cockatoo, *Calyptorhynchus baudinii* are listed as 'Vulnerable' under the *EPBC Act*.

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) - This species inhabits the south-west of WA. Its preferred habitat is the woodland where it preferentially feeds on plants of the Proteaceae family. Preferred nesting trees include, the smooth-barked salmon gum (*Eucalyptus salmonophloia*), which contain deep hollows (Johnstone and Storr, 1998). Nesting also occurs in Marri (*Corymbia calophylla*) and Tuart (*Eucalyptus gomphocephala*).

This species may visit the project area to feed on the *Eucalyptus* species. No trees suitable for breeding Black-Cockatoos were recorded within the project area and this species is therefore unlikely to utilise the area for breeding purposes.

Chuditch or Western Quoll (*Dasyurus geoffroii*) - Formally known from over 70% of Australia, the Chuditch now has a patchy distribution throughout the Jarrah

forest and mixed Karri/Marri/Jarrah forest of south-west WA, but they have been found in dry sclerophyll forests, riparian vegetation, beaches and deserts.

Although highly mobile and able to utilize habitat remnants and corridors, it is unlikely that Chuditch would occupy the study site given its smaller size, lack of connectivity with nearby habitat patches, lack of understorey vegetation and close proximity to industrial activity.

Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*) - This species is most common in the far south-west of WA where it breeds. It is known to breed from the southern forests north to Collie and east to near Kojonup. Baudin's Cockatoo is typically found in vagrant flocks and utilises the taller, more open Jarrah and Marri woodlands, where it feeds mainly on Marri seeds and various Proteaceous species. When seasonally present on the coastal plain, Baudin's Black-Cockatoo are more likely to occur in the vicinity of eastern areas of the coastal plain.

This species may be a seasonal visitor to the project area and may utilise the area for feeding. No trees suitable for breeding Black-Cockatoos were recorded within the project area and this species is therefore unlikely to utilise the area for breeding purposes.

Cattle Egret (*Ardea alba*) - This species is often seen in flocks with livestock. The Cattle Egret's close association with livestock and habitat adaptability has helped this species spread. It is usually associated with moist pastures with tall grass, shallow open wetlands and margins and mudflats.

The Cattle Egret may be a visitor to the area but is unlikely to rely on the project area.

Great Egret (*Ardea ibis*) - This migratory species is common and very widespread in any suitable permanent or temporary habitat, including wetlands, flooded pastures, dams, estuarine mudflats, mangroves and reefs.

This species may be a visitor to the area but is unlikely to rely on the project area for its survival.

Fork-tailed Swift (*Apus pacificus pacificus*) - This species breeds in the north-east and mid-east Asia and winters in Australia and southern New Guinea. It is a visitor to most parts of Western Australia, beginning to arrive in the Kimberley in late September, in the Pilbara and Eucla in November and in the south-west land division in mid-December, and leaving by late April. It is common in the Kimberley, uncommon to moderately common near north-west, west and south-east coasts and rare to scarce elsewhere.

It may occur within the project area but is unlikely to rely on the area for its survival.

Rainbow Bee-eater (*Merops ornatus*) - This species is found across the better-watered parts of Western Australia including islands. It prefers lightly wooded, preferably sandy, country near water. It is a resident, breeding visitor,

postnuptial nomad, passage migrant and winter visitor, wintering from the Gascoyne north to Indonesia. It moves south mainly in late September and early October and north from February to April.

It is scarce to very common across its range and may be found within the vicinity of the area but is unlikely to rely on the site.

2.3 Threatened or Priority Vertebrate Species Under WA Wildlife Conservation Act 1950-1979 That Were Listed as Being Potentially Occurring Within the Proposed Amendment Area

Six Scheduled and six Priority species listed under the *WA Wildlife Conservation Act 1950* may potentially occur within the proposed amendment area, five of which were recorded in the CALM Threatened Fauna search.

Schedule 1 – Fauna that are Rare or Likely to Become Extinct

Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) - *Calyptorhynchus banksii naso* occurs in the Jarrah, Marri and Karri forests of the south-west corner, in the area receiving more than 600mm of annual average rainfall. It feeds on Eucalypt seeds with Marri being an important source of food (Saunders *et al.*, 1985). The Forest Red-tailed Black-Cockatoo prefers to nest in hollows of Marri, Jarrah and Karri and is dependent on Jarrah-Marri forest.

This species may visit the project area to feed on the *Eucalyptus* species. No trees suitable for breeding Black-Cockatoos were recorded within the project area and this species is therefore unlikely to utilise the area for breeding purposes.

Schedule 4 - Fauna that are in Need of Special Protection

Peregrine Falcon (*Falco peregrinus*) - This species is uncommon, although widespread throughout much of Australia, excluding the extremely dry areas and has a wide and patchy distribution. It shows habitat preference for areas near cliffs along coastlines, rivers and ranges and within woodlands along watercourses and around lakes.

It has been recorded in surrounding areas but is unlikely to rely on the project area for survival.

Carpet Python (*Morelia spilota imbricata*) - The Carpet Python is a large snake found across the south-west of Western Australia, from Northampton, south to Albany and eastwards to Kalgoorlie including undisturbed remnant bushland near Perth and the Darling Ranges. This subspecies has been recorded from semi-arid coastal and inland habitats, *Banksia* woodland, eucalypt woodlands and grasslands.

Carpet Pythons have not been recorded within the vicinity of the project area and is unlikely to be present due to the highly disturbed nature of the project area.

Priority 2 – Taxa with Few, Poorly Known Populations on Conservation Lands

Barking Owl (*Ninox connivens connivens*) – This subspecies is sparsely distributed along the coastal and sub-coastal regions of Western Australia, from Esperance to Greenough River. The southern subspecies occurs primarily in dry sclerophyll woodland, particularly associated with riparian vegetation in the south-west and on forest edges in the south-east. They nest in large hollow in live Eucalypts, often near open country. The Barking Owl primarily feeds on insects in the non-breeding season and birds and mammals during the breeding season.

The Barking Owl may be present within the project area due to potentially suitable habitat within the area.

Priority 3 - Taxa with Several, Poorly Known Populations, Some on Conservation Lands

Masked Owl (*Tyto novaehollandiae novaehollandiae*) – Little information is available on the Masked Owl. It is distributed from Yanchep east to Yealering, south to Gnowangerup and Albany and occasionally seen north to Geraldton. This species inhabits forests and woodlands and nests in tree hollows. It is locally common around Karridale and Manjimup, but is generally uncommon elsewhere.

The Masked Owl may occur within the project area, given that little is known about its habitat preferences.

Southern Brush-tailed Phascogale (*Phascogale tapoatafa tapoatafa*) - The present range of this species is believed to have been reduced to 50% of its former range. It is now known from Perth and south to Albany, west of Albany Highway. This arboreal marsupial occurs in forest and woodland where suitable tree hollows are available.

This species has not been recorded within the area and is unlikely to occur due to the degraded condition of the site and the likely presence of feral predators, such as cats and foxes.

Priority 4 - Taxa in Need of Monitoring

Western Brush Wallaby (*Macropus irma*) - This species was very common in the early days of settlement, however, its range has been seriously reduced and fragmented and there is a significant decline in abundance within most remaining habitat. It is now distributed across the south-west of WA from north of Kalbarri to Cape Arid. The optimum habitat is open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets.

The Western Brush Wallaby is unlikely to occur within the area due to the lack of suitable habitat and degraded condition of the project area.

Water Rat or Rakali (*Hydromys chrysogaster*) – The Water Rat is widely distributed around Australia and occurs in fresh brackish waters in the south-west of Western Australia that contain its main prey items including molluscs and crustaceans. In winter months, they spend less time in the water and tend to feed on larger vertebrate prey. Nests are constructed in logs or tunnels dug into banks.

The Water Rat or Rakali may be present along the river bank, although this area is severely degraded.

Priority 5 - Taxa in Need of Monitoring

Quenda or Southern Brown Bandicoot (*Isodon obesulus fusciventer*) - Quenda prefer dense scrub (up to one metre high), with swampy vegetation that provides ample protection from predators. They will often feed in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover. There are numerous records of Quenda sightings within the vicinity of the project area, including Helena Valley, Caversham, Glen Forrest, Kalamunda and High Wycombe.

However, the Quenda is unlikely to be present within the project area due to the lack of dense understorey vegetation. No diggings or scratchings were observed during the site assessment

2.4 Conclusions and Recommendations

Eleven species of conservation significant fauna are possibly found within the vicinity of the Midland site including the following:

- Peregrine Falcon
- Carnaby's Black-Cockatoo
- Baudin's Black-Cockatoo
- Forest Red-tailed Black-Cockatoo
- Cattle Egret
- Great Egret
- Rainbow Bee-eater
- Fork-tailed Swift
- Water Rat
- Masked Owl
- Barking Owl

However, none of these species are likely to rely on the project area for survival and therefore, the proposal is unlikely to have any significant impact on these species of conservation significance.

The vegetation of the area, including the riparian vegetation, is highly degraded and disturbed with little understorey remaining. It is therefore considered to have very limited faunal conservation values, although it may provide habitat for some bird species. There is likely to be a paucity of native mammals present as has been the case for most isolated urban bushland remnants. The reptile assemblage is also likely to be poor due to the degraded condition of the vegetation and the high numbers of feral

mammals likely to be present. The conservation significant fauna species are more likely to utilise larger areas of better quality remnant bushland within the vicinity of the area.

Management measures to ensure faunal links are maintained should involve the following:

- Minimise vegetation clearance and avoid clearing old, large eucalypts that may contain nesting habitats and areas of continuous vegetation (i.e. along the Helena River) that may act as a corridor for fauna movement.

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ATTACHMENT A

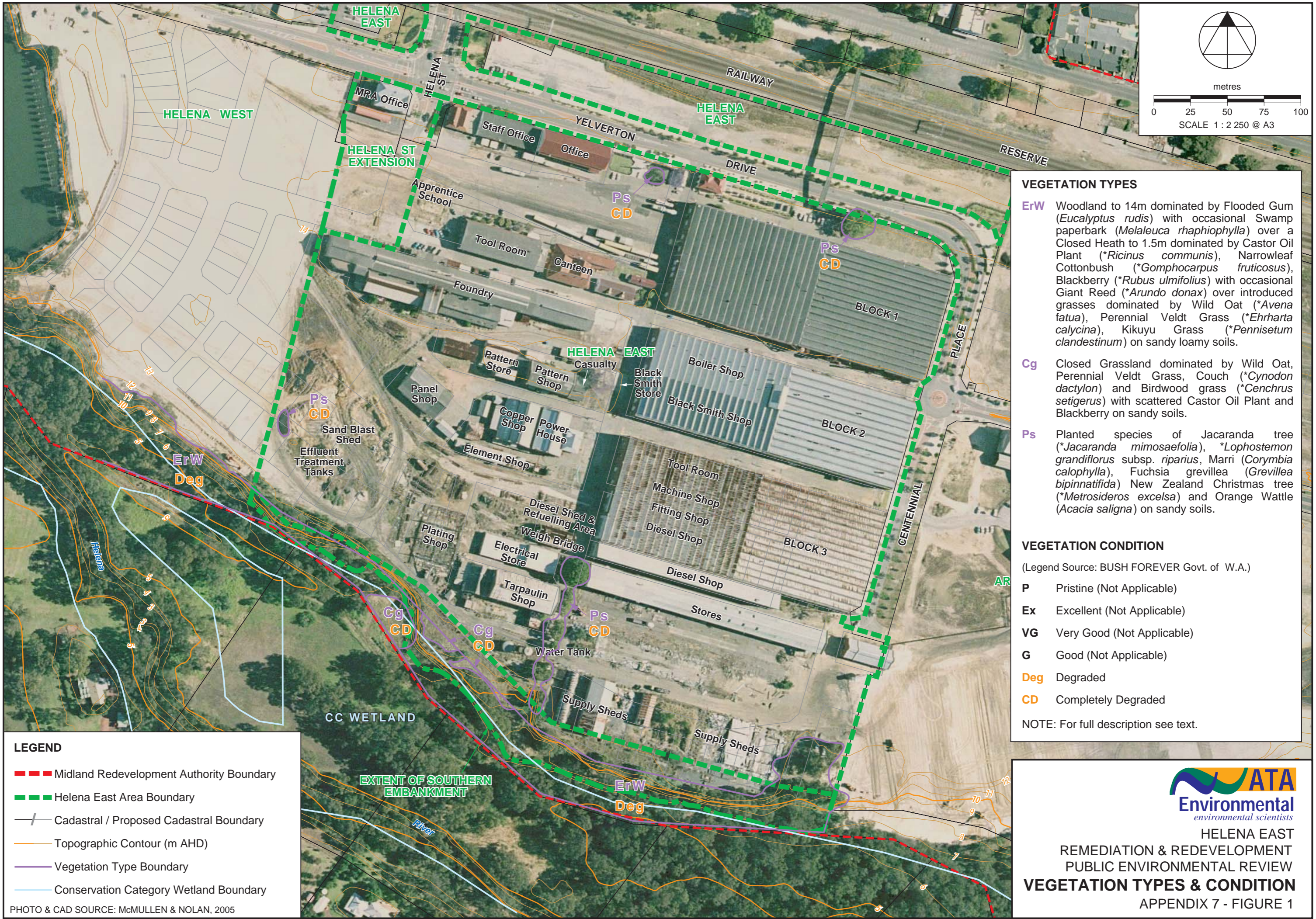
FLORA LIST

**ATTACHMENT A
FLORA LIST**

Family	Genus/Species
MONOCOTYLEDONS	
JUNCACEAE	<i>Juncus pauciflorus</i>
POACEAE	* <i>Arundo donax</i> * <i>Avena fatua</i> * <i>Briza maxima</i> * <i>Briza minor</i> * <i>Bromus diandrus</i> * <i>Cenchrus setigerus</i> * <i>Cortaderia selloana</i> * <i>Cynodon dactylon</i> * <i>Ehrharta calycina</i> * <i>Eragrostis curvula</i> * <i>Paspalum distichum</i> * <i>Pennisetum clandestinum</i>
TYPHACEAE	<i>Typha domingensis</i>
DICOTYLEDONS	
APIACEAE	* <i>Foeniculum vulgare</i>
ASCLEPIADACEAE	* <i>Gomphocarpus fruticosus</i>
ASTERACEAE	* <i>Conyza sumatrensis</i> * <i>Hypochaeris glabra</i> * <i>Sonchus oleraceus</i>
BIGNONIACEAE	* <i>Jacaranda mimosaeifolia</i>
BORAGINACEAE	* <i>Echium plantagineum</i>
EUPHORBIACEAE	* <i>Ricinus communis</i>
FUMARIACEAE	* <i>Fumaria capreolata</i>
MELIACEAE	* <i>Melia azedarach</i>
	Genus/Species

Family	Genus/Species
MIMOSACEAE	<i>Acacia saligna</i>
MYRTACEAE	<i>Corymbia calophylla</i> <i>Eucalyptus rudis</i> * <i>Lophostemon grandiflorus</i> subsp. <i>riparius</i> <i>Melaleuca raphiophylla</i> * <i>Metrosideros excelsa</i>
PAPILIONACEAE	* <i>Trifolium campestre</i>
POLYGONACEAE	* <i>Rumex crispus</i>
PROTEACEAE	<i>Grevillea bipinnatifida</i> subsp. <i>bipinnatifida</i>
ROSACEAE	* <i>Rubus ulmifolius</i>
SOLANACEAE	* <i>Solanum linnaeanum</i>

*Denotes introduced species (weed)



VEGETATION TYPES

- ErW** Woodland to 14m dominated by Flooded Gum (*Eucalyptus rudis*) with occasional Swamp paperbark (*Melaleuca raphiophylla*) over a Closed Heath to 1.5m dominated by Castor Oil Plant (**Ricinus communis*), Narrowleaf Cottonbush (**Gomphocarpus fruticosus*), Blackberry (**Rubus ulmifolius*) with occasional Giant Reed (**Arundo donax*) over introduced grasses dominated by Wild Oat (**Avena fatua*), Perennial Veldt Grass (**Ehrharta calycina*), Kikuyu Grass (**Pennisetum clandestinum*) on sandy loamy soils.
- Cg** Closed Grassland dominated by Wild Oat, Perennial Veldt Grass, Couch (**Cynodon dactylon*) and Birdwood grass (**Cenchrus setigerus*) with scattered Castor Oil Plant and Blackberry on sandy soils.
- Ps** Planted species of Jacaranda tree (**Jacaranda mimosaeifolia*), **Lophostemon grandiflorus* subsp. *riparius*, Marri (*Corymbia calophylla*), Fuchsia grevillea (*Grevillea bipinnatifida*) New Zealand Christmas tree (**Metrosideros excelsa*) and Orange Wattle (*Acacia saligna*) on sandy soils.

VEGETATION CONDITION

(Legend Source: BUSH FOREVER Govt. of W.A.)

- P** Pristine (Not Applicable)
- Ex** Excellent (Not Applicable)
- VG** Very Good (Not Applicable)
- G** Good (Not Applicable)
- Deg** Degraded
- CD** Completely Degraded

NOTE: For full description see text.

- LEGEND**
- - - Midland Redevelopment Authority Boundary
 - - - Helena East Area Boundary
 - Cadastral / Proposed Cadastral Boundary
 - Topographic Contour (m AHD)
 - Vegetation Type Boundary
 - Conservation Category Wetland Boundary

PHOTO & CAD SOURCE: McMULLEN & NOLAN, 2005



HELENA EAST
REMEDICATION & REDEVELOPMENT
PUBLIC ENVIRONMENTAL REVIEW
VEGETATION TYPES & CONDITION
 APPENDIX 7 - FIGURE 1