



**FLORA & FAUNA SURVEY,  
AND  
RIPARIAN ZONE ASSESSMENT  
FOR  
26 SHEPHERD STREET, LIVERPOOL**

**Prepared for:**

**CORONATION PROPERTY Pty Ltd  
9 – 25 Commonwealth Street  
Sydney NSW 2000**

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## **ABBREVIATIONS**

DECCW – State Department of Environment, Climate Change and Water

DoE – Commonwealth Department of Environment

EPA Act – Environment Protection Act

EPBC Act – Environment Protection and Biodiversity Conservation Act

FM Act – Fisheries Management Act

LLEP - Liverpool Local Environment Plan

NPWS – State National Parks and Wildlife Service

OEH – Office of the Environment and Heritage

RC - Riparian Corridor

SJB - SJB Architects

SMCMA – Sydney Metropolitan Catchment Management Authority

SREP - State Regional Environmental Plan

SREP No. 2 - Greater Metropolitan Region No. 2 - Georges River Catchment

TSC Act – Threatened Species Conservation Act

VRZ - Vegetated Riparian Zone

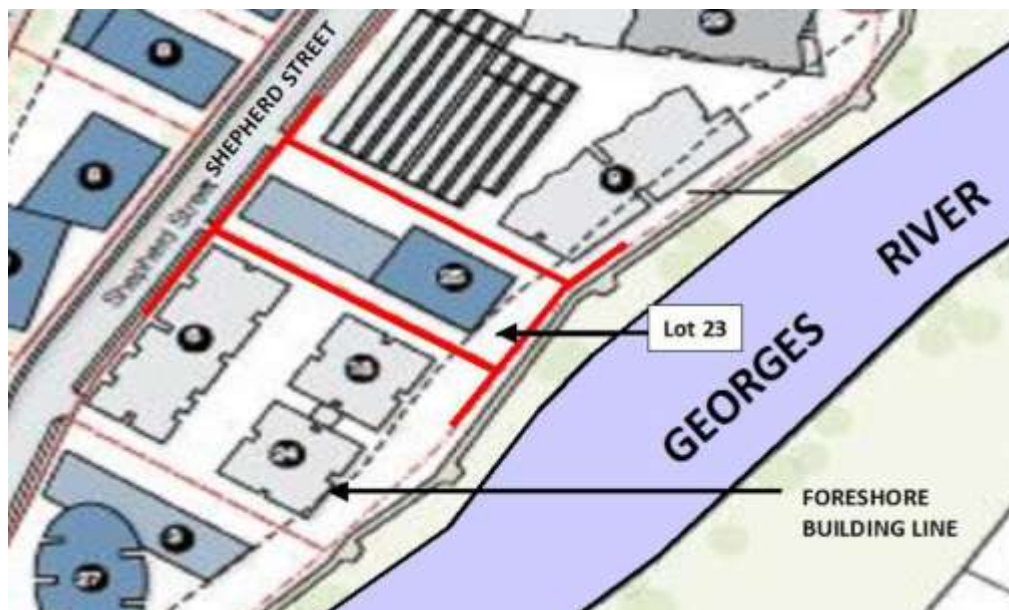
## PART A: FLORA AND FAUNA SURVEY & BIODIVERSITY ASSESSMENT AT 26 SHEPHERD STREET, LIVERPOOL

### 1. Introduction

ACS Environmental was commissioned by Coronation to undertake a flora and fauna survey and assessment at 26 Shepherd Street, Liverpool. The proposal is for the development of a multistorey residential tower block at the above address with a VPA offer of public domain upgrades to the Shepherd Street, Precinct (Figure 1).

Assessment of the riparian buffer zone in relation to the above property as shown in the SJB Precinct Plan were prepared, in accordance with the NSW Fisheries and NSW Office of Water Guidelines for riparian zones and permissible activities.

Finally, recommendations for suitable vegetative rehabilitation and landscape planting of River-flat Forest and Alluvial Woodland aligned assemblages in relation to proposed development at 26 Shepherd Street, Liverpool, were prepared.



**Figure 1** - 26 Shepherd Street. Liverpool outlined in red requiring both ecological and riparian studies (from SJB 2016).

## 2. Location and description of subject site at 26 Shepherd Street, Liverpool

### 2.1 General location and description

The site at 26 Shepherd Street, Liverpool is situated within the Western perimeter of the Georges River (Figure 2), and has been developed for industrial purposes since well before 1943 (Figure 3).



**Figure 2** - Location of 26 Shepherd Street occurring along a section of the Western embankment of the Georges River, Liverpool (SIX MAPS).



**Figure 3** - Prior to 1943 the site has developed for industrial uses. Only a narrow strip of land along its eastern boundary with the Georges River remained vegetated (SIX maps).



## 2.2. Description of vegetation occurring along the Georges River embankment

The current vegetated landscape that occurs along the western riverbank of the Georges River to the rear of the subject property consists of patches of tall scrub and occasional trees mostly comprising woody weeds such as Large-leaved Privet, Lantana, Camphor laurel, Jacaranda and Mulberry and smothered with invasive noxious weedy vines such as Balloon Vine and Morning Glory (Figure 4).

Small patches of Common Reed (*Phragmites australis*) occur along the edges of the river.

Appendix 1 lists the floristic species recorded within and at the rear of the properties at 26, Shepherd Street, Liverpool.



**Figure 4** - Exotic clumps of woody weeds and small trees at the rear of 26 Shepherd Street, Liverpool, including Green Cestrum, Lantana, Morning Glory and Balloon Vine.

## 3. Description of subject area at 26 Shepherd Street, Liverpool

The site at 26 Shepherd Street is currently being used as a storage yard for motor vehicles involved in accidents (Figure 5 and 6). The site has in the past been cleared of all vegetation and currently supports only sporadic incursions of opportunistic weed species. These include Red-flowered Mallow, Paddy's Lucerne, Pigweed, Jimson Weed, Black Nightshade, White

Clover and African Lovegrass. Some areas adjacent to Shepherd Street have recently been sprayed with herbicide as a control measure (Figure 7 and 8).



**Figure 5** - The site at 26 Shepherd Street is currently being used as a storage yard for motor vehicles involved in accidents.



**Figure 6** - Damaged motor vehicles in yard at 26 Shepherd Street.



**Figure 7** - Sporadic occurrence of weed species following herbicide spraying



**Figure 8** - Dead weedy ground cover adjacent to Shepherd Street following herbicide control.



A total of 11 exotic weed species were recorded across the subject sites at 26 Shepherd Street Liverpool. No indigenous species of flora were recorded.

**Table 1: Floristic species recorded at 26 Shepherd Street, Liverpool**

<b>KEY</b>
<b>Status</b>
* - Exotic species
*pl - planted exotic or ornamental
u rare to uncommon
o occasional
c common to very common

STATUS	SCIENTIFIC NAME	COMMON NAME	FREQUENCY
*	<i>Bidens pilosa</i>	Cobblers Pegs	o
*	<i>Conyza sumatrensis</i>	Tall Fleabane	o
*	<i>Medicago polymorpha</i>	Burr Medic	o
*	<i>Trifolium repens</i>	White Clover	o
*	<i>Malva parviflora</i>	Cheese Weed	o
*	<i>Modiola caroliniana</i>	Red-flowering Mallow	o
*	<i>Sida rhombifolia</i>	Paddys Lucerne	o
*	<i>Portulaca oleracea</i>	Pigweed	c
*	<i>Datura stamonium</i>	Jimson Weed	o
*	<i>Solanum nigrum</i>	Black Nightshade	o
*	<i>Eragrostis curvula</i>	African Lovegrass	o

#### 4. Fauna species

Bird species recorded either on site, on adjacent land, or over flying the area included the Noisy Miner (*Manorina melanocephala*), Australian Magpie (*Cracticus tibicen*), Australian Raven (*Corvus coronoides*) Laughing Kookaburra (*Dacelo novaeguineae*), Black-faced Cuckoo Shrike (*Coracina novaehollandiae*), Masked Lapwing (*Vanellus miles*) and Superb Fairy-wren (*Malurus cyaneus*). All of the above species are common to urban landscapes and none are listed as threatened. No mammalian species were recorded however species with some potential to occur would include the Common Ringtail Possum (*Pseudocheirus peregrinus*) as well as the introduced Black Rat (*Rattus rattus*) and House Mouse (*Mus musculus*).

## 6. Threatened flora species

A total of 7 threatened flora species have been recorded by the OEH Atlas of NSW Wildlife within a 5km radius of the subject site in the past 25 years (Table 2).

However, no threatened species have been recorded within 1 km of the site, the vegetation of the subject site being exotic herbaceous weeds.

Targeted searches for the mostly large-life form threatened species recorded within a 5km radius of the site did not locate any of these threatened species, or any other threatened flora species, and nor were any of these threatened species expected to occur at the subject site as current habitat is unsuitable for their occurrence, the subject site being greatly disturbed.

Family	Common name	Scientific name	NSW status	Comm. status	No. of records
Apocynaceae	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i>	E2		3
Ericaceae	Woronora Beard-heath	<i>Leucopogon exolasius</i>	V	V	1
Fabaceae (Faboideae)	Matted Bush-pea	<i>Pultenaea pedunculata</i>	E1		8
Fabaceae (Mimosoideae)	Downy Wattle	<i>Acacia pubescens</i>	V	V	85
Proteaceae	Small-flower Grevillea	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	V	V	2
	Nodding Geebung	<i>Persoonia nutans</i>	E1	E	3
Thymelaeaceae	Spiked Rice-flower	<i>Pimelea spicata</i>	E1	E	8

**Table 2** - Records for 7 threatened flora species recorded within the last 25 years within a 5km radius of the subject site.



Other threatened terrestrial fauna species listed by the Commonwealth DoE were reviewed in relation to the distribution, habitat and likelihood of occurrence. The current study concluded the site contained no nesting or foraging habitat for any of the species listed in Table 3 and as such development of the site would be unlikely to cause impact to any threatened species.

Family	Common name	Scientific name	NSW status	Comm. status	No. of records
Hylidae	Green and Golden Bell Frog	<i>Litoria aurea</i>	E1	V	1
	Little Eagle	<i>Hieraaetus morphnoides</i>	V		5
Falconidae	Black Falcon	<i>Falco subniger</i>	V		1
Cacatuidae	Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	V		2
Psittacidae	Little Lorikeet	<i>Glossopsitta pusilla</i>	V		10
	Swift Parrot	<i>Lathamus discolor</i>	E1	E	4
Strigidae	Powerful Owl	<i>Ninox strenua</i>	V		3
Meliphagidae	Regent Honeyeater	<i>Anthochaera phrygia</i>	E4A	E	1
	Black-chinned Honeyeater	<i>Melithreptus gularis gularis</i>	V		2
Neosittidae	Varied Sittella	<i>Daphoenositta chrysoptera</i>	V		9
Phascolarctidae	Koala	<i>Phascolarctos cinereus</i>	V	V	4
Petauridae	Squirrel Glider	<i>Petaurus norfolcensis</i>	V		1
Pteropodidae	Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	V	46
Molossidae	Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	V		10
Vespertilionidae	Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V		1
	Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	V		6
	Southern Myotis	<i>Myotis macropus</i>	V		4
	Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V		6
Camaenidae	Cumberland Plain Land Snail	<i>Meridolum corneovirens</i>	E1		81

V = Vulnerable; E = Endangered

**Table 3-** Records for 19 threatened fauna species recorded within the last 25 years within a 5km radius of the subject site.

## 9. Migratory fauna species subject to international agreements

The OEH Atlas of NSW Wildlife database 2015 listed seven (7) migratory species of avifauna covered by bi-lateral bird agreements, and recorded within a 5 km radius of the site (Table 4).

However none of the migratory species listed has potential to occur on the site and would not be impacted by the proposed development.

	Common name	Scientific name	<u>NSW</u> <u>status</u>	<u>Comm.</u> <u>status</u>	No. of records
Apodidae	White-throated Needletail	<i>Hirundapus caudacutus</i>	P	C,J,K	1
Ardeidae	Cattle Egret	<i>Ardea ibis</i>	P	C,J	5
Threskiornithidae	Glossy Ibis	<i>Plegadis falcinellus</i>	P	C	1
Accipitridae	White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	P	C	8
Scolopacidae	Common Greenshank	<i>Tringa nebularia</i>	P	C,J,K	1
Laridae	Caspian Tern	<i>Hydroprogne caspia</i>	P	C,J	1
Meropidae	Rainbow Bee-eater	<i>Merops ornatus</i>	P	J	1

P - Protected species in NSW.

J - Japan and Australia Migratory Bird Agreement, C - China and Australia Migratory Bird Agreement, K - Republic of Korea Migratory Bird Agreement.

**Table 4** - Records for 7 migratory fauna species recorded within the last 25 years within a 5km radius of the subject site.



## **PART B: RIPARIAN ISSUES, ASSESSMENT AND MANAGEMENT AT 26 SHEPHERD STREET, LIVERPOOL**

### **1. Location and description**

The site is located along a section of the western perimeter of the Georges River (Figures 1 & 2) and has been developed for industrial purposes since well before 1943 (Figure 3).

Currently, embankment riparian setbacks to the rear of the subject property is comprised of tall weed-infested scrub with emergent woody weed trees to 12m tall (Figure 4 and 5).

### **2. General riparian setbacks and management of riparian corridors according to NSW Office of Water Guidelines (2012)**

According to the NSW Office of Water (2012) the Riparian Zone or Corridor is defined as:

A transitional zone between the land, also known as the terrestrial environment, and the river or watercourse or aquatic environment. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary.

The riparian corridor consists of:

- the channel which comprises the bed and banks of the watercourse (to the highest bank), and
- the vegetated riparian zone (VRZ) adjoining the channel.

Riparian corridors may perform a range of important environmental functions such as:

- providing bed and bank stability and reducing bank and channel erosion
- protecting water quality by trapping sediment, nutrients and other contaminants
- providing diversity of habitat for terrestrial, riparian and aquatic plants (flora) and animals (fauna)
- providing connectivity between wildlife habitats
- conveying flood flows and controlling the direction of flood flows
- providing an interface or buffer between developments and waterways
- providing passive recreational uses.

Controlled activities carried out in, on or under waterfront land are regulated by the *Water Management Act 2000* (WM Act). The NSW Office of Water administers the WM Act and is

required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity.

As such, a controlled activity approval must be obtained from the NSW Office of Water before commencing the development activity.

### **Changes to Controlled Activities within Riparian Corridors**

On 1 July 2012 new rules commenced regarding controlled activities within riparian corridors. The new rules amend the riparian corridor widths that apply to watercourses, providing more flexibility in how riparian corridors can be used and making it easier for applicants to determine the Office of Water controlled activity approval requirements. Key aspects of the changes include:

- Provision of greater flexibility in the allowable uses and works permitted within riparian corridors.
- The core riparian zone and vegetated buffer have been combined into a single vegetated riparian zone (VRZ).
- The width of the VRZ within the riparian corridor has been pre-determined and standardised for first, second, third and fourth order and greater watercourses.
- Where suitable, applicants may undertake non-riparian corridor works or development within the outer 50 per cent of a VRZ, as long as they offset this activity by connecting an equivalent area to the RC within the development site.
- A new 'riparian corridors matrix' enables applicants to determine what activities can be considered in riparian corridors.

These changes will simplify the controlled activities application and assessment process, provide greater flexibility, help make more land available for housing, support floodplain, stormwater and bush fire management, and allow riparian corridors to be used for public amenity whilst continuing to deliver environmental outcomes required under the WM Act (NSW Office of Water 2012).

### **Objectives for Riparian Corridor Management**

The overarching objective of the controlled activities provisions of the WM Act is to establish and preserve the integrity of riparian corridors.

Ideally the environmental functions of riparian corridors should be maintained or rehabilitated by applying the following principles:

- If a watercourse is present, define the RC/VRZ on a map.
- Seek to maintain or rehabilitate a RC/VRZ with fully structured native vegetation.

- Seek to minimise disturbance and harm to the recommended RC/VRZ.
- Minimise the number of creek crossings and provide perimeter road separating development from the RC/VRZ.
- Locate services and infrastructure outside of the RC/VRZ. Within the RC/VRZ provide multiple service easements and/or utilise road crossings where possible.
- Treat stormwater run-off before discharging into the RC/VRZ.

The Office of Water however, does allow for a range of works and activities on waterfront land and in riparian corridors to better meet the needs of the community, so long as they cause minimal harm.

The section of the Georges River that forms the eastern boundary of the Shepherd Street Precinct, is a 4th Order watercourse as defined by the Strahler system for classifying the various watercourse systems (NSW Office of Water 2012).

As such a riparian setback of 40m from the riverbank is taken as a guideline to the distance incorporating a vegetated buffer zone or Vegetated Riparian Zone (VRZ) to development (NSW Office of Water 2012).

### **3. Environmentally Significant Land (from Liverpool LEP 2008)**

Figure 10 indicates the riparian environmentally significant land setback along the Georges River, parallel to Shepherd Street, Liverpool (Environmentally Significant Land Map (LLEP 2008, Sheet ESL-012). The objective of this setback is to ensure that development in the foreshore area will not impact on natural foreshore processes or affect the significance and amenity of the area (LLEP 2008, Part 7, Division 2, Clause 7.9 (1)).

The 40m riparian setback recommended by the guidelines issued by the NSW Office of Water (2012) for the section of the Georges River at Shepherd Street, Liverpool, is significantly wider than that indicated by the mapping of Environmentally Significant Land in Figure 10 (see also Figure 12).



**Figure 10** - Environmentally Significant Land (shown in Sheet ESL-012 of the Liverpool LEP 2008) indicated by the olive green shading

#### 4. Proposed development

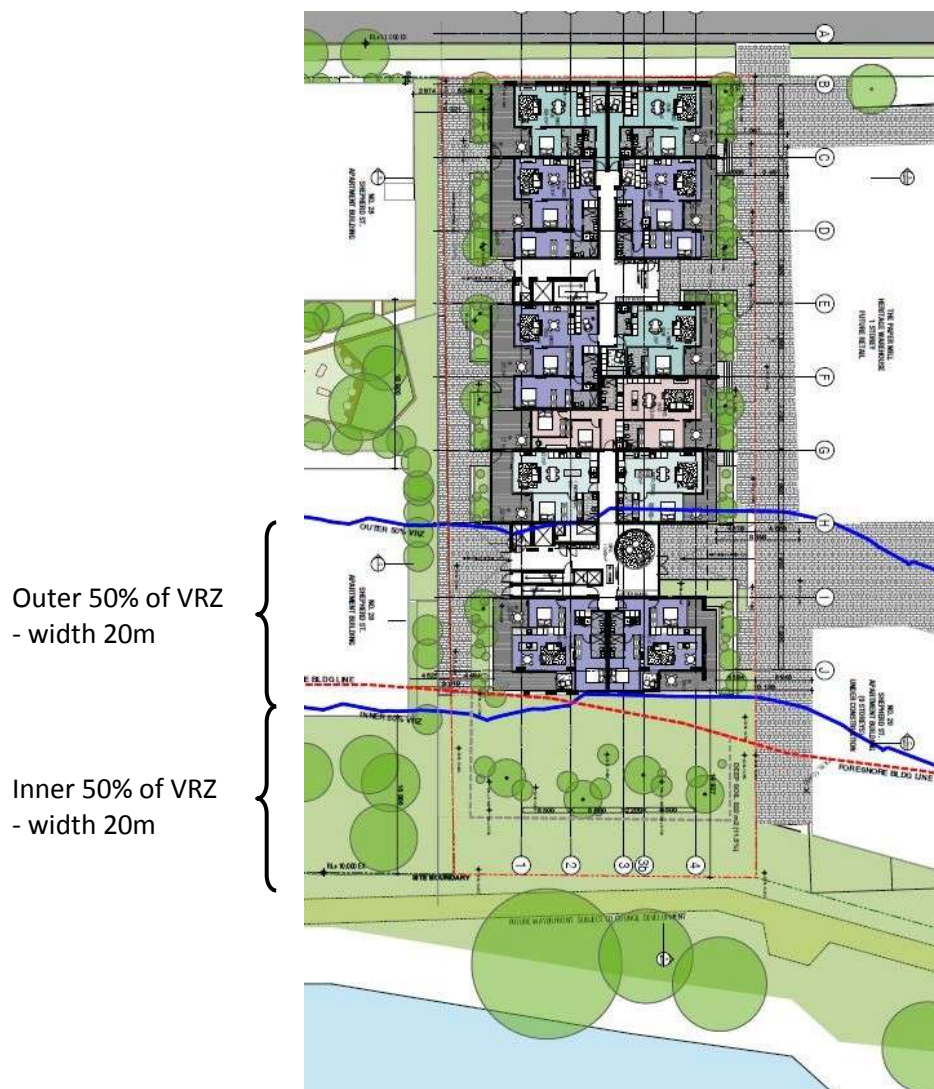
Side elevation of the proposed development for the subject site (from Woods Bagot 2016) is shown in Figure 11 below.



**Figure 11** - Side elevation for proposed development at 26 Shepherd Street, Liverpool .

## 5. Proposed development - Riparian zones at subject development site - 26 Shepherd Street, Liverpool

The proposed site plan for 26 Shepherd Street, Liverpool (from Woods Bagot 2016) is shown in Figure 12.



**Figure 12** - Site plan for 26 Shepherd Street, Liverpool (from Woods Bagot 2016) showing inner and outer Vegetated Riparian Zones. Note that the proposed building construction does not encroach into the Inner VRZ and is also behind the Council building line (red font).

## 6. Permissible activities within the riparian zone (VRZ)

According to the guidelines given by the NSW Office of Water, certain controlled activities are allowable within particularly the outer 50% of the VRZ (from 20 - 40m from the edge of

the river embankment), with consideration given to offsetting an equal area of land within the development that has been given to a prescribed use within the riparian zone (NSW Office of Water 2012).

According to the guidelines given by the NSW Office of Water, allowable development within, particularly the outer 50% of the VRZ, may include the following:

- **Cycleways and paths:** Cycleways or paths no wider than four metres total disturbance footprint can be built in the outer 50 per cent of the VRZ;
- **Detention basins:** Detention basins can be built in the outer 50 per cent of the VRZ. Refer to the Office of Water's *Controlled activities. Guidelines for outlet structures* and *Controlled activities. Guidelines for in-stream works*.
- **Stormwater outlet structures and essential services:** Stormwater outlets or essential services are allowed in the RC. Works for essential services on a fourth order or greater stream are to be undertaken by directional drilling or tied to existing crossings. Refer to the Office of Water's *Controlled activities. Guidelines for laying pipes and cables in watercourses* and *Controlled activities. Guidelines for outlet structures*.
- **Road crossings:** Indicates permitted road crossing methods. Refer to the Office of Water's *Controlled activities. Guidelines for watercourse crossings*.

However, as the section of the river associated with the subject sites is heavily weed-infested and requires extensive rehabilitation, a merit-based development may be proposed in negotiation with the NSW Office of Water.

The area encroached within the outer 50% of the VRZ may be required to be offset elsewhere within the developmental land area (NSW Office of Water 2012).

The characteristics and merits of maintaining, with modifications to the VRZ, are as follows:

- In a study of disturbance patterns in vegetation associated with the Georges River estuarine processes, Kirchner (in SMEC 2010) mapped similarly weed-infested riparian vegetation occurring along the river banks downstream of the subject sites as 'Very High Intensity Disturbance Pattern - generally >70% affected'.
- DEC (2002) has not mapped the Conservation Significance Assessment of the current weed-infested riparian vegetation along the edges of the Georges River at Shepherd Street, Liverpool, as containing any significant vegetation indicating its extensive disturbance history and current lack of integrity as a naturally sustainable ecological community.
- The currently weed-infested VRZ vegetated sections of the river bank land at Shepherd Street, Liverpool, should be rehabilitated by best-practice bush regeneration to a weed-free vegetated River-flat Forest 'alluvial woodland' zone to provide an effective

integrated and floristically and structurally restored vegetation community in the locality.

- The extent of areas encroached by building and other structures into the outer 20m width of the nominal 40m wide VRZ should be amply offset elsewhere within the development.

Applications for controlled activities approvals should be informed by the riparian corridor matrix shown in Table 2 of the Guidelines (Office of Water 2012) and prepared using the *Application for a Controlled Activity Approval for works on waterfront land* form and the *Guideline for completing an application for a Controlled Activity Approval*.

Other controlled activity guidelines are available on the Office of Water website and outline relevant considerations for applicants when proposing activities and works on waterfront lands.

The current vegetation of the riparian component of the river bank is heavily weed-infested, and it is recommended that this vegetation undergo best-practice bush regeneration and rehabilitation for the health of the ecosystem and surrounding vegetated areas. It is recommended that for any development this zone is reconstructed to remove all weeds and that the vegetation within the VRZ be reconstructed with species comprising riparian forest or alluvial woodland assemblages.

## **7. Riparian width and justification of encroachment into outer riparian area**

The NSW DPI Water have classified the Georges River on the basis of the Strahler system as a Stream Order 4+ requiring a 40 metre average riparian setback (DPI Water 2012).

Notwithstanding the importance of maintaining riparian areas for the biological and physical health of waterways, the application of a 40 metre wide riparian can be difficult to apply in some cases. Such is the case at the Shepherd Street Precinct, Liverpool, where urbanisation has resulted in lot sizes too narrow to accommodate viable new development together with a wide riparian setback.

The proposed buildings at 26 & 28 Shepherd Street will be set back behind the Inner 50% VRZ at ground level and beyond the Liverpool Council delineated 'foreshore building line' which demarcates the foreshore area as outlined in section B3 on page 21 of this report. The objectives of Council's foreshore building line and DPI's vegetated riparian zone are similar however in that their intent is to ensure that development in the foreshore area will not impact on natural foreshore processes or affect the significance and amenity of the area (LLEP 2008, Part 7, Division 2, Clause 7.9 (1)).

This will allow for the creation of a fully protected and structured riparian zone with endemic native vegetation to be established up to the easternmost extent of the building



footprint. For the proposed development all basement structures will be located outside the council defined foreshore area, allowing for deep plantings as part of riparian rehabilitation.

In an assessment of the broader Shepherd Street Precinct an offsetting strategy has been developed to over compensate for incursions into the outer 50% VRZ at 26 and 28 Shepherd Street. In addition Coronation Property will provide further revegetation and improvement in an area to the north of Shepherd Street precinct (Northrop 2016).

The strategy proposed for the precinct demonstrates that sufficient offsets are available within the precinct itself following the carrying out of improvement works in relation to removal of existing structure within the inner and outer VRZs, then rehabilitation and revegetation work undertaken as part of the redevelopment of the site. Outcomes have been identified to ensure that the work is delivered satisfactorily and in line with the objectives of DPI Water (Northrop 2016).

## **8. Proposed strategy to rehabilitate riparian areas within western section of Georges River at Liverpool**

Vegetation Management Plans will provide for the provision and reconstruction of a riparian zone commensurate with vegetation that would have occurred along this section of the river-edge before degradation. The objectives of such plans will be related to ensuring that biodiversity values on the site are improved and ensuring that the development enhances the character of the riparian vegetation at this location.

Objectives will include the following:

- To undertake rehabilitation works in degraded areas of native vegetation including sequential removal of smothering noxious and environmental woody weeds and climbers whilst maintaining the current environmental status and condition of the Georges River waterway;
- To reconstruct and restore native vegetation along the riparian corridor, including areas currently encumbered with noxious woody weeds and exotic environmental weed climbers, as well as sections of land occurring beneath a concreted slab of a former industrial development to a level that reflects the cover, diversity and density of former assemblages of indigenous vegetation; and
- To provide educational material to promote responsible management of reconstructed native vegetation in riparian setback areas.

Species suitable in a reconstructed, landscaped VRZ setting for 26 Shepherd Street, Liverpool and surrounds, could include the following (taken from compositions indicative of River-flat Paperbark Swamp Forest and Cumberland River-flat Forest assemblages known to occur along stretches of the embankments of the Georges River (OEH 2013).



Trees	Small trees	Shrubs	Ground cover plants
Rough-barked Apple ( <i>Angophora floribunda</i> )	<i>Acacia decurrens</i>	<i>Ozothamnus diosmifolius</i>	<i>Dianella longifolia</i>
Broad-leaved Apple ( <i>Angophora subvelutina</i> )	<i>Acacia parramattensis</i>	<i>Hibbertia diffusa</i>	<i>Brunoniella australis</i>
Cabbage Gum ( <i>Eucalyptus amplifolia</i> )	<i>Exocarpus cupressiformis</i>	<i>Acacia longifolia</i>	<i>Pratia purpurascens</i>
Blue Box ( <i>Eucalyptus baueriana</i> )	<i>Melaleuca decora</i>	<i>Callistemon citrinus</i>	<i>Microlaena stipoides</i>
Forest Red Gum ( <i>Eucalyptus tereticornis</i> )	<i>Melaleuca styphelioides</i>	<i>Kunzea ambigua</i>	<i>Dichondra repens</i>
Blue Gum ( <i>Eucalyptus saligna</i> )	<i>Melaleuca linariifolia</i>	<i>Bursaria spinosa</i>	<i>Oplismenus aemulus</i>
Swamp Mahogany ( <i>Eucalyptus robusta</i> )			<i>Pteridium esculentum</i>
Grey Box ( <i>Eucalyptus moluccana</i> )			<i>Viola hederacea</i>
			<i>Einadia hastata</i>
			<i>Cheilanthes sieberi</i>
			<i>Clematis glycinoides</i>

**Table 5** - Species suitable for planting in a reconstructed riparian forest/woodland landscaped VRZ setting for 26 Shepherd Street, Liverpool and surrounds.

## 9. Compliance with Greater Metropolitan Regional Environmental Plan No. 2 - Georges River Catchment (2008)

This SREP must be addressed and complied with whenever a consent authority determines a development application, or a public authority or another person proposes to carry out development or an activity which does not require development consent but which has the potential to adversely affect the water quality, river flows, flood regime or ecosystems within the Georges River Catchment.

As such, the cumulative impact of the proposed development or activity on the Georges River or its tributaries must be considered and mitigated in such a way that there will be no overall detrimental impact of wastewater or stormwater entering the river at Shepherd Street, Liverpool.

The development should effectively utilise any relevant plans of management including any River and Water Management Plans approved by the Minister for Environment and the

Minister for Land and Water Conservation and best practice guidelines approved by the Department of Urban Affairs and Planning (all of which are available from the respective offices of those Departments), the *Georges River Catchment Regional Planning Strategy* (prepared by, and available from the offices of, the Department of Urban Affairs and Planning), and all relevant State Government policies, manuals and guidelines of which the council, consent authority, public authority or person has notice (SREP No. 2 - 2008).

The following specific issues must be addressed and complied with in regard to SREP No. 2 (2008):

#### **Bank disturbance**

Specifically, the development requires that all stormwater and water flowing from hard surfaces be retained in appropriate on-site stormwater detention basins, excess flows regulated in such a way that disturbance of the bank or foreshore along the Georges River and its tributaries is to be avoided and those areas and any adjoining open space or vegetated buffer areas must be protected from degradation (SREP No. 2).

#### **Urban/stormwater runoff**

The impacts of stormwater runoff, including sewage contaminated runoff into or near streams within the Catchment, is to be minimised and mitigation measures that address urban stormwater runoff are to be implemented in accordance with local council requirements and the Managing Urban Stormwater series of documents. Development is also to be in accordance with the *NSW State Rivers and Estuaries Policy* available from offices of the Department of Urban Affairs and Planning. Stormwater management must be integrated so that quality, quantity and land use aspects are all encompassed.

#### **Urban development areas**

The environment within or in the vicinity of the Catchment is to be protected by ensuring that new or expanding urban development areas are developed in accordance with the Urban Development Program and the Metropolitan Strategy and that the requirements of the *NSW Floodplain Development Policy and Manual* (prepared by and available from the Department of Land and Water Conservation) are also satisfied. It is important to ensure that the level of nutrients entering the waterways and creeks is not increased by the development.

### **Vegetated buffer areas**

Appropriate vegetated buffer widths (as proposed and recommended in Sections 2, 3 & 5 of Part B of this report) must be retained as a means of improving surface runoff entering into the Georges River or its tributaries.

### **Land degradation**

Land degradation processes, such as:

- (a) erosion,
- (b) sedimentation,
- (c) deterioration of soil structure,
- (d) significant loss of native vegetation,
- (e) pollution of ground or surface water,
- (f) soil salinity and acidity, and
- (g) adverse effects on habitats and sensitive natural environments (aquatic and terrestrial), within the Catchment, must be avoided where possible, and minimised where avoidance is not possible (SREP No. 2)

### **Catchment water quality**

Water quality within the Catchment is to be maintained or improved through the implementation of environmental objectives for water quality agreed between the Minister for Environment and the Minister for Land and Water Conservation and by the application of consistent decisions affecting the use and management of land (SREP No. 2).

### **Specific matters for consideration for the section of the Georges River at Shepherd Street, Liverpool (SREP NO. 2)**

The following considerations must be taken into account and addressed by appropriate expert personnel in the case of the current development, at a suitable stage in the assessment process:

- The likely impact of the proposal on the water table.
- The likely impact of the proposal on natural flows in the Georges River and its tributaries.
- The likely impact of the proposal on other downstream water users in the Catchment.
- Whether the proposal will contribute to enhancing both the recreational and environmental amenity within the Catchment.
- If the proposal is part of rehabilitation works, whether the proposal is in keeping with an approved rehabilitation plan.
- Whether the proposal is likely to result in a propagation zone for noxious aquatic weeds.

- The likelihood of the development resulting in the formation of algal blooms and the documentation of measures proposed to control that.

## **10. Compliance with Fisheries Management Act 1994 (FM Act)**

Fisheries NSW is responsible for ensuring that fish stocks are conserved and that there is no net loss of key fish habitats upon which they depend. To achieve this, Fisheries NSW ensures that developments comply with the requirements of the Fisheries Management Act 1994 (FM Act) (namely the aquatic habitat protection and threatened species conservation provisions in Parts 7 and 7A of the Act, respectively), and the associated Policy and Guidelines for Fish Habitat Conservation and Management (2013). As such, the following conditions would be satisfied:

- It is considered that a average 40m riparian VRZ setback (Vegetated Riparian Zone) for the Shepherd Street precinct having a similar width to that indicated on the Environmentally Significant Land map as indicted in Liverpool LEP (2008) (Figure 16) would be commensurate with foreshore buffer guidelines as recommended by Fisheries NSW for a merit-based proposed development along this weed-infested bank of the Georges River that occurs above the tidal downstream weir.
- River bank regrading works are not proposed for the development and the river banks will be left intact (Northrop 2015, Woods Bagot 2015).
- The location of the proposed bioswales occur outside the riparian zone and all surface flows grade to this point for treatment prior to discharge to the Georges River. Roof water is directed to a vault containing Stormwater360 treatment cartridges prior to discharge into the Georges River (Northrop 2015).
- It is considered that the riparian buffer zones proposed provides generous provision of native vegetation and habitat on the Georges River. Provision for connectivity in both upstream and downstream directions is made. Deep rooted areas are provided for native tree species such as recommended for landscaping as indicated in Table 5.

## 11. References and literature reviewed

ACS Environmental P/L (2015) Riparian issues, assessment and management at No. 20 Shepherd Street, Liverpool, (prepared for Coronation Property P/L)

ACS Environmental P/L (2015) Flora and fauna survey and biodiversity assessment at No. 28 Shepherd Street, Liverpool, (prepared for Coronation Property P/L)

ACS Environmental P/L (2015) Riparian issues, assessment and management at No. 28 Shepherd Street, Liverpool, (prepared for Coronation Property P/L)

Aspect Studios (2015) Proposed Development Plan at Shepherd Street, Liverpool

Kirchner, E. (in SMEC) 2010 - Georges River Estuarine Process Study

Liverpool City Council DCP (2008)

Liverpool City Council LEP (2008)

Northrop (2016) Water and Consulting Engineers

NSW Office of Water (2012) Guidelines for Riparian Corridors on Waterfront Land

NSW Scientific Committee. Final Determinations (1996 – 2015) Determinations relating to listings of threatened species, populations, ecological communities and key threatening processes in the Schedules of the *Threatened Species Conservation Act 1995*.

OEH Atlas of NSW Wildlife (2016). NPWS Geographic Information Systems Division, Hurstville NSW, 2220

OEH (2013) 'The Native Vegetation of the Sydney Metropolitan Catchment Management Authority Area'.