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11th November 2016

Job Number: 150168-01

DPI Water
Level 10, Macquarie Tower
Locked Bag 5123
Parramatta NSW 2124

Attention: Frank Garofalow

Dear Mr Garofalow

RE: 28 Shepherd St, Liverpool (DA 612/2015) – Additional advice in relation to Riparian Zone issues

We are providing this advice for the proposed residential development at No.28 Shepherd Street. This is as a result of my client's proposal to obtain development approval and to subsequently develop the site for residential development.

In undertaking this assessment, we have relied on the following information:

- Results of a meeting between Coronation (proponent) and DPI Water staff held on 3rd November 2016
- A previous letter issued on this matter and authored by us, referenced as follows: *28 Shepherd St, Liverpool – Further advice in relation to Riparian Zone issues* dated 15 July 2016
- *Guideliners for riparian corridors on waterfront land* (DPI Water 2012)
- A report written by ACS Environmental titled *Riparian Issues Assessment & Management at No. 28 Shepherd Street Liverpool*

The purpose of our assessment is as follows:

- To adopt the highest bank at RL9.0m and to formalize a 40m wide Vegetated Riparian Zone pertaining to the Georges River.
- To calculate the balance of offset land based on incursions into the inner and outer 50% VRZ, and to do so in consideration of the broader Shepherd Street Precinct developments, i.e. 26-33 Shepherd Street, to provide a coordinated approach to the redevelopment of the precinct.
- To describe an out-of-precinct offsetting strategy
- To outline commitments to be carried out by the proponent in relation to improvement weeding/rehabilitation works within the VRZ.

What we are proposing, and this letter explains, is a modified riparian zone from that previously submitted, with the following characteristics:

- Adoption of RL9.0m as the Highest Bank and to ensure all buildings are set behind that line at ground level
- Set Inner and Outer 50% VRZs from that RL 9.0m line line, and to project it throughout the precinct

- Determination of the area of land that requires offsetting, based on incursions into the Outer 50% VRZ, and balanced against the offsets being proposed within the Shepherd Street Precinct
- Propose a strategy to provide offsetting to waterfront land immediately to the north of the Shepherd Street Precinct.

The strategy proposed for the precinct above 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.

Determination of Vegetated Riparian Zone

Consistent with previous advice, we adopt RL 9.0m as the highest bank and we have measured a line 20m offset from that to define the Inner 50% VRZ. We also have measured a further 20m offset (40m in total from highest bank) which defines the Outer 50% VRZ. As a result, the proposed building at 28 Shepherd Street will be set back behind the Inner 50% VRZ at ground level. This will allow for a 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.

An indicative section is provided in Figure 1 to show how the development sits in relation to the riparian zone.

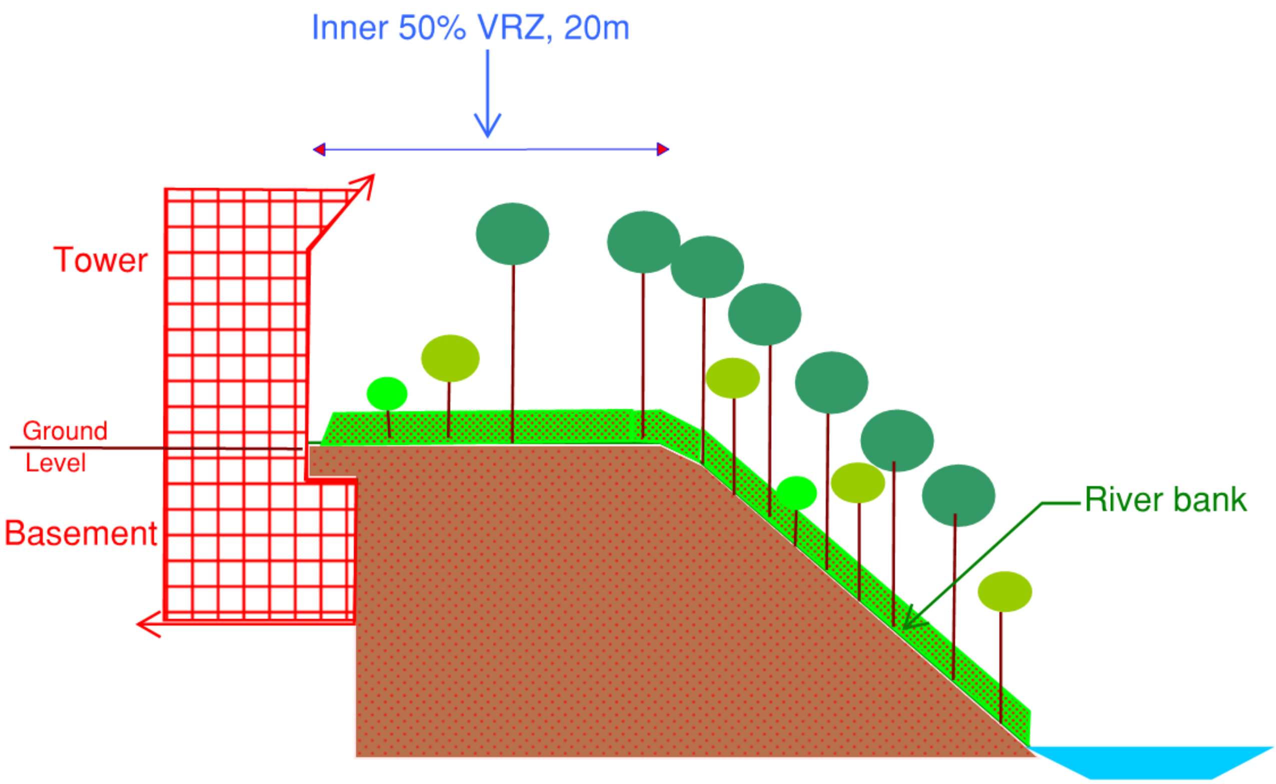

Figure 1: Indicative section of riparian zone after it has been rehabilitated and revegetated (NTS)

Council advise that the renewal of the precinct and the riverbank is in line with Council's strategy of becoming a river city and that they are working closely with Coronation to determine how to deliver a boardwalk and bank stabilisation works. Thus an integrated outcome will result where waterfront land provides significantly enhanced riparian zone functions, including:

- Stabilization of banks
- Habitat improvement and connectivity
- Provision of an interface/buffer between development and the waterway
- Passive recreation – shared path/boardwalk and river access

Averaging rule and offsetting

The 28 Shepherd Street development is but one of the developments proposed in the Shepherd Street precinct by Coronation Property. The northernmost development is No. 20 Shepherd Street and is already approved and under construction. Other developments will be proposed to complete the development of the precinct, up to and including 33 Shepherd Street. Therefore, we expand out the assessment of riparian zones so that a precinct-wide strategy can be devised, and used as the basis of ongoing assessment of developments proposed (Attachment 1).

Non-riparian corridor works and activities can be authorized within the Outer 50% VRZ. The proposed development would result in the construction of buildings and ancillary infrastructure in this outer zone. In creating a reclaimed riparian zone in the Inner 50% VRZ, lands that are currently built-upon with car parks, harstands and buildings will be fully revegetated Figure 2). This counts as offsetting against development incursions into the outer 50% VRZ. This was advised by you in our meeting on 3rd November 2016.

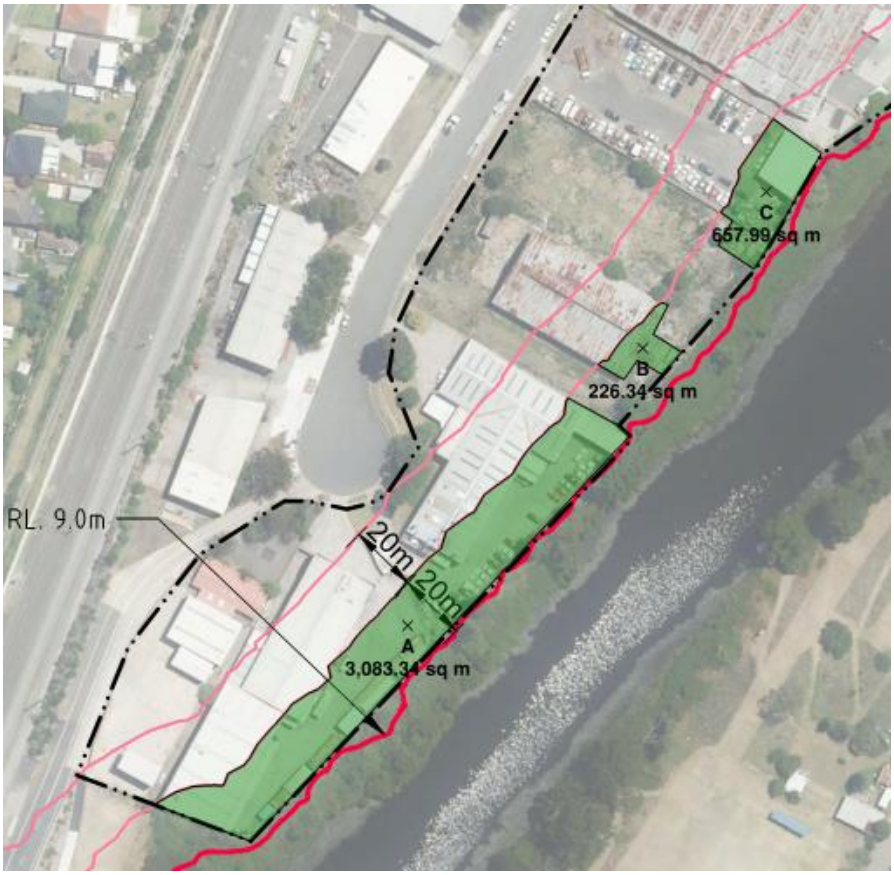

Figure 2: Currently built-upon lands that will be returned to riparian zones

We have conducted a comparative spatial assessment of offsets vs incursions across the Shepherd Street precinct, and this is shown in Attachment 1. In summary, the amount of land that counts as offset is greater than the land that requires offsetting. This results in a 901m^2 surplus of of land that will be offset. This demonstrates that no offsetting is required outside of the Shepherd Street Precinct.

Regardless, Coronation is prepared to act in good faith to provide further works that can be counted as offsetting as a commitment to the redevelopment of the precinct and delivery of a catalyst project consistent with Council's strategy of becoming a river city.

River Reach Context

The Shepherd Street precinct forms part of the reach of the Georges River bounded by the weir to the north, and the Casula Powerhouse to the south.

For the purposes of this assessment, we ignore the eastern bank of the river which will be the subject of future development proposals over much of its extent, and riparian matters will be dealt with separately by other development proponents.

The western bank is of more relevance to this assessment. To the immediate north of Shepherd Street is a spread-out development that was constructed in the 1980-90s comprising apartment blocks. This and the Shepherd Street precinct will be the only developments along the entire reach. The remainder of the land on the reach is dedicated open space land in Council ownership (Figure 4). Council has plans to upgrade all this riverfront open space into recreational and environmental land use for the people of Liverpool. Developer contributions will be used to fund much of this work to improve the environmental features of these lands.

Coronation will provide offsetting by improving the quality of the riparian zone to the immediate north of the Shepherd Street Precinct.

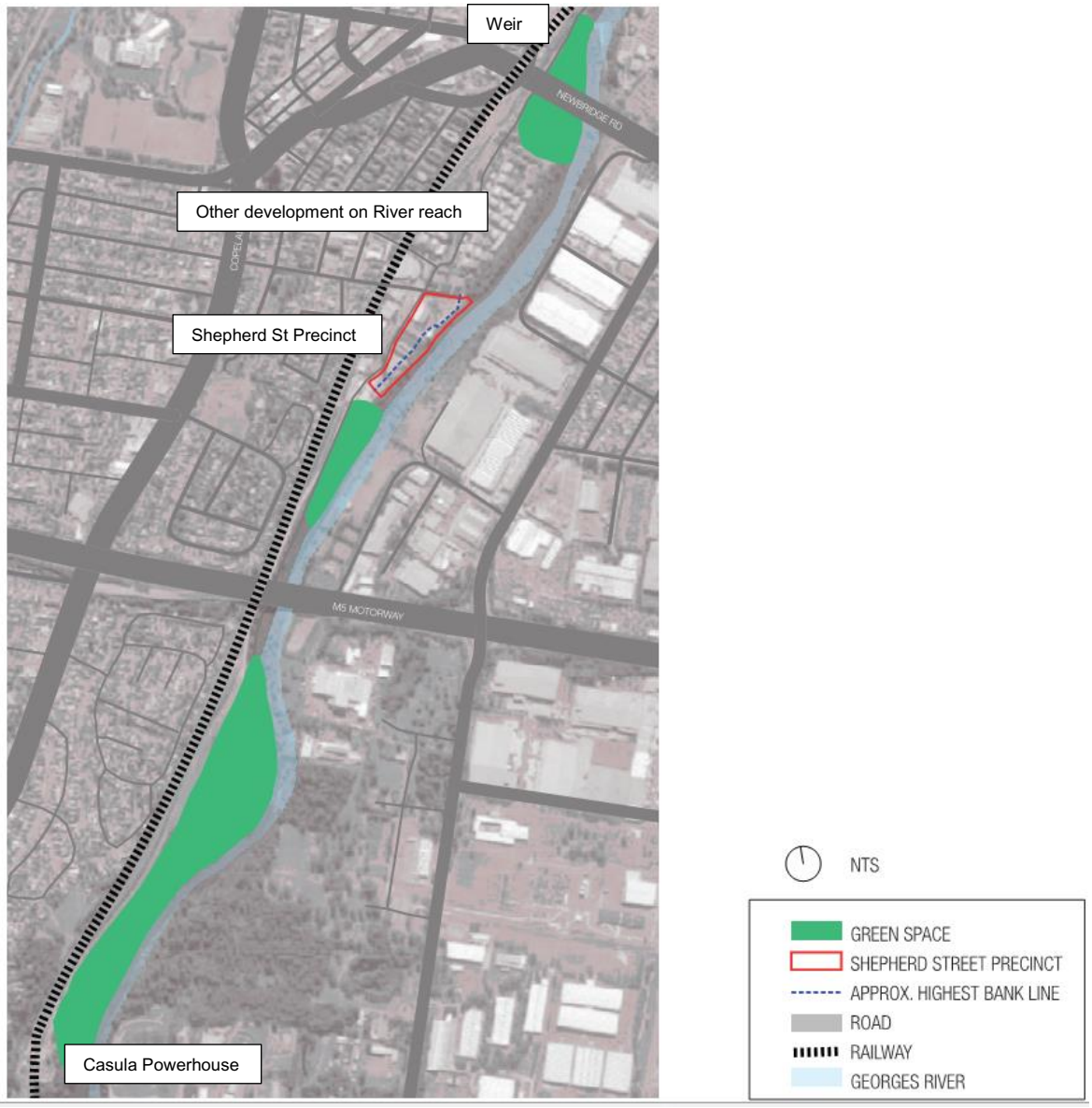

Figure 4: Georges River reach context for riparian offsetting

Requirements to inform future assessments

It is important to define the types of works that are required, the documentation of them, and the subsequent maintenance requirements to ensure the success of riparian stabilization and revegetation. At the meeting with DPI Water on 3 November, it was discussed that the offsetting/rehabilitation works could be defined by either a monetary amount or by an outcome. It is proposed to define these works by outcomes, which are detailed below. We envisage this would be managed through a Vegetation Management Plan, which can be required to be submitted as part of the Controlled Activity Approval (CAA) as a condition of approval in the General Terms of Approval (GTAs) issued by DPI Water for the current DA.

Once the built-upon lands in the Inner 50% VRZ are reclaimed, they will be stabilised and revegetated as follows:

- Bank stabilization structures – Coronation are currently undertaking a fluvial geomorphic assessment of the entire Georges River reach both upstream and downstream of the Shepherd Street precinct. The results of this assessment will be used to determine if any stabilization measures are required at the toe of banks, or in other situations. If so, they will be incorporated into a Rehabilitation Plan for the Precinct. The preference is to include hard measures such as revetment only where they are required, and to seek to maximize vegetative responses. This work is being undertaken in conjunction with Council as they seek to design a boardwalk along the reach. It will be important to install any protective works initially, followed by other works, as follows;
- Soil amelioration/amendment – existing site soils will be assessed for their properties to support vigorous plant growth. Should they be found to be deficient in any characteristic, they will be ameliorated as required, e.g. lime, fertilizer, gypsum, etc. This would be spelled out in a *Vegetation Management Plan* for the Precinct.
- Revegetation of the Inner and Outer 50% VRZs. Species should be selected based on those recommended by ACS Environmental (2015) (Table 1), and a full revegetation design showing these plants and where they are to be planted in zones and with planting densities will be provided. This would form part of the *Vegetation Management Plan* for the Precinct.

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

Table 1 - Species suitable for planting in a reconstructed riparian forest/woodland landscaped VRZ setting for No. 28 Shepherd Street, Liverpool. and surrounds

- A full maintenance plan will be devised to ensure that the revegetated riparian zones are stable and fully self-sustaining with no erosion, no noxious weeds and only 5% cover of environmental weeds at the end of the maintenance period. Of the total number of plants to be planted, 90% survival must be recorded at the end of the 5 year period. The details of this would be included in a *Vegetation Management Plan* for the precinct.

Conclusion

We have adopted RL 9.0m as the highest bank and offset this line by 20m and 40m to eastblish and formalise the Inner and Outer 50% VRZs for the Shepherd Street Precinct (26-33 Shepherd Street).

We have assessed the broader Shepherd Street precinct to define an offsetting strategy to offset the incursions into the outer 50% VRZ, as follows:

- The outer 50% VRZ has 3,840m^2 of development footprint that needs to be offset
- Currently built-upon land in the Inner 50% VRZ will be returned to riparian lands totaling 4,031m^2
- A further 710m^2 of land will be revegetated beyond the Outer 50% VRZ which is also counted as offsetting
- The surplus of offset lands totals 901m^2 (4031+710-3840)
- Despite being in surplus, Coronation Property will provide further riparian revegetation and improvement in an area to the north of Shepherd Street precinct.
- All riparian works and subsequent maintenance will be the subject of a *Vegetation Management Plan* for the precinct.
- The measurable outcomes for works under the VMP are as follows:
  - Banks stable with no visible signs of erosion
  - 90% survival of all plants after 5 years
  - 0% cover of Noxious weeds after 5 years
  - Less than 5% cover of Environmental Weeds after 5 years.

The strategy proposed for the precinct above 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. We believe this to be consistent with the agreed approach in the meeting with DPI Water on 3 November 2016, though we would be happy to discuss any aspect of this strategy further if required.

We invite conditions which reflect these riparian proposals as part of GTAs. Further details which expand upon these concepts would be provided to DPI Water as part of the assessment of a Controlled Activity Approval for the current DA for 28 Shepherd Street. Other Development Appications for developments in the precinct would also be consistent with Attachment 1 but obviously assessed separately when lodged.

If you would like to discuss the contents of this letter, please do not hesitate to contact me.

Yours faithfully,

Mal Brown
Principal | Group Manager – Water and Environment
NORTHROP CONSULTING ENGINEERS

KEY

- FORESHORE BUILDING LINE (MAPPED IN LIVERPOOL LEP)
- HIGHEST BANK
- INNER & OUTER 50% VEGETATED RIPARIAN ZONES (VRZ)

- Development Footprint in Outer 50% VRZ - Approx. 3840m2
- Remainder Outer 50% VRZ - approx. 1815m2
- Inner 50% VRZ built-upon area to be returned to Riparian Zone - approx. 4031 m2
- Riparian offsets provided outside of VRZ - 710 m2

Area requiring offsetting: 3840m2 - 4031m2 - 710m2 = -**901** m2

RESULT: THERE IS A SURPLUS OF OFFSETTING

Attachment 1

Notes
CONTRACTOR MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK OR PREPARING SHOP DRAWINGS. DO NOT SCALE DRAWING.

Rev	Description	Date	App'd
B	FOR INFORMATION	10/11/2016	
A	FOR INFORMATION	02/08/2016	

Project
28 SHEPHERD ST

28 SHEPHERD ST
LIVERPOOL NSW

Client
CORONATION PROPERTY CO

Coronation Property Co Pty Ltd
9-25 Commonwealth Street

Drawing title
Sketch
PRECINCT PLAN

Date generated 11-11-16
Checked
Approved
Scale NTS
@ A1 sheet size
50mm on original

WOODS BAGOT
AUSTRALIA
ASIA
MIDDLE EAST
EUROPE
NORTH AMERICA

Project number 120597
Drawing number SK104
Revision D
Status
DEVELOPMENT APPLICATION