

No. 26 Shepherd Street is a rectangular shaped lot which is largely vacant except for a 2-storey building at the rear of the property. Along the eastern perimeter and straddling the very top of the river bank is a tall walled fence (Figs 1 and 2). The eastern part of the site has been filled to create a level pad to support the development on the site.



Beyond the eastern perimeter fence is the river bank which is thickly vegetated and which falls steeply to the toe of the bank (Figs 2 & 3). The bank appears to be stable with no signs of erosion.



ACS Environmental (2016a) describe the vegetation on the river bank as having patches of tall scrub and occasional trees mostly comprising woody weeds, smothered with noxious weedy vines (Fig 3). *Phragmites* spp is present in the shallow depths at the bottom of the river bank. They predicted that no impacts to threatened flora or fauna species would likely occur as a result of the proposed development.

ACS Environemtal (2016b) describe the river bank vegetation at 28 Shepherd Street as weed infested, and presumably similar to the description they provided for No 26 Shepherd Street (they are connected and look very similar). The bank at No. 28 has less taller vegetation and is dominated by groundcovers. The banks of No. 28 are also not as steep as those at No. 26. The river bank at No. 28 appears to be stable with no apparent signs of erosion.

Determination of Vegetated Riparian Zone

In our previous advice for 28 Shepherd Street, we adopted RL 9.0m as the level at which the VRZ commences. We also considered other factors in relation to adopting the VRZ extents, including:

- Highest Bank - The highest bank at 26 Shepherd Street is the point at which the high walled fence is sited along the site's eastern perimeter. The level of the highest bank is approximately RL10.4m. Note that the site has had fill placed on its eastern extent in order to create a flat pad for development. Therefore the actual highest bank is not clearly delineated, and sits below the RL 10.4m level.
- Flood levels - There are varying flood levels on the Georges River relating to different recurrence intervals of storm events. Flood levels range from the adopted river level in "normal" or base flows of RL2.79m up to RL 9.7m in the 1% AEP storm.
- Levels on opposite river bank - In relation to Item 3, we have used Lidar data to show levels on the opposite (eastern) bank of the Georges River. This shows that the bank levels fluctuate between RL 8.1-8.5m and applying a 0.5m freeboard translates to RL 8.6-9.0m. Again, this is consistent with the adopted VRZ line of RL 9.0m.

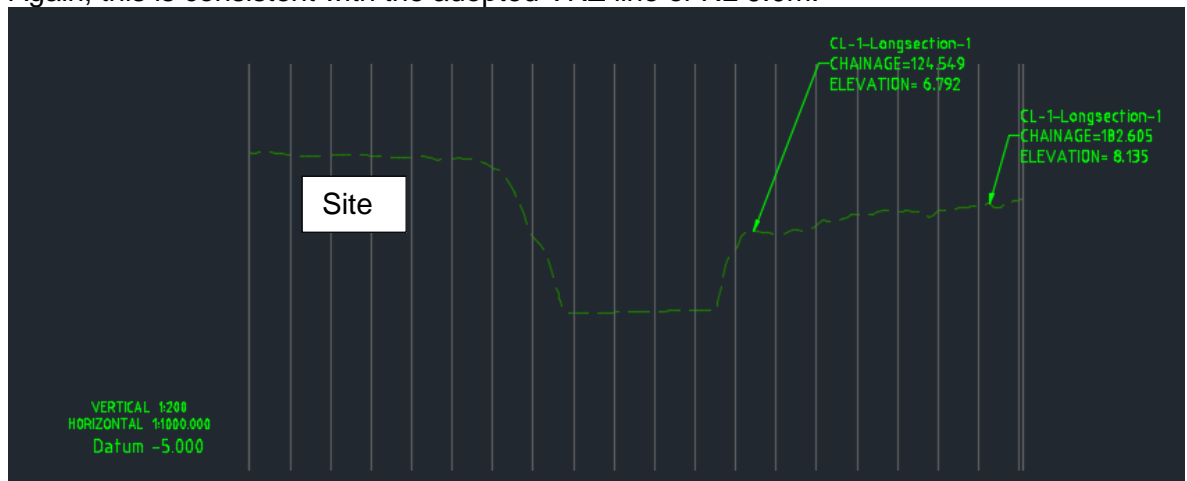


Figure 5: Section of Georges River showing site (26 & 28 Shepherd Street and opposing bank

- Condition of opposite banks - The eastern river bank is shown to be stable (no erosion evident) with vegetation dominated by weeds (Figure 6).



Figure 6: Eastern (opposite) river bank

From this information, we conclude that the VRZ should commence at RL 9.0m. The 20m wide Inner 50% VRZ and adjoining 20m wide Outer 50% VRZ shall be offset from this line.

Impact of the newly determined VRZ

As a result, the proposed buildings at 26 & 28 Shepherd Street will be set back behind the Inner 50% VRZ at ground level. 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.

Landscaping features, walking paths and stormwater outlets are permitted in this Inner Zone. The Outer 50% VRZ may accommodate the development's built form, with offsetting occurring for native landscaping elsewhere (see Justification in next section). The river bank below the highest bank should be rehabilitated and revegetated.

The development is shown in relation to the riparian zone in Figure 7.

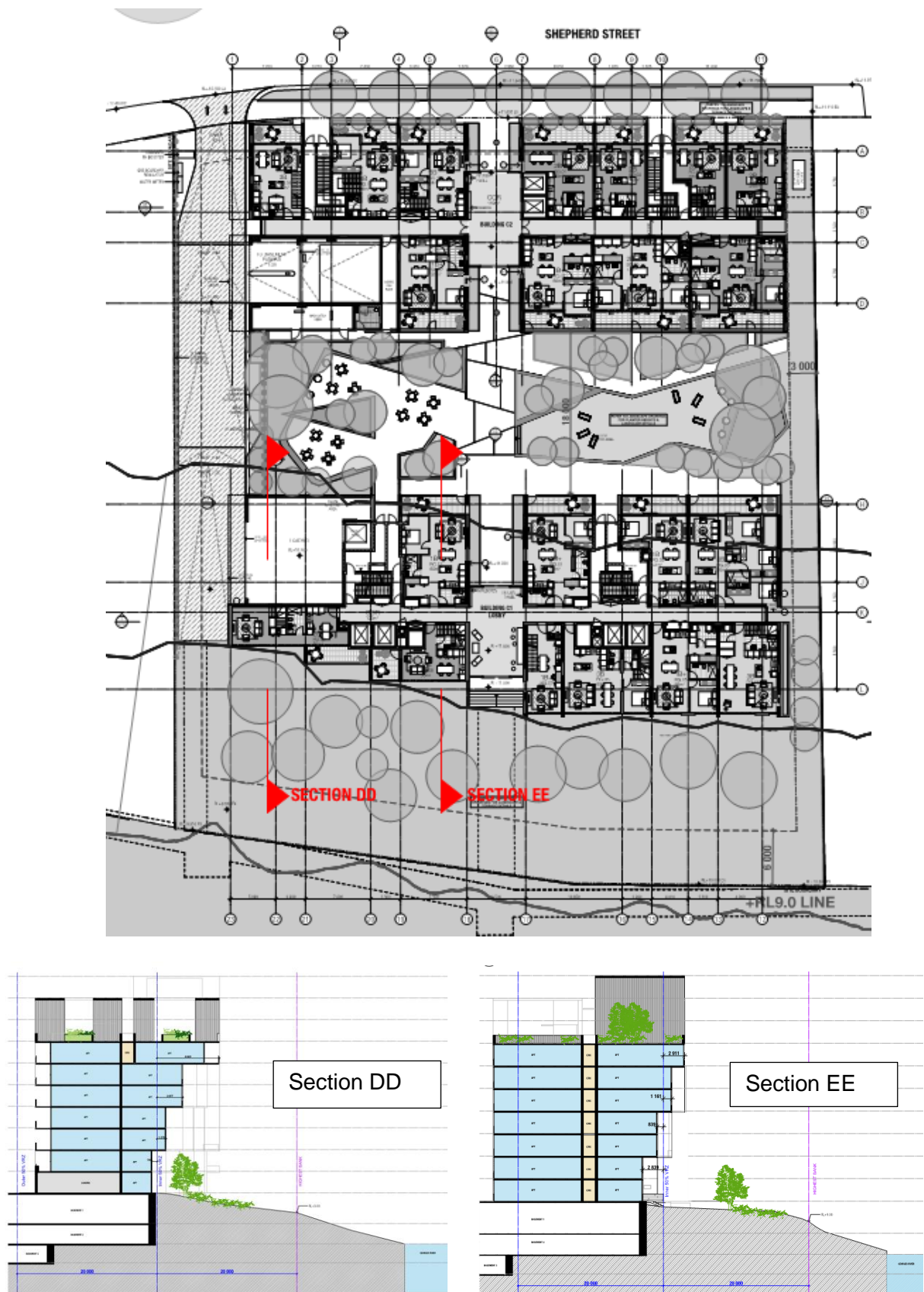


Figure 7: The proposed development in relation to the riparian zone

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 26 & 28 Shepherd Street developments form a part 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. This counts as offsetting against development incursions into the outer 50% VRZ. This was advised by Mr Frank Garofalow in our meeting on 3rd November 2016.

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 area that requires offsetting. This results in a 901m² surplus of land that will be offset.

While this demonstrates that no further offsetting is required outside of the Shepherd Street Precinct, Coronation is committing to provide offsets as a commitment to the redevelopment of the precinct, and the delivery of a catalyst project consistent with Council's strategy of becoming a river city.

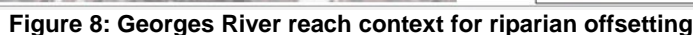
River Reach Context

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 8). Council has plans to upgrade all this riverfront open space into recreational and

When seen in the context of the entire river reach, a clear indication of offsets can be ascertained. It shows that there is good potential to enhance the waterway and environmental outcomes for the reach, in balance with development outcomes.



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.

Table 1: Species suitable for planting in a reconstructed riparian forest/woodland landscaped VRZ for 26 and 28 Shepherd Street Liverpool

Trees	Small trees	Shrubs	Ground cover plants
Rough-barked Apple (<i>Angophora floribuna</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>

- 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.

We have adopted RL 9.0m as the highest bank and offset this line by 20m and 40m to establish and formalise the Inner and Outer 50% VRZs for Nos. 26 & 28 Shepherd Street.

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:

- 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.

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

Mal bone

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Attachment 1