

22 December 2015

Our reference: 15184 r3

Your reference:

RPS Australia East Pty Ltd
PO BOX 428
Hamilton NSW 2303

ATT: Rob Dwyer

Dear Rob,

Planning Proposal for Land at Lot 240 DP1027965 (795 Medowie Road), Medowie Preliminary Flooding and Stormwater Review

GCA Engineering Solutions (GCA) has completed a preliminary site assessment of flooding and stormwater management considerations for potential future development at the above address.

The assessment was completed to inform a Planning Proposal for amending the land use zoning on the site.

The assessment outcomes are discussed below and on the following pages.

1. Background and site description

The subject property is located near the Medowie Town Centre with two potential points of access from Medowie Road and one potential point of access from Peppertree Road. The site's location is presented on Figure 1.

The site is currently zoned RE1 (Public Recreation) and R2 (Low Density Residential) under Port Stephens LEP 2013. A Planning Proposal is being prepared for rezoning the site into a mixture of RE1 and B2 (Local Centre). The existing and preliminary proposed zone boundaries are presented on Figure 2.

The site area is approximately 5.9ha, of which 4.1ha is proposed for the B2 (Local Centre) zone. Average surface slopes are 5% across the B2 zone, falling to Campvale Drain in the west.

Campvale Drain is the central main drainage path for conveying stormwater flow from all of Medowie. It passes through Campvale Swamp before terminating at Grahamstown Dam approximately 6km downstream of the site. Grahamstown Dam is the primary drinking water storage for the Newcastle and Hunter Region operated by Hunter Water Corporation.

2. Flooding

The site is located within the drainage catchment for the *Medowie Drainage and Flood Study* (May 2012) prepared by WMA Water for Port Stephens Council and the Office of Environment and Heritage.

Council provided the following for the purpose of this preliminary flood assessment:

- The WMA Water report referenced above.
- Raw 1% AEP flood envelope results from the WMA Water report (in CAD format)
- Flood planning area linework from the Port Stephens LEP 2013 (in CAD format)

The following interpretation of the above information is offered:

- The WMA Water report describes Ferodale Road (120m downstream of the site) as being an impediment to flow in Campvale Drain. The report figures and profiles imply a 1% AEP flood level around 8.2m AHD (0.3m water depth over Ferodale Road). Ferodale Road is identified as a hydraulic control for flood levels upstream.
- WMA also completed a sensitivity analysis on the extent of blockage for the existing bridge structure under Ferodale Road. The exercise revealed little impact on model-predicted flood levels in this location, suggesting the bridge waterway section is of limited capacity for this event and most of the flow actually occurs over Ferodale Road.
- Figure 31 from the WMA Water report flow shows velocities to the west of the site between 0 and 0.5m/s. Figure 33 from the WMA Water report shows the provisional hydraulic hazard immediately west of the proposed B2 zone as 'low hazard'. This suggests that the hydraulic hazard arising from the 1% AEP event is more a function of flow depth rather than velocity. In addition, the flood profiles (Figure 38A) show a significant 'step' in the profile at Ferodale Road which continues to support the conclusion that the bridge at Ferodale Road is a major hydraulic control on flood waters upstream of this location.
- The 1% AEP flood level results from the WMA Water study appear to coincide with the RL8.5m AHD contour on the site. This is generally supported by the 'design flood profiles' in Figure 38A of the WMA Water report for a location approximately 100m upstream of Ferodale Road.
- The flood planning line from PSC LEP 2013 is located approximately between the RL8.5m AHD and RL9.0m AHD contours, though it is noted that the flood planning level adopted in Council's LEP usually include 0.5m freeboard on the estimated 1% AEP flood level which is typical for residential areas but not always adopted for commercial or industrial.

Based on the assessment and considering the potential uncertainty in the regional flood study by WMA Water an absolute minimum flood planning level of RL8.5m AHD (equal to the estimated 1% AEP flood level) may be appropriate for the proposed B2 local centre zone.

However, it may also be appropriate for appropriate freeboard to be added to this particularly for structures that may be sensitive to flood water and area where sensitive equipment (such as electrical componentry) may be located.

A site overlay of the 1% AEP flood envelope and the FPL from Port Stephens LEP 2013 is provided on Figure 3. The boundary of the proposed B2 zone approximately coincides with the FPL from Port Stephens LEP 2013 and is above the 1% AEP flood envelope from the WMA Water 2012 flood study.

Accordingly, it is considered that flooding during the 1% AEP event will not constitute a significant constraint on development within the proposed B2 zone shown.

3. Stormwater Management

Port Stephens Development Control Plan 2014 became effective on 6 August 2015.

Section B4 of PSC DCP 2014 prescribes various requirements for Drainage and Water Quality that must be addressed in a 'Stormwater Management Plan' (lodged with the Development Application'). These generally include:

- catchment boundaries
- existing surface conditions
- proposed surface contours
- proposed building flood or floor levels
- location and levels of discharge points
- overland flow paths and flood liable areas
- location of drainage pits and lines
- location and area of on-site detention easements
- calculations for any proposed stormwater system
- methods of draining the land
- water quality measures identified by Small Scale Stormwater Water Quality Model (SSSQM) or water quality modelling, such as MUSIC Modelling

The above elements can only be properly considered when a specific development proposal is known. This assessment seeks only to provide a broad overview of the future requirements against site and current known catchment constraints in order to comment on whether the proposed land will be capable of supporting development consistent with the proposed B2 mixed use zone.

Generally speaking, stormwater management can be considered in two main areas

- (1) Stormwater Flow Rates
- (2) Stormwater Runoff Quality

3.1. Stormwater Flow Rates

The site currently drains towards Campvale Drain. It is logical for a formalised drainage network in future development to continue discharging toward Campvale Drain.

As noted earlier, Campvale Drain passes underneath Ferrodale Road via road bridge crossing approximately 120m downstream of the site. The waterway cross section under the road bridge appears to be of significant cross section however the flooding figures in the WMA Water 2012 flood study suggest that Ferrodale Road may be frequently overtopped, perhaps even as often as once per year or once every two years.

It follows that the downstream system could be considered being potentially sensitive to increases in flow rates that will occur when additional impervious surfaces are constructed during development. Future development proposals are likely to require on-site stormwater detention to ensure that post-development discharge flow rates are no greater than currently leave the site.

On-site stormwater development may be provided in a variety of structures or devices including:

- Above-ground water storage tanks (generally for roof areas only)
- On the ground surface within at-grade car parking areas
- Underground storage reservoirs
- Open constructed basins

The approach must be selected to suit the particular development proposal (or proposals). For example, building type developments will tend to adopt above-ground tanks, surface storage within car parks, and underground storage reservoirs. Subdivisions seeking to address on-site stormwater detention upfront and negate the need for future solutions on each lot will often adopt open constructed basins as a centralised 'outlet based' method of control.

It is commonplace to include stormwater detention measures in new developments and this requirement is not expected to unreasonably restrict development within the proposed B2 local centre zone.

In accordance with Council requirements any future drainage strategy prepared to support the Development Application for proposed development in the B2 mixed use zone:

- must consider the impact of increase in the volume of stormwater on downstream properties (particularly in the Campvale Indundation Area); and
- any proposed detention basin must be constructed outside of the flood planning area.

3.2. Stormwater Runoff Quality

The site drains in a westerly direction towards Campvale Drain that ultimately discharges into the Grahamstown Dam. It is also formally identified as being part of a 'Drinking Water Catchment' in Port Stephens LEP 2013.

Clause 7.8(3) and 7.8(4) of Port Stephens LEP 2013 relate to development within Drinking Water Catchment areas and are reproduced below.

- (3) *Before determining a development application for development on land to which this clause applies, the consent authority must consider the following:*
- (a) *whether or not the development is likely to have any adverse impact on the quality and quantity of water entering the drinking water storage, having regard to the following:*
 - (i) *the distance between the development and any waterway that feeds into the drinking water storage,*
 - (ii) *the on-site use, storage and disposal of any chemicals on the land,*
 - (iii) *the treatment, storage and disposal of waste water and solid waste generated or used by the development,*
 - (b) *any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.*
- (4) *Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:*
- (a) *the development is designed, sited and will be managed to avoid any significant adverse impact on water quality and flows, or*
 - (b) *if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or*
 - (c) *if that impact cannot be minimised—the development will be managed to mitigate that impact.*

Port Stephens Development Control Plan 2014 seeks to achieve compliance with Clauses 7.8(3) and (3) of Port Stephens LEP 2013 by nominating a particular level of level of stormwater quality assessment, documentation requirements, and water quality targets for new developments within the designated drinking water catchments.

The following summary requirements from PS DCP 2014 (Section B4.C) will apply to proposed development in the B2 zone:

- (1) The development stormwater management plan will need to include appropriate measures for capture and treatment of stormwater runoff from the development's impervious surfaces.
- (2) The stormwater management plan will need to include quantitative assessment (i.e. stormwater quality modelling) to demonstrate that proposed treatment measures will ensure 'Neutral or Beneficial Effect' (NorBE) on water quality. This means that post-development surface runoff quality must be equal to or better than currently runs from the site. This is a more stringent set of criteria than normally adopted for non-drinking water catchment areas.
- (3) Hunter Water will be notified of any development proposals and will have 21 days to provide comment.

There are many potential stormwater quality treatment approaches available for consideration as part of future development proposals. The most likely options for future development on this site include:

- Harvesting rainwater from roof areas in storage tanks for re-use
- Proprietary gross pollutant traps and hydrocarbon separation devices
- Buffer strips, vegetated swales and bioretention systems
- Permeable paving
- Rain gardens
- Other proprietary treatment systems that are becoming increasingly prevalent in the marketplace.

For general commercial-type development water quality assessments will normally consider gross pollutants (bulk litter), hydrocarbons, nutrients (nitrogen and phosphorus), and sediment. The measures listed above tend to have different and varying degrees of effectiveness in removing some of these pollutants over others. For this reason it is expected that future development proposals would incorporate a combination of measures arranged in a 'treatment train' approach which is normal practice.

Ultimately, the long term effectiveness of any 'treatment train' will also depend on diligent periodic maintenance. A management plan for maintaining the stormwater quality treatment devices prescribes the activities required to ensure the long term performance and would normally be prepared at the end of the future design process.

It is also noted that the B2 local centre zone is at least 150m from the formal channel of Campvale Drain to the west. Stormwater discharge from development in the B2 zone would run overland for this distance before entering the main channel. This overland flow will provide an opportunity for vegetation to provide a further water quality 'buffer' before surface runoff enters the main channel and is conveyed to Campvale Swamp and ultimately Grahamstown Dam 6km downstream of the site.

4. Summary

In summary:

- The proposed B2 local centre zone boundary is not affected by the 1% AEP flood envelope predicted in the WMA Water 2012 flood study. Flooding is therefore not expected to form a significant constraint on development within the proposed B2 local centre zone.
- The area downstream of the site could be considered to have existing stormwater runoff conveyance capacity limitations.

It is likely that on-site stormwater detention measures will be required to address any increase in stormwater discharge flow rates from future development in the proposed B2 local centre zone. These measures may take a variety of formats and should be integrated with the overall layout and engineering design of the particular development proposals, with a detailed analysis being included with the stormwater management plan to be prepared at Development Application.

Provided the on-site detention assessment and design is prepared correctly, development in the proposed B2 local centre zone will not further exacerbate existing downstream stormwater conveyance capacity. The matter is one of a technical / design and financial nature and should not be considered a significant factor when determining if the proposed B2 local centre zone is appropriate for the site.

- The site is located within a 'drinking water catchment' area. Future development proposals will need to demonstrate that stormwater runoff will be of equivalent quality (or better than) currently occurs. Hunter Water Corporation will also be provided with the opportunity to comment on development proposals at the Development Application stage.

There are a many water quality treatment approaches available for consideration as part of future development planning and design. These include custom designed- and constructed measures in addition to a wide range of proprietary treatment solutions.

Provided the water quality treatment measures are designed and selected appropriately, and maintained diligently and in perpetuity, development in the proposed B2 local centre zone will be able to achieve the required water quality treatment targets. Stormwater quality is also a technical / design and financial matter and should not be considered a significant factor when determining if the proposed B2 local centre zone is appropriate for the site.

We trust this assessment sufficiently addresses flooding and stormwater management considerations to the level of detail required for a Planning Proposal to amend the land use zoning.

Please do not hesitate to contact the undersigned on (02) 4964 1811 if you have any queries.

Yours sincerely,



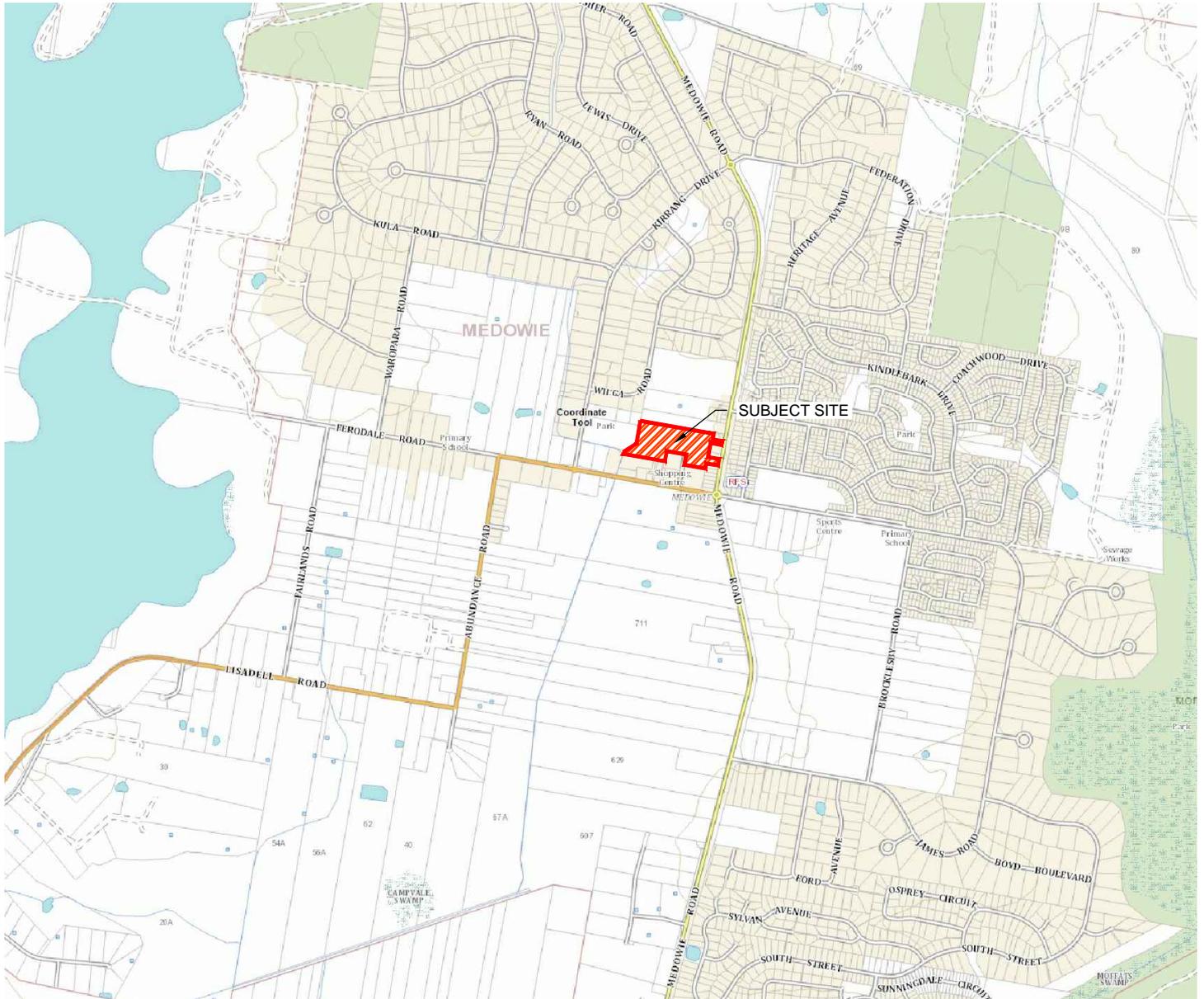
Adam Shaw MIEAust CPEng NER
Senior Civil / Environmental Engineer
for and on behalf of GCA Engineering Solutions

Client: RPS AUSTRALIA EAST PTY LTD
Project: MEDOWIE PLANNING PROPOSAL
Location: LOT 240 DP1027965
795 MEDOWIE ROAD, MEDOWIE, NSW



DWG REF: 15184 F01 r3 DATE: 22.12.15

SCALE: N.T.S.



LOCALITY PLAN

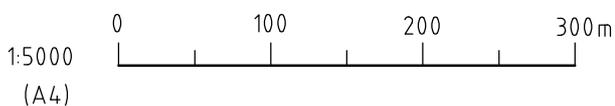
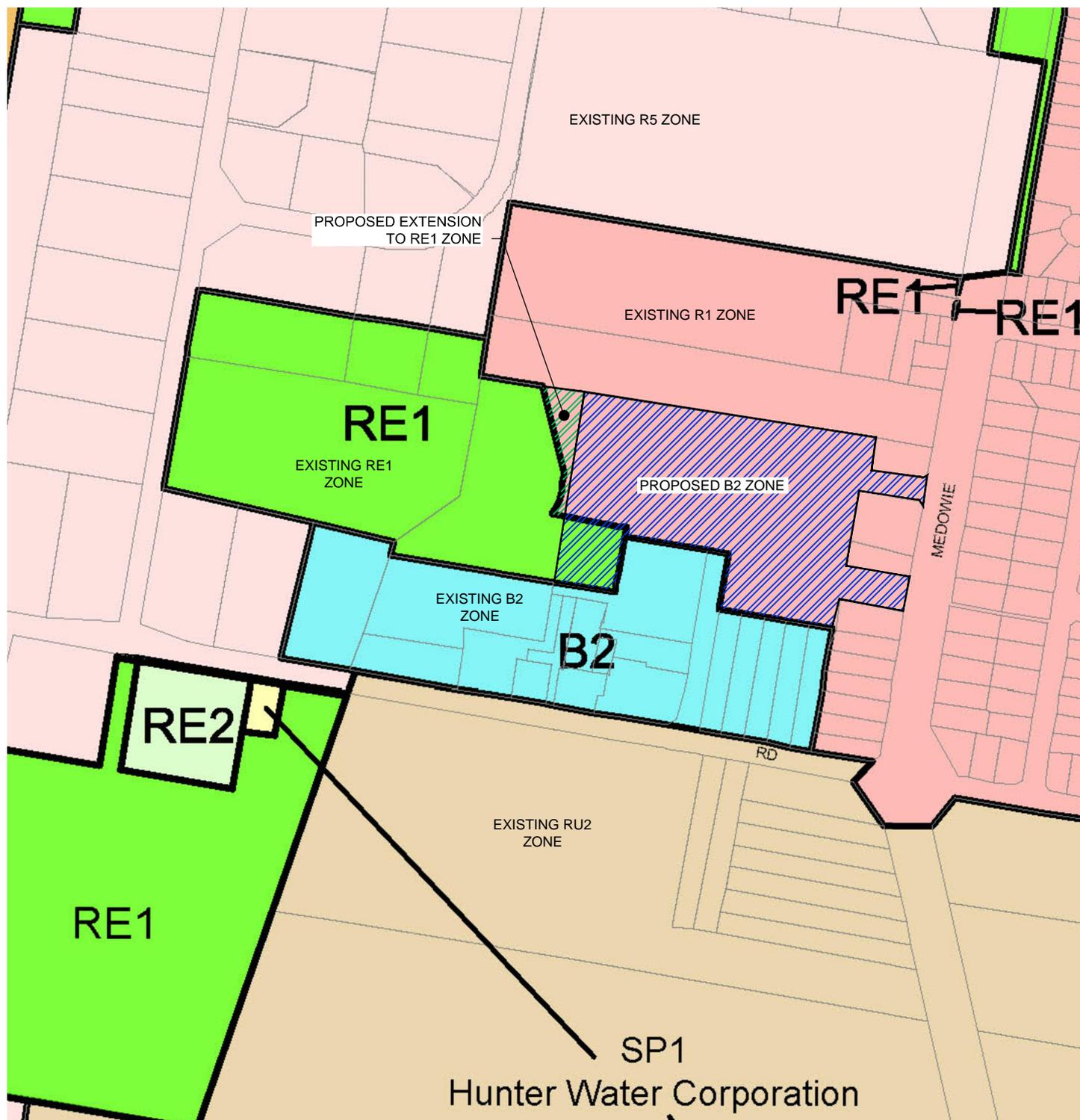
FIGURE 1

Client: RPS AUSTRALIA EAST PTY LTD
Project: MEDOWIE PLANNING PROPOSAL
Location: LOT 240 DP1027965
795 MEDOWIE ROAD, MEDOWIE, NSW



DWG REF: 15184 F02 r3

DATE: 22.12.15



CONCEPT ZONING PLAN

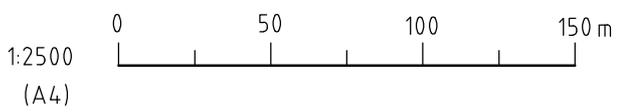
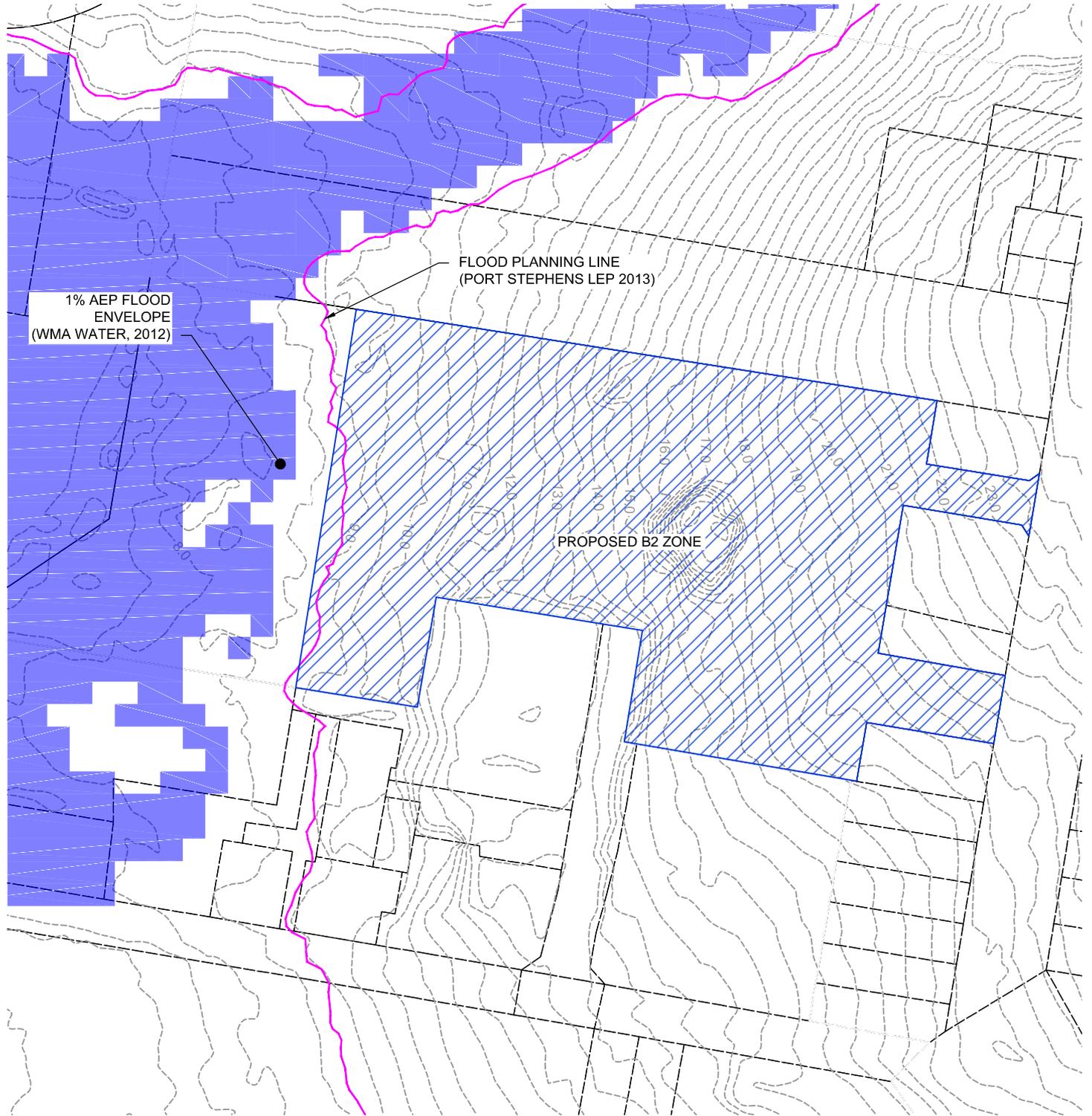
NOTE:
REFER TO THE PLANNING PROPOSAL FOR FINAL ZONE BOUNDARY PROPOSALS. THIS FIGURE PROVIDES CONCEPTUAL ZONE BOUNDARIES ONLY TO PROVIDE CONTEXT FOR THE FLOOD AND STORMWATER ASSESSMENT.

FIGURE 2

Client: RPS AUSTRALIA EAST PTY LTD
Project: MEDOWIE PLANNING PROPOSAL
Location: LOT 240 DP1027965
795 MEDOWIE ROAD, MEDOWIE, NSW



DWG REF: 15184 F03 r3 DATE: 22.12.15



FLOOD DATA OVERLAY

NOTE:
REFER TO THE PLANNING PROPOSAL FOR FINAL ZONE BOUNDARY PROPOSALS. THIS FIGURE PROVIDES CONCEPTUAL ZONE BOUNDARIES ONLY TO PROVIDE CONTEXT FOR THE FLOOD AND STORMWATER ASSESSMENT.

FIGURE 3