



**Transport**  
Roads & Maritime  
Services

# Bringelly Road upgrade

Camden Valley Way  
to The Northern Road

**Submissions Report**

FEBRUARY 2012

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# Roads and Maritime Services

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## Bringelly Road upgrade

## Camden Valley Way to The Northern Road

Submissions report  
February 2012

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# Executive summary

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Roads and Maritime Services (RMS) is planning for the upgrade of Bringelly Road between Camden Valley Way, Leppington and The Northern Road, Bringelly (the proposal). The proposal is for the widening and upgrade of about 10 kilometres of Bringelly Road to a mix of four lanes and six lanes with divided carriageways separated by a central median. It also includes widening of the Bringelly Road reservation to cater for an ultimate six lane configuration between Camden Valley Way, Leppington and The Northern Road, Bringelly if required in the future.

The proposal would be delivered in two stages:

- Stage 1 of the proposal would be east of King Street where Bringelly Road would be initially upgraded to a four lane divided carriageway except between the Upper Canal and Eastwood Road which would be a six lane divided carriageway to cater for the anticipated traffic demand arising from the development of Leppington Town Centre and train station.
- Stage 2 of the proposal would be the road upgrade west of King Street to a four lane divided carriageway with provision for six lanes if required in the future.

A review of environmental factors (REF) was prepared to assess the environmental impacts of the proposal. The REF was displayed between 7 November 2011 and 2 December 2011 at one location in Liverpool and two locations in Narellan. It was also made available for download on the RMS website. Community updates were distributed in the adjacent areas and advertisements were placed in local papers to advise of the display of the REF.

Two information sessions were held in Leppington. Feedback was received from residents and government agencies. The issues raised in the submissions were analysed, grouped and a response provided as part of this submissions report.

This submissions report relates to the REF prepared for the Bringelly Road upgrade and widening, and should be read in conjunction with the REF. A total of 11 submissions were received in response to the display of the REF comprising six government agency submissions and five community submissions.

The main issues raised were in relation to:

- Property access
- Impacts to the Upper Canal
- Noise
- Pedestrian access
- Future precinct development
- Property acquisition
- Flora and fauna assessments
- Drainage and water quality
- Travel times and distances
- Traffic management
- Flooding

The submissions received raised specific concerns about the proposal. Responses to these issues have been prepared as part of this report.

Some additional measures for the management of impacts during construction and operation have been developed in response to the submissions received. These measures have been incorporated into the revised environmental management measures for the proposal.

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# 1 Introduction and background

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## 1.1 Purpose

This submission report relates to the review of environmental factors (REF) prepared for the Bringelly Road upgrade between Camden Valley Way and The Northern Road, Bringelly and should be read in conjunction with that document.

The REF was placed on public display and during this time Roads and Maritime Services (RMS) received submissions relating to the proposal and the REF. This report summarises the issues raised in all submissions, provides responses to each issue (Chapter 2) details investigations carried out since finalisation of the review of environmental factors (Chapter 3), and identifies new or revised environmental management measures (Chapter 4).

## 1.2 The proposal

The proposal is for the widening and upgrade of about 10 kilometres of Bringelly Road to a mix of four lanes and six lanes with divided carriageways separated by a central median. The proposal would cater for future traffic growth mainly arising from increased residential and commercial activity anticipated in the area as a result of the development of the South West Growth Centre. Bringelly Road would play a major role as one of the principal arterial transport corridors in the South West Growth Centre.

The proposal would result in improved safety for road users, reduced travel times, improved access to the M7 and M5 motorways, improved access to the South West Growth Centre, improved access and travel times for road freight in Sydney's south west, improved access and safety for cyclists and pedestrians by providing an off-road shared path, bus priority capability at traffic lights and improved landscape and urban design.

The proposal would be delivered in two stages:

- Stage 1 of the proposal would be east of King Street, where Bringelly Road would be initially upgraded to a four lane divided carriageway except between the Upper Canal and Eastwood Road which would be a six lane divided carriageway to cater for the anticipated traffic demand.
- Stage 2 of the proposal would include the upgrade west of King Street to a four lane divided carriageway with provision for six lanes if required in the future.

The proposal would include increasing the Bringelly Road reservation to cater for an ultimate six lane configuration between Camden Valley Way, Leppington and The Northern Road, Bringelly if required in the future.

Key features of the proposal include:

- Divided carriageways with a central median.
- A proposed posted vehicle speed limit of 80 km/h (except through Rossmore Village where it would be signposted at 60 km/h).
- Provision for a three-metre wide off-road shared pedestrian/cyclist path. This would be provided on both sides of the road in the Leppington Town Centre between Eastwood Road and Cowpasture Road. Along the remainder of Bringelly Road it would initially be on the southern side between The Northern Road and Eastwood Road and on the

northern side between Cowpasture Road and Camden Valley Way, with space provided on both sides for provision in the future.

- Two-metre wide shoulders.
- Bicycle and pedestrian crossing provisions at traffic lights.
- Bus priority capability at traffic lights and indented bus bays on both sides of Bringelly Road.
- Traffic lights at the following 11 intersections:
  - The Northern Road (four-way intersection)
  - Kelvin Park Drive (three-way intersection)
  - Jersey Road (four-way intersection)
  - Masterfield Street (four-way intersection)
  - North Avenue (four-way intersection)
  - King Street (four-way intersection)
  - Eastwood Road (four-way intersection)
  - Fourth Avenue/Dickson Road (four-way intersection)
  - Edmondson Avenue/Rickard Road (four-way intersection)
  - Browns Road (realigned three way-intersection)
  - Cowpasture Road (realigned three-way intersection)
- Provision for future Western Sydney Parklands entry (three-way intersection – to be built by others when required).
- Four non-signalised left in/left out intersections at Church Street, Allenby Road, Glen Allan Road and Kelly Street.
- Designated turning lanes at traffic lights.
- Temporary U-turn facilities located opposite traffic lights at the upgraded intersections of North Avenue, Jersey Road and Eastwood Road.
- Existing properties on Bringelly Road would continue to have direct left in/left out access until precinct development takes place but would lose right in/right out access.
- New culverts at Kemps Creeks, Scalabrini Creek and Bonds Creek.
- New bridge at Sydney Catchment Authority Upper Canal.
- New bridge at the South Creek crossing adjacent to the existing bridge.
- Creek re-shaping works at Scalabrini Creek, Bonds Creek, Kemps Creek and South Creek.
- Fill batters north of Bringelly Road along 26th Avenue and between Eastwood Road and 120 metres west of the Fourth Avenue intersection.
- Retaining walls north of Bringelly Road along 26th Avenue near the Western Sydney Parklands entry.
- Flood immunity for a 1 in 100 year average recurrence interval.

The proposal would result in improved safety for road users, reduced travel times and improved access to the locality and wider region. Improved access and safety for cyclists and pedestrians would be achieved through provision of an off-road shared path. Bus priority capability at traffic lights and improved landscape and urban design would also be provided.

### 1.3 REF display

RMS prepared a review of environmental factors to assess the environmental impacts of the proposed works. The review of environmental factors was displayed between Monday 7 November 2011 and Friday 2 December 2011 at three locations, as detailed in Table 1.1. The review of environmental factors was placed on the RMS website and made available for download.

**Table 1.1:** Display locations

Location	Address
Liverpool Motor Registry	357 Hume Highway, Liverpool
Narellan Library	Civic Place, Corner Queen and Elyard Streets, Narellan
Narellan Motor Registry	Shop G1, Narellan Town Centre, 326 Camden Valley Way, Narellan

The exhibition locations and website link were advertised in the following local newspapers:

- Macarthur Chronicle on Tuesday 8 November 2011
- Liverpool Leader on Wednesday 9 November 2011
- South Western Rural Advertiser on Wednesday 9 November 2011

Two community information sessions were held at Leppington Progress Hall, 123 Ingleburn Road, Leppington on:

- Saturday 19 November 2011 from 12pm to 4pm
- Tuesday 22 November 2011 from 4pm to 8pm

During the community information sessions, Roads and Maritime Services project team answered questions about the proposal and received feedback.

In addition to the above public exhibition, an invitation to comment was sent to several identified stakeholders (Appendix A).

## 2 Response to issues

RMS received 11 submissions, accepted up until 18 January 2012. Table 2-1 lists the respondents and each respondent's allocated submission number. The table also indicates where the issues from each submission have been addressed in Chapter 2 of this report.

**Table 2-1** Respondents

<b>Respondent</b>	<b>Submission No.</b>	<b>Section number where issues are addressed</b>
Individual submission	1	2.3, 2.8.3
Individual submission	2	2.11.3
Individual submission	3	2.9.1, 2.11.3
Bellfield College	4	2.8.3, 2.8.4
Individual submission	5	2.3, 2.11.4
Sydney Catchment Authority (SCA)	6	2.9.1, 2.6, 2.8.4, 2.9.2, 2.11.1, 2.12, 2.13
Department of Planning and Infrastructure (DP&I)	7	2.2, 2.7.1, 2.8.1, 2.8.3, 2.8.4, 2.9.1, 2.11.1, 2.11.3, 2.13
Liverpool City Council	8	2.5.1, 2.5.2, 2.8.1, 2.8.2, 2.10, 2.11.2, 2.11.4, 2.11.4, 2.12
Liverpool City Council	9	2.5.1, 2.8.1, 2.8.4, 2.11.1, 2.11.4, 2.13
Camden Council	10	2.6, 2.8.1, 2.8.2, 2.8.4
Camden Council	11	2.7.2, 2.7.3

### 2.1 Overview of issues raised

A total of 11 submissions were received in response to the exhibition of the REF comprising six submissions from four government agencies and five submissions from the community.

Each submission has been examined individually to gain an understanding of the issues raised. The issues raised in each submission have been extracted and collated, and corresponding responses to the issues have been provided. Where similar issues have been raised in different submissions, only one response has been provided. The issues raised and RMS' response to these issues forms the basis of this chapter.

The majority of the submissions did not offer a position on the proposal. One individual submission did not support the proposal in its current form and one submission supported the proposed upgrade layout.

The main issues raised by the Sydney Catchment Authority (SCA) included:

- Potential water quality impacts on the Upper Canal water supply.
- Maintaining the Upper Canal's structural integrity.
- Provision of access to the canal corridor during operation and construction.
- Security, public safety, and the heritage value of the canal.

The main issues raised by the Department of Planning and Infrastructure (DP&I) related to:

- Consistency of the flora and fauna assessment with biocertified areas as mapped by the Department.
- Consideration of future precinct development during the detailed design.

The main issues raised by Liverpool City Council included:

- The use of council land for construction activities.
- Potential flooding and drainage impacts.
- Public transport considerations.
- Pedestrian access.
- Future development of the South West Growth Centre adjoining Bringelly Road.

The main issues raised by Camden Council related to:

- Traffic and access.
- Heritage.
- Land acquisition for road purposes.
- Flora and fauna.

The main issues raised in the individual submissions related to property impacts such as land acquisition and potential traffic impacts.

## 2.2 Consultation

Submission number(s)

7

Issue description

- 1) DP&I requests ongoing consultation and notification of any further technical investigations to be undertaken by RMS, particularly in relation to flooding/stormwater management and noise.
- 2) Opportunities to undertake any future community consultation activities for Bringelly Road in parallel with consultation for future precinct planning would be welcomed.

Response

- 1) RMS would continue to consult with DP&I to ensure DP&I is kept informed about technical studies prepared for the detailed design of the road, particularly in relation to issues such as flooding, stormwater management and noise.
- 2) RMS would continue to consult with DP&I about opportunities to undertake community consultation activities for the proposal in parallel with consultation for future precinct planning.

## 2.3 Alternatives and options considered

Submission number(s)

1, 5

Issue description

- 1) RMS should consider an option to accommodate the Byron Road extension while leaving Browns Road in its current location. This would require the proposed Byron Road extension to be aligned with the existing Browns Road reserve when it is required in the future. This would allow for the ongoing use of the existing community hall until at least 2036. It would also allow for the long term incorporation of the Byron Road extension into a short term T-intersection at Browns Road as proposed in the 2010 upgrade plan without the need for realignment through private properties on the northern side of Bringelly Road.
- 2) Alternatively, RMS should consider an option of making Browns Road left in/left out only and retaining the proposed Byron Road Extension as a three-way intersection with traffic lights. This would accommodate traffic from the town centre and business park area travelling west to The Northern Road or east to the M5 and M7.
- 3) An option of opening Fifth Avenue and Sixth Avenue between Edmondson Avenue and the Sydney Water Upper Canal to access Browns Road should be considered to service future land releases.
- 4) Has an option with no concrete median and with turning lanes been considered?

Response

- 1) The proposal has changed from the concept design placed on public display in 2010. The design refinements were made in response to the outcomes of specialist studies, community feedback on the concept design emerging information about the Austral and Leppington North precinct planning and the South West Rail Link project and with consideration to how to best meet the proposal objectives.

During consultation with DP&I, RMS was asked to consider aligning the intersection of Browns Road with the future Byron Road extension. The design of the intersection was subsequently investigated and considered against the proposal objectives. It was found that realigning the intersection to the east would minimise environmental impacts on Bonds Creek, reduce flooding impacts to the road corridor, minimise overall property impacts (including to existing buildings), and reduce the requirement for a wider bridge structure over Bonds Creek. Retaining the intersection in its current location would not achieve these benefits and would not allow implementation of the Indicative Layout Plan which identifies an appropriate intersection layout and configuration to meet precinct requirements.

The proposed realigned four way intersection with traffic lights at Browns Road, accommodating a future Byron Road extension, was found to best meet the proposal objectives and to positively contribute to the development of the Austral and Leppington North precincts by providing suitable access and improved road infrastructure. The Austral and Leppington North Indicative Layout Plan was released by DP&I in November 2011 showing the realigned Browns Road intersection connecting to Byron Road, which is consistent with the concept design for the proposal.

Detailed design would continue to aim to minimise property impacts wherever possible.

- 2) Traffic modelling undertaken for the proposal and the Austral Leppington North precinct planning determined that a sub arterial road is required at this location to cater for the expected type and volumes of traffic. A four way intersection is needed to allow traffic to circulate around the Leppington Town Centre, wider Austral and Leppington North precincts, and to provide access to the business park proposed by DP&I. A combination of an unsignalised left in-left out intersection and a signalised T intersection would not provide a sufficient level of access for both sides of Bringelly Road.

The intersection at Browns Road would be the first intersection on the northern side of Bringelly Road after the Upper Canal when travelling from the east, and this arrangement would not allow a right turn into the precinct areas north of Bringelly Road. It would increase traffic on Edmondson Avenue which is intended to perform a transit boulevard function. The proposed four way signalised intersection configuration best caters for the expected increase in traffic from the Leppington Town Centre and the business park/employment areas to the south of Bringelly Road.

An offset intersection (a signalised T intersections on opposite sides of the road, set a short distance apart but designed to work together as one system) was also considered but was found to not be appropriate for a principal arterial road as there would not be enough space between the two separate intersections of Browns Road and Byron Road to allow for efficient turning movements or adequate storage of turning vehicles.

- 3) Fifth Avenue and Sixth Avenue are local roads, and changes to these roads do not form part of the proposal. Changes to these roads would be a matter for future precinct planning and Liverpool City Council.
- 4) Three options, including a 'do nothing' option, were developed as outlined in Section 2.4.2 of the REF. The options were broadly assessed and compared on their economic, environmental and social performance and against the proposal objectives including the objective to improve driver safety and access for both local and through traffic by constructing a central median to separate opposing traffic.

Improving road safety is a key objective for the proposal as Bringelly Road in its current form has a higher than average proportion of fatal and injury crashes than the rest of NSW. The latest available data (for the 12-month period ending December 2009) shows an average fatality rate across NSW of 0.7 per 100 Million Vehicle Kilometres (MVKM) compared to 1.8 per 100 MVKM for Bringelly Road. Bringelly Road therefore has an average fatality rate nearly two and a half times higher than the state rate. As a result, an upgrade option with no median and allowing all turning movements for residents along the length of the road was not developed as it would not meet the proposal objective to improve road safety.

The proposal is designed to facilitate safe and efficient transport on a principal arterial road corridor. The central median is required to address current road safety issues by separating opposing flows of traffic and confining turning movements to signalised intersections. The concept design meets current standards and is consistent with other roads that have been upgraded across the South West Growth Centre including Camden Valley Way.

Ultimately all access from Bringelly Road to properties in adjacent precincts would be via traffic lights and an internal road network which would be implemented in accordance with precinct planning.

## 2.4 Soils, landscape and water quality

### 2.4.1 Water quality

Submission number(s)

6

Issue description

- 1) The proposal should not affect the quality of water in the Upper Canal.
- 2) Anti-throw screens should be incorporated in the design of the new bridge over the Upper Canal.

Response

- 1) The REF has assessed the potential construction and operational impacts of the proposal on water quality at the Upper Canal (refer to section 6.1 of the REF). The proposal would include measures to contain any spills, as a result of accidents or road runoff, to prevent pollutants from entering the Upper Canal from Bringelly Road. These spill containment measures would be developed in consultation with Sydney Catchment Authority.

During construction there would be potential impacts to water quality including as a result of exposure of soils during earthworks, demolition of the existing bridge, construction of the new bridge and potential for spills.

The safeguards and management measures for water quality identified in the REF are summarised in Section 4 of this report and include preparation of a soil and water management plan and a work method statement for demolition of the Upper Canal bridge and construction of the new bridge in consultation with the Sydney Catchment Authority. The REF found that with the implementation of the safeguards and management measures identified that the potential impacts to water quality could be avoided, managed and mitigated.

The safeguards also outline that SCA would be consulted during detailed design for the proposed works at the Upper Canal as summarised below:

- Requirement to consult the SCA during development of the construction methodology and preparation of the soil and water management plan for the bridge over the Upper Canal.
  - Requirement to further consult the SCA to make sure satisfactory mitigation measures are implemented at the Upper Canal.
  - Requirement for SCA to review the Work Method Statement for the demolition and construction of the bridge over the Upper Canal.
  - Requirement to consult SCA during detailed design in regard to suitable pollution prevention for the Upper Canal.
- 2) Anti-throw screens would be provided as part of the new bridge over the Upper Canal. The visual impact of the screens has now been assessed as detailed in Section 3 of this report and is attached as Appendix B to this report. The assessment found that the visual impact would be minor.

## 2.5 Hydrology

### 2.5.1 Flooding impacts

Submission number(s)

8, 9

Issue description

- 1) The REF identifies that several properties may experience increased flooding as a result of the proposal. Appropriate solutions to mitigate any flooding problems should be developed during detailed design. Where drainage is being directed through natural water courses across private properties, the watercourses should be upgraded to receive such waters.
- 2) Maps should be provided showing before and after flood extents as a result of the proposed works.
- 3) Appropriate blockage factors should be used that are consistent with current industry standards.
- 4) Mitigation measures should be provided to mitigate any flooding associated with the South Creek crossing in the event of blockage.
- 5) A detailed flood impact assessment should be undertaken to identify the impact of proposed works on existing flooding regime across the catchments. Any flooding impacts should be assessed and addressed to ensure pre-development flooding regime is maintained or improved and the Flood Impact Assessment report should be submitted for Council's review and concurrence as part of the detailed design process.
- 6) A peer review of the various flood studies, that are currently underway to inform the planning of Austral and Leppington North new release areas, should be undertaken as outlined in the REF and a copy of the report is to be submitted for council concurrence.
- 7) Gross pollutant traps, where provided, should include appropriate provision for access and maintenance. These devices should be designed to ensure performance is not compromised as a result of blockage.
- 8) Basins should meet the requirements of the Dam Safety Committee.
- 9) All bridge and major waterway crossings should be designed in accordance with AS5100-Bridge design.
- 10) Detailed drainage design should take into consideration the Indicative Layout Plan, especially layout of drainage crossings under and swales running alongside Bringelly Road.

Response

- 1) An assessment of the drainage requirements and flooding impacts of the proposal was prepared by Lyall and Associates (2011). A copy of the report is available in Appendix B of the REF. Section 6.1 of the REF includes an assessment of the potential flooding impacts on properties and recommends design measures to avoid or minimise flooding impact, which have been incorporated into the concept design.  
Further investigations would be undertaken during detailed design to ensure appropriate treatments are implemented to avoid or minimise flooding impacts to ensure waterways

are able to receive any increased peak flows as a result of the proposal.

The REF includes a safeguard that identifies that appropriate mitigation measures for any flood impacts on property would be developed during detailed design in consultation with affected landowners

- 2) Maps would be provided for Council's information during detailed design showing before and after flood extents as a result of the proposed works. Extents of inundation would remain no greater than under present day conditions.
- 3) Blockage factors referred to in Lyall and Associates (2011) were provided for the assessment of potential blockage on road and cross drainage upgrade requirements. A review of blockage factors used in the concept design would be undertaken as part of the detailed design and any new industry standards for blockage and design would be applied.
- 4) The Initial Assessment of Drainage Requirements (Lyall and Associates 2011) has assessed the South Creek crossing. The risk of blockage of the existing bridge opening at South Creek is considered to be low, given the large waterway area and span of the existing bridge. The proposed bridge is unlikely to increase the risk of blockage at this location because it does not change the cross sectional area of the waterway. Further flood investigations would be undertaken during detailed design and measures would be developed to mitigate any flooding impacts associated with the South Creek crossing in the event of blockage.
- 5) A flood study would be prepared during detailed design for each stage in conjunction with precinct planning being undertaken by DP&I for adjacent release areas and would be provided to council. The study would also consider the timing of future drainage improvements and flood mitigation measures provided by the development of the surrounding land catchments.

The design hydrologic standard of the proposal is for a 1 in 100 year ARI level of flood immunity. The REF has identified that detailed design would ensure that flooding conditions for existing developments upstream and downstream of the proposal would not be adversely impacted. RMS, in consultation with Council and DP&I, would investigate the use of permanent detention basins at various locations as required by the mitigation measures in the REF. This would include the potential use of basins planned for precinct development. The Senior regional environmental officer, Sydney region would be consulted about the need for any further environmental assessment for measures identified including detention basins.

- 6) As outlined in the REF, a flood study investigation for the upper South Creek catchment located within the Camden local government area is currently in progress. A peer review of the Lyall and Associates report (2011) in conjunction with the upper South Creek flood study (once released) would be undertaken to determine the most accurate flows during detailed design. The report documenting the peer review would be provided to Council for information.
- 7) Gross pollutant traps (GPT) would be considered for South Creek, Kemps Creek, Scalabrini Creek and Bonds Creek during detailed design. Design considerations for any proposed GPTs (or other water quality treatment devices) would address access and maintenance issues, as well as the impact of potential blockage on treatment performance.
- 8) Design standards for any basins required would include the relevant requirements of the Dam Safety Committee.

- 9) Waterway crossings including bridges would be designed in accordance with AS5100-Bridge design. Relevant bridge design standards and safety considerations would form part of the detailed design scope.

RMS would undertake risk assessments during detailed design to guide the provision of safety barriers at drainage inlet and outlet structures. Relevant bridge design standards and safety considerations would form part of the scope of detailed design.

- 10) The concept design has taken into consideration the precinct development plans available at the time. RMS would continue to liaise with DP&I and councils and take into consideration any new or revised plans, including the Indicative Layout Plan, made available during detailed design.

## 2.5.2 Maintenance

Submission number(s)

8

Issue description

- 1) Council does not accept responsibility for the maintenance of the channels along the batters and they are viewed as a major cost burden to Council. Council has made a number of suggestions in its submission to address issues relating to ongoing maintenance of channels. Appropriate access should be provided for the cleaning and maintenance of drainage channels.
- 2) Appropriate access and safety measures should be provided for the proposed drainage channel at the King Street intersection.

Response

- 1) Standards relevant to the design of drainage channels would be included in the detailed design scope for the proposal and would take into account cleaning and maintenance requirements. RMS would continue to minimise the size and number of drainage channels required, and would consult with Council regarding maintenance responsibilities.
- 2) Appropriate safety and access measures for the drainage channel at the King Street intersection would be provided.

## 2.6 Non-Aboriginal heritage

Submission number(s)

6, 10

Issue description

- 1) The Upper Canal is listed on the State Heritage Register and impacts should be minimised. The SCA's s170 Heritage and Conservation Register is finalised and endorsed by the NSW Heritage Council.
- 2) The relocation of the original riveted iron gate should be undertaken in consultation with SCA.

- 3) RMS should consider landscaping for, and repositioning of the William Brown memorial and water trough so that they can be better viewed by the public.
- 4) Council agrees with the Heritage assessment and Statement of Heritage Impact undertaken by Austral Archaeology (July 2011). Council requests that RMS implement all safeguards in Section 8.2 of Austral Archaeology (July 2011) to mitigate impacts to Heritage.

## Response

- 1) A Statement of Heritage Impacts (SoHI) was carried out by Austral Archaeology (2011) for the Upper Canal. At the time of the assessment, the Upper Canal was identified on the draft SCA s170 Heritage and Conservation Register. It is noted that the register has been finalised and includes the Upper Canal.  
The SoHI found that there would be direct impacts to some elements of the State Heritage listed Upper Canal including removal of the existing road bridge, and relocation of the iron riveted gate (main entrance).

Section 6.4.5 of the REF provides safeguards to minimise impacts including:

- SCA to be consulted regarding the proposed design and construction of the new bridge over the Upper Canal.
- Archival recording to be undertaken.

In addition, the REF further identifies that works would be undertaken in accordance with the Section 60 approval to be sought from the NSW Heritage Council prior to any works that would affect the State Heritage listed item.

- 2) Section 6.4.5 of the REF includes a requirement for RMS to consult with SCA in regard to the design and construction footprint of the proposed Upper Canal bridge to avoid or minimise impacts to its heritage value. This would include consultation in regard to the relocation of the original riveted iron gate.
- 3) RMS would consult with SCA during detailed design and prior to construction regarding landscaping of and potential repositioning of the William Brown Memorial and water trough to improve viewing access.
- 4) All safeguards outlined in section 6.4.5 of the REF would be implemented in order to mitigate impacts to heritage. Section 4 of this report includes all of the relevant safeguards listed in Section 8.2 of Austral Archaeology (July 2011).

## 2.7 Biodiversity

### 2.7.1 Biodiversity certification

Submission number(s)

7

Issue description

- 1) DP&I is concerned that the REF is inconsistent with the Biodiversity Certification.

DP&I has identified a number of issues for RMS to address:

- a. RMS should map the areas of existing native vegetation (ENV) to be cleared based on the ENV maps in the Growth Centres Conservation Plan.
- b. The Flora and Fauna paragraph of the executive summary in the REF should emphasise that the proposed upgrade maintains consistency with the biodiversity certification and should make reference to biodiversity measure (RBM 11).
- c. Section 4.1.2 of the REF should highlight the need for the proposed upgrade to be compliant with the biodiversity certification.
- d. An offset provided through riparian vegetation restoration plan is not adequate and does not meet the requirements of the Biodiversity Certification. If offsetting is being undertaken via restoration or revegetation it should be done at a ratio of 3:1.
- e. A Biodiversity Offset Strategy should be developed in consultation with both the Strategies and Land Release section of DP&I and OEH/EPA and should satisfy the requirements of the Biodiversity Certification.
- f. Details of the Offset Strategy and how it is to be implemented should be included in the REF.
- g. RMS should provide offset areas prior to determination if possible and at least before construction takes place.
- h. In order to maintain biodiversity certification, all infrastructure projects should be consistent with the certification. The proposal should be consistent with the biodiversity certification.

#### Response

- 1) RMS would ensure that the proposal is consistent with the biodiversity certification. The safeguard in Section 6.6.4 of the REF states that offsetting would be undertaken through a riparian vegetation restoration plan. It is noted that DP&I would not consider this plan to be adequate therefore a Biodiversity Offset Strategy would be developed in consultation with the Strategies and Land Release section of DP&I and Office of Environment and Heritage/Environment Protection Agency (OEH/EPA) and would be in accordance with RBM11 and the biodiversity certification. The strategy would be prepared as a separate document during project development and would be based on the areas mapped as part of the Growth Centres Conservation Plan. RMS would map the existing native vegetation to be cleared as part of the offset strategy and would endeavour to secure offsets prior to construction where possible.

#### 2.7.2 Flora impacts

Submission number(s)

11

Issue description

- 1) Council requests RMS to provide any revegetation proposal, including Vegetation Management Plans and details of vegetation off-setting within the South West Growth Centre particularly where it occurs in Camden LGA and where the land is identified to come under its future care and maintenance as a Council reserve.
- 2) Council requests the RMS to translocate the *Marsdenia viridiflora* ssp. *viridiflora* population to an appropriate nearby location which guarantees its long term conservation within either Camden or Liverpool LGA. Additionally a Translocation Management Plan should be developed and approved by the Office of Environment and Heritage (OEH/EPA) prior to its translocation.

## Response

- 1) As addressed above in section 2.7.1, RMS would prepare a Biodiversity Offset Strategy for the removal of the existing native vegetation as mapped in the Growth Centres Conservation Plan and provide this plan to Council. Any residual land handed back to Council for future care and maintenance would have a vegetation management plan prepared.
- 2) As in the REF Section 6.6.4, the locations of *Marsdenia viridiflora* found near Bringelly Road were all within certified lands. RMS would commit to preparing a management plan for *Marsdenia viridiflora* that would include, but not be limited to, opportunities for staff from The Australian Botanic Gardens to collect specimens. In addition, Camden Council would be consulted about possible relocation of this species within a Council reserve and the management plan would be prepared prior to construction and in consultation with OEH/EPA and Council.

### 2.7.3 Fauna impacts

#### Submission number(s)

11

#### Issue description

- 1) Three locations of the Cumberland Plain Land Snails were identified in the REF in the Liverpool LGA in non-certified land. Council recommends relocation of the Cumberland Plain Land Snails.
- 2) The Eastern Bent-wing Bat has previously been recorded in the locality and is known to roost in stormwater channels. The consultant has advised that the placement of a bat box under the bridge is under consideration by RMS. Council requests RMS to provide the bat boxes as recommended. Council also requests RMS to provide an equivalent number of bat boxes in appropriate locations prior to the removal of the hollow bearing trees and construction commencing.

## Response

- 1) Section 6.6.4 of the REF includes safeguards to mitigate impacts to flora and fauna. This section specifically includes the requirement for a procedure for a suitably qualified ecologist to undertake pre-clearing surveys for the Cumberland Land Snail. Suitable habitat would be identified and snails and important habitat elements (large woody debris) would be relocated from the impact area to a suitable pre-identified area within the study area which would not be cleared as part of the proposal. In addition, any plan to relocate the Cumberland Land Snail would be discussed with the National Parks and Wildlife Service (NPWS).
- 2) A terrestrial ecology report was prepared (Parsons Brinckerhoff, 2011) and is summarised in section 6.6 of the REF. It found that five threatened species of bats have the potential to use hollow bearing trees and the South Creek Bridge as habitat. Section 6.6.4 of the REF identifies that a nest box management plan would be prepared by a suitably qualified ecologist to determine the need/requirements for nest/roost boxes to mitigate impacts on threatened bats.

## 2.8 Traffic and access

### 2.8.1 Precinct development impacts

Submission number(s)

7, 10

Issue description

- 1) DP&I and RMS should continue to work together to ensure that the road network in the Austral and Leppington North Precincts is supported by the proposed configuration of intersections along Bringelly Road.
- 2) The detailed design and land acquisition should consider the Austral and Leppington North Precinct Plan, in particular the planned dual carriageways of Eastwood Avenue and Rickard Road and a fourth leg at the Browns Road intersection, linking southwards to Byron Road.
- 3) Detailed design should take into consideration the DP&I Indicative Layout Plan, especially layout of local roads that are adjacent to and/or intersect Bringelly Road.

Response

- 1) RMS in its development of the concept plan for the proposal has taken future precinct development into consideration (refer to section 2.1 of the REF). RMS would continue to work with DP&I to ensure that the road network in the Austral and Leppington North Precincts would be supported by the proposed configuration of intersections along Bringelly Road.
- 2) The concept design and land acquisition for classified road purposes has taken into consideration future land development in the South West Growth Centre (SWG) and detailed design and land acquisition would refer to any updated precinct plans, including the Indicative Layout Plan developed by DP&I.

Boundaries for Bringelly Road would be finalised during detailed design based on the proposed ultimate configuration of the road (six lanes, three in each direction). The intersections of Bringelly Road with Eastwood Road and Rickard Road / Edmondson Avenue have been designed to accommodate the dual carriageways proposed for these side roads.

Provision has been made in the DP&I Indicative Layout Plan for a future extension to Byron Road. RMS would provide an intersection at Bringelly Road and Browns Road that would accommodate the future extension of the fourth leg to Byron Road. Construction of the extension to Byron Road would be the responsibility of Council or a developer when it is required.

RMS is responsible for land acquisition for the purposes of upgrading State Roads and this includes Bringelly Road.

- 3) The concept design took into consideration the precinct development plans available at the time. RMS would continue to liaise with DP&I and councils and take into consideration any new or revised plans, including the draft Indicative Layout Plan released in November 2011, and any updates made available by DP&I during detailed design.

## 2.8.2 Construction impacts

Submission number(s)

8

Issue description

- 1) Construction traffic haul routes should be identified and Council's written consent required for the use of local roads.

Response

- 1) Section 6.7.2 of the REF identifies that construction traffic, including delivery trucks, would require the use of local roads. The REF identifies safeguards for construction traffic impacts including that a Traffic Management Plan would be prepared and would include measures to maintain the capacity of local roads. This would include identification of haul routes including those on local roads.

In addition RMS would:

- Discuss the Traffic Management Plan with the local council.
- Prepare condition surveys of haul routes prior to construction.
- Ensure that load limits of local roads would be observed.

## 2.8.3 Operational traffic impacts

Submission number(s)

1, 4, 5, 7

Issue description

- 1) The concrete median between Cowpasture Road and Browns Road would restrict residents turning movements. There is a perception that the proposal would decrease safety and people would attempt to make unsafe U-turn movements.
- 2) Turning Church Street into a left in-left out arrangement would result in traffic congestion at Masterfield Street including that the right hand turning lane would be congested by buses and parents and staff attempting to gain access to Rossmore Ave West. Turning lanes and traffic light synchronisation should be adequate to avoid impacting through traffic on Bringelly Road. A more suitable alternative at this junction would have been a roundabout enabling travellers to return back up Bringelly Road and turn left into Church Street.
- 3) Rossmore Avenue West near Bellfield College should include a school zone and appropriate signage.
- 4) The proposal would increase traffic impacts on residents of Rossmore Avenue West.
- 5) There are too many traffic lights (seven) between Eastwood Road and Camden Valley Way.
- 6) It is recommended that the road environment is designed in such a way as to encourage slower speeds in built up areas such as Leppington Town Centre and Rossmore Village.

## Response

- 1) The concrete median would improve safety and reduce the potential for head on crashes by restricting movements to left in left out only at properties and preventing U-turns between two intersections. It is illegal to make a U-turn at signalised intersections in NSW.

The proposal is designed to facilitate safe and efficient transport on a principal arterial road corridor. Ultimately all access to properties in Austral and Leppington North precincts would be via the internal road network which would be implemented over time. The Austral and Leppington North precincts are expected to be gazetted in mid 2012 with development of the precincts to commence after this.

The proposal would have some impact on local traffic by restricting turning movements to left in and left out at unsignalised intersections, and from property driveways. The temporary provision of U-turn facilities at Jersey Road, North Avenue and Eastwood Road as well as signalised intersections at less than one kilometre spacings would minimise the additional distance to travel as a result of these restrictions (refer to Section 6.7 of the REF for further detail).

- 2) A traffic study (AECOM 2011) was undertaken which included modelling for all intersection arrangements for the proposal, including at Masterfield Street. Traffic modelling was undertaken at the intersection of Bringelly Road and Masterfield Street. The modelling has accounted for Bellfield College school traffic and shows that the level of service at this intersection is predicted to be at Level of Service (LOS) A until 2026. Intersection performances can be characterised by their Level of Service in a six-point scale (A to F) measuring the extent of delay experienced at the intersection, with Level of Service A being the highest level of service.

The design of the signalised intersections at North Avenue and Masterfield Street would consider the turning circle for buses. A dedicated right turn bay from Bringelly Road would be provided at both these intersections and would be of sufficient length to avoid impacting through traffic.

The sequencing and timing of the traffic signals would be determined closer to the opening date of the intersections and would be governed by the volume and movement of traffic at that time. Sequencing of traffic signals would be monitored and adjusted as required to provide an efficient level of service including for traffic associated with Bellfield College.

A roundabout would not be a suitable treatment at a four-way dual lane (two lanes in each direction) intersection as suggested by submission for the corner of Bringelly Road and Masterfield Street. The proposed traffic light intersection would better manage traffic flow and provide a safe intersection treatment

Proposed works west of King Street, including at Church Street, would form part of Stage 2 works. Bringelly Road along this section would be upgraded as precinct development progresses. It is thought that this would not occur for some time.

- 3) Rossmore Avenue West is a local road managed by Liverpool City Council. Signage requirements including an appropriate posted school zone would be discussed with Council during detailed design for Stage 2 of the proposal, if required.

- 4) Rossmore Avenue West between Masterfield Street and Church Street is assumed to have low existing traffic volumes. During Stage 2 of the proposal traffic volumes on this section of Rossmore Avenue West would increase as vehicles including school buses, and cars for staff and students of Bellfield College would be required to turn right onto Masterfield Street and travel east along Rossmore Avenue West to Bellfield College. Prior to construction of Stage 2 the potential for any traffic impacts on Rossmore Avenue West between Masterfield Street and Church Street would be considered and appropriate management and mitigation measures identified. In addition, access arrangements for the Bellfield College would be altered during precinct planning by DP&I and council. An outcome of the precinct planning process would be an indicative street layout, and proposed land uses, including at Rossmore Avenue West.
- 5) The proposed signalised intersections are consistent with the DP&I Indicative Layout Plan and they utilise existing roads where possible. The seven proposed traffic signals would allow traffic to make safe turning movements into and out of adjacent precincts, and maintain the flow of traffic on Bringelly Road. The traffic signals have been located 500 metres apart through the Leppington town centre to facilitate access into and out of the town centre and to nearby areas.

The intersections at Browns Road/Byron Road, and Dickson Road/Fourth Avenue, and transit boulevard of Edmondson Avenue/Rickard Road in particular, would perform an important function in circulating traffic around the future Leppington town centre. With substantial growth and changes being planned for adjacent land uses, the number of traffic lights is considered appropriate. The sequencing and timing of the traffic signals would be determined closer to the opening date of the intersections and would be governed by the volume and movements of traffic at that time. Sequencing of traffic lights would be monitored and adjusted as required.

- 6) The proposal was designed to the standards in the RMS road design guide (RTA 1988) and would be reviewed by RMS road safety section as stated in section 6.7.3 of the REF. The intended sign posted speed limit would be 80 km/h except through Rossmore Village where it would be 60 km/h until the land is redeveloped as an outcome of precinct planning. Consideration would be given to revising the posted speed limit for safety reasons if required along certain sections (eg in the vicinity of Leppington Town Centre). This would be considered during detailed design in consultation with Council and DP&I when more information is available regarding adjacent land uses.

#### 2.8.4 Operational access impacts

Submission number(s)

4, 6, 7, 9, 10

Issue description

- 1) A pedestrian crossing should be provided at the proposed railway station.
- 2) Access to all properties should be maintained after the proposal is complete. RMS should further consider options for access to lands between Camden Valley Way intersection and Cowpasture Road (south of Bringelly Road) when finalising the concept design.
- 3) There is likely to be a major north-south movement of cars, buses, bicycles and pedestrians across Bringelly Road at the future Leppington Town Centre. Cowpasture Road South, Browns Road, Edmondson Avenue, Fourth Avenue and Eastwood Road

are identified as key pedestrian crossing locations.

- 4) The land for the construction of a pedestrian bridge in the vicinity of Leppington Town Centre should form part of property acquisitions.
- 5) An option of extending Rossmore Avenue West to North Road should be considered to improve access and address traffic impacts for Bellfield College.

#### Response

- 1) Appropriate pedestrian crossing facilities have been incorporated by DP&I into the street layouts close to Leppington station. A shared path for pedestrians and cyclists would be provided along Bringelly Road. Crossing facilities would be available at all signalised intersections for the proposal.
- 2) The concept design includes provision for a three way intersection 650 metres west of Camden Valley Way. This was requested by Western Sydney Parklands as detailed in Section 3.2.1 of the REF. The intersection would service the northern side of Bringelly Road. The geometry of the intersection has been designed so that a fourth leg can be constructed if required in the future, with the southern leg of the intersection able to provide access to land between Camden Valley Way and Cowpasture Road on the southern side of Bringelly Road. Access to Bringelly Road would be maintained as left in-left out for existing properties until such time as the road network has been developed as part of precinct planning.
- 3) Pedestrian crossings would be provided at all signalised intersections along Bringelly Road as detailed in the concept design (refer to Section 3 of the REF for proposal description and Appendix A for concept design). This includes Cowpasture Road South, Browns Road, Edmondson Avenue, Fourth Avenue and Eastwood Road.
- 4) Pedestrian crossings would be provided at all signalised intersections along Bringelly Road as detailed in the concept design. RMS has commenced discussions with DP&I about the need for a pedestrian bridge within Leppington Town Centre, and any land acquisition requirements.
- 5) Rossmore Avenue West is a local road and any extension of it through to North Avenue would need to be considered in future precinct planning by DP&I and Liverpool Council. The traffic modelling conducted by (AECOM 2011) summarised in Chapter 6.7 of the REF indicates that the Church Street left in-left out and the Masterfield Street signalised intersections would adequately meet the traffic and access demands to and from the school.

## 2.9 Noise and Vibration

### 2.9.1 Noise

Submission number(s)

3, 7

Issue description

- 1) The proposal should include operational noise mitigation measures such as window glazing, roof soundproofing and noise reduction walls (to be built on the road reserve).
- 2) RMS should consider operational noise impacts on future land uses under the draft Indicative Layout Plan.

## Response

- 1) A noise and vibration assessment was prepared (Renzo Tonin and Associates 2011) in accordance with noise and vibration criteria presented in the NSW Office of Environment and Heritage's (OEH) 'Road Noise Policy' (RNP) (2011), 'Interim Construction Noise Guideline' (ICNG) (2010) and RMS's 'Environmental Noise Management Manual' (ENMM) (2001) and a summary is provided in Section 6.8 of the REF. This assessment identified existing properties along the route that would exceed noise criteria (at design year 2026) and require noise attenuation as part of the proposal. The assessment also identified existing properties along the proposal route that currently experience acute noise levels and would also require noise treatment as part of the proposal.

During detailed design a feasible and reasonable assessment would be undertaken in accordance with RMS ENMM Practice Note IV (selecting and designing feasible and reasonable treatment options). This would determine what noise mitigation treatments would be applied to the proposal and affected properties. All affected property owners would be consulted regarding proposed noise treatments for their properties.

As identified in section 6.8.3 of the REF, due to the requirement of driveway access for most of the residences facing Bringelly road and residences not typically closely grouped together, noise walls would not be considered as part of the proposal.

- 2) Noise treatments for new developments (future land uses) would be the responsibility of the developer in accordance with the Growth Centres Development Code. RMS would treat existing properties where noise criteria are exceeded.

## 2.9.2 Vibration

Submission number(s)

6

Issue description

- 1) Dilapidation surveys of the Upper Canal should be undertaken prior to construction and report sent to SCA for review.
- 2) An Upper Canal Collapse Contingency Plan should be prepared and submitted to SCA for review at least four weeks prior to construction works. The plan should address: potential instability of the Upper Canal wall leading to collapse during construction and potential failure of the Upper Canal catch drains and/or drainage system due to changes in stormwater flows from the road corridor and construction area. Such failure may lead to runoff flowing into the Upper Canal.

## Response

- 1) A condition survey would be undertaken for all buildings and structures within 50 metres of the construction works including the Upper Canal in accordance with a Construction Noise and Vibration Management Plan (refer to Section 6.8.4 of the REF). RMS would prepare a condition survey for the Upper Canal and it would be provided to SCA for review. RMS would measure vibration levels from each plant on site prior to commencement of construction and identify safe buffer distances to be maintained to avoid structural damage to the Upper Canal. These safeguards are outlined in Section 6.8.4 of the REF.

- 2) Section 6.8.3 of the REF assesses the potential vibration impacts to structures and Section 6.8.4 of the REF lists safeguards to protect the Upper Canal. A Work Method Statement would be prepared and would include an Upper Canal Collapse Contingency Plan. This plan would be submitted to SCA for review. The plan would address potential instability of the Upper Canal wall leading to collapse during construction and potential failure of the Upper Canal catch drains and/or drainage system due to changes in stormwater flows from the proposal.

## 2.10 Landscape character and visual impacts

Submission number(s)

8

Issue description

- 1) Batter slopes should be treated with mass plantings to eliminate the need for intensive maintenance.
- 2) The area between the shared paths and the kerbs should be planted with ground cover and shrubs and should not be turfed to ensure these areas can be safely maintained by Council.

Response

- 1) An urban design and visual assessment report was prepared for the proposal (HBO+EMTB et al 2011). A complete copy of the report is available in Appendix D of the REF, and a summary of the findings is provided in Section 6.9 of the REF. The report provides a framework and general principles for the landscape design. The landscape design would be prepared at the detailed design stage and would determine the planting mass required including consideration of maintenance requirements. Landscaping requirements would be prepared in consultation with the relevant council and/or land manager for that area.
- 2) The landscape plan would be prepared during the detailed design in consultation with the relevant local council. The framework and general principles provided in the urban design and visual assessment (outlined above) would be applied for the landscaping between the shared paths and kerbs. The safety of maintenance crews as well as pedestrians, cyclists and road users would also be considered as part of the landscaping plans.

## 2.11 Socio-economic impacts

### 2.11.1 Access

Submission number(s)

6, 7, 9

Issue description

- 1) SCA vehicles and its contractors should be able to access the Upper Canal corridor on the northern side of the bridge at all times. Detailed design of access gates, security fencing and sufficient turning circles at the intersection of the Upper Canal and Bringelly Road should be finalised in consultation with SCA. Temporary security fencing during construction and permanent fencing during operation should be provided for at least 50

metres along the canal corridor from the bridge to prevent illegal access to the canal.

- 2) Pedestrian crossings at intersections in Leppington Town Centre should be encouraged through appropriate signal phasing. The carriageways should be as narrow as possible at this location to reduce severance caused by the road.
- 3) Pedestrian and bicycle crossing of Bringelly Road should be provided to ensure a link from the Western Sydney Parklands to the parkland corridor to Edmondson Park Town Centre.

#### Response

- 1) RMS would ensure that SCA vehicles and its contractors are able to access the Upper Canal corridor on the northern side of the bridge during construction. Appropriate security fencing during construction and operation would be provided. RMS would consult with SCA when finalising the design of the access gates, security fencing and turning circle requirements for the Upper Canal.
- 2) The size of signalised intersections has taken into account the number of lanes required for a principal arterial road function (three lanes, plus turning lanes for each direction) as well as road design requirements such as lane widths of 3.5 metres. Their size has been minimised where possible such as through reducing the width of the medians at intersections. Pedestrian requirements would be further considered during detailed design and through appropriate phasing of traffic signals to ensure pedestrian amenity and safety and to minimise severance impacts on the Leppington Town Centre.
- 3) Pedestrian/bicycle crossings would be provided at all signalised intersections along Bringelly Road and are included in the concept design. A pedestrian and bicycle link from the Western Sydney Parklands to the parkland corridor to Edmondson Park Town Centre would be provided. This would be a shared path and would be located on the northern side of Bringelly Road from Eastwood Road to the intersection with Camden Valley Way and Cowpasture Road. Here it would connect with the existing shared path on both of these roads. Users would then travel along the northern side of Camden Valley Way and cross at a signalised intersection using pedestrian activated signals to connect to Edmondson Park Town Centre.

#### 2.11.2 Maintenance

Submission number(s)

8

Issue description

- 1) A plan should be submitted for Council acceptance showing all assets that are to become Council's maintenance responsibility.
- 2) Road boundaries should be adjusted to ensure that all public assets are fully contained within the dedicated public roads.

#### Response

- 1) Following construction, a number of assets would be handed back to Council and subsequently maintained by the local council. A plan listing these assets would be provided to, and discussed with Council during detailed design.

- 2) RMS would contain all road assets within the road corridor. Utility assets would be relocated within the road corridor where possible.

### 2.11.3 Property impacts

Submission number(s)

2, 3, 5, 8

Issue description

- 1) The proposal could diminish the saleability of land due to the partial acquisition of land to accommodate Browns Road. Acquisition of properties should be kept to an absolute minimum.
- 2) The proposal would reduce the value of the identified land which would cause hardship as it is an asset for a self-funded superannuation.
- 3) Council should be provided with evidence of approval from property owner for any works on private property.
- 4) The proposal should avoid the use of batters in front of the identified property.
- 5) RMS should ensure the extent of the road widening is more than five metres from the house at the eastern end of Bringelly Road to allow for adequate entry and exit to the property.
- 6) A retaining wall should be provided in front of the identified house to avoid impacts on the piers of the house.

Response

- 1) As discussed in section 2.3 of this report, the proposed realigned four way intersection with traffic lights at Browns Road, accommodating a future Byron Road extension, was found to best meet the proposal objectives and to positively contribute to the development of the Austral and Leppington North precincts by providing suitable access and improved road infrastructure.

Following consultation with the affected landowner, the proposal at Browns Road has been refined to further reduce the impact on properties at this location. RMS will continue to minimise property impacts wherever possible during detailed design to keep the acquisition requirements to a minimum.

RMS would consult further with the affected property owners to discuss acquisition options and timing. All property valuations and acquisitions would be carried out in accordance with the RMS Land Acquisition Information Guide (RTA 2011 and provided at Appendix C of the REF) and the *Land Acquisition (Just Terms Compensation) Act 1991*. This would include a six month consultation period and twelve months until compulsory acquisition occurs if required. Acquisition could also be initiated by the owner due to hardship. Property valuations are determined based on the value of the property unaffected by the proposal as outlined in the Land Acquisition Guide.

- 2) RMS has adjusted the concept design to reduce the impact on properties at this location and would continue to minimise property impacts where possible during detailed design.

Property valuations are determined based on the value of the property unaffected by the road proposal as outlined in the Land Acquisition Guide. Acquisition can be initiated by the owner due to hardship.

- 3) RMS would consult with the relevant property owner about any works on private property including the potential lease of private property for construction purposes.
- 4) The extent of batters would be further investigated during detailed design. Access to properties would be maintained and/or adjusted as part of detailed design and property impacts would be minimised where possible. If required, any acquisition would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and the RMS Land Acquisition Information Guide (March 2011).
- 5) During detailed design, RMS would minimise property impacts where possible and continue to consult with affected property owners. Access to properties would be maintained and/or adjusted as part of detailed design.

At the eastern end of Bringelly Road, the road design is constrained by the bridge over the Sydney Water Upper Canal and heritage items located on the south east corner of Cowpasture Road. RMS would consult further with the affected property owner about the distance of the proposal from the identified property and to ensure adequate access is maintained.

- 6) The location and dimensions of retaining walls would be further investigated during the detailed design stage. The location and design of retaining walls would avoid or minimise property impacts wherever possible, including to ensure no damage to house piers as a result of construction and operation.

#### 2.11.4 Public transport

Submission number(s)

8, 9

Issue description

- 1) All bus stops should comply with Disability Standards for Accessible Public Transport.
- 2) All existing bus shelters are to be replaced with a modern equivalent and approved by council.
- 3) Bus priority measures should be considered for buses crossing Bringelly Road at Edmondson Avenue and northern extension of Eastwood Road.

Response

- 1) Bus stops would be designed to comply with all relevant Disability Standards for Accessible Public Transport.
- 2) The design of bus shelters would be in accordance with the RMS document *Beyond the Pavement* (RTA 2009), the RMS urban design policy, procedures and design principles. These would be designed in consultation with Camden Council and Liverpool City Council, and would have a consistent design on both sides of Bringelly Road.
- 3) Bus priority measures are included for the identified Transit Boulevard of Edmondson

Avenue/Rickard Road in the concept design. The Traffic and Transport modelling undertaken by AECOM (2011) identified that no bus priority measures are required for Eastwood Road at the intersection of Bringelly Road and that the proposal accounts for the proposed long term bus network.

## 2.12 Licensing and approvals

Submission number(s)

6, 8

Issue description

- 1) As the Upper Canal is a controlled area, RMS and its contractors may only enter SCA land in accordance with an access consent issued under clause 9 of the *Sydney Water Catchment Management Regulation 2008*. RMS is required to apply for access consent covering the design and construction stages. RMS should obtain a construction licence or lease for works on SCA land until land is acquired.
- 2) Council land should not be used for construction or ancillary facilities without prior consent from Council. Areas to be used for ancillary facilities, access or other construction purposes should be clearly identified for Council's consideration. Council may charge a commercial rent in accordance with its adopted fees and charges for the temporary use of land.

Response

- 1) RMS would consult further with SCA about the appropriate consent requirements under the *Sydney Water Catchment Management Regulation 2008* and would obtain all appropriate consents.
- 2) RMS would consult with Council about the potential use or lease of Council land for construction purposes, including any areas to be used for ancillary facilities, access or other construction purposes.

## 2.13 Cumulative impacts

Submission number(s)

6, 7, 9

Issue description

- 1) The Upper Canal bridge should be designed in a manner that would accommodate a future water supply pipeline.
- 2) RMS and DP&I should continue to monitor development interest and consider how commencement of the Bringelly Road upgrade might contribute to positive development outcomes in the Austral and Leppington North precincts.
- 3) Any changes to the road footprint proposed by RMS should preferably be confirmed and communicated to DP&I by April 2012 to enable the road design to be reflected in the final Precinct Plan.
- 4) The development of Bringelly Road should take into account planning documents (for

the Austral and Leppington North precincts) particularly the Indicative Layout Plan.

- 5) Detailed design should take into consideration future developments, for example the Bulky Goods area, and potential access via Bringelly Road during land development as well as visibility of development from Bringelly Road during operation.
- 6) Detailed design needs to take into consideration the South West Growth Centre Structure Plan, particularly in terms of adjoining land uses and proposed road links.

#### Response

- 1) Detailed design of the Upper Canal bridge would be undertaken in consultation with SCA and would consider the potential to accommodate a future water supply pipeline.
- 2) RMS in its development of the concept plan for the proposal has taken future precinct development and consultation with DP&I into consideration (refer to section 2.1 of the REF). RMS would, in consultation with DP&I, continue to monitor development interest and consider how commencement of the Bringelly Road upgrade might contribute to positive development outcomes in the Austral and Leppington North precincts.
- 3) RMS would continue to consult with DP&I during detailed design to ensure the best possible outcome is achieved and that the road design can be reflected in the final Precinct Plan.
- 4) The concept design has taken into consideration the precinct development plans available at the time (refer to Section 2.1 of the REF). The DP&I Indicative Layout Plan was made available in November 2011. During detailed design RMS would continue to liaise with DP&I and councils and take into consideration any new or revised plans, including updates to the Indicative Layout Plan.
- 5) Access to the bulky goods area and other developments would be from side streets as no vehicle access would be provided directly from Bringelly Road. Property access on Principal Arterial Roads would be restricted to maintain traffic flow and allow a higher speed limit.

Developments that have the potential to impact classified roads during construction or operation would have their development applications referred to RMS by Council. RMS would review the development application and provide consent conditions to avoid or minimise impacts to the operation of the classified road.

The visibility of developments from Bringelly Road would not be affected by the proposal.

- 6) The DP&I Indicative Layout Plan for the Austral and Leppington North Precincts was made available in November 2011. The transport network proposed in the precinct plan would be used during detailed design to maximise opportunities for land use and transport integration. The design of Bringelly Road is based on more recent and detailed information than the South West Growth Centre Structure Plan which was published as an "indicative land use planning tool" in 2005.

## 3 Additional assessment

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### 3.1 Provision of throw screens – Upper Canal bridge

#### 3.1.1 Summary

RMS would provide throw screens for the new bridge over the Upper Canal as part of the proposal.

An additional assessment (HBO+EMTB, February 2012) was undertaken to provide design guidance to reduce the visual impact of the throw screens to be installed on the Upper Canal Bridge. The assessment found that the visual impact of the screens would be minor when considered against the overall bulk and scale of the new bridge. Viewed from Bringelly Road the throw screens would be mostly in section and not visible until close to the bridge. Viewed from the Upper Canal, the throw screens would be seen in elevation, and a transparent screen material would make them hard to see until close to the bridge. The assessment noted that a well designed throw screen would visually articulate and enhance the character of the bridge.

A copy of the assessment is attached as Appendix B to this report. The throw screens would be designed during detailed design.

#### 3.1.2 Additional management and mitigation measures

The following additional landscape and visual impact safeguards and management measures have been identified for the detailed design of the throw screens:

- Consideration to tapering the ends of the screen towards the parapet and integrating the post positions with the traffic barrier posts.
- Design of the throw screens would consider providing an unsupported top edge in order to reduce the visibility of the screen.
- The mesh selected would maximise transparency to reduce impacts on views to and from the bridge where feasible.

The screens would be designed in accordance with RMS urban design guidelines for bridges and in consultation with SCA.

## 4 Environmental management

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The REF for the Bringelly Road upgrade identified the framework for environmental management, including management and mitigation measures that would be adopted to avoid or reduce environmental impacts (section 7 of the review of environmental factors).

After consideration of the issues raised in the public submissions, the management and mitigation measures for the following have been revised:

- General
- Soils, landscape and water quality
- Biodiversity
- Traffic and access
- Noise and vibration
- Landscape character and visual impacts
- Socio-economic impacts

Should the proposal proceed, environmental management will be guided by the framework and measures outlined below.

### 4.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Project Environmental Management Plan (PEMP) and a Contractors Environmental Management Plan (CEMP) will be prepared to describe safeguards and management measures identified. These plans will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The plans will be prepared prior to construction of the proposal and must be reviewed and certified by the RMS Environmental Officer, Sydney region, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP and PEMP would be developed in accordance with the specifications set out in the:

- RTA QA Specification G36 – Environmental Protection (Management System)
- RTA QA Specification G38 – Soil and Water Management (Soil and Water Plan)
- RTA QA Specification G40 – Clearing and Grubbing.

### 4.2 Summary of safeguards and management measures

Environmental safeguards outlined in this document would be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards would minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in Table 3.1. This table includes all safeguards from the REF. Where safeguards in the REF have been replaced or additional safeguards included, the text is highlighted in *Italics*.

**Table 4-1:** Summary of site specific environmental safeguards.

No.	Impact	Environmental safeguards
1	General	<ul style="list-style-type: none"> <li>• <i>RMS would undertake risk assessments during detailed design to guide the provision of safety barriers at drainage inlet and outlet structures.</i></li> </ul>
2	Soil, landscape and water quality	<p>Design</p> <ul style="list-style-type: none"> <li>• Detailed design of bridges and culverts would include measures to minimise potential scouring of banks.</li> <li>• The location and sizing requirements for the temporary sediment retention basins would be reviewed during detailed design and be based on the guidelines and procedures set out in the publication entitled Soils and Construction – Managing Urban Stormwater Volume 1 (Landcom, 2004) and Volume 2 (DECC 2008).</li> <li>• A soil conservationist from the then RTA’s Erosion, Sedimentation and Soil Conservation Consultancy Services Register is to be engaged during detailed design to develop an Erosion and Sedimentation Management Report. All recommendations are to be considered for incorporation during design development. The soil conservationist is to at least consider: <ul style="list-style-type: none"> <li>○ Proposed staging plans for the project to ensure appropriate erosion and sediment control is possible.</li> <li>○ The likely run-off from each road sub-catchment</li> <li>○ Diversion of up-slope water around the site</li> <li>○ The direction of run-off and drainage points during each stage of construction</li> <li>○ The locations and sizing of sediment basins</li> <li>○ Requirements for erosion and sediment controls during construction according to the Department of Housing’s publication Managing Urban Stormwater – Soils and Construction.</li> </ul> </li> <li>• The construction methodology and soil and water management plan for the bridge over the Upper Canal would be developed in consultation with the Sydney Catchment Authority. The Sydney Catchment Authority would be further consulted to confirm satisfactory measures are employed at the Upper Canal.</li> <li>• During detailed design the use of regional stormwater management basins would be investigated including</li> </ul>

No.	Impact	Environmental safeguards
		<p>those basins identified on preliminary plans for development of adjacent precincts. These investigations would consider water quality and spill containment measures to protect the water quality in Scalabrini Creek, Bonds Creek, Kemps Creek and South Creek and would take into account the progression of precinct planning and development. <i>The Senior Regional environmental officer, Sydney region would be consulted about the need for any further environmental assessment for measures identified.</i></p> <p>Pre-construction</p> <ul style="list-style-type: none"> <li>• A Soil and Water Management Plan (SWMP) would be prepared as part of the Construction Environmental Management Plan (CEMP) for the proposal prior to the commencement of construction. The SWMP would address the then RTA Code of Practice for Water Management, the then RTA Erosion and Sedimentation Procedure and incorporate specifications outlined in the NSW Soils and Construction – Managing Urban Stormwater Volume 1 “the Blue Book”(Landcom, 2004) and Volume 2 (DECC, 2008).</li> <li>• The SWMP would: <ul style="list-style-type: none"> <li>○ Include an Erosion and Sedimentation Control Plan (ESCP).</li> <li>○ Identify areas requiring management controls.</li> <li>○ A maintenance schedule for on-going maintenance of temporary and permanent sedimentation (if determined as being required during detailed design) controls</li> <li>○ Be reviewed by RMS’s Environmental Officer, Sydney Region prior to commencement of works.</li> </ul> </li> <li>• The ESCP would include: <ul style="list-style-type: none"> <li>○ Staged plans for the creek diversion works.</li> <li>○ Staged plans for the construction of the bridges over South Creek and the Upper Canal including the installation of appropriate/adequate safety barriers along</li> </ul> </li> </ul>

No.	Impact	Environmental safeguards
		<p>the Upper Canal within the construction area prior to works commencing.</p> <ul style="list-style-type: none"> <li>○ The prompt completion of works relating to drainage and sediment control to minimise exposure time of disturbed areas</li> <li>○ The provision of sediment and filter traps in advance of and in conjunction with earthworks operations, to prevent sediment laden run-off leaving the site.</li> </ul> <ul style="list-style-type: none"> <li>● Testing for contaminated materials would be undertaken at the proposed excavation areas adjacent to the service station at Rossmore Village, the intersection of Northern Road and the Upper Canal Bridge.</li> <li>● Should contaminated material be found, then a procedure would be developed to manage the contaminated material in terms of rehabilitation requirements, waste classification and subsequent transport and disposal requirements.</li> </ul> <p>Construction</p> <ul style="list-style-type: none"> <li>● A procedure would be prepared for dewatering activities. The procedure would include but not be limited to: <ul style="list-style-type: none"> <li>○ A map showing areas of the proposal that would require dewatering</li> <li>○ Detailed description and justification of all selected dewatering methods.</li> <li>○ Description of onsite water reuse requirements</li> <li>○ A map showing proposed discharge locations for any offsite discharge</li> <li>○ Design requirements for each offsite discharge location to prevent erosion at the discharge location or in the receiving environment</li> <li>○ Water quality objectives relevant to the type of dewatering activity</li> </ul> </li> </ul>

No.	Impact	Environmental safeguards
		<ul style="list-style-type: none"> <li>○ Description of the water quality treatment techniques to be used</li> <li>○ Water sampling and testing regime to validate water quality prior to and (if required) during dewatering</li> <li>○ Proposed monitoring and supervision regime.</li> <li>● Work Method Statements (WMS) would be prepared for high risk activities such as culvert and bridge works including but not limited to: <ul style="list-style-type: none"> <li>○ The embankment north of Bringelly Road from 150 metres west of the Western Sydney Parklands entry to 70 metres along 26th Avenue</li> <li>○ The embankment north of Bringelly Road from 140 metres up along 26th Avenue to 300 metres east of the Western Sydney Parklands entry. The maximum height would be 7.8 metres along a total length of around 440 metres.</li> <li>○ The embankment north of Bringelly Road between Eastwood Road (north) and 120 metres west of the Fourth Avenue intersection. The maximum height would be 6.5 metres along a total length of around 410 metres.</li> <li>○ Chainage 5180 (Kemps Creek culvert)</li> <li>○ Chainage 6450 (Scalabrini Creek culvert)</li> <li>○ Chainage 7640 (Bonds Creek culvert)</li> <li>○ Chainage 8330 (Upper Canal bridge) including demolition of the Upper Canal bridge and construction of the new bridge including adjacent batters or retaining walls to the east and west of the bridge.</li> <li>○ Chainage 1100 (tributary of South Creek culvert)</li> <li>○ Chainage 1780 (main arm of South Creek bridge)</li> </ul> </li> </ul>

No.	Impact	Environmental safeguards
		<ul style="list-style-type: none"> <li>• The Work Method Statement (WMS) for the high risk activities would include, but not be limited to, the following: <ul style="list-style-type: none"> <li>○ Description of works/activities including machinery</li> <li>○ Outline of the sequence of the works/activities, notably creek diversion works and any dewatering requirements.</li> <li>○ Dewatering would be undertaken in accordance with the then RTA Environmental Management of Construction Site Dewatering (April 2011).</li> <li>○ Identification of environmental impacts due to works/activities.</li> <li>○ An environmental risk assessment to determine potential risks to discrete work elements or activities likely to affect the environment or residents.</li> <li>○ A map indicating the locations of likely potential environmental impacts.</li> <li>○ Evaluation of methods to reduce environmental risks.</li> <li>○ Mitigation measures to reduce environmental risks.</li> <li>○ A process for assessing the performance of the implemented mitigation measures.</li> <li>○ A process for resolving environmental issues and conflicts.</li> <li>○ Emergency procedures for chemical spills and other potential emergency incidents.</li> </ul> </li> <li>• The WMS would be forwarded by the Project Manager to the environmental officer for review and approval prior to commencement of works.</li> <li>• The Sydney Catchment Authority would be given the opportunity to review the WMS for works to demolish</li> </ul>

No.	Impact	Environmental safeguards
		<p>the existing bridge and construction a new bridge over the Upper Canal.</p> <ul style="list-style-type: none"> <li>• Construction works would be undertaken in line with RMS's Guideline for Construction Water Quality Monitoring.</li> <li>• Progressive erosion and sediment control plans would be prepared and implemented.</li> <li>• Temporary sediment retention basins (Appendix A) would be constructed to assist in the control of sediment laden water leaving the construction site. The final location of these has not been determined. Should the location of these be outside the impact area, further assessment may be required.</li> <li>• An incident emergency spill plan would be developed and incorporated into the CEMP. The plan would include measures to avoid spillages of fuels, chemicals, and fluids onto any surfaces or into any adjacent/nearby waterways and emergency response plan. An emergency spill kit would be kept onsite at all times.</li> <li>• In the event of an incident the OEHL/EPA would be notified of any incidents resulting in environmental harm as per Part 5.7 of the <i>Protection of the Environment Operations Act 1997</i>.</li> <li>• All staff would be inducted into the incident emergency procedures and made aware of the location of emergency spill kits.</li> <li>• Should a spill occur during construction, the incident emergency spill plan would be implemented, and RMS Regional Environmental Officer, Sydney Region would be contacted. Incidents and spills potentially affecting the Upper Canal would also be reported to the Sydney Catchment Authority's incident notification hotline.</li> <li>• All fuels, chemicals, and liquids would be stored at least 50 metres away from any waterways or drainage lines and would be stored in an impervious bunded area within the compound site.</li> <li>• The refuelling of plant and maintenance of machinery would be undertaken in impervious bunded areas.</li> </ul>

No.	Impact	Environmental safeguards
		<ul style="list-style-type: none"> <li>• Vehicle wash downs and/or concrete truck washouts would be undertaken within a designated bunded area of an impervious surface or undertaken off-site.</li> <li>• Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery.</li> <li>• Stockpiles would be managed in accordance with the Stockpile Site Management Guideline (RTA 2011)</li> <li>• A site stabilisation plan would be prepared as part of the CEMP. The plan would include but not be limited to the following: <ul style="list-style-type: none"> <li>○ Identification and mapping of areas along the length of the proposal requiring stabilisation</li> <li>○ Risk assessment for disturbed areas and stockpiles</li> <li>○ Detailed methods for stabilisation</li> <li>○ Develop a monitoring program for the stabilised areas</li> <li>○ Develop a process for determining the success of stabilised areas or methods</li> <li>○ Develop a process for identifying additional stabilisation methods <ul style="list-style-type: none"> <li>▪ All high risk areas would be stabilised within two weeks</li> <li>▪ All medium risk areas would be stabilised within one month</li> </ul> </li> </ul> </li> <li>• Batters would be stabilised using appropriate ground cover.</li> <li>• Disturbed surfaces would be compacted in anticipation of rain events to reduce the potential for erosion.</li> <li>• Topsoil would be stockpiled separately for possible reuse in landscaping and rehabilitation works.</li> <li>• Controls would be implemented at entry and exit points to minimise the tracking of soil and particulates onto pavement surfaces.</li> <li>• Any material transported onto pavement surfaces</li> </ul>

No.	Impact	Environmental safeguards
		<p>would be swept and removed at the end of each working day.</p> <ul style="list-style-type: none"> <li>• Soil sampling would be undertaken along South Creek, Kemps Creek and Bonds Creek where high risk of salinity occurs, to determine the level of salinity in the soils.</li> <li>• Where high saline soils are identified, salinity management options would be considered and incorporated into the detailed design for structure protection (eg concrete cover requirements).</li> <li>• Revegetation would include planting of deep-rooted salt-tolerant native species to assist in reducing the current potential for salinity in the locality.</li> <li>• Native trees would be retained where possible to prevent exacerbation of urban salinity.</li> <li>• In the event that indications of contamination are encountered (such as odorous or visually contaminated materials), work in the area would cease until an environmental consultant can advise on the need for remediation or other action, as deemed appropriate.</li> <li>• Testing for contaminants would be undertaken at the Upper Canal bridge prior to its removal. Should contaminants be found, appropriate containment measures would be employed during the removal so that water is not impacted. Any works on the bridge would be undertaken in consultation with the Sydney Catchment Authority.</li> </ul>
3	Hydrology	<p>Detailed design</p> <ul style="list-style-type: none"> <li>• The potential for the head wall at the north western side of the South Creek bridge to be shifted back about 200 metres into an open drainage structure to allow a longer time for water to settle and infiltrate in line with Water Sensitive Urban Design would be investigated during detailed design.</li> <li>• Waterway crossings including bridges would be designed in accordance with AS5100-Bridge design. Relevant bridge design standards and safety considerations would form part of the detailed design scope.</li> </ul>

No.	Impact	Environmental safeguards
		<ul style="list-style-type: none"> <li>• Consideration would be given to the design of waterway crossings at Kemps Creek and Bonds Creek to reduce impacts on the natural creek system.</li> <li>• The raising of the road level around Chainage 3760 would be considered during detailed design.</li> <li>• The potential to raise the road levels at Kemps Creek in order to achieve the necessary cover and flood immunity would be investigated during detailed design.</li> <li>• Provision of a permanent detention basin on the corner of Kelvin Park Drive would be investigated during detailed design.</li> <li>• RMS would discuss opportunities to take pavement water to the basin included in the precinct plan on Fourth Avenue with the Department of Planning and Infrastructure and incorporate into the detailed design. This would relieve pressure on the outlet into Scalabrini Creek.</li> <li>• The potential to use the basin included on the precinct plan at the corner of Browns and Bringelly Road would be discussed with the Department of Planning and Infrastructure.</li> <li>• The requirements for the outlet structure at Edmondson Avenue are not known at this stage and the works associated with the outlet would be investigated during detailed design and subject to further environmental impact assessment if required. The intent of the design would be that flow conditions as a result of the proposal do not impact on adjacent properties.</li> <li>• At the defined creek crossings (South Creek, Kemps Creek, Scalabrini Creek and Bonds Creek) measures such as gross pollutant traps would be considered in the detailed design to protect the environmental values of these creeks.</li> <li>• RMS would ensure that the road design does not reduce existing levels along the top of the levee east of the South Creek bridge during detailed design.</li> <li>• A flood study investigation for the upper South Creek Catchment located within the Camden Local</li> </ul>

No.	Impact	Environmental safeguards
		<p>Government Area is currently in progress. A peer review of the Lyall and Associates (2011) report in conjunction with the upper South Creek flood study (once released) would be undertaken to determine the most accurate flows during detailed design.</p> <ul style="list-style-type: none"> <li>• The proposal would be undertaken in line with the Code of Practice for Water Management (RTA 1999) and RMS's Water Policy.</li> <li>• The feasibility of including stormwater/pollutant treatment into the proposal drainage system would be investigated during detailed design.</li> <li>• Sydney Catchment Authority would continue to be consulted during detailed design in regard to suitable pollution prevention for the Upper Canal.</li> <li>• RMS would consult with Camden and Liverpool Councils during detailed design to confirm that future development upstream of Bringelly Road, including that which would take place in Leppington North and adjacent South West Growth Centre precincts would not increase peak flows arriving at the road corridor boundary.</li> <li>• During detailed design RMS would consult with affected landowners identified in Appendix E of Lyall and Associates (2011) regarding the potential drainage and flooding impacts on private properties and in order to formulate appropriate mitigation measures.</li> </ul> <p>Operation</p> <ul style="list-style-type: none"> <li>• Drainage systems would be checked at regular intervals and maintained to ensure they are operating at full capacity (eg clearance of debris from drainage lines).</li> </ul>
4	Air quality	<ul style="list-style-type: none"> <li>• An Air Quality Sub Plan would be prepared prior to the commencement of works as part of the CEMP. This plan would include the safeguards and mitigation measures detailed in the REF.</li> <li>• The NSW Office of Environment and Heritage (OEH) dust suppression goals would be applicable to the works. The goals stipulate that the maximum total dust deposited would be no more than four grams per square metres per month over a 12 month period but</li> </ul>

No.	Impact	Environmental safeguards
		<p>that there would not be more than two grams per square metres per month increase in dust deposition.</p> <ul style="list-style-type: none"> <li>• Any stockpiles and general areas with the capacity to cause dust would have site-specific safeguards implemented such as water spraying, compaction or progressive revegetation or stabilisation with cover crops to suppress dust emissions.</li> <li>• Stockpiles would be managed in accordance with the Stockpile Site Management Guidelines (RTA 2011).</li> <li>• Construction equipment would be properly maintained to ensure exhaust emissions comply with the <i>Protection of the Environment Operations Act 1997</i>.</li> <li>• Should wind reach a level where dust cannot be controlled, then the dust generating activity would be stopped.</li> <li>• Rehabilitation of disturbed surfaces would be undertaken within 20 days of final construction levels.</li> <li>• Temporary stabilisation of disturbed surfaces would be undertaken within one week.</li> </ul>
5	Non Aboriginal heritage	<p>Detailed design</p> <ul style="list-style-type: none"> <li>• RMS would endeavour to minimise any impacts to identified heritage items during the detailed design.</li> </ul> <p>Pre-construction</p> <ul style="list-style-type: none"> <li>• A Heritage Management Plan would be prepared as part of the CEMP. The plan would include, but not be limited to the following: <ul style="list-style-type: none"> <li>○ Sensitive areas map which clearly identifies the exclusions zones</li> <li>○ Mitigation measures to avoid risk of harm</li> <li>○ Process to communicate risk and responsibilities through environmental awareness training.</li> </ul> </li> <li>• Consultation with the Camden and Liverpool City Councils would be undertaken regarding potential impacts to locally listed heritage items, and with the NSW Heritage Council regarding potential impacts to the State listed Upper Canal.</li> <li>• The Department Education and Training would be advised of the proposal in relation to the Bringelly Public School Group and the Rossmore Public School heritage listed buildings as they are listed on that agency's s170 register.</li> </ul>

No.	Impact	Environmental safeguards	
		Site specific management measures	
		Item	Mitigation measure
		Allenby	<ul style="list-style-type: none"> <li>• A fenced exclusion zone would be erected around the curtilage prior to construction and maintained through construction works.</li> <li>• Archival recording of the ornate picket fence (including the gate posts and fence) located at the entrance of the property would be undertaken prior to construction works and/or any relocation of heritage items and in accordance with the NSW Heritage Guidelines.</li> <li>• The ornate picket fence would be reinstated in consultation with Camden Council and the property owner.</li> </ul>
		Bringelly Public School	<ul style="list-style-type: none"> <li>• A fenced exclusion zone would be erected around the school prior to construction and maintained through construction works.</li> <li>• Vegetative screening would be planted at the school boundary in consultation with the school.</li> <li>• Fencing (using a design appropriate to the heritage buildings) would be erected around the school boundary.</li> </ul>
		Church of the Holy Innocents	<ul style="list-style-type: none"> <li>• A fenced exclusion zone would be erected around the Church and Lot 2, 3 and 4 DP 117688 prior to construction and maintained through construction works.</li> <li>• Impacts to the old fence posts on Lots 2 and 3 and excavation at Lot 2 of the Church of the Holy Innocents would be avoided.</li> <li>• If excavation works are required to be undertaken within Lot 2, 3 and/or 4 of the church site, the Statement of Heritage Impact would be updated. This would determine if an archaeological Excavation or Exception Permit is necessary. If so a Section 140 or Exception application would be lodged with the NSW Heritage Branch.</li> </ul>
		Rossmore	<ul style="list-style-type: none"> <li>• A fenced exclusion zone would be</li> </ul>

No.	Impact	Environmental safeguards	
		Public School heritage buildings	<p>erected around the school prior to construction and maintained through construction works.</p> <ul style="list-style-type: none"> <li>• Vegetative screening would be planted at the school boundary in consultation with the school.</li> <li>• Fencing (using a design appropriate to the heritage buildings) would be erected around the school boundary.</li> </ul>
		W A Rogers House	<ul style="list-style-type: none"> <li>• A fenced exclusion zone would be erected around the house prior to construction and maintained through construction works.</li> <li>• Relocation of the brick pillars and fencing located at the entrance of W A Rogers House to the new front property boundary would be undertaken prior to the commencement of construction.</li> </ul>
		Sydney Catchment Authority Upper Canal System	<ul style="list-style-type: none"> <li>• A Section 60 application to the NSW Heritage Council would be submitted for impact on the State listed Upper Canal area. This application would be accompanied by an assessment and Statement of Heritage Impact that clearly sets out the precise nature of the predicted impacts and the recommended mitigative actions.</li> <li>• Impacts to the identified heritage items and associated infrastructure located within the Upper Canal allotments (Lot 1 DP 596355 and Lot 1 DP 725231) would be avoided or minimised.</li> <li>• Archival recording would be undertaken of all items (that may be inspected) in accordance with the Conservation Management Plan (CMP) for the Upper Canal and the NSW Heritage Guidelines prior to any works occurring.</li> <li>• The Avenue of Bunya pines would be protected with exclusion fencing during construction in accordance with the RMS Biodiversity Guidelines.</li> <li>• The SCA would be consulted in regard to any impact to heritage items associated with the Upper</li> </ul>

No.	Impact	Environmental safeguards	
			<p>Canal.</p> <ul style="list-style-type: none"> <li>• CMP heritage items such as the former cottage site (CMP Item 32) and other listed heritage items and infrastructure located within the Upper Canal allotments (Lot 1 DP 596355 and Lot 1 DP 725231) would be protected from accidental damage during construction by erecting exclusion fencing.</li> <li>• If below ground works (other than the bridge works) are required to be undertaken within the Upper Canal area, archaeological test excavation and/or archaeological monitoring may be required.</li> </ul> <p>Construction</p> <ul style="list-style-type: none"> <li>• If non-Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and the Senior Regional Environmental Officer contacted immediately. Works in the vicinity of the find must not re-commence until clearance has been received from those RMS officers and the Office of Environment and Heritage. Draft RTA unexpected finds procedure (2011) would be implemented including formal heritage impact assessments undertaken where required and management plans developed.</li> <li>• All construction personnel would undertake a heritage induction prior to construction works commencing.</li> </ul>
6	Aboriginal heritage	<p>Detailed design</p> <ul style="list-style-type: none"> <li>• Where RMS seeks to make a change to the design and construction of the proposal which changes the assessed impact on Aboriginal cultural heritage, RMS would need to prepare an assessment of the new impacts of this work in consultation with the archaeologist and stakeholders.</li> </ul> <p>Pre-construction</p> <p>An Aboriginal Heritage Management Plan would be prepared and incorporated into the CEMP. The plan would include, but not be limited to the following:</p> <ul style="list-style-type: none"> <li>• Sensitive areas map which clearly identifies the exclusions zones.</li> <li>• Mitigation measures to avoid risk of harm.</li> <li>• Process to communicate risk and responsibilities through environmental awareness training.</li> </ul> <p>Safeguards at specific locations</p> <ul style="list-style-type: none"> <li>• The location of the Aboriginal archaeological sites BRP-S-01, BRP-S-02, BRP-S-03, BRP-S-04, BRP-S-</li> </ul>	

No.	Impact	Environmental safeguards
		<p>08, BRP-S-19, BRP-IF-02, BRP-IF-04, BRP-IF-07, BRP-IF-08, BRP-IF-10, BRP-IF-12, SWRL Site 4, SWRL Site 7 are outside the impact area but would be identified in the contractor's environmental management plan, construction heritage sites map and proposal inductions to ensure they are not inadvertently damaged as a result of the proposal.</p> <ul style="list-style-type: none"> <li>• Salvage through the collection of surface artefacts would be undertaken at the archaeological sites BRP-S-05, BRP-S-06, BRP-S-07, BRP-S-11, BRP-S-12, BRP-S-17, BRP-S-18, BRP-S-20, BRP-IF-01, BRP-IF-11, BRP-IF-14. An AHIP would be obtained to undertake this work.</li> <li>• The five archaeological sites (BRP-S-10, BRP-PAD-01, BRP-S-24, BRP-S-25, BRP-IF-16) are of moderate Aboriginal heritage significance and require archaeological salvage excavation if the sites cannot be avoided. An AHIP would be obtained to undertake this work.</li> </ul> <p>Unexpected Finds</p> <ul style="list-style-type: none"> <li>• If Aboriginal heritage items are uncovered during the works the RMS unexpected finds procedure would be followed. All works in the vicinity of the find must cease and RMS Aboriginal Cultural Heritage Advisor and the Senior Regional Environmental Officer contacted immediately. Works in the vicinity of the find must not re-commence until clearance has been received from those RMS officers and the OEH/EPA.</li> </ul>
7	Biodiversity	<ul style="list-style-type: none"> <li>• Consideration would be given to the design of waterway crossings, including at Kemps Creek and Bonds Creek to reduce impacts on the natural creek system.</li> <li>• Temporary infrastructure would be sited and the sites managed to avoid potential impacts to areas of significant biodiversity, such as areas of native vegetation and the locations of records of the Cumberland Plains Land Snail.</li> <li>• <i>In addition, any plan to relocate the Cumberland Land Snail would be discussed with the National Parks and Wildlife Service (NPWS).</i></li> <li>• Minimising the removal of vegetation within areas that are 'non-certified' would be considered in the detailed design.</li> <li>• Scour protection works would minimise riparian vegetation loss wherever possible. Should removal of riparian vegetation be required the 'cut stump' method would be used to minimise bank scour. Scour protection measures would include revegetation with native riparian species as soon as practicable with the use of geotextile or similar to help stabilise banks while vegetation becomes established. Hard scour protection measures would be avoided wherever possible.</li> </ul>

No.	Impact	Environmental safeguards
		<ul style="list-style-type: none"> <li>• <i>During detailed design a nest box management plan would be prepared by a suitably qualified ecologist to determine the need/requirements for nest/roost boxes to mitigate impacts on threatened bats.</i></li> <li>• A flora and fauna management plan would be prepared as part of the CEMP. The plan would include but not be limited to the following: <ul style="list-style-type: none"> <li>○ Clearly defined vegetation clearing boundaries including a map representing areas that would need to be protected</li> <li>○ A suitably qualified ecologist is to be engaged to visit the site prior to any clearing works to clearly demarcate and map vegetation protection areas and conduct pre-clearing surveys</li> <li>○ Incorporate management measures identified as a result of the pre-clearing survey report and nominate actions to respond to the recommendations made</li> <li>○ A procedure for clearing of hollow bearing trees in line with the then RTA Biodiversity Guidelines</li> <li>○ Details of measures to be implemented to minimise the potential risk of clearing outside vegetation protection boundaries (eg exclusion zone fencing).</li> <li>○ Provision of education to all personnel taking part in construction activities with regards to the importance of clearing limits and remnants/individual trees of significant value</li> <li>○ Provisions to ensure that protected vegetation areas are not used as stockpile sites or vehicle parking areas</li> <li>○ A procedure for a suitably qualified ecologist to undertake pre-clearing surveys for the Cumberland Land Snail in suitable habitats and relocate any snails and important habitat elements (large woody debris) from the impact area to a suitable pre-identified area within the study area which would not be cleared during the proposal</li> <li>○ A weed management plan</li> <li>○ Rehabilitation requirements including the selection of suitable native plant species. Plant species chosen for revegetation under South Creek bridge would be chosen for their shade-tolerance (eg rainforest understorey species native to the Sydney Basin Bioregion) even if these species are not usually found in the Alluvial Woodland vegetation type</li> <li>○ <del>A nest/roost box management plan prepared by a suitably qualified ecologist. The plan</del></li> </ul> </li> </ul>

No.	Impact	Environmental safeguards
		<p>would include:</p> <ul style="list-style-type: none"> <li>▪ <del>an assessment of the number and type of roost boxes required to be installed at the bridge over South Creek to provide roost sites for the Large-footed Myotis which was recorded as roosting under this bridge and may be affected by vegetation clearing in this vicinity</del></li> <li>▪ <del>an assessment of the number and type of nest boxes required to be installed to mitigate the impact of loss of hollow bearing trees</del></li> <li>▪ <del>a monitoring and maintenance plan.</del></li> </ul> <ul style="list-style-type: none"> <li>• Compound and materials storage areas would be located within existing cleared areas within the impact area</li> <li>• Staff from the Mount Annan Botanic Gardens would be offered the opportunity to collect seed or vegetative material (eg cuttings or tubers) from the <i>Marsdenia viridiflora</i> ssp. <i>viridiflora</i> plants prior to vegetation clearing, for propagation at the gardens to aid in the conservation of the population of the species. <i>RMS would prepare a management plan for Marsdenia viridiflora that would include, but not be limited to, opportunities for staff from The Australian Botanic Gardens to collect specimens and consultation with Camden Council about possible relocation within a Council reserve. In addition, Camden Council would be consulted about possible relocation of this species within a Council reserve. The management plan would be prepared prior to construction and in consultation with OEH/EPA and Council.</i></li> <li>• The existing fish passage conditions would be maintained with the extension of culverts and duplication of the bridge over South Creek. All crossings would as a minimum adhere to the fish friendly passage guidelines (Fairfull &amp; Witheridge 2003) for waterway crossings</li> <li>• <del>Impacts on the vegetation and habitat in non-certified areas including the clearing of 1.4 hectares of highly disturbed Cumberland Plain Woodland and 3.1 hectares of highly disturbed River Flat Eucalypt forest would be offset through the implementation of a riparian vegetation restoration plan. This plan would be developed in consultation with OEH, be undertaken in accordance with "Recovering bushland on the Cumberland Plain" (DEC 2005) and would include measures to re-establish native vegetation, provide fauna habitat, protect water quality and increase habitat connectivity within the riparian zones of the study area. Offsets would be in accordance with relevant</del></li> </ul>

No.	Impact	Environmental safeguards
		<p><del>biodiversity measure 11 of the Biodiversity Certification.</del>  <i>A Biodiversity Offset Strategy would be developed in consultation with the Strategies and Land Release section of DP&amp;I and OEH/EPA and be in accordance with RBM11 and the biodiversity certification. The strategy would be prepared as a separate document during project development and would be based on the areas mapped as part of the Growth Centres Conservation Plan. RMS would map the ENV to be cleared as part of the offset strategy and would endeavour to secure offsets prior to construction where possible.</i></p>
8	Traffic and Construction access	<ul style="list-style-type: none"> <li>• A detailed traffic management plan (TMP) would be prepared as part of the construction environmental management plan (CEMP) during the detailed design phase. The TMP would be prepared in accordance with the RMS Traffic Control at Worksites and would include the guidelines, general requirements and procedures to be used when activities or areas of work have a potential impact on existing traffic arrangements. The TMP would be submitted in stages to reflect the progress of work and would include that: <ul style="list-style-type: none"> <li>○ <i>RMS would discuss the Traffic Management Plan with the local council.</i></li> <li>○ <i>Prepare condition surveys of haul routes prior to construction.</i></li> <li>○ <i>Ensure that load limits of local roads would be observed.</i></li> <li>○ Identify the traffic management requirements during construction.</li> <li>○ Describe the general approach and procedures to be adopted when producing specific traffic control plans.</li> <li>○ Ensure the continuous, safe and efficient movement of traffic for both the public and construction workers.</li> <li>○ Maintain the capacity of local roads.</li> <li>○ Determine temporary speed restrictions to ensure safe driving environments around work zones.</li> <li>○ Minimise impacts on existing Bringelly Road and local traffic.</li> <li>○ Provide access to local roads and properties, including the use of temporary turn-around bays.</li> <li>○ Provide temporary works and traffic signals.</li> <li>○ Determine the number and width of traffic lanes in operation.</li> <li>○ Identify traffic barrier requirements and placement.</li> <li>○ Include methods for implementing the traffic management plan.</li> <li>○ Include methods for minimising road user delays.</li> <li>○ Provide appropriate warning and advisory</li> </ul> </li> </ul>

No.	Impact	Environmental safeguards
		<p>signposting.</p> <ul style="list-style-type: none"> <li>○ Consider other developments such as the South West Rail Link and South West Growth Centre precincts that may also be under construction, to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic.</li> <li>○ Maintain designated pedestrian and cyclist access for safe movements along Bringelly Road.</li> </ul> <p>Operation</p> <ul style="list-style-type: none"> <li>• The proposal would be designed to the then RTA road design guide and would be reviewed by RMS road safety section.</li> <li>• RMS would ensure that SCA vehicles and its contractors are able to access the Upper Canal corridor on the northern side of the bridge during construction. Appropriate security fencing during construction and operation would be provided.</li> </ul>
9	Noise and vibration	<p>Pre-construction</p> <ul style="list-style-type: none"> <li>• During the detailed design stage of the proposal, further investigation of all feasible and reasonable noise control options would be undertaken. All feasible and reasonable noise mitigation treatments would be considered for the affected receivers as part of the road upgrade to reduce traffic noise levels at residences to within the applicable noise limits. Noise mitigation measures would also be considered to reduce traffic noise levels at residences identified as having 'acute' noise levels, where such levels have been predicted for the design year (ten years after opening of the proposal).</li> <li>• Noise mitigation measures would only be required for existing residences. Any future developments within the upgrade study area would be the responsibility of the developer or Council and not RMS.</li> </ul> <p>Construction</p> <ul style="list-style-type: none"> <li>• A Construction Noise and Vibration Management Plan (CNVMP) would be developed during finalisation of the construction methodology and the detailed design phase to mitigate noise impacts upon sensitive receivers. The CNVMP would include but not be limited to: <ul style="list-style-type: none"> <li>○ Identification of potentially affected properties and residences</li> <li>○ A risk assessment to determine potential risk for discrete work elements/activities likely to affect residents</li> <li>○ A map indicating the locations of likely potential impacts</li> <li>○ Mitigation measures to reduce excessive noise during construction activities including</li> </ul> </li> </ul>

No.	Impact	Environmental safeguards
		<p>those associated with truck movements</p> <ul style="list-style-type: none"> <li>○ A process for assessing the performance of the implemented mitigation measures</li> <li>○ A process for resolving issues and conflicts.</li> </ul> <ul style="list-style-type: none"> <li>• Vibration emission levels from each plant would be measured on site prior to the commencement of construction works and safe buffer distances should be determined to avoid structural damage to the Upper Canal and buildings of the school.</li> <li>• Dilapidation surveys for buildings within 50 metres of the construction works would be prepared in accordance with the Construction Noise and Vibration Management Plan (CNVMP). <i>The condition survey would be provided to SCA for review.</i></li> <li>• <i>An Upper Canal Collapse Contingency Plan would be prepared as part of the work method statement and provided to the SCA for review prior to construction. The plan would address: potential instability of the Upper Canal wall leading to collapse during construction and potential failure of the Upper Canal catch drains and/or drainage system due to changes in stormwater flows from the road corridor and construction area.</i></li> <li>• Where actual construction activities differ from those assessed in the noise and vibration assessment (Appendix J), more detailed design of noise control measures may be required once specific items of plant and construction methods have been chosen and assessed on site.</li> <li>• A CNVMP would be prepared and implemented to manage, mitigate and avoid adverse noise and vibration disturbance, taking into consideration OEH's Interim Construction Noise Guideline, 2009.</li> <li>• Works would be carried out during standard working hours (ie 7am–6pm Monday to Friday, 8am–1pm Saturdays). Any work that is performed outside normal work hours or on a Sunday or public holiday is to minimise noise impacts in accordance with the RMS <i>Environmental Noise Management Manual 2001, "Practice Note vii – Roadworks Outside of Normal Working Hours"</i> and the <i>Interim Construction Noise Guidelines</i> (OEH 2010). This would include notifying the local community of any works planned to be undertaken outside standard construction hours.</li> <li>• Regular updates on the proposal would be provided to the community.</li> <li>• A community liaison phone number and site contact would be provided so that noise and or vibration-related complaints if any can be received and addressed in a timely manner.</li> </ul> <p>Post-construction</p> <ul style="list-style-type: none"> <li>• Post construction noise monitoring of operational noise</li> </ul>

No.	Impact	Environmental safeguards
		<p>would be undertaken in accordance with Practice Note VIII of the RMS ENMM, within two to twelve months of proposal completion at selected representative locations along the upgrade route to give a minimum of seven days of data (excluding adverse weather).</p> <ul style="list-style-type: none"> <li>Operational feasible and reasonable noise mitigation would be determined during detailed design for impacted areas.</li> </ul>
10	Landscape character and Visual impacts	<ul style="list-style-type: none"> <li>Detailed design would be according to the urban design vision, objectives and principles which underpin the concept design.</li> <li>Detailed design would incorporate the urban and landscape design masterplan for Bringelly Road from section 6 of the urban design report.</li> <li>Existing trees would be retained in road corridor where technically feasible. During detailed design and construction the following techniques would be used to achieve this: <ul style="list-style-type: none"> <li>Arboricultural assessment of existing trees to identify techniques which can be applied to maximise trees' health and longevity. Arboricultural advice would continue during construction to identify specific mitigation for marginal situations identified during construction,</li> <li>Identification of and preparation of controls for 'no go areas' to restrict access around trees not affected by the proposal.</li> <li>Minor adjustment to the horizontal and vertical carriageways to move them clear of root zones</li> <li>Low retaining walls to avoid changes to ground level</li> </ul> </li> <li>Additional tree and shrub planting would be provided to minimise visibility of the road from adjoining residences.</li> </ul> <p>Specific recommendations to mitigate the potential landscape character and visual impact of the Bringelly Road upgrade have been separated into three sections.</p> <p>Specific mitigation for zones 1-6 (Stage 2):</p> <ul style="list-style-type: none"> <li>Zone 1 - Landscape and urban design would be integrated with road intersection design to reinforce the intersection area as a nodal point.</li> <li>Zone 2 - Landscape treatment along northern verge</li> </ul>

No.	Impact	Environmental safeguards
		<p>would maintain long distance views from the road while minimising visibility of the road from adjoining residences. Landscape treatment along southern edge would include screen planting to minimise potential views of road from residences.</p> <ul style="list-style-type: none"> <li>• Zone 3 - Existing trees would be retained in road corridor where technically feasible following the principles outlined in the general safeguard.</li> <li>• Zone 4 - Views from road across market gardens and grazing on flood plain would be maintained.</li> <li>• Zone 5 - The enclosed landscape character of the creek corridor would be retained and reinforced by additional tree planting in consultation with an ecologist.</li> <li>• Zone 6 – The existing semi-enclosed landscape character would be maintained by strategic tree planting along the road corridor.</li> </ul> <p>Specific mitigation for zones 7-9:</p> <ul style="list-style-type: none"> <li>• Zone 7 - Urban and landscape design of Rossmore commercial centre would create an integrated character to this nodal point and alert motorists as they approach it. Views from road to commercial development would be framed by tree planting in road corridor. Views to road from the school would be minimised by landscape treatment in road corridor. Existing trees would be retained.</li> <li>• Zone 8 - Enclosed visual character of road corridor would be maintained and reinforced where necessary by new planting associated with road upgrade. Shrub planting where necessary would screen views of the road from adjoining residences.</li> <li>• Zone 9 - Existing trees would be retained in road corridor where technically feasible following the principles outlined in general safeguard. Semi-enclosed landscape character would be maintained by strategic tree planting along road corridor.</li> </ul> <p>Specific mitigation for zones 10-15</p> <ul style="list-style-type: none"> <li>• Zone 10 - Open view from road across WV Scott Memorial Park to be maintained and framed by strategic tree planting. Existing trees to be retained as much as possible by methods described for sections 1-6 above.</li> <li>• Zone 11 - Enclosed character of road corridor would be maintained and reinforced where necessary by new planting associated with road upgrade. Shrub planting where necessary would screen views of the road from</li> </ul>

No.	Impact	Environmental safeguards
		<p>adjoining residences.</p> <ul style="list-style-type: none"> <li>• Zone 12 - Views from road to the Upper Canal and slopes of Western Sydney Parklands would be maintained. Cultural landscape character would be maintained and reinforced by additional tree planting, including Araucarias. Views to intersection from residences would be screened as much as possible.</li> <li>• Zone 13 - Enclosure provided by existing roadside cut slopes would be maintained.</li> <li>• Zone 14 - Panoramic views from road for motorists travelling east would be maintained with limited tree planting strategically placed in relation to key views.</li> <li>• Zone 15 - Views to road from adjoining areas would be minimised by landscape treatment including tree and shrub planting.</li> </ul> <p><i>During detailed design of the anti throw screen on the Upper Canal bridge, the following measures would be implemented:</i></p> <ul style="list-style-type: none"> <li>• <i>Consideration to tapering the ends of the screen towards the parapet and integrating the post positions with the traffic barrier posts.</i></li> <li>• <i>Design of the throw screens would consider providing an unsupported top edge in order to reduce the visibility of the screen.</i></li> <li>• <i>The mesh selected would maximise transparency to reduce impacts on views to and from the bridge where feasible.</i></li> <li>• <i>The screens would be designed in accordance with RMS urban design guidelines for bridges and in consultation with SCA.</i></li> </ul>
11	Socio-economic impacts	<ul style="list-style-type: none"> <li>• Local residents would be notified prior to works commencing and would be kept regularly informed of construction activities during the construction process.</li> <li>• A complaints-handling procedure and register would be included in the CEMP.</li> <li>• During construction, road users, pedestrians and cyclists would be informed of changed conditions including likely disruptions to access.</li> <li>• Property access would be maintained wherever possible. Prior to any unavoidable disruption to access, consultation would be undertaken with the affected property owner.</li> </ul>

No.	Impact	Environmental safeguards
		<ul style="list-style-type: none"> <li>• Residents would be informed prior to any interruptions to utility services that may be experienced as a result of utilities relocation.</li> <li>• Prior to construction RMS would also notify residents that may be in the vicinity of the site compound and work area.</li> <li>• Property acquisition would be managed in accordance with the provisions of the RMS Land Acquisition Policy and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i>.</li> <li>• <i>Security fencing would be installed for at least 50 metres along the Upper Canal corridor from the bridge.</i></li> <li>• <i>A plan listing assets that would be handed over to Council for maintenance would be provided to Council during detailed design.</i></li> <li>• <i>Bus stops would be designed to comply with Disability Standards for Accessible Public Transport.</i></li> <li>• <i>The design of replaced bus shelters would be in accordance with the RMS document <i>Beyond the Pavement (RTA 2009)</i>, the RMS urban design policy, procedures and design principles.</i></li> </ul>
12	Resource demand	<ul style="list-style-type: none"> <li>• Water captured in construction sediment basins would be reused for dust suppression. Watering of landscaped areas and any other suitable construction activity where feasible.</li> <li>• Procurement would endeavour to use materials and products with a recycled content and low carbon footprint where that material or product is cost and performance effective.</li> <li>• Excavated material would be reused on-site for fill where feasible.</li> <li>• Guideposts and signs would be reused or recycled where feasible.</li> </ul>
13	Resource and waste management	<ul style="list-style-type: none"> <li>• The contractor would classify any excavated spoil as per the <i>Protection of the Environment Operations Act 1997</i>.</li> <li>• Resource management hierarchy principles are to be followed:</li> </ul>

No.	Impact	Environmental safeguards
		<ul style="list-style-type: none"> <li>○ avoid unnecessary resource consumption as a priority</li> <li>○ avoidance is followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery)</li> <li>○ disposal is undertaken as a last resort (in accordance with the <i>Waste Avoidance &amp; Resource Recovery Act 2001</i>).</li> <li>● Water captured in construction sediment basins would be reused for dust suppression, watering of landscaped areas and any other suitable construction activity, where feasible.</li> <li>● Roadside materials (guide posts, guard rails etc) would be recycled.</li> <li>● Excavated material would be reused on other RMS projects where possible.</li> <li>● Other recyclable wastes would be separated and transported to a suitable recycler.</li> <li>● Construction waste material would not be left on-site once the works have been completed.</li> <li>● Working areas would be maintained, kept free of rubbish and cleaned up at the end of each working day.</li> <li>● Any offsite disposal of spoil would be accompanied by a Section 143 permit under the <i>Protection of the Environment Operations Act 1997</i>.</li> </ul>
14	Operational hazards and risks	<ul style="list-style-type: none"> <li>● In addition to the safeguards listed in other sections, a safety audit of the proposal would be undertaken prior to commissioning.</li> </ul>
15	Climate change	<p><b>Design</b></p> <ul style="list-style-type: none"> <li>● Detailed design, including drainage requirements, would take into consideration the effect of climate change on the proposal.</li> <li>● Further investigations into opportunities for reducing greenhouse emissions during construction and operation of the proposal would be undertaken during the detailed design phase.</li> <li>● Conservation of vegetation and planting of street trees providing shade to the road surfaces would be</li> </ul>

No.	Impact	Environmental safeguards
		<p>considered during detailed design.</p> <p><b>Construction</b></p> <ul style="list-style-type: none"> <li>• Delivery of materials with full loads would be collected from local suppliers where possible.</li> <li>• Appropriate sized construction equipment, plant and vehicles would be used.</li> <li>• Frequent servicing of equipment would be undertaken to ensure optimal performance and minimise down-time (which can reduce time disturbance and access areas).</li> <li>• Layout of the vehicles and buildings would be undertaken in a way to minimise movement and clearing.</li> <li>• Intelligent vehicle use, such as not leaving the engine idling when not in use, would be undertaken.</li> <li>• Investigation of alternative fuels and power sources to be used would be undertaken and implemented, where appropriate.</li> <li>• Energy efficiency and related carbon emissions of vehicle and plant equipment would be considered, where possible.</li> <li>• Recycling of waste would be undertaken where possible.</li> <li>• Material and waste supply and departure scheduling would be undertaken to optimise full loads and minimise required vehicle trips.</li> <li>• Minimisation of clearing of natural vegetation in the road design process would be considered and undertaken where feasible.</li> </ul> <p><b>Operation</b></p> <ul style="list-style-type: none"> <li>• Regular inspections of pavement and structures along the road corridor would be undertaken and maintenance carried out as necessary.</li> <li>• Energy-efficient lighting would be used where appropriate.</li> <li>• Investigation of alternative power sources to be used where appropriate (eg solar power).</li> </ul>

### 4.3 Licensing and approvals

**Table 4-2: Summary of licensing and approval required.**

Requirement	Timing
<p>Under the EPBC Act, a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance, the environment of Commonwealth land or are being carried out by the Commonwealth or a Commonwealth agency and are likely to have a significant impact on the environment.</p> <p>An assessment of significance has concluded that the proposal is likely to significantly affect Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest CEEC. The proposal would be referred to the Australian Government Minister for the Sustainability, Environment, Water, Population and Communities to determine whether or not the proposal constitutes a controlled action.</p>	<p>If the proposal is determined to be a 'controlled action', the approval of the Australian Government Minister for Sustainability, Environment, Water, Population and Communities would be required prior to any work commencing on-site.</p>
<p>In accordance with Section 199 of the <i>Fisheries Management Act 1994</i>, the RMS would have to give the Minister written notice and would have to consider any matters raised by the Minister in order to carry out any dredging or reclamation work.</p> <p>Section 220 of this Act requires the Minister to issue a permit for blocking of fish passage.</p>	<p>The proposal would involve dredging and reclamation work and therefore notification would be given to the Minister, and any matters raised by the Minister would be considered within 28 days after the giving of the notice. This would be undertaken prior to any dredging and reclamation being undertaken.</p> <p>It is likely that the proposal would temporarily block fish passage during the construction of culverts and accordingly a permit to block fish passage would be required under Section 220(1) of the Act.</p>
<p>An Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the <i>National Parks and Wildlife Act 1974</i> would be required. The proposal would impact upon 18 Aboriginal heritage sites either completely or partially. Where these sites cannot be conserved a Section 90 consent would be required prior to any impact to these sites.</p>	<p>An Aboriginal Heritage Impact Permit (AHIP) would be obtained prior to any construction works that may impact any of the 18 identified sites.</p>
<p>An excavation permit under Section 139 of the <i>Heritage Act 1977</i> may be required during excavation if a heritage item or relic is found.</p>	<p>This would be required during excavation if a heritage item or relic is found, prior to undertaking any further excavation works in that area.</p>

Requirement	Timing
<p>The proposal would impact the State Heritage Register (SHR) listed Upper Canal area and would require lodgement of a Section 60 application under the <i>Heritage Act, 1977</i> to the NSW Heritage Council. This application would be accompanied by an assessment and Statement of Heritage Impact that clearly sets out the precise nature of the predicted impacts and the recommended mitigation measures (see below). This would determine if an archaeological Excavation or Exception Permit is necessary.</p>	<p>Prior to the commencement of any work that would impact upon the Sydney Catchment Authority Upper Canal System.</p>
<p>The proposal would be a scheduled activity under the <i>Protection of the Environment Operations Act 1997</i>. An environment protection licence would be required under Section 48 of this Act to authorise the carrying out of scheduled development work.</p>	<p>This would be required prior to undertaking the scheduled work. Each period of 12 months (commencing from the issue of a licence) is a licence fee period for a licence. The administrative fee for any licence fee period of a licence must be paid not later than 60 days after the beginning of that licence fee period.</p>
<p>A Certificate of Competency under the <i>Pesticides Act 1999</i> would be required from OEH/EPA if certain types of pesticides are used to control pests.</p>	<p>The certificate must state the period of time for which it is granted and pesticides can only be used within that period.</p>
<p><i>Sydney Water Catchment Management Regulation 2008</i></p>	<p><i>RMS would consult further with SCA about the appropriate consent requirements under the Sydney Water Catchment Management Regulation 2008 and would obtain all appropriate consents.</i></p>
<p>Land acquisition would be required prior to construction of the proposal under the <i>Western Sydney Parklands Act 2006</i>.</p> <p>In the Act there are provisions for the Trust to surrender a parcel of land for the purposes of a public road.</p>	<p><i>RMS would consult further with the Western Sydney Parklands Trust about the land acquisition requirements under the Western Sydney Parklands Act 2006.</i></p>

## 5 References

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AECOM 2011, *Bringelly Road Upgrade review of environmental factors- Traffic and Transport Modelling Assessment*.

Austral Archaeology 2011, *MR647 Bringelly Road upgrade Camden Valley Way, Leppington to The Northern Road, Bringelly. Heritage Assessment and Statement of Heritage Impact*.

HBO+EMTB, February 2012, *Memorandum: Upper Canal Bridge Throw Screens Visual Impact*.

HBO+EMTB and Corkery Consulting 2011, *Bringelly Road upgrade: Camden Valley Way to The Northern Road. Urban design and visual assessment report*.

Lyll and Associates 2011, *Initial assessment of drainage requirements, Bringelly Road upgrade, The Northern Road to Camden Valley Way*.

**ngh**environmental 2011, *Bringelly Road upgrade Review of Environmental Factors*.

Parsons Brinckerhoff 2011, *Bringelly Road upgrade ecological assessment*.

Renzo Tonin and Associates 2011, *Bringelly Road upgrade, Camden Valley Way to The Northern Road, Noise and Vibration Assessment*.

RTA, 1988. *Road design guide*.



# Appendix A

## Invitation to comment

Table A-1. Method by which local businesses, community groups and Government agencies were invited to comment on REF

Community update provided	Hardcopy of REF provided	Electronic notification provided
Fire and Rescue NSW	Liverpool City Council	Oran Park Town - Greenfields Development Company
Ambulance Service of NSW	Camden City Council	
Comfort Delgro Cabcharge	Department of Planning & Infrastructure Strategy & Land Release	
Dr Andrew McDonald MP Member for Macquarie Fields		
Mr Chris Patterson MP Member for Camden		
The Hon Paul Lynch MP Member for Liverpool		
Camden Library		
Western Sydney Parklands Trust		
Office of Environment and Heritage		
Rebel Motorcycle Club		
The Islamic Community Centre		
Annabella Child Care Centre		
Renbury Farm Animal Shelter		
Austech Motors		
Ellis Produce		
Rossmore Brakes & Mechanical Repairs		
BP Service Station		
Rossmore Public School		
Bringelly Public School		
Department of Planning & Infrastructure		
Rossmore Veterinary		
Busabout		
Interline Buses		
Anglican Church Property Trust		
Hi Quality Group		
GT Business Solutions Pty Ltd		
Department of Education and Training		



# Appendix B

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Upper Canal bridge – throw screens  
visual impact

# HBO + EMTB

Architecture | Interior Design | Urban & Landscape Design | Heritage Conservation | Facility Management | Project Coordination | Consulting

## REQUEST FOR INFORMATION

Facsimile Message  
 Transmittal

Memorandum  
 Minutes

Telephone  
 RFI

Attention

Date:

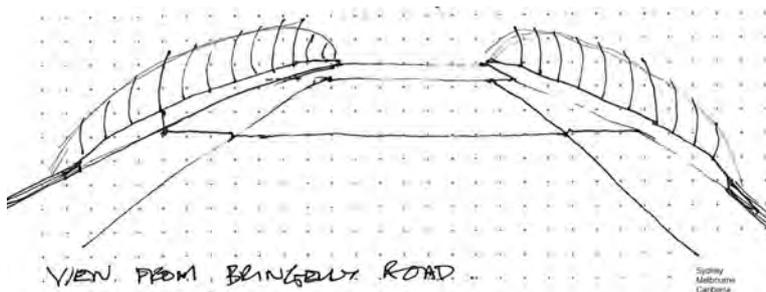
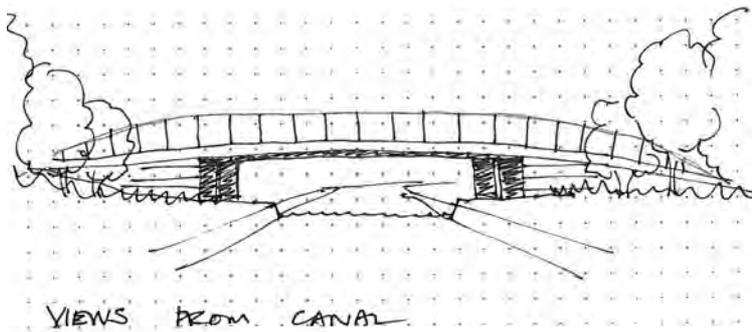
COMPANY	ATTENTION	PHONE NO.	EMAIL
<input checked="" type="checkbox"/> RMS	<input checked="" type="checkbox"/> Emma Davies	02 8849 2468	Emma.DAVIES@rms.nsw.gov.au

### Comments: Upper Canal Bridge Throw Screens Visual Impact

Throw screens are to be considered and designed as an integral part of the overall bridge design thereby reducing the visual impact. Generally a key principle is for the throw screen to extend for the full length of the bridge with a generous overlap to each abutment. This helps to give a balanced visual outcome and extend the apparent length of the screen with the bridge itself. A well designed throw screen can visually articulate and enhance the character of a bridge. Viewed from Bringelly Road the throw screens would be mostly seen in section and not clearly visible until close to the bridge. Viewed from the Sydney Water Canal the throw screens will be seen in elevation and the transparency of the mesh will make the throw screen hard to see until close to the bridge.

Other detailed design considerations will include:

- Minimising visual clutter through terminating screens by tapering the ends towards the parapet and integrating the post positions with the traffic barrier posts.
- The top edge of throw screens can be designed to be unsupported and the posts can be detailed with tapered ends creating an almost invisible edge.
- Careful detailing of the throw screen can help to minimise the visibility of the mesh. A 50 x 50mm aperture galvanised steel mesh is relatively transparent particularly when viewed as part of the bridge itself and background.



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