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# Googong IWC Project – Stage C Network West

## Review of Environment Factors

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## Executive Summary

Googong Township Proprietary Limited (GTPL) – a partnership between Canberra Investment Corporation (CIC) and Mirvac – is responsible for the development of the new Googong township that will be located in the Canberra region, around seven kilometres south of Queanbeyan in NSW. The new Googong township will be home to about 16,000 people and developed over the next 25 years.

The township is designed around an integrated water cycle (IWC), with a dedicated Water Recycling Plant (WRP) that will reduce the consumption of potable water in the community by around 60 per cent and recycle the township's water for non-potable use. The Googong Township IWC Project is being constructed and operated in stages to ensure the infrastructure is appropriately sized to meet the incremental level of demand as development of the Googong township progresses.

On 24 November 2011, the Googong Township Water Cycle Project Environmental Assessment (Manidis Roberts, 2010) was approved by the Minister for Planning under Part 3A (now repealed) of the *Environment Planning and Assessment Act 1979* (EP&A Act). The approval included Concept Approval for the ultimate development (Stage 1 and 2) and the Project Approval for Stage 1 development of the Googong Township IWC Project.

Stage 1 of the IWC project is under construction or has commenced operation. The Googong township development is expected to reach capacity of the Stage 1 IWC project by late 2016, therefore planning for Stage 2 of the IWC project has commenced.

Stage 2 of the IWC Project will be delivered in two sub stages in order to provide the appropriate IWC infrastructure to accommodate the size and growth of the Googong township. Therefore, Stage C is under development, with Stage D to be developed as demand requires in the future. Stage C has been further divided into three components, to facilitate project planning approvals, these being Stage C Network West (within Queanbeyan local government area (LGA)), Stage C Network East (within Palerang LGA) and Stage C WRP (within Queanbeyan LGA).

This REF assesses the Stage C Network West. The Stage C Network West works will include the following:

- Works associated with the installation of a potable water and a recycled water reservoir at Hill 800, the permanent reservoirs, including a recycle water discharge pipeline for any excess recycled water that needs to be released from the recycled water reservoir.
- Works associated with the installation of mains for recycled water and potable water, including:
  - The installation of a new potable water and recycled water rising mains (an extension to the existing pipelines) from the interim reservoirs to the permanent reservoirs.
  - The installation of a new gravity potable water and recycled water mains from the permanent reservoirs back into the Township.
  - A new potable water pipeline from the boundary of the Googong Foreshores to the WRP for potable water top-up. The upstream parts of this pipeline located within the Googong Foreshores, are part of the Stage C Network East.
- Works associated with the WRP, including:
  - The installation of a new recycled water holding tank.
  - Expanding the recycled water pumping station at the WRP site.
- Works associated with the decommissioning of the interim potable and recycled water reservoirs.

The proposal is for the purpose of a water reticulation system and under the provisions of the ISEPP (Clause 125(1)), development consent is not required for the proposal and the proposal is subject to an environmental impact assessment and determination under Part 5 of the EP&A Act. QCC is the determining authority for the proposal.

The components of the proposal related to recycled water or located on the WRP site are classified as a scheduled activity under the PoEO Act and therefore an EPL under this Act is required for both construction and operations.

## Consultation

Community consultation regarding the proposal for a Googong Township commenced in the preliminary development stages in early 2000s. The stakeholder consultation process for the Part 3A Concept Approval assessment for the Googong Township formally commenced in May 2007.

Consultation regarding the proposed Integrated Water Cycle for the Googong Township was undertaken during the preparation of concept designs and the environmental assessment throughout 2009 – 2010. The results of this consultation was considered as part of the proposal environmental assessment and are outlined in Chapter 16 of the Googong Township Water Cycle Project Environmental Assessment (Manidis Roberts, 2010).

In 2010 the NSW Department of Planning placed the Googong Township Water Cycle Project Environmental Assessment (Manidis Roberts, 2010) on public exhibition from 17 November to 20 December 2010. A Submissions Report was prepared in May 2011 considering and responding to the issues raised from the submission received and additional meetings were held with a number of residents and government agencies, including QCC, to discuss their concerns with the proposal.

In July 2015, a Community Letter for the Googong Stage C Network West project was delivered to all residents of the Googong township (via letterbox drop to about 250 residents) and to all community members listed on the Googong IWC stakeholders list (about 70 listed stakeholders). By early September no community members had contacted the project team to raise any issues or make any comments regarding the proposal.

In July 2015, key State and Federal agencies (as identified in the Part 3A Conditions of Approval) were consulted on the Googong township IWC Stage C Network West project. A letter was sent providing a brief outline of the project to agencies in accordance with the Part 3A Conditions of Approval. Responses were received six agencies. A majority of the submission were to ensure that particular issues were considered and assessed as part of the preparation of the REF, which has been undertaken.

## Environmental assessment

### *Traffic and transport*

The proposal would result in additional vehicle movements (both light and heavy vehicles) along local roads throughout the construction period. This impact is expected to be minor given the overall construction activities occurring within the Googong township.

The proposal would include the construction of a temporary access point to the permanent reservoir site from Old Cooma Road. This would include building a southbound deceleration and acceleration lane along Old Cooma Road immediately adjacent to the permanent reservoir site to provide safe access. Consultation with Roads and Maritime would be undertaken regarding the design and construction of these lanes and the impacts to the operation of Old Cooma Road are expected to be minor. The permanent access point would be established through the Googong township once development of the adjacent areas has commenced.



### *Visual amenity*

During construction the construction machinery, construction activities and excavation of the area will impact the visual amenity of the proposal area. However, given much of the Googong township is currently under development there are expected to be minimal to negligible visual impacts.

Works associated with the RWPS will not be visible from outside the WRP.

The permanent reservoirs site is located within an area currently shown on the masterplan as undeveloped open space labelled “Hilltop Park Lookout”. The reservoirs are positioned near the middle of the open space and would be able to be seen from most areas within the open space. Areas most visually affected are those immediately west of the reservoirs as the areas to the east are further away, at a lower elevation. The visual amenity of any dwellings built in close proximity to the permanent reservoir site will likely be affected to some degree; however views of the reservoirs from Old Cooma Road will likely be partially screened by future development. An existing residence near Fernleigh Drive and Old Cooma Road will have clear views to Hill 800 and the reservoirs from the south west. The permanent reservoir site is expected to have a moderate to high visual impact rating.

None of the pipelines or pumps are expected to have significant impacts on visual amenity as they are located in areas of limited visual accessibility and would primarily be located underground.

Decommissioning of the interim reservoirs will result in an improved visual amenity for the surrounding areas.

### *Noise and vibration*

A number of construction activities have the potential to exceed the required criteria at adjacent properties, including:

- Earthworks and concrete work stages at the WRP at two properties.
- Concrete works at the permanent reservoir site at three properties.
- Road works at one property.

However, due to the transient nature of many of the activities, the predicted maximum noise levels are only likely to be sustained at any one receiver for a relatively short period of time. All predicted construction noise levels are below the ‘highly noise affect’ NML target of 75dBA.

Impacts of the operation of the proposal to existing and future residential properties are expected to be negligible.

Construction activities are unlikely to have building damage impacts to adjacent buildings but some activities may cause human discomfort to some adjacent properties.

### *Biodiversity*

The proposal is not likely to impact on any threatened flora or fauna species, endangered ecological communities or migratory species.

About 0.18ha of the TSC Act threatened ecological community Box Gum Woodland would be cleared as a result of the proposal. However this community is highly modified within the proposal area and is not likely to have a significant impact. A total of five trees within this Box Gum Woodland would be removed as a result of the proposal. A seven part test has been undertaken for this impact on this ecological community and identified that a significant impact is unlikely and therefore a Species Impact Statement is not required.

Construction activities and the disturbance of soils may encourage the spread of noxious weeds throughout the proposal area and potentially into adjacent areas.

### *Bushfire assessment*

There is the potential for a grassfire to spread towards the permanent reservoirs site and WRP. This potential is limited by the availability of fuel influenced by season (rainfall, rates of growth and curing) and grazing by sheep. The intensity at the asset would be limited by the fuel load available within the grassland and would be of short duration during passing of the fire front (residence time), most likely less than 5 seconds based on the available fuel load present at time of site inspection.

Above ground assets and infrastructure at both sites are rated to be of low vulnerability primarily due to the nature of construction and external materials used. The reliance on steel (non-combustible) construction and the fact that the asset is not habitable or offering protection for human life, coupled with the low consequence of impact, means that the risk of significant or costly damage, or disruption to capacity, is low.

### *Aboriginal heritage*

No Aboriginal sites will be directly impacted by construction of the project. One Aboriginal site, GA6, is located twelve metres from the defined project area and is vulnerable to indirect and/or inadvertent impact during construction of the potable water and recycled water mains.

Operational activities related to proposal will not impact the identified Aboriginal sites.

### *Non-Aboriginal heritage*

Site GRWH5 does not meet the criteria for heritage listing and does not meet a threshold of local significance. In addition it is unlikely that the proposed works would have direct impacts on the identified heritage item and the item would likely be removed in the near future as part of the development of the Googong township. Therefore potential impacts on non-Aboriginal heritage are negligible.

### *Soil and water*

Construction activities that may affect soil include:

- Vegetation clearance, topsoil stripping and soil disturbance.
- Trenching and soil excavation.
- Soil contamination.

Soil erosion is most likely to occur during clearance and excavation works, particularly during any trench construction. Erosion can be from water (creating inter-rill erosion, rill and gully erosion and tunnel erosion) and wind. Potential impacts include the erosion of exposed areas, damage to retained vegetation due to eroded soils, and sedimentation of waterways increasing turbidity.

The key operational activity related to the Stage C Network West scope of works which has the potential to impact on the existing soil landscape is the discharge of excess recycled water from the recycled reservoirs site. Discharge would be via the excess recycled water discharge pipeline. Emergency discharges of potable water and recycled water in the event of a malfunction of telemetry and controls within the IWC system would also discharge from this pipeline. The excess recycled water discharged into the environment will meet the water quality requirements of the Project Approval for Stage 1 and the requirement that are expected to be included in the EPL for the operation of the IWC Project. Modelling has been undertaken to predict the volumes of excess recycled water that would be discharged from the permanent reservoirs site. In summary:

- Up to a maximum of 986kL of excess recycled water could be discharged in a day, but on some days no excess recycled water would be discharged. The average daily discharge is predicted to be about 159kL.

- On a monthly basis, January is predicted to have the lowest volume of excess recycled water discharged – 0.018ML or 18kL – as demand is predicted exceed supply on most days during the hottest months. July is predicted to have the highest volume of excess recycled water discharged – 11.978 ML – as demand in the colder months is predicted to be lower than supply.

There is potential impacts of erosion along the natural drainage line as part of this excess water discharge during operation, however it is only a temporary issue.

#### *Air quality*

Construction would generate minor dust impacts. The following construction activities are potential sources of dust generation:

- Vegetation clearing, trenching, backfilling and reinstatement.
- Wind erosion from stockpiling of excavated topsoil and trench spoil.
- Movement of vehicles and construction machinery, both within and in/out of the construction site.
- Drilling and blasting of hard rock areas.

During operation, it is unlikely that particulate matter (dust) would affect air quality within the proposal area. Odour impacts associated with the proposal are also likely to be negligible. All chemicals stored at the permanent reservoir site do not have potential odour impacts.

### **Conclusion**

The proposal as described in the REF best meets the project objectives and is consistent with the Part 3A Concept Approval, but would still result in some impacts on visual amenity, traffic, aquatic, noise and air quality. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts and they are not considered to be significant. The proposal would also provide important infrastructure to provide the integrated water cycle system for the Googong township. On balance the proposal is considered justified.

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# 1 Introduction

## 1.1 The proposal

Googong Township Proprietary Limited (GTPL) – a partnership between Canberra Investment Corporation (CIC) and Mirvac – is responsible for the development of the new Googong township that will be located in the Canberra region, around seven kilometres south of Queanbeyan in NSW. The new Googong township will be home to about 16,000 people and developed over the next 25 years.

The township is designed around an integrated water cycle (IWC), with a dedicated Water Recycling Plant (WRP) that will reduce the consumption of potable water in the community by around 60 per cent and recycle the township's water for non-potable use. The Googong Township IWC Project is being constructed and operated in stages to ensure the infrastructure is appropriately sized to meet the incremental level of demand as development of the Googong township progresses.

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Stage 2 of the IWC Project will be delivered in two sub stages in order to provide the appropriate IWC infrastructure to accommodate the size and growth of the Googong township. Therefore, Stage C is under development, with Stage D to be developed as demand requires in the future. Stage C has been further divided into three components, to facilitate project planning approvals, these being Stage C Network West (within Queanbeyan local government area (LGA)), Stage C Network East (within Palerang LGA) and Stage C WRP (within Queanbeyan LGA).

This REF assesses the Stage C Network West. The Stage C Network West works will include the following, (refer to Figure 1-1):

- Works associated with the installation of a potable water and a recycled water reservoir at Hill 800, the permanent reservoirs, including a recycle water discharge pipeline for any excess recycled water that needs to be released from the recycled water reservoir.
- Works associated with the installation of mains for recycled water and potable water, including:
  - The installation of a new potable water and recycled water rising mains (an extension to the existing pipelines) from the interim reservoirs to the permanent reservoirs.
  - The installation of a new gravity potable water and recycled water mains from the permanent reservoirs back into the Township.
  - A new potable water pipeline from the boundary of the Googong Foreshores to the WRP for potable water top-up. The upstream parts of this pipeline located within the Googong Foreshores, are part of the Stage C Network East.

- Works associated with the WRP, including:
  - The installation of a new recycled water holding tank.
  - Expanding the recycled water pumping station at the WRP site.
- Works associated with the decommissioning of the interim potable and recycled water reservoirs.

Further details of Stage C Network West works are provided in Section 3.

## 1.2 Purpose of the report

This REF has been prepared by RPS for GTPL, the proponent of the proposal. GTPL are acting as the proponent for and on behalf of Queanbeyan City Council (QCC). Under the provisions of the State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) the proposal is defined as a water reticulation system and development consent is not required. Therefore it is subject to an environmental impact assessment and determination under Part 5 of the EP&A Act with QCC as the determining authority.

The purpose of this REF is to describe the proposal, assess the likely impacts of the proposal on the environment, and to recommend measures to mitigate these impacts.

This REF has been prepared within the context of Clause 228 of the *Environmental Planning and Assessment Regulation 2000*, the *Threatened Species Conservation Act 1995*, the *Fisheries Management Act 1994*, and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999*. In doing so, the REF helps to fulfil the requirements of section 111 of the EP&A Act that the determining authority examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environment impact statement to be prepared and approval sought from the Minister for Planning under Part 5.1 of the EP&A Act.
- The significance of any impact on threatened species as defined by the *Threatened Species Conservation Act* and/or the *Fisheries Management Act*, in section 5A of the EP&A & Act and therefore the requirement for a Species Impact Statement.

In addition, this REF has taken into account the environmental assessment requirements for future stages of the Googong Township IWC Project that were included in the Concept Approval for the Project. These requirements are provided in Schedule 2 of the Concept Approval and are reproduced in Appendix B of this REF, with a reference to the section of the REF where each requirement is addressed. Where relevant, each section of this REF starts with an excerpt from Schedule 2 of the Concept Approval which lists the specific requirements relevant to each section and summarises the response to the requirement.

The potential for the Googong IWC Project to significantly impact a matter of national environment significance or Commonwealth land and the need to make a referral to the Commonwealth Department of the Environment for a decision by the Commonwealth Minister for the Environment was previously completed in parallel with the Part 3A Concept Approval process. An approval for the ultimate development of the Googong Township IWC Project (including Stage C) was granted on 19 May 2011 and no additional approvals are required for the proposal.



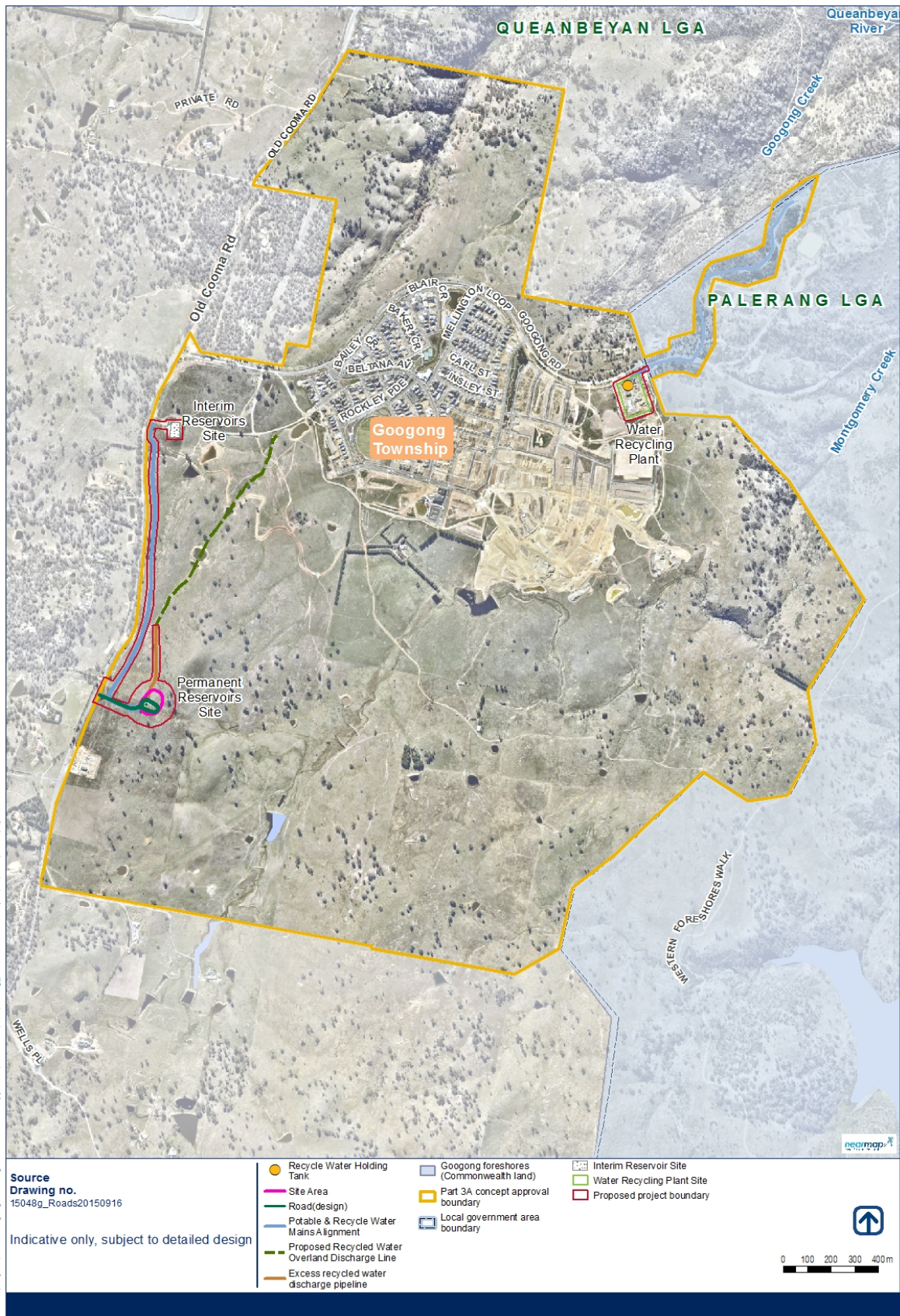


Figure 1-1 Stage C Network West scope of works

## 2 Strategic need

### 2.1 Part 3A Concept Plan Conditions of Approval

CoA#	Condition	Response
2.1 (c)	A demonstration that the project is consistent with the requirements of this Concept Plan approval and generally consistent with the scope and intent of the Concept Plan and environmental impacts outlined in the documents under condition 1.1 of this approval.	A demonstration that the proposal is consistent with the Concept Plan approval is outlined in section 2 of the REF.  Consideration of the environmental impacts of the proposal are outlined in section 6 of this REF.

### 2.2 Background

Googong is a new, master planned township in the Canberra region within NSW, located about seven kilometres south of the Queanbeyan CBD and about 16 kilometres from the Australian Parliament House (refer to Figure 2-1). On 24 December 2009 the NSW government re-zoned the area to provide for the Googong township. The township is to be built on 780 hectares of former grazing land and will include a town centre and four neighbourhood centres located in five walkable neighbourhoods. As a complete self-contained township, in addition to housing, Googong will provide community facilities, shops, schools, recreational and employment facilities.

GTPL – a partnership between CIC and Mirvac – is responsible for the development of the new Googong township. The new Googong township will include about 5,500 new homes, which will be home to about 16,000 people and will be developed over 25 years. The township is designed around the IWC system, with a dedicated WRP that will reduce the consumption of potable water in the community by around 60 per cent and recycle the township’s water for non-potable use.

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#### 2.2.1 IWC Project – Concept Approval

The Concept Plan Approval for the IWC Project provided for the potable water, recycled water and sewage system required to service the anticipated population of the Googong township at the ultimate development. This included (also refer to Figure 2-2):

- Potable water system – a new bulk water pumping station (BWPS) located adjacent to the existing Googong water treatment plant to transfer flows from the existing Icon Water supply system to new potable water reservoirs via a new rising main. Potable water distribution mains provided to transfer flows from the potable water reservoirs to the township’s water reticulation system. A potable water main to allow the recycled water system to be topped up when demand is high.
- Sewerage system – sewage to be collected from the Googong township and transferred to the WRP using the sewage mains. In some sections it would be pumped and in other sections it would flow by



gravity. The sewerage system includes a series of sewage pumping stations to transfer the flow to the WRP.

- WRP – a new WRP to treat sewage from the Googong township to a standard suitable for non-potable urban re-use and discharge to the environment. The plant utilises physical removal, biological and chemical treatment and disinfection to meet these standards, and membrane bioreactor technology at the core of the treatment process. Treated effluent from the plant would primarily be used for the recycled water system. When recycled water availability exceeds demand, excess water would be discharged into the stormwater management system.
- Recycled water system – recycled (non-potable) water produced by the WRP would be pumped to reservoirs. Flow from these reservoirs would then be transferred to the recycled water reticulation system through distribution mains and be used as required within the Googong township for non-potable household uses such as toilet flushing and garden watering, as well as for open space irrigation. This would reduce potable water demand by an estimated 60 per cent. Rainwater would also be collected throughout the new township for non-potable uses in houses and commercial facilities. To maintain supply of non-potable water during times of high demand, the potable water system would be used to top up the recycled water system.



Figure 2-1 Googong township master plan

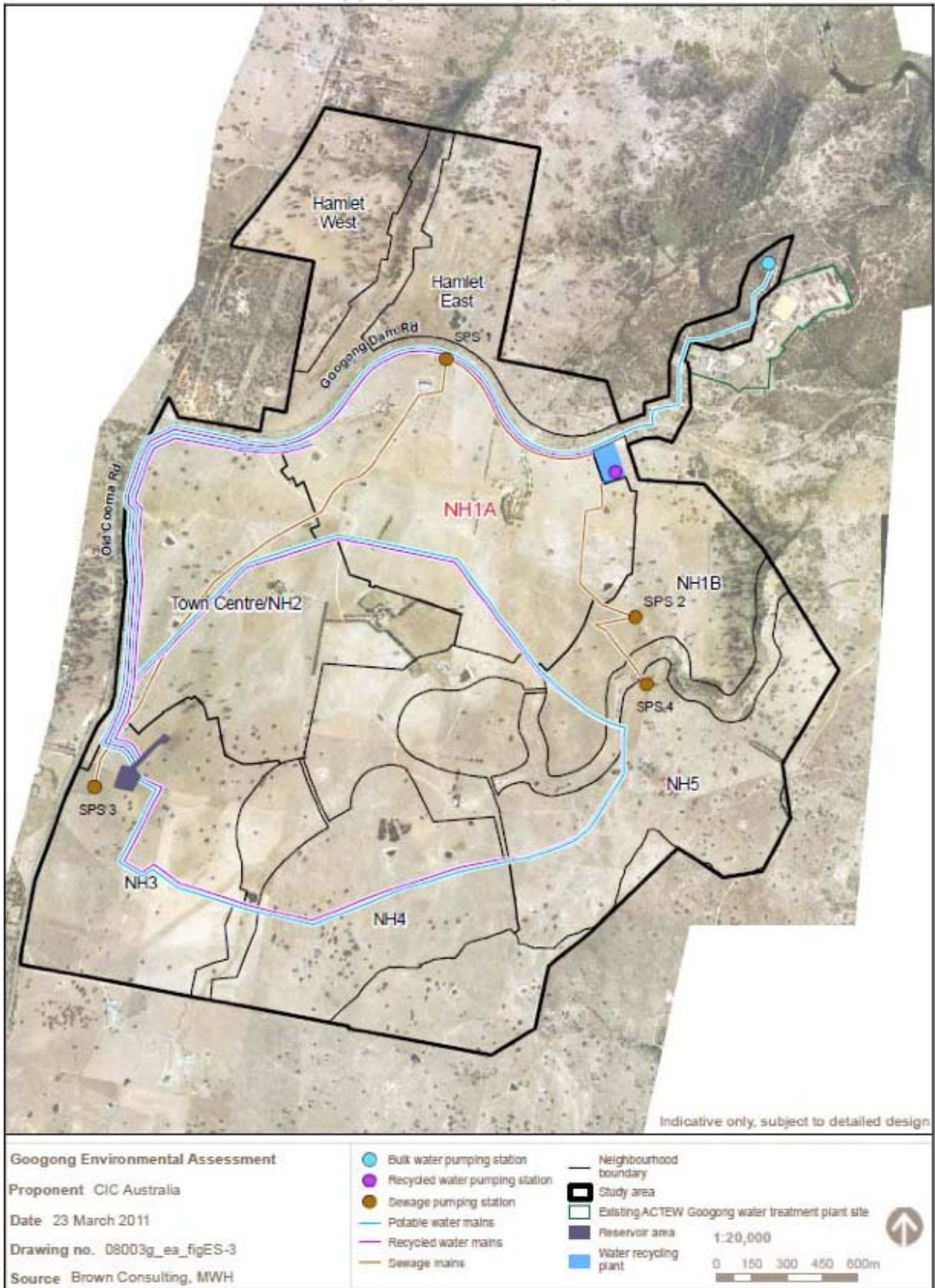


Figure 2-2 Googong IWC Concept Plan as approved under Part 3A Concept Approval

## 2.2.2 IWC Project – Stage 1 Project Approval

In addition to approving the overall Concept Plan for the Googong IWC Project, the Part 3A approval included a Project Approval for Stage 1 of the IWC Project. Stage 1 involves the infrastructure required to service the initial stage of the Googong township, with an equivalent population (EP) of 3,600.

Stage 1 of the IWC Project includes (refer to

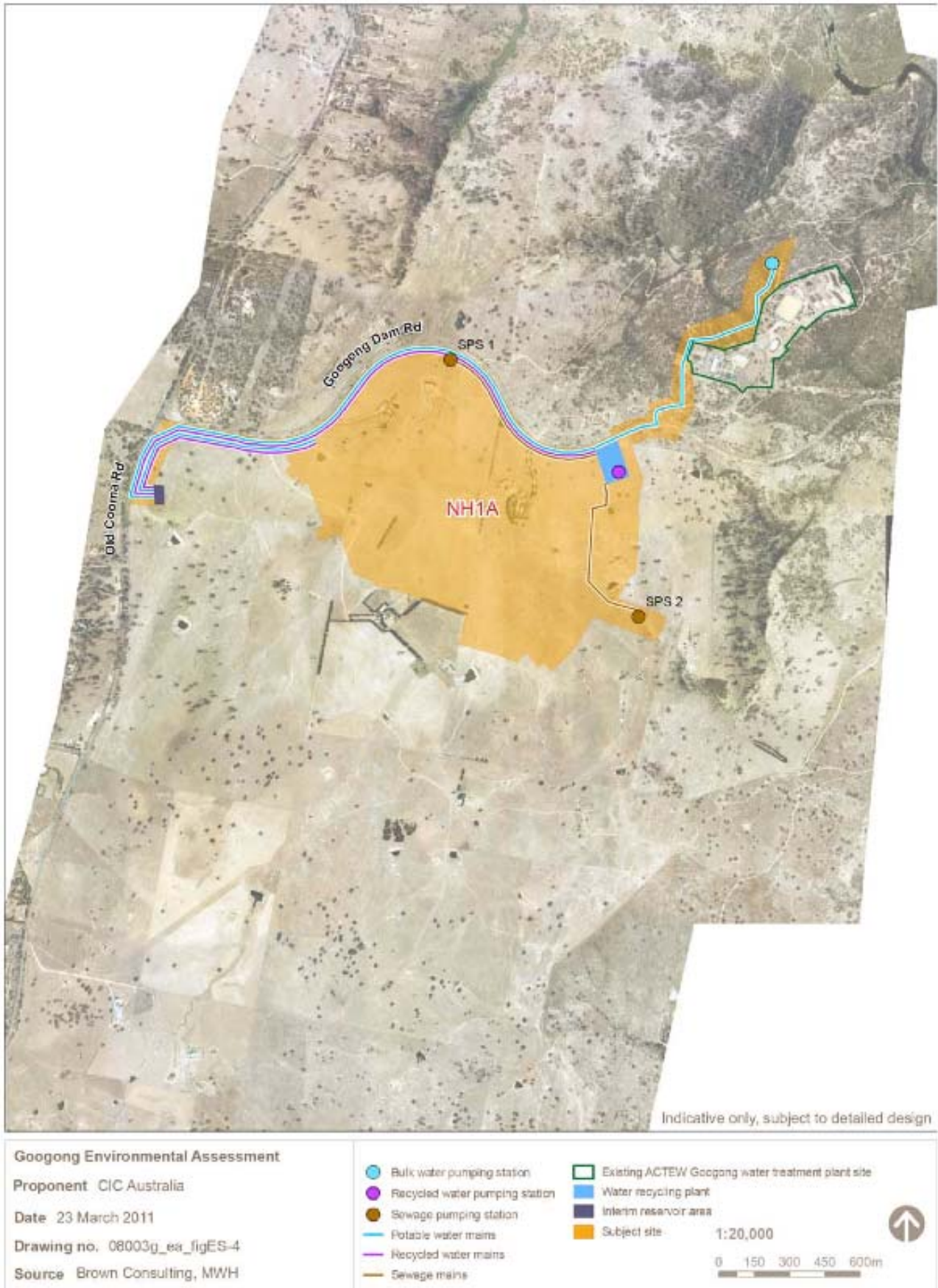
Figure 2-3):

- Stages A and B of the WRP.
- The establishment of an interim reservoir site at Hill 765 for recycled and potable water reservoirs.
- Pumping stations for sewage, recycled water and potable water:
  - Sewage Pumping Stations (SPSs) – SPS1 is located in the northern part of the site adjacent to Googong Dam Road and SPS2 is located within the eastern part of the site. The SPSs collect flows from the initial development and are sized with a capacity to collect flows from all future stages of the Googong township.
  - The bulk water pumping station – located within the north of the site adjacent to the existing Icon Water Googong Water Treatment Plant.
  - The recycled water pumping station – located within the WRP site.
- Rising and distribution mains for sewage, recycled water and potable water to connect to the initial development area.

Stage 1 of the IWC Project has been delivered in sub-stages (Stages A and B) to allow the staged development of the project in line with the staged development of the township. The various components of Stage 1 are either under construction (i.e. the WRP) or have commenced servicing the township (i.e. the bulk water pumping station, the SPSs and the interim reservoirs).

Under the Part 3A approval, Stage 1 of the WRP is limited to servicing an EP of 3,600. However, Stage 1 WRP can actually treat up to an EP of 4,700 due to its modular design. While planning for the Stage C works is undertaken, GTPL intends to seek a modification to the Part 3A Project Approval to provide for the WRP to treat up to an EP of 4,700.





**Figure 2-3 Googong IWC Stage 1 project as approved under Part 3A Stage 1 Project Approval**



### 2.2.3 Future stages of IWC Project

Works will continue to progress on Stage 1 (sub stages A and B) at the WRP. Future works at this stage will include seeking a modification to the current approval to increase the operation capacity of the WRP from an EP of 3,600 to an EP of 4,700. The existing infrastructure is capable of processing the increases capacity, however the current approval only permits the WRP to operate at an EP of 3,600. This would be undertaken as a separate assessment and has not yet been approved.

A concept design of Stage 2 of the IWC Project was outlined in the Environmental Assessment (Manidis Roberts, 2010). As described in this document, the timing for these stages was to be determined by the servicing requirements of the developing township. Based on the current growth of the Googong township, GTPL estimates that the township will reach the capacity of Stage 1 of the IWC Project (about 1,200 dwellings) by late 2016. Therefore, additional capacity under Stage 2 of the IWC Project will be required at that time. Stage 2 of the IWC Project will be delivered in two sub-stages to meet the requirements of the developing township. These stages are:

- Stage C – Increasing the capacity of the IWC Project to 9,600 EP. This would include construction of the initial stages of the permanent reservoir facilities and associated mains and pumps, increases in capacity of the WRP, upgrades to the BWPS and associated mains and pumps.
- Stage D – All final works to bring the IWC Project to full capacity.

Detail designs are currently being prepared for Stage C in order to ensure delivery prior to the end of 2016. Stage C is to be delivered in three separate components:

- Stage C Network West – all network elements within Queanbeyan LGA
- Stage C Network East – all network elements within the Googong Foreshores area, within Palerang LGA
- Stage C WRP – within Queanbeyan LGA (this is currently planned to be delivered in 2018).

This REF assesses Stage C Network West including construction and operation impacts. Separate assessments for the Stage C Network East and Stage C WRP will be prepared.

## 2.3 Strategic need

The Concept Approval for the Googong Township IWC Project considered the strategic need for the ultimate project in order to provide sustainable water supply to the planned township. Section 2.1 of the Googong Township Water Cycle Project Environmental Assessment (Manidis Roberts, 2010) outlined the strategic need for the IWC Project. It identified that the Project is consistent with the following strategic planning documentation:

- The Sydney – Canberra Regional Strategy 2006 – 2031 (DoP, 2008).
- Queanbeyan Residential and Economic Strategy 2013.
- Memorandum of Understanding on ACT and NSW Cross Border Water Resources (between the Commonwealth, NSW and ACT governments, 2006).
- The Memorandum of Understanding on ACT and NSW Cross Border Region Settlement (between the NSW and ACT governments, 2006).
- General regional water security planning.
- Queanbeyan Local Environment Plan (Googong) 2009 LEP.

Therefore the strategic need for the ultimate proposal has previously been justified and approved.

The proposed Stage C Network West works are therefore considered to be justified as they are consistent with and a critical component of the IWC Project covered by the Part 3A Concept Approval.

## 2.4 Proposal objectives

Section 2.5 of the Googong Township Water Cycle Project Environmental Assessment (Manidis Roberts, 2010) identifies the general and specific objectives for the IWC Project.

The general project objectives are:

- Delivery of essential water and wastewater services to the Googong township community.
  - Ensure that the supply of water, recycled water and wastewater services meets the demand profile of the Googong township community.
  - Ensure that all potential human health impacts from provision of water and wastewater services are mitigated.
- To achieve best practice water conservation outcomes relative to other regional urban developments.
- Ecologically sustainable development, including:
  - Minimise impacts on the environment from wastewater discharge.
  - Minimise impacts on the environment from construction activities.
  - Minimise impacts on the environment from location and operation of plant and machinery.

The key objectives of the IWC Project are:

- Provide an integrated water cycle system for the Googong township that reduces potable water consumption by at least 60 per cent, when compared with traditional developments.
- Treat all waste water from the Googong township and produce high quality recycled water suitable for irrigation, household use and discharge to the environment.
- Ensure that construction and operation environmental and human health risks are adequately managed during construction and operation of the Project.
- Protect the Googong Dam and Foreshores area.
- Gain endorsement from relevant stakeholders.
- Construction and operate an economically feasible water cycle system.

GTPL proposes to continue to adopt the above objectives for Stage C Network West.

## 2.5 Options

Chapter 4 of the Googong Township Water Cycle Project Environmental Assessment (Manidis Roberts, 2010) considered:

- The alternative water and wastewater systems that were considered for the Googong township.
- Why a self-contained IWC is the only feasible alternative, when considered against the project objectives.
- The environmental costs and benefits of an IWC system versus a traditional system, highlighting superior environmental outcomes achieved by an integrated system incorporating the use of recycled effluent.

- The IWC scenarios that were assessed and identified the preferred scenario.
- The options assessed for the key elements of the system, including alternative wastewater treatment processes, excess recycled water discharge management and service water reservoirs.

The proposed Stage C Network West is generally consistent with the Concept Approval for the Googong Township IWC Project. Therefore the options for the proposed works have already been addressed, and approved as part of the Part 3A Concept Approval and have not been repeated here.

However several minor design refinements have been made during the development of the detailed design for Stage C Network West. These design refinements are outlined below.

## 2.5.1 Design refinements

Several refinements and details have been included in the design for Stage C Network West which are either a minor variation from the Concept Approval or additional details developed as part of the design that wasn't considered in the Concept Approval. These include:

- The concept approval provided for the excess recycled water discharge point to be located at the interim reservoirs site in the catchment of Googong Creek (refer to
- Figure 2-3). This would require construction of an additional pipeline for excess recycled water from the permanent reservoirs site to the interim reservoirs for Stage C. To eliminate this pipeline, it is now proposed that the excess recycled water discharge point will be closer to the permanent reservoirs on Hill 800. The justification for this refinement is:
  - The new location would reduce the construction activities required, and therefore the environmental impacts and capital costs would be lower.
  - The proposed discharge location is along the existing natural drainage line within the local landform which ultimately drains to Googong Creek. The interim reservoir excess recycled water discharge point discharges into Googong Creek. Therefore the excess recycled discharged would continue to flow through the township's stormwater management system before ultimately reaching Googong Creek, which is a consistent impact to that identified in the Concept Approval.
  - The discharge into the natural drainage lines would be temporary as these drainage lines would ultimately be built into the stormwater management system for the Googong township.
  - Sufficient environmental management measures could be installed for the open drainage line to manage any impacts as a result of the excess recycled water discharge point into the natural drainage line (refer to section 6.9).
- The number and height of the reservoir tanks were not determined as part of the Concept Approval with only a general indication of location provided. The height and number of permanent reservoir tanks have now been confirmed and include
  - One potable water reservoir at 17.7 metres wide (internal diameter) and 11.2 metres high.
  - One recycled water reservoir at 26.5 metres wide (internal diameter) and 11.2 metres high.
  - In addition, space for a third reservoir at the permanent reservoir site will be established. However the third reservoir will be part of the Stage D development and is not considered as part of this assessment. The ultimate size of that reservoir is yet to be determined.

- An access point into the permanent reservoir site had not been identified as part of the Concept Approval and was to be determined at detailed design. A temporary access road has been identified running west from the permanent reservoir site leading from a T-intersection with Old Cooma Road (refer to section 3.3.1 for more details). This was determined to be most direct access point that would not impact on the development future stages of the Googong township. The permanent access road has not been determined and would wait until the plans for the adjacent township are developed to identify the final access route location.

### 3 Proposal description

The purpose of Stage C Network West is to support the ongoing development of the Googong Township with the capacity to service approximately 9,400EP. The proposal is primarily focussed on the construction of the initial stages of the permanent reservoir facilities and associated mains and pumps, increases in capacity of the WRP, upgrades to the BWPS and associated mains and pumps.

This chapter provides a detailed description of the proposal, including the design and location of ancillary infrastructure, and a description of construction and operational activities.

#### 3.1 Part 3A Concept Approval Conditions of Approval

CoA#	Condition	Response
2.1 (a)	A detailed project description, including the design and location of ancillary infrastructure (including access roads and temporary construction compounds) and its relationship to the approved concept and approved project stages.	Section 3 outlines a detailed description of the proposal and all ancillary facilities including temporary compound sites.

#### 3.2 Summary of the proposal

Stage C Network West will include the following components, and is represented in Figure 3-1 to Figure 3-6:

- Works associated with the installation of two permanent reservoirs at Hill 800, including a recycled water discharge pipeline for excess recycled water that needs to be released from the recycled water reservoir.
- Works associated with the installation of mains for recycled water and potable water, including:
  - The installation of new potable water and recycled water rising mains (an extension to the existing pipelines) from the interim reservoirs to the permanent reservoirs.
  - The installation of new gravity potable water and recycled water mains from the permanent reservoirs back into the Googong Township.
  - Continue the new Stage C Network East potable water pipeline from the boundary of the Googong Foreshores to the WRP for potable water top-up of the recycled water supply.
- Works associated with the WRP, including:
  - The installation of a new recycled water tank.
  - Increasing the capacity of the recycled water pumping station at the WRP site by installing new pumps.
- Works associated with the decommissioning of the interim potable and recycled water reservoirs.

Figure 3-1 to Figure 3-3 outline the proposed project boundary for the proposal. This boundary provides a buffer around all works to ensure all construction and operation activities have been assessed. All works are within the Part 3A Concept Plan approval boundary with the exception of minor works that would occur on Old Cooma Road to provide temporary safe access to the permanent reservoir site.

A detailed description of each component of the proposal is provided in this chapter.



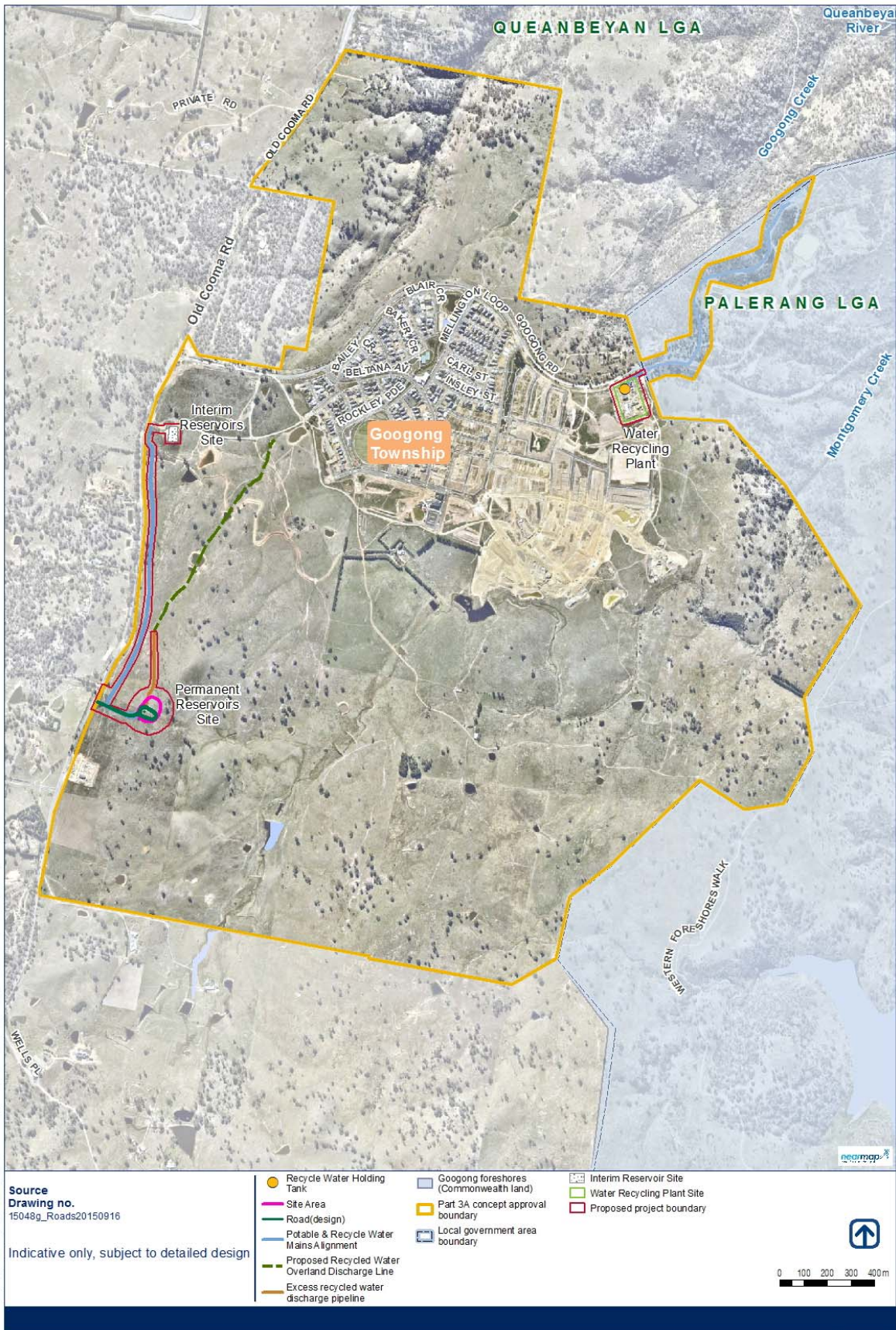


Figure 3-1 Stage C Network West overall scope of works



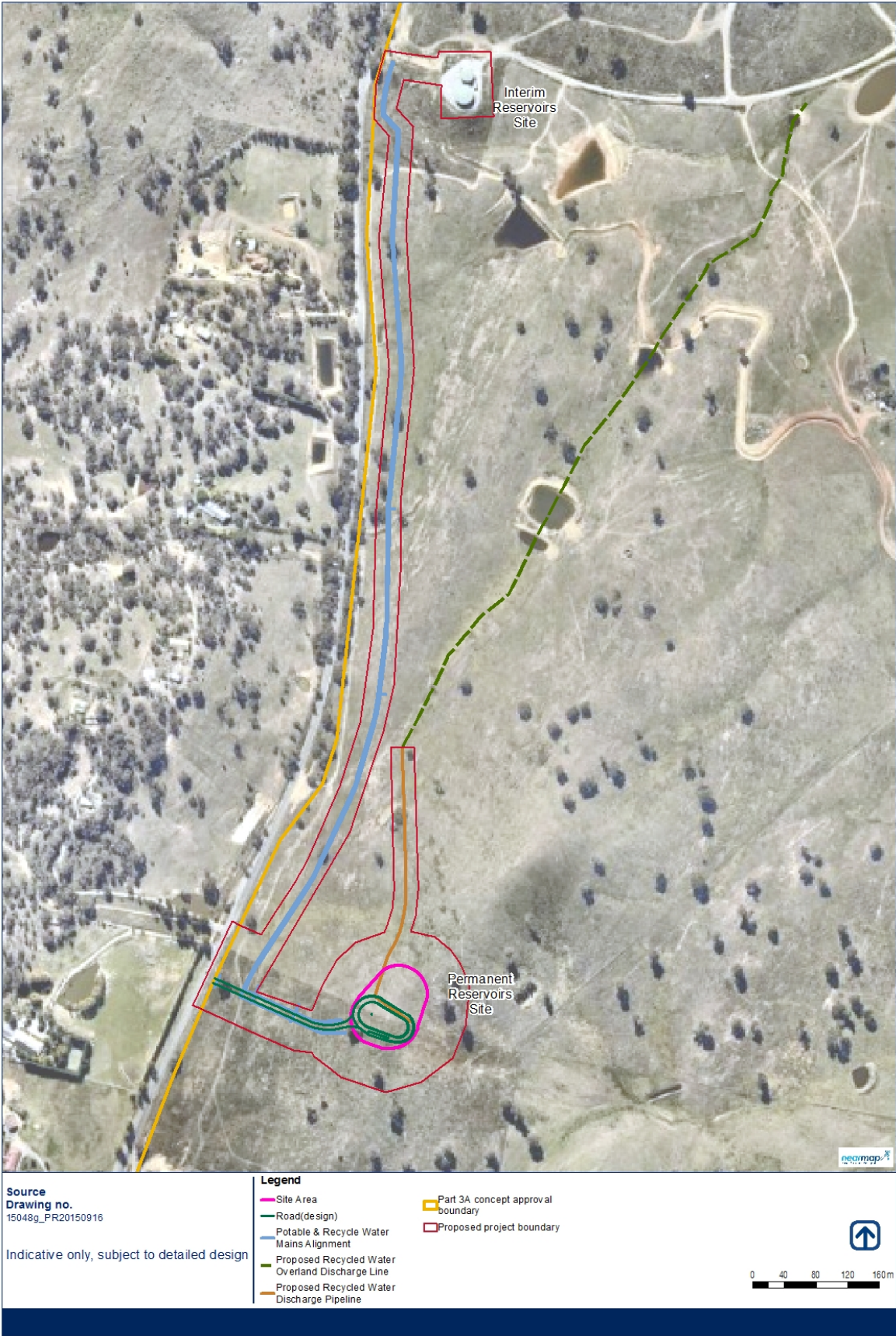


Figure 3-2 Stage C Network West works adjacent to Old Cooma Road





Figure 3-3 Stage C Network West works within and in proximity to the WRP



### 3.3 Detailed description of proposal

#### 3.3.1 Potable and recycled water reservoirs

The new potable and recycled water reservoirs will be located on the highest ground within the Googong Township, known as Hill 800. The site was selected to provide sufficient water pressure, due to the natural elevation of the landscape, to the majority of the Googong Township.

The proposed reservoir site is located approximately 1.4km south of the interim reservoir site, east of Old Cooma Road. The area is approximately 7,500 square meters (refer to Figure 3-4) and a level area will be established at the site for the reservoirs.

Figure 3-4 shows the indicative concept design layout of the permanent reservoir site and the approximate dimensions of both reservoirs are outlined in Table 3-1. The permanent reservoir site will include all aspects identified below in Figure 3-4 and would be located within the identified boundary, however the final layout and design may be subject to change during detailed design to allow for the optimum operation of the facility.

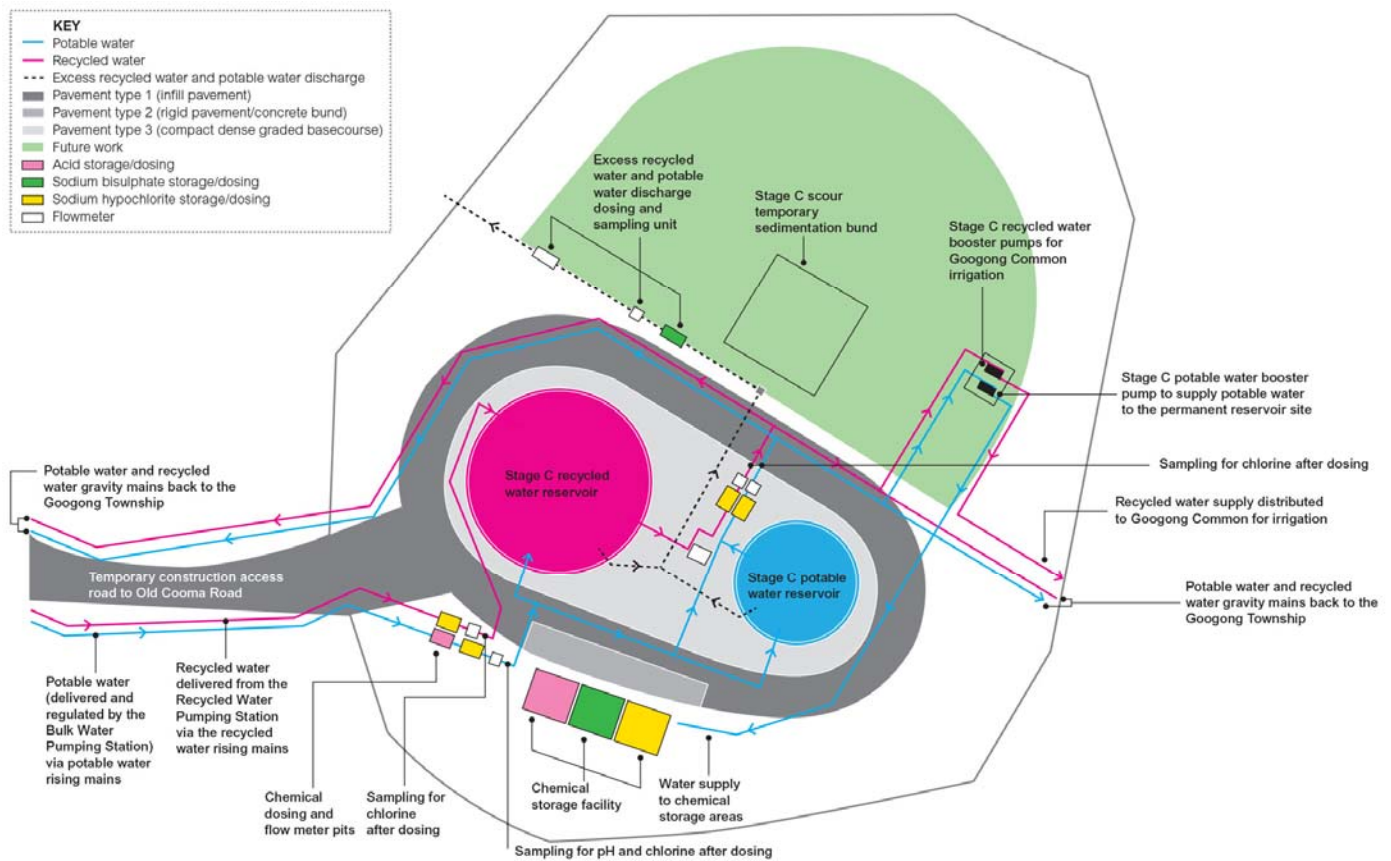


Figure 3-4 Stage C Network West – permanent reservoir site (indicative) layout

Table 3-1 Permanent reservoir parameters

Parameter	Potable water reservoir	Recycled water reservoir	Unit
Capacity	1.9	4.0	ML
Internal diameter	17.7	26.5	m
Bench level	795	795	RL mAHD
Height (including domed roof)	11.2	11.2	m
Inlet diameter	225	375	DN

Parameter	Potable water reservoir	Recycled water reservoir	Unit
Inlet level	804.48	804.33	RL mAHD
Overflow (OF) level	803.90	803.45	RL mAHD
Full Storage Level	803.70	803.25	RL mAHD
Reserve Storage Level	798.57	798.42	RL mAHD
Minimum Water Level	796	796	RL mAHD

## The reservoirs

The reservoir material will be determined during the procurement process with the selected materials meeting QCC's specifications for tanks of this nature. The reservoirs will likely be fabricated from the one following materials:

- Glass-fused bolted steel installed on a concrete base slab or otherwise on a concrete ring beam with bolted floor plates for the tank floor.
- Reinforced concrete with a concrete slab foundation.
- Post-tension, precast reinforced concrete with concrete slab foundation.
- Welded steel with welded floor plates or installed on a concrete floor slab.

The roof of each reservoir will be constructed using galvanised steel rafters with internal column supports as required. The roof structure will include (but not limited to) the following key features and provisions:

- Multiple removable roof panel sections to allow natural light in the tank, to assist with future inspections/maintenance.
  - Rainwater to flow off the roof to the hardstand area below, guttering not to be provided.
  - Roof sheets to have sliding joints or similar to account for thermal effects.
  - Non-powered ventilation system for the roof space that utilises natural means subject to the prevailing wind conditions at any point in time.
  - Access to the roof to be via stairs, platforms and an access hatch located within a security enclosure.
- Potable water and recycled water mains at the permanent reservoir site

Water entering the facility will flow through the potable water and recycled water rising mains entering the site from the west. They will proceed through a chemical dosing tank and then into their respective reservoirs.

Water exiting the facility will be via one of the following avenues:

- Recycled water and potable water gravity mains will be constructed to the western boundary of the permanent reservoir site. These mains will then continue parallel to the incoming mains back to the interim reservoir site (refer to section 3.3.2 for more detail about these mains).
- Recycled water and potable water gravity mains will be constructed to the eastern boundary of the permanent reservoir site. At this stage of development, these mains will be tied off and terminated at the boundary of the reservoir site. When adjacent development requires, connecting mains will be built from these stubs to the development. Therefore although the infrastructure will be built as part of this assessment, these pipes will not be in operation as part of this proposal.

- Excess recycled water (and in some cases potable water) will be discharged via an excess recycled water discharge pipeline. Excess water would be released from the reservoirs and proceed through a chemical dosing and water quality monitoring station. Water would then proceed through the pipe, which would exit the reservoir site at the north-western boundary and proceed about 300 metres down Hill 800 in a northerly direction. Water would then be released into the environment via the outlet pipe. A head wall would house the pipe with an energy dissipation mattress at the base of the water flow for sufficient distance to prevent scour of the drainage line. Water would then flow down the natural drainage lines into the existing stormwater management system in the township prior to reaching and flowing through Beltana Pond. The water quality monitoring station would provide that all water being released into the environment meets conditions set by the EPA. All the infrastructure for the above would be built as part of this proposal. It is noted that this drainage line is located with one of the future development neighbourhoods and is likely (subject to approval) to be incorporated into the stormwater management system included in this neighbourhood.

Any excess recycled water would be as a result of recycled water supply from the township exceeding demand in the Googong township. Excess potable water being discharged from the site would be a rare occurrence and would only be due to a temporary fault in the pump system which allowed excess potable water to be pumped to the reservoir site when demand did not require it.

Booster pumps will be built within the reservoir facility to pump both recycled and potable water into and through the above outlets, dosing and monitoring stations and to and from the reservoirs.

### **Chemical dosing and storage facilities**

A chemical storage facility will be erected on the site to house the necessary chemicals and equipment for the operation of the facility. The storage facility will be bunded and have dedicated drainage to ensure any potential spills are captured and disposed of properly. A separate area will be allocated to each of the three dosing chemicals required (sulphuric acid, sodium bisulphate and sodium hypochlorite).

The chemical storage facility and the booster pumps infrastructure will be sheltered with either:

- An open structure with a roof, or
- An enclosed shed structure.

### **Access roads and foundations**

The facilities will be situated on a concrete hardstand foundation with designated paths to provide for the ongoing operation of the facility. A sealed road surface will be constructed around the perimeter of the reservoirs and leading to the temporary (and ultimately the permanent) access road.

A temporary access road will be constructed at a T-intersection with Old Cooma Road directly west of the reservoir side (refer to

Figure 3-5). Along the southbound side of Old Cooma Road, a 200 metre deceleration lane and a 200 metres acceleration lane will be built to provide safe access for vehicles accessing the access road. The access road will have a sealed surface and will likely include temporary table drains along the edges. A construction gate access will be established at the entry to the Googong site and a sealed access road will be constructed up to the reservoir site with necessary table drains running parallel. This temporary access road will continue to be used into operation until a permanent access route is determined through the Googong township as development progresses.



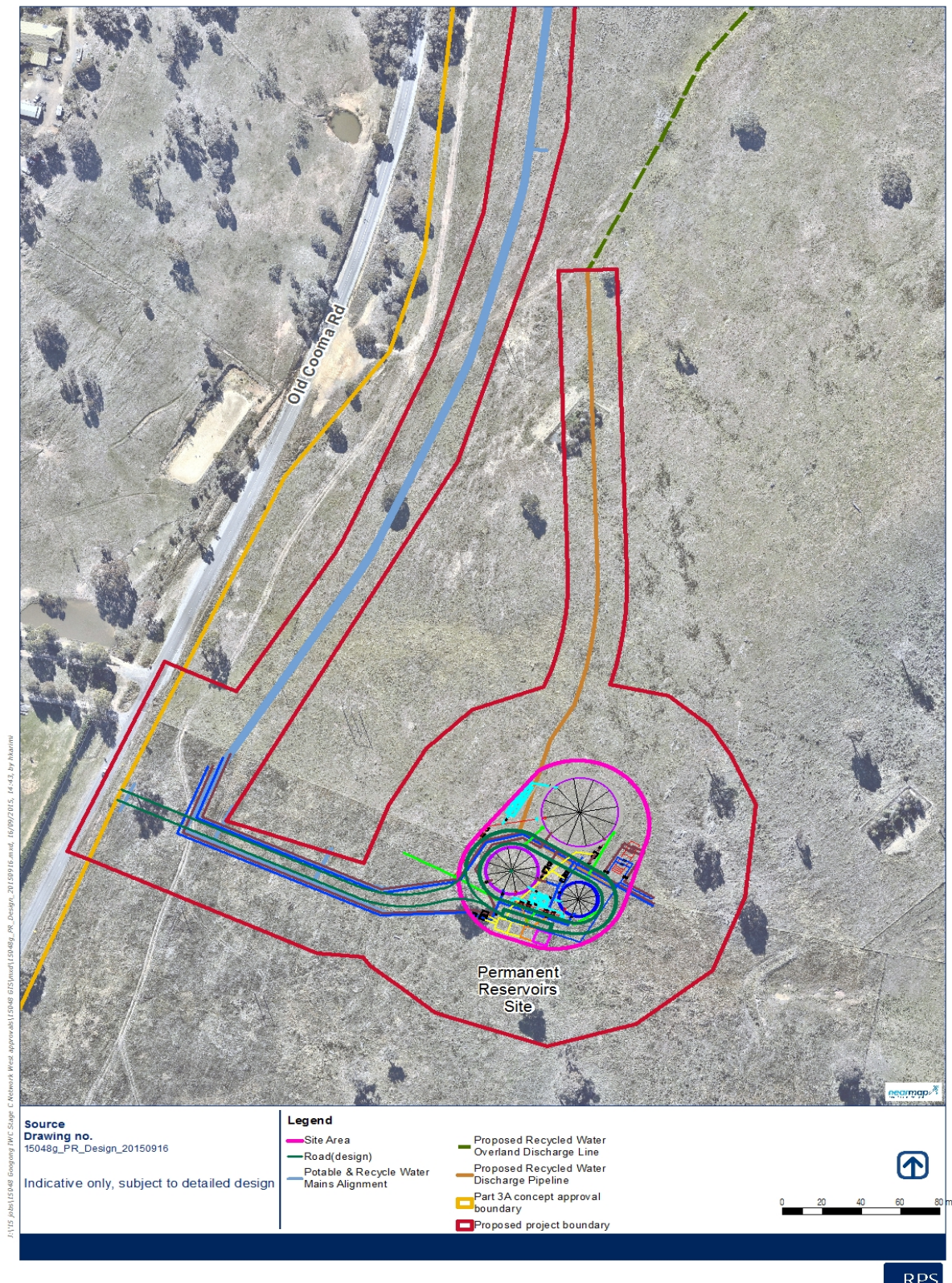


Figure 3-5 Indicative access road design to permanent reservoir site



## Allowance for future stages at the permanent reservoirs site

The permanent reservoir site has been designed to allow for future expansion (Stage D) of the IWC Project as the Googong development progresses. This area is shown in Figure 3-4 as an area designated for future works.

### 3.3.2 Potable water and recycled water rising and gravity mains

#### Adjacent to Old Cooma Road

This component of work involves:

- The installation of a potable water and a recycled water rising main, extending both from the existing pipelines at the interim reservoirs site to the permanent reservoirs site.
- A potable water and a recycled water gravity main that runs from the permanent reservoirs site back to connect to the existing mains (at the interim reservoirs site) to feed back into the Googong township. These pipelines will also include the installation of two connection stubs along the length of the pipe to provide for future connections to the Googong townships future development as required. These stubs will be tied off and not used as part of these proposed works and the connection to these will be assessed separately at a later stage as development requires.

The mains will run parallel to Old Cooma Road on the western side of the Googong Township and will be approximately 1.5km in length. The size of the mains is likely to be between 225-375mm in diameter. All mains will run parallel to each other and would be installed within the same trench during construction. Refer to Figure 3-2 to show the location of these mains.

#### From the Googong Foreshores boundary to the WRP site along Googong Dam Road

This will include extending the new Stage C Network East (being developed and assessed separately) potable water rising main from the boundary of the Googong Foreshores to the WRP site, along Googong Dam Road for approximately 150m. The size of the rising main is likely to be between 225-375mm in diameter.

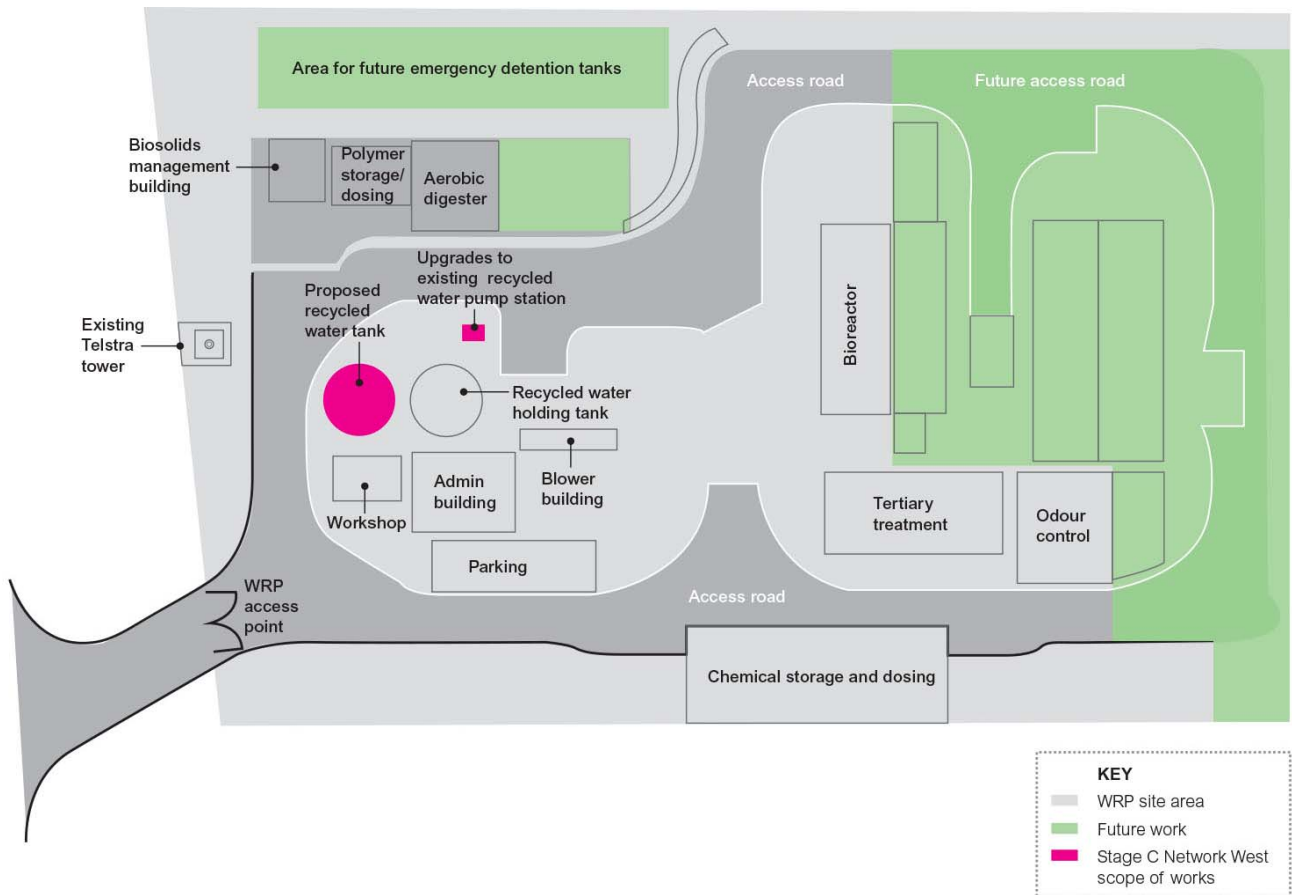
Refer to Figure 3-3 to show the location of the potable water rising main.

In addition, along this alignment within the trench for the rising main, a fibre optic cable will be installed from the Palerang LGA boundary into the WRP site.

### 3.3.3 Installation of a recycled water tank and upgrades to the RWPS at the WRP site

This component of work involves the construction and installation of a recycled water tank within the WRP site, adjacent to the existing recycled water tank (in the north of the WRP) as shown in Figure 3-6. Existing access roads will be utilised for the construction and operation of this tank.

In addition, upgrades to the recycled water pumping station (RWPS) within the WRP will include augmentation of the existing Stage A/B Recycled Water Pumping Station (RWPS) to replace the existing duty/stand by pumps with new pumps capable of meeting the requirements outlined in Table 3-2.



**Figure 3-6 Water Recycling Plant layout – Stage C Network West works**

**Table 3-2 RWPS and rising main upgrade parameters**

Parameter	Value	Unit	Comment
Duty flow rate	102.1	L/s	67% of ultimate pump flow rate due to single duty pump at Stage C
Pump centreline	726.4	RL mAHD	-
Static head	77.9	m	Maximum, at MOL of WRP holding tank
Duty head	TBC	m	
Rising main diameter	375	mm	DICL PN35
Rising main length	3.9	km	Includes existing section

The proposed recycled water tank will be the same size as the adjacent existing tank at about 10 metres high and will have the capacity to hold 415kL. Figure 3-7 shows the existing recycled water tank during the construction of the WRP. The proposed recycled water tank will be located next to the existing tank and will be the same height and diameter.



**Figure 3-7 Existing recycled water tank at the WRP site** (as viewed from the Googong sales viewing platform about 500 metres west of the WRP)

## 3.4 Construction activities

### 3.4.1 Works at the permanent reservoirs site and the WRP site

The construction activities required at the permanent reservoirs site and the WRP site will be similar as they both involve the construction of water reservoirs/tanks, pumping stations and associated equipment. The key difference is that the WRP site will be operational during the construction works and only minor establishment and preparatory works will be required.

#### Site establishment

Site establishment for the permanent reservoirs site will include:

- Services search on site (both aboveground and belowground).
- Survey location.
- Install temporary perimeter fencing and gates.
- Install environmental controls.
- Subgrade preparation.
- Transport and establishment of site office and amenities.

- Install temporary power supply.
- Install temporary water and plumbing.

### **Clearing, stripping and stockpiling**

Stripping and stockpiling of topsoil for later re-use will commence after site establishment activities are complete. An area approximately 7,500 square meters will be required for the permanent reservoirs site, stockpile, access road, construction office and compound.

The following machinery is expected to be required to carry out these activities (final list of plant to be determined by contractor):

- Staff site vehicles.
- Dozers for clearing and vegetation removal.
- Excavators for clearing, stripping and stockpiling.
- Water cart for dust suppression.
- Tippers for the relocation of spoil to designated stockpile sites.

### **Earthworks**

Excavation works at the site will be predominately achieved with conventional earth moving equipment such as bucket excavators and tippers for spoil movement. Some pneumatic rock hammering may be required to facilitate excavation. Open trenching will be used for the installation of buried services, conduits, connection to incoming flowlines and site drainage piping.

Foundation size and design will vary depending on the geotechnical nature of the soils and rock strata levels. The current assumption is that piling will be required to provide adequate reservoir foundations.

The following machinery is expected to be required to carry out these activities (final plant to be determined by contractor):

- Excavators for trenching, backfilling and stockpiling.
- Roller for compaction of backfill materials.
- Cranes for positioning pipework.
- Whacker for compaction around pipework.
- Water cart for dust suppression.
- Tippers for spoil movement.
- Piling rigs for piling for reservoir foundations.
- Blasting equipment if required.

### **Concrete works**

Concrete works will be required for the construction of reservoir foundations, building slabs, hard stand areas and chemical delivery and storage bunds within the site.

Preparation works for foundations will involve the surface preparation, construction of formwork, and the placement and tying of reinforcing steel.



A concrete washout area will be provided for disposal and wash down of excess concrete from delivery trucks.

The following machinery is expected to be required to carry out these activities (final list of plant to be determined by contractor):

- Cranes for lifting of formwork and reinforcement steel.
- Excavators for excavation, backfilling and stockpiling.
- Concrete trucks for the supply of concrete to the site.
- Concrete pump for pumping of concrete to foundations.
- Staff site vehicles.

## Structures

The tank walls will be constructed as required, based on the material selected during the procurement process. The construction methodology will either involve the installation of sections of tank wall manufactured off-site (steel or reinforced concrete panels) or concrete pouring in situ. All options will have a structural steel roof.

Additional carport type roof structures will be installed on the chemical dosing and storage facilities.

Steel frames and panels will be factory fabricated before delivery to site for final assembly.

The onsite potable water and recycled water booster pumping station building will be constructed from masonry/block work with reinforced concrete slab foundation.

The following machinery is expected to be required to carry out these activities (final list of plant to be determined by contractor):

- Cranes for lifting and placing steel frames and panels/formwork.
- Elevated working platforms (EWPs) for the erection of steel frame and tank panels/formwork.
- Staff site vehicles.

## Roadworks

Construction of the internal permanent roadways will be among the final excavation activities to take place for the proposed works. Roads will be constructed as flexible pavement with subgrade, sub base, and base course layers compacted and finished with an asphalt concrete wearing course.

Typical equipment required for these works will include (final list of plant to be determined by contractor):

- Truck and dogs for the delivery of road base materials.
- Rollers for the compaction of backfill materials.
- Concrete trucks for the delivery of concrete.
- Staff site vehicles.
- Water cart for dust suppression.

## Mechanical fit out

The majority of the mechanical plant will be installed as part of the potable water and recycled water booster pumping station and chemical dosing facilities. Equipment will be delivered to site as packaged units where possible, that can be positioned directly onto their designated operational areas. Mechanical site works will predominantly involve the installation and assembly of pipework.

Mechanical installation will require the following equipment (final list of plant to be determined by contractor):

- Crane for unloading and installation of plant and equipment.
- EWP for installation of piping.
- Welder for pipe welding and cutting.
- Staff site vehicles.

## Electrical fit out

Electrical installation works will include the installation of cable trays, installation and testing of power and instrumentation wiring to plant, pumps, alarm instrumentation, lighting and control and monitoring equipment. The control systems will be interfaced with an overall project control system.

Electrical installation will require the following equipment (final list of plant to be determined by contractor):

- EWP for installation of cable trays and lighting etc.
- Staff site vehicles.

## Demobilisation

As construction activities are completed, materials and plant will be removed from the site. Site offices and amenities buildings will remain until construction is complete. Construction plant and facilities will be removed from site using standard flatbed trucks, 19 – 25m articulated heavy vehicles, with some larger equipment requiring a float from site using a low loader.

## Restoration and landscaping

A landscaping plan will be developed for restoration works upon completion of construction activities.

The proposed access to the permanent reservoir site will be stabilised and finished with compacted road base and bounded by the perimeter roadway to provide clear, unhindered all weather access. A landscaped buffer will be provided on the outside of the perimeter roadway. This buffer will help maintain the aesthetics of the area and the selected plant species will tie in with the overall landscape for the surrounding open space parkland to be established on Hill 800.

Any batters that are required as a result of establishing the all weather access area around the reservoirs will be designed to blend in with the existing landform. The batters will be finished with either an appropriate grass mix or a combination of grass and shrubs.

The permanent reservoir site will require shelters for facilities such as the chemical storage tanks and the booster pumps. Therefore it is anticipated that as part of minimising the aesthetic, colours for any structures and the reservoirs will be selected to ensure they can blend in with the surrounding environment. Standard basic colours like Environmental and/or Midnight green will be considered to ensure a subtle blending of the major built forms with the surrounding environment.

The following equipment will be used during restoration works (final list of plant to be determined by contractor):

- Excavators for distribution of topsoil and mulch.
- Tipper cart for the movement of topsoil and mulch.
- Water cart for dust suppression.

### 3.4.2 Installation of potable water and recycled water mains

The proposed construction activities for this component of work are based on installing approximately 50m of each of the four mains per day. Construction works would include:

- Continuous stripping/excavating of soil material to create trenches.
- Removal/stockpile of surplus spoil material.
- Intermittent pipe laying.
- Intermittent backfilling of trenches.
- Intermittent compaction of backfill.
- Rock excavation as required for trenching in rock.

Construction traffic and traffic movements are expected to be (final figures would be developed by contractor prior to construction):

- Employee traffic (light vehicles) up to 10 vehicles movements each way per day.
- Delivery of mobile plant at beginning and end of the project.
- Deliveries of resources, up to 4 semi-trailer each way per day (assuming 50m/day production rate – 80m<sup>3</sup>).
- Deliveries of pipes and jointing components, 1 semi-trailer each way per week.

For this to be achieved, the following construction equipment would be required:

- Excavators (30t-50t).
- Backhoe.
- Padfoot roller.
- Rigid truck.

### 3.4.3 Decommissioning of the interim reservoir site

The interim reservoir site will not be decommissioned until the permanent reservoir site has had successful operation for several months. In this way the interim reservoirs can be relied upon as a back system for the supply of potable water and recycled water to the Googong Township in the unlikely event of a significant failure at the permanent reservoirs.

Once the permanent reservoir site has been successfully operating for a few months the interim reservoir site will be fully decommissioned with the removal of all above and below-ground assets to provide an unencumbered site for future development.

### 3.4.4 Construction access points

#### **Construction access to the permanent reservoir site**

Access to the permanent reservoir site during construction works will require a new access road via Old Cooma Road (refer to

Figure 3-5). A sealed access road will be constructed at a T-intersection with Old Cooma Road directly west of the reservoir site. Along the southbound site of Old Cooma Road, a 200 metre deceleration lane and a 200 metres acceleration lane will be built to provide safe access for vehicles onto the access road.

Specific traffic control measures will be implemented during mobilisation and demobilisation of large earth moving equipment, site amenities and other large deliveries that require slow movements to and from the site access roads.

#### **Construction access for the installation of rising and gravity mains**

Construction access entry to the construction site for the installation of the rising and gravity mains will be via the access road identified above (refer to

Figure 3-5). Informal access tracks (e.g. dirt roads) would be established along the length of the construction trench for these works. This access track would be within the project area identified in Figure 3-2.

#### **Construction access to the WRP site**

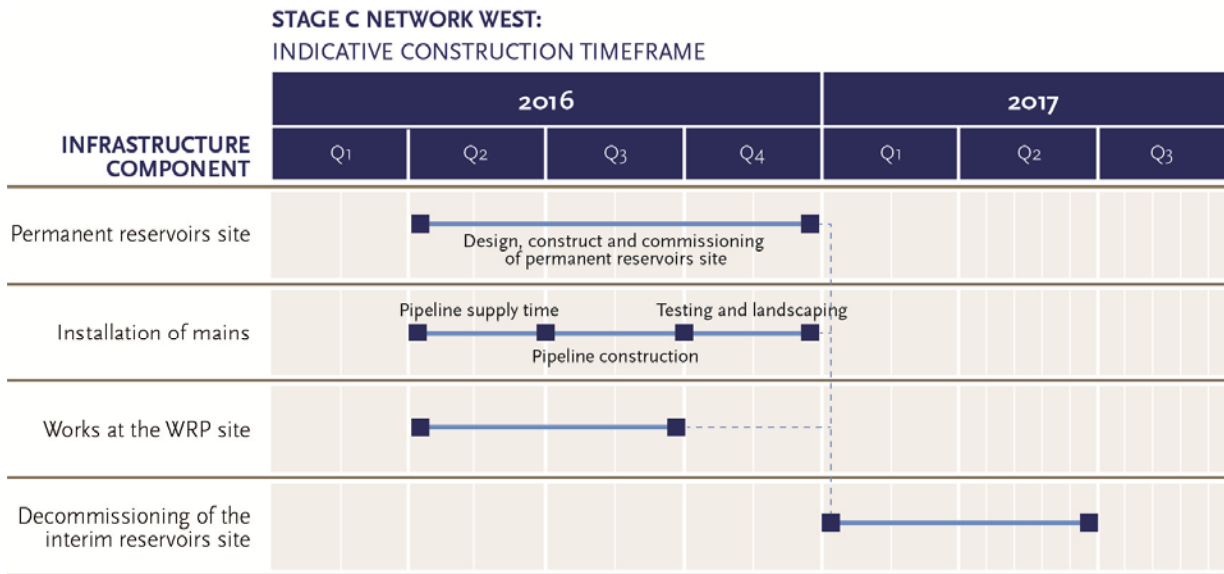
Construction access to the WRP site to install the proposed recycled water tank and upgrade the RWPS will be via the existing WRP site access from Googong Road shown in Figure 3-6. No additional access works would be required for this aspect of the proposal.

### 3.4.5 Construction timing and durations

The construction program would be determined by the project contractor prior to the start of works. It is expected to start in early 2016 and is estimated to take about 18 months to complete. Works would be undertaken in stages with some aspects of construction being undertaken concurrently and others in sequence.

Figure 3-8 shows a rough indication of the construction phasing and timeline for the Stage C Network West proposal.





**Figure 3-8 Indicative Stage C Network West construction timeline**

### 3.4.6 Commissioning of Stage C Network West

The permanent reservoirs site and all associated infrastructure (i.e. the associated rising mains, gravity mains and chemical dosing facilities) and the proposed works at the WRP will need to be fully commissioned prior to them being cut over to supply potable water and recycled water to the Googong Township.

A commissioning and cut-over plan will be developed towards the conclusion of the detail design phase when the final design is fully understood. It is likely that the new assets will be commissioned in the order as nominated in Table 3-3.

**Table 3-3 Stage C Network West asset operation requirements before the interim reservoirs site is decommissioned**

Asset	Requirement	Comment
1. BWPS upgraded existing pumps (not part of Stage C Network West scope of works)	Fully commission	Upgraded pumps will have the capacity to supply the potable water reservoir at the permanent reservoirs site
2. Potable water rising main extension	Pressure test	Use the bulk water pumping station to fill potable water reservoir via extended potable water rising main
3a. Potable water reservoir	Pre, dry and wet commission potable water reservoir	Use water in reservoir to support commissioning of chemical dosing systems
3b. Chemical dosing systems and yard pipe work	Pre, dry and wet commission dosing system	Use water in the potable water reservoir
4a. Recycled water reservoir	Pre, dry and wet commission recycled water reservoir	Use BWPS to fill recycled water reservoir

Asset	Requirement	Comment
4b. Chemical dosing systems and yard pipe work	Complete any supplementary commissioning activities needed	There may be some supplementary chemical dosing system commissioning tests that rely on the recycled water reservoir to be available
5. Telemetry and SCADA	Commission all SCADA and telemetry	
6. Recycled water pumping station	Progressively install and replace existing recycled water pumps	New units will be able to continue to supply the interim reservoirs recycled water reservoir
7. Recycled water rising main extension	Pressure test the mains to the permanent reservoir site	
8. Recycled water holding tank	Pre-commissioning and hydrostatically test	
9. Recycled water holding tank	Clean and super-chlorinate	
10. Recycled water rising main extension to permanent reservoir site	Scour and super-chlorinate	Use water from super-chlorination of recycled water holding tank
11. Potable water and recycled water reservoirs and yard piping	Clean and super-chlorinate	
12. Potable water and recycled water gravity mains	Pressure test, scour and super-chlorinate	
13. Potable water and recycled water reservoirs, yard piping and gravity mains	Charge with potable water and recycled water as required and cut-over	Googong recycled water and potable water networks now being fed by permanent reservoirs site

### 3.5 Stage C Network West operation

#### 3.5.1 Recycled water tank at WRP

The existing 415 kL recycled water storage capacity at the WRP will be augmented by duplicating the existing recycled water tank. There are no plans to further augment the recycled water storage capacity of the WRP in the future; therefore the proposed tank has been sized to service the ultimate requirements of the Googong township.

The combined recycled water storage facilities and the WRP will store the recycled water produced by the WRP prior to it being pumped to the recycled water reservoir, located at the permanent reservoirs site. In addition, the provision of a second tank at the WRP facilitates the maintenance of the existing tank, by allowing it to be out of service for maintenance while maintaining operation of the WRP. Each tank has sufficient volume on top of standard operation capacity to support the WRP's operation if one tank is offline for a period of time.

### 3.5.2 Recycled water pumping station at the WRP

The existing RWPS at the WRP site will be augmented by replacing the existing pumps with new pumps capable of servicing a population of 9,400 EP. The Stage C configuration of the RWPS will consist of three pumps sized for ultimate development in a duty/assist/stand-by configuration.

The RWPS will operate with a variable flow rate to maintain the desired volume in the WRP recycled water tanks at the WRP and will distribute recycled water via a rising main to the permanent recycled water reservoir.

### 3.5.3 Potable water and recycled water rising mains

During operation, the potable water and recycled water rising mains will deliver potable water (from the BWPS) and recycled water (from the RWPS) to the permanent reservoirs site.

The potable water and recycled water gravity mains will deliver potable water (from the potable water reservoir) and recycled water (from the recycled water reservoir) to the Googong township.

Flows into and out of the facility will vary and are subject to change dependent on the stages of the urban development, the season and a number of other variables.

The incoming flow to the potable water reservoir is regulated by the BWPS and is equipped with variable speed drives to allow the rate of fill to be adjusted. An indicative representation of key flow rates for Stage C Network West are provided in Table 3-4.

**Table 3-4 Summary of indicative BWPS flowrates**

Item	Stage C	Units
Minimum BWPS pump rate	2	L/s
	0.35	ML/d
Googong average demand	18.5	L/s
	1.6	ML/d
Peak BWPS pump rate	29.3	L/s
	2.5	ML/d

Source: Table 18-4, MWH Googong Integrated Water Cycle Stage C – Network West Concept Design Report, June 2015

Indicative potable water demand data for the Googong Township for Stage C Network West is outlined in Table 3-5.

**Table 3-5 Indicative Googong Township potable water demand data**

Item	Stage C	Units
Googong average day demand	18.5	L/s
	1.6	ML/d
Googong potable water peak hour demand	69.5	L/s
	6.0	ML/d

Source: Table 18-5, MWH Googong Integrated Water Cycle Stage C – Network West Concept Design Report, June 2015

The incoming feed to the recycled water reservoir will be controlled by the RWPS and indicative inputs for Stage C Network West are summarised in Table 3-6.

**Table 3-6 Summary of indicative RWPS flowrates**

Item	Stage C	Units
Minimum RWPS pump rate	6.9	L/s
	0.6	ML/d
Average recycled water pumping average flows	16.2	L/s
	1.4	ML/d
Peak RWPS pump rate	102.1	L/s
	8.8	ML/d

Source: Table 18-6, MWH Googong Integrated Water Cycle Stage C – Network West Concept Design Report, June 2015

Demand for and production of recycled water will vary dependent on a number of factors including, population size, the season and time of year etc. Representative recycled water demand data for Stage C Network West is outlined in Table 3-7.

**Table 3-7 Summary of indicative recycled water reservoir flows**

Item	Stage C	Units
Googong average recycled water average day demand	16.2	L/s
	1.4	ML/d
Googong recycled water peak hour demand	140.5	L/s
	12.1	ML/d

Source: Table 18-7, MWH Googong Integrated Water Cycle Stage C – Network West Concept Design Report, June 2015

### 3.5.4 Operation of the potable water and recycled water reservoirs

Once at the potable reservoirs site, the potable water enters a chemical dosing and flow meter for pH adjustment measures and sodium hypochlorite dosing. Icon Water has advised that at a high water age (approximately 90 days) pH as high as nine has been observed in the potable water supply. This may be attributed to leaching of calcium-based materials from the cement lining of pipelines. Therefore, at QCC’s request, dosing of sulphuric acid to the potable water (prior to storage in the potable water reservoir at the permanent reservoir site) will be required when the pH increases above 8.5 to achieve a set point of a pH of 7.5.

To maintain chlorine levels in the potable water and recycled water, water will be dosed with chlorine (in the form of sodium hypochlorite) prior to entering the reservoirs to achieve a residual set point in the storage system (i.e. storage at the potable water and recycled water reservoir).

The potable water and recycled water will then be stored in the potable water reservoir and recycled water reservoir respectively, until there is demand. When this occurs, potable water and recycled water will be distributed from their respective reservoirs via a sodium hypochlorite dosing unit (for chlorine dosing) and distributed via the potable water and recycled water mains to the Googong Township.

For Stage C, a booster pump for recycled water will be installed to irrigate Googong Common. In addition, a booster pump will be installed to distribute potable water around the permanent reservoir site to ensure the correct pressure is maintained at the site.

Additionally, the potable water pipe work configuration at the permanent reservoir site also allows for the BWPS to pump directly into the potable distribution network to the Googong Township, bypassing the potable water reservoir, should the reservoir be offline for maintenance or any other reason (e.g. in an emergency).



## Excess recycled water discharge point

The potable water and recycled water reservoirs will be provided with a discharge pipeline which will run below ground to the northwest for approximately 300m, refer to

Figure 3-9. The pipework will include a weir structure to submerge a magnetic flow meter to monitor and record discharge volumes and to initiate chemical dosing for de-chlorination of the water.

The water will be sampled for water quality and will be dosed with appropriate levels of sodium bisulphate before being discharged into the environment. The sodium bisulphate is used to remove the residual chlorine to ensure appropriate water quality prior to being discharged to the environment.

The majority of discharged water will occur from the recycled water reservoir, with recycled water supplied in excess of demand from the township being discharged. The potable water discharge would occur in the emergency event that the BWPS fails to stop pumping water to the potable water reservoir when it is already full.

Modelling has been undertaken to predict true expected discharge of excess recycled water to the environment. The data is based on the water balance model and takes into account 40 years of climatic data to calculate the daily wastewater flow generation and daily water and recycled water demands. It takes into consideration the low storage in the four megalitres Stage C Recycled Water reservoir at Hill 800 and assumes 100 per cent of wastewater flow is recycled which is facilitated by flow attenuation measures at the WRP storage facilities. The model also assumes Stage AB flows, ie based on a 3600 EP. The results of this modelling is summarised in Table 3-8 and Table 3-9.

**Table 3-8 Summary of daily excess recycled water discharges to the environment**

Parameter	Excess recycled water discharge (kL/d)
Maximum daily flow	986
90 <sup>th</sup> percentile daily flow	399
Average daily flow	159
Minimum daily flow	0

**Table 3-9 Summary of monthly excess recycled water discharges**

Month	Average excess recycled water discharge (ML/month)
January	0.018
February	0.112
March	0.474
April	3.215
May	7.122
June	10.477
July	11.978
August	10.996
September	8.300
October	4.310
November	2.118
December	0.408

## Scour water and collection and treatment at the permanent reservoir site

The design of the permanent reservoir site has taken into account additional infrastructure maintenance activities such as scour water collection and treatment during operation. This maintenance activity is likely to be undertaken every 5 to 10 years.

The potable water and recycled water reservoirs will be provided with a scour pipeline passing through the side wall at the base of the respective tanks with an isolation valve located on the external pipe penetration.

To address QCC's requirements regarding scour water collection, a temporary scour sedimentation area has been allocated in the area of the site designated for future works. The temporary sedimentation area will be sized to treat one third of the largest reservoir volume over an eight hour period. It will be used in the event that cleaning of a reservoir is required and will capture any sediment accumulated in the reservoir that is removed with the scour water. Treated water will be allowed to discharge from the sedimentation area as surface runoff, or via the discharge pipe.

For future stages (Stage D), scour water will be directed to the future sewage reticulation system to the east of Hill 800.

### 3.5.5 Access roads during operation

A sealed temporary access road will be constructed at a T-intersection with Old Cooma Road directly west of the reservoir site (refer to

**Figure 3-5).** Along the southbound side of Old Cooma Road, a 200 metre deceleration lane and a 200 metre acceleration lane will be built to provide safe access for heavy vehicles onto the access road. These lanes will have a sealed surface and will likely include temporary table drains along the edges. A construction gate access will be established at the entry to the Googong site and will be built up to the reservoir site with necessary table drains running parallel. This temporary access road will continue to be used into operation for a period of time (up to 2 to 3 years) until a permanent access route is determined through the Googong township as development progresses. This permanent access route will be designed and assessed separately when required as part of the ongoing Googong urban development.

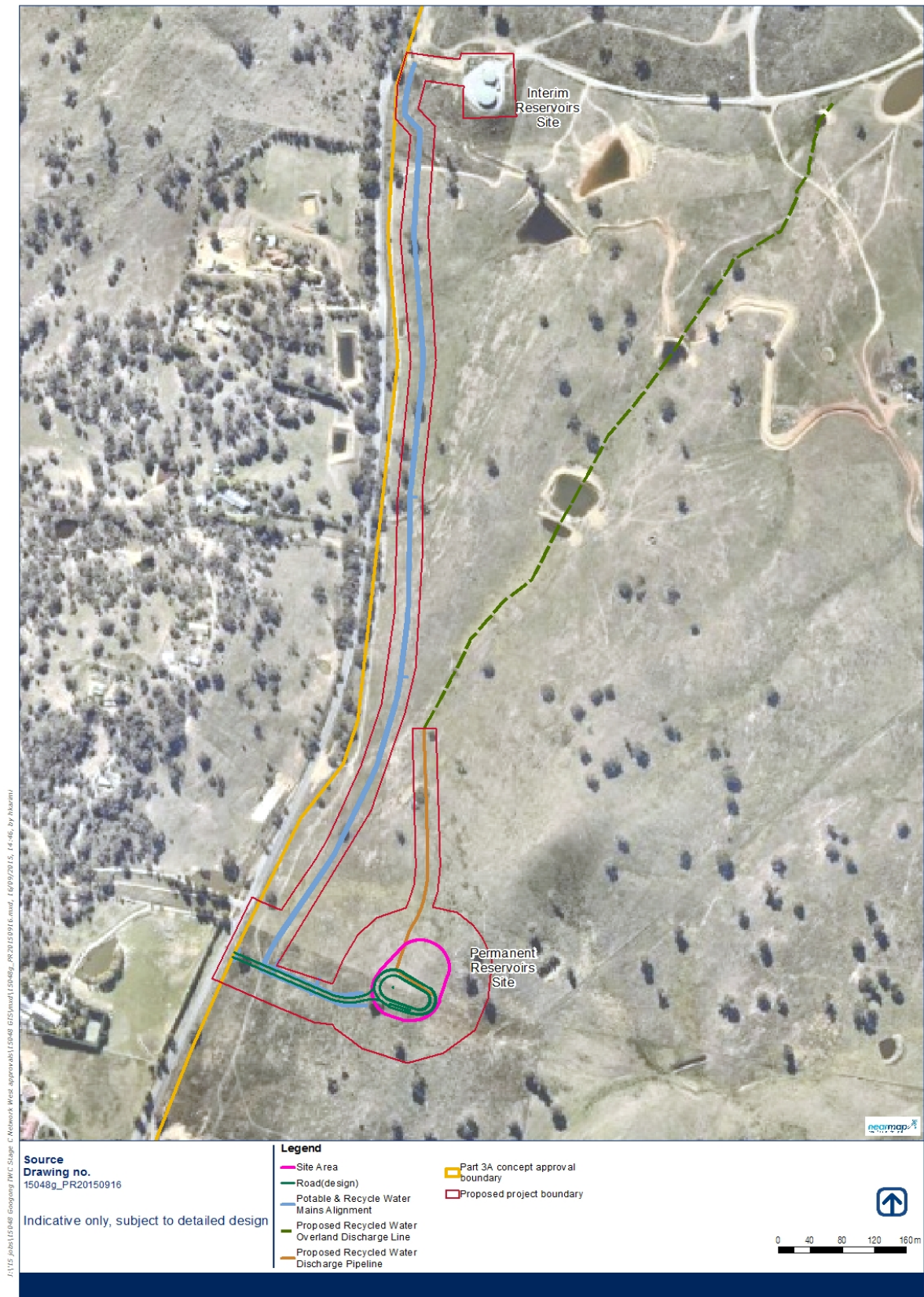


Figure 3-9 Location of the excess potable and recycled water overland discharge

## 4 Statutory and planning framework

### 4.1 Requirements of Concept Approval

The table below outlines the relevant Conditions of Approval that apply to this section of the environmental impact assessment.

CoA#	Condition	Response
2.1(b)	An assessment of relevant statutory matters including land zoning, permissibility and consistency with the objects of the EP&A Act.	An assessment of relevant statutory matters including land zoning and permissibility is outlined in section 4 of the REF.  Consistency of the proposal with the objects of the EP&A Act are outlined in section 7.2 of the REF.
2.1 (j)	The environmental assessment of the project must take into account relevant State Government guidelines, policies and plans	Section 4, below, outlines how the proposed works have taken into account relevant NSW legislation

### 4.2 Environmental Planning and Assessment Act 1979

On 24 November 2011, the Googong Township Water Cycle Project Environmental Assessment (Manidis Roberts, 2010) was approved by the Minister for Planning under Part 3A (now repealed) of the EP&A Act. The approval included Concept Approval for the ultimate development (Stage 1 and 2) and the Project Approval for Stage 1 development of the Googong Township IWC Project. Individual Conditions for Approval (CoAs) were included for both the Stage 1 Project Approvals and the overall Concept Approval.

The *Environmental Planning and Assessment Amendment (Part 3A Repeal) Act 2011* (Part 3A Repeal Act) commenced 1 October 2011. Under the Part 3A Repeal Act, projects deemed to be ‘transitional Part 3A projects’ will continue to be subject to Part 3A of the EP&A Act (as in force immediately before the repeal and as modified by the Part 3A Repeal Act).

Transitional Part 3A projects include certain projects that were the subject of an existing approval under Part 3A. As the IWC Project Concept Approval was issued under Part 3A, it is considered to be a transitional Part 3A project. The provisions of Part 3A (as in force immediately prior to its repeal) continue to be applicable.

In issuing the Part 3A approval, under Section 75O of the EP&A Act the Minister for Planning determined that further assessment would be required for projects developed under Stage 2 of the Concept Plan in accordance with the EP&A Act. It identified that under section 75P(2)(C):

- (i) where development is subject to Part 4 of the EP&A Act, that development is subject to the further environmental assessment requirements specified in Schedule 2 of this approval.
- (ii) where development is subject to Part 5 of the EP&A Act, that development is subject to the further environmental assessment requirements specified in Schedule 3 of this approval.

As no Schedule 3 was provided as part of the Concept Approval, the assumption has been made that this clause should be referring to the requirements outlined in Schedule 2 instead. These requirements have been addressed as part of this assessment and are reproduced in Appendix B of this REF, with a reference to the section of the REF where each requirement is addressed. Where relevant, each section of this REF starts with an excerpt from Schedule 2 of the Concept Approval which lists the specific requirements relevant to each section and summarises the response to the requirement.



## 4.3 State environmental planning policies

### 4.3.1 State Environmental Planning Policy (Infrastructure) 2007

The State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 125(1) of ISEPP permits development on any land for the purposes of a water reticulation system to be carried out by or on behalf of a public authority without consent.

Clause 124 of ISEPP defines a water reticulation system as a facility for the transport of water, including pipes, tunnels, canals, bores, pumping stations, related electricity infrastructure, dosing facilities and water supply reservoirs.

As the proposal meets the definition of water reticulation system and is being carried out by GTPL on behalf of QCC (a public authority), development consent under Part 4 of the EP&A Act is not required. Therefore, the proposal is assessed under Part 5 of the EP&A Act with QCC acting as the determining authority.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Clauses 13-15 require a public authority to consult with local council where certain conditions are met. However Clause 17 of ISEPP provides exceptions for the need to consult with the local council. This includes Clause 17(1)(a) which removes the need for a local council to be consulted where approval is being sought from the local council. Therefore only Clause 16 applies to this proposal. Consultation including consultation as required by ISEPP (where applicable), is discussed in Chapter 5 of this REF.

### 4.3.2 Other state environmental planning policies

The proposal does not affect land or development regulated by the State Environmental Planning Policy No.14 – Coastal Wetlands, State Environmental Planning Policy No. 26 – Littoral Rainforests or State Environmental Planning Policy (State and Regional Development) 2011.

## 4.4 Queanbeyan Local Environment Plan 2012

The Queanbeyan Local Environment Plan (LEP) 2012 provides for the planning requirements and zoning classifications for the proposal. The proposal is located within two zones under the Queanbeyan LEP, as outlined below and shown in Figure 4-1:

- SP2 Infrastructure (Sewage Treatment Plant) – proposal works within this zoning includes all works associated with the WRP. Under this zone classification the Queanbeyan LEP provides for development consistent with the purpose shown on the land zoning map (in this case "sewage treatment plant") to be permitted with consent.
- R1 General Residential – all other proposal works fall within this zoning classification, including the installation of mains, the installation of the two permanent reservoirs and the decommissioning of the interim reservoir site. Under this zone classification the Queanbeyan LEP provides that "water and resource management facilities" are permitted with consent.

Therefore, under the Queanbeyan LEP the proposed works would be permitted with consent from QCC. However, as outlined in Section 4.3, clause 125(1) of ISEPP provides for the proposed works to be undertaken without consent. Therefore the conditions of the LEP do not apply to this proposal.

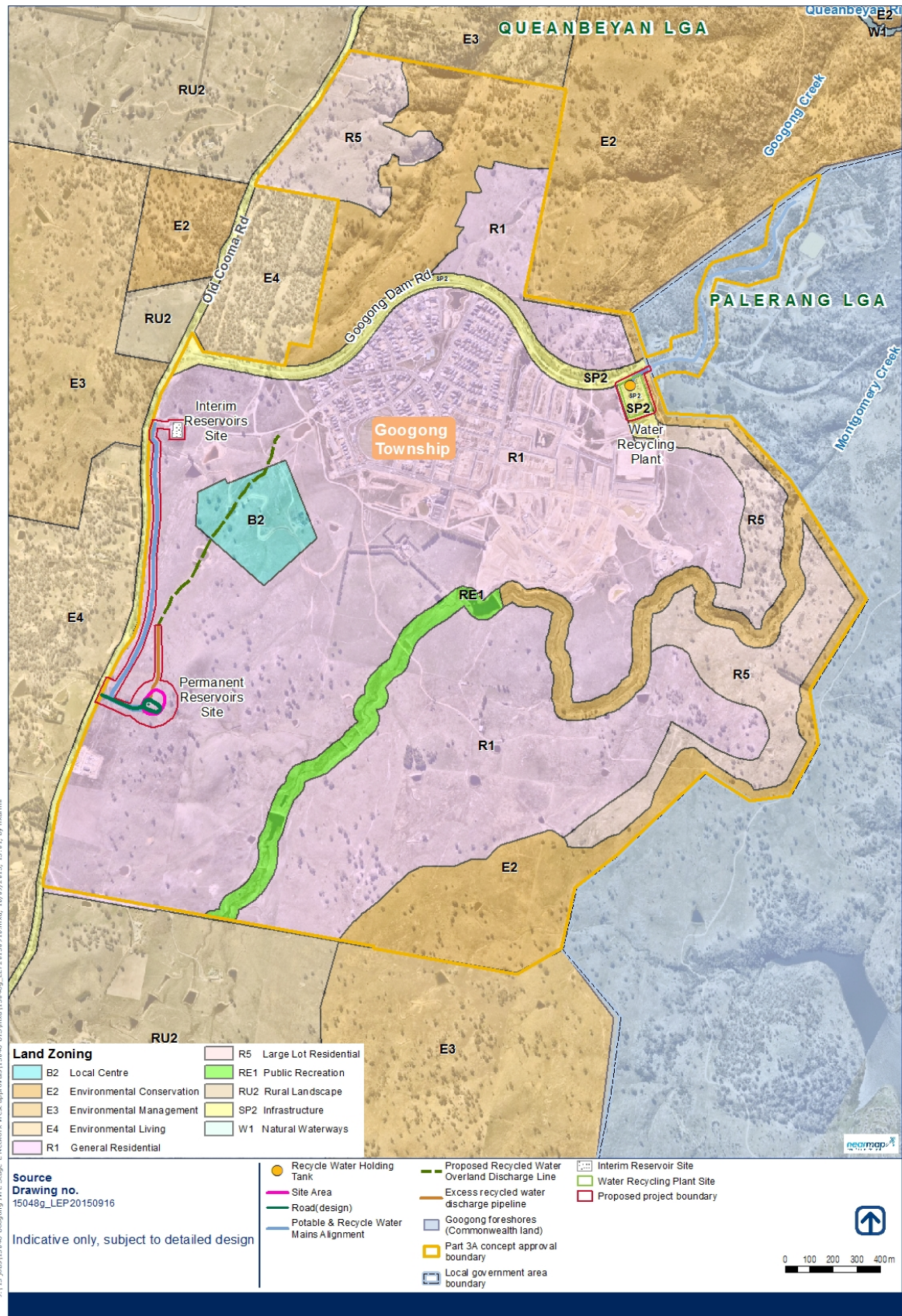


Figure 4-1 Queanbeyan LEP zones for the proposal



## 4.5 Other relevant NSW legislation

### 4.5.1 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) provides for the protection of threatened or endangered flora and fauna species, populations and ecological communities.

The TSC Act requires that a species impact statement be prepared under Sections 109-113 of the TSC Act (terrestrial species) and/or Sections 221J and 221K of the *Fisheries Management Act* (aquatic species) for a proposed activity that:

- Would have a significant effect on critical habitat of flora and fauna;
- Would have a significant effect on threatened species, populations or ecological communities or their habitats.

A biodiversity assessment for the proposal has been undertaken and is outlined in Section 6.4 of this REF. This assessment concluded that no significant impacts are predicted and a species impact statement is not required.

### 4.5.2 National Parks and Wildlife Act 1974

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* (NPW Act).

The NPW Act provides protection for Aboriginal objects (material evidence of indigenous occupation) and Aboriginal places (areas of cultural significance to the Aboriginal community) across NSW.

It is an offence to harm Aboriginal objects or places without a permit authorised by the Director-General of the Office of Environment and Heritage (OEH). This permit is issued under Section 90 of the Act to allow the investigation, impact and/or destruction of Aboriginal objects.

An Aboriginal heritage assessment has been prepared for the proposed works and is outlined in Section 6.5 of this REF. This assessment concluded that no harm to Aboriginal object or places is predicted.

### 4.5.3 Heritage Act 1997

The *Heritage Act 1997* applies to deposits, objects or material evidence within NSW which either relates to the non-Aboriginal settlement of the area that comprises NSW, or items listed as being of State or local heritage significance. Under this Act it is an offence to harm relics protected by Interim Heritage Orders (IHO) or the State Heritage Register (SHR) unless an exemption (section 57), an approval (section 60) or a permit (section 140) is obtained. Furthermore, the impact to or removal of a relic requires an excavation permit from the NSW Heritage Council.

A non-Aboriginal heritage assessment had been considered for the proposed works and is outlined in Section 6.7 of this REF. This assessment concluded that no impacts to non-Aboriginal heritage are predicted.

### 4.5.4 Protection of the Environment Operations Act 1997

Section 120 of the *Protection of the Environment Operations Act 1997* (PoEO Act) prohibits the pollution of waters. Section 6.9 identifies the potential impacts to local natural water systems and the management measures to address risk of water pollution.

Part 3.2 of the PoEO Act requires an Environmental Protection Licence (EPL) for scheduled development work and the carrying out of schedule activities. Scheduled activities are listed in Schedule 1 of the Act. Clause 36 of Schedule 1 lists sewage treatment processes as a scheduled activity and scheduled development works are defined as the construction of work to undertake a scheduled activity.

The WRP is currently being constructed under EPL 20188 (GTPL is the licensee) and it is expected that this EPL will be amended to allow the operation of the WRP following commissioning (QCC will be the licensee). The EPL for operations will also cover the components of the Googong IWC Project that manage sewage and recycled water (i.e. the SPSs, sewage and recycled water mains and the recycled water reservoir at the interim reservoir site). The PoEO Act does not regulate potable water systems and therefore an EPL is not required for these components of the Googong IWC Project, unless they are located within the WRP site (i.e. parts of one of the potable water mains).

As the proposal would be part of the Googong IWC Project, an EPL would be required for the construction and operations of the recycled water components the proposal (i.e. the recycled water reservoir at the permanent reservoirs site and the recycled water mains) and the components of the proposal located within the WRP. Given the complex nature of the licensing regime for the Googong IWC Project, with multiple stages and two licensees, GTPL proposes to discuss and agree the appropriate licensing arrangements with both QCC and the EPA prior to the commencement of construction.

## 4.6 Commonwealth legislation

### 4.6.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Commonwealth for proposed 'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land.'

The potential for the Googong IWC Project to significantly impact a matter of national environment significance or Commonwealth land and the need to make a referral to the Commonwealth Department of the Environment for a decision by the Commonwealth Minister for the Environment was previously completed in parallel with the Part 3A Concept Approval process. An approval for the ultimate development of the Googong Township IWC Project (including Stage C) was granted on 19 May 2011 and no additional approvals are required for the proposal.

## 4.7 Confirmation of statutory position

The proposal is for the purpose of a water reticulation system and under the provisions of the ISEPP (Clause 125(1)), development consent is not required for the proposal and the proposal is subject to an environmental impact assessment and determination under Part 5 of the EP&A Act. QCC is the determining authority for the proposal.

The components of the proposal related to recycled water or located on the WRP site are classified as a scheduled activity under the PoEO Act and therefore an EPL under this Act is required for both construction and operations.



## 5 Stakeholder and community consultation

### 5.1 Concept Plan Conditions of Approval

CoA #	Condition	Response
2.1 (i)	<p>evidence of an appropriate level of consultation with (but not necessarily limited to) the following parties, including identification of the issues raised and how these have been addressed in the assessment:</p> <ul style="list-style-type: none"> <li>▪ Commonwealth Department of Sustainability, Environment, Water, Population and Communities (now referred to as the Department of the Environment);</li> <li>▪ Office of Environment and Heritage (including its Heritage Branch);</li> <li>▪ Department of Trade and Investment, Regional Infrastructure and Services (including its Primary Industries Division) (now referred to as Department of Primary Industries);</li> <li>▪ Roads and Traffic Authority (now referred to as Roads and Maritime Services);</li> <li>▪ Queanbeyan City Council;</li> <li>▪ Palerang Council;</li> <li>▪ Relevant services providers; and</li> <li>▪ Property owners and the local community.</li> </ul>	<p>All consultation that has been undertaken for this proposal, the issues raised in response to this consultation and GTPL's responses are described in section 5.5 below.</p>
3.1	<p>Subject to confidentiality, the Proponent shall make all documents required under this approval available for public inspection on request.</p>	<p>All planning documents for the Googong IWC project have been made publicly available by GTPL on the projects website <a href="http://www.compliance.googong.net">www.compliance.googong.net</a>.</p>

CoA #	Condition	Response
3.2	<p>Prior to the commencement of construction of any projects associated with this Concept Plan approval, the Proponent shall establish a dedicated website or maintain dedicated pages within its existing website for the provision of electronic information associated with the project. The Proponent shall publish and maintain up-to-date information on this website or dedicated pages including, but not necessarily limited to:</p> <ul style="list-style-type: none"> <li>(a) the status of the project;</li> <li>(b) a copy of each relevant environmental approval, licence or permit required and obtained in relation to the project;</li> <li>(c) a copy of each approved plan, report, or monitoring program required by this approval and associated project approvals;</li> <li>(d) a summary of the monitoring result of the project, which have been reported in accordance with the various plans and programs approved under this approval and associated project approvals;</li> <li>(e) a summary of the monitoring results of the project, which have been reported in accordance with the various plans and programs approved under this approval and associated project approvals;</li> <li>(f) details of the outcomes of compliance reviews and audits of the project, to the satisfaction of the Director-General.</li> </ul>	<p>GTPL has established the IWC project website to inform the community of progress on the planning and construction of the project. This website is <a href="http://www.compliance.googong.net">www.compliance.googong.net</a>.</p> <p>In addition GTPL provides regular quarterly updates delivered via email to all residents, property owners and any other listed on the Googong stakeholder list.</p> <p>Contact information is made available for all residents to report any issues with construction activities and records are kept of any reports and how these were addressed.</p>

## 5.2 Background

Community consultation regarding the proposal for a Googong Township commenced in the preliminary development stages in early 2000s. The stakeholder consultation process for the Part 3A Concept Approval assessment for the Googong Township formally commenced in May 2007.

Consultation regarding the proposed Integrated Water Cycle for the Googong Township was undertaken during the preparation of concept designs and the environmental assessment throughout 2009 – 10. The results of this consultation was considered as part of the proposal environmental assessment and are outlined in Chapter 16 of the Googong Township Water Cycle Project Environmental Assessment (Manidis Roberts, 2010).

In 2010 the NSW Department of Planning placed the Googong Township Water Cycle Project Environmental Assessment (Manidis Roberts, 2010) on public exhibition from 17 November to 20 December 2010. As a result of the public display of the project environmental assessment, twelve (12) submissions were received, including:

- Four from local residents;
- Two from ACT government agencies – ACT Department of Environment, Climate Change, Energy and Water and ActewAGL;
- Five from NSW government agencies – the RTA, the Greater Southern Area Health Service, the Department of Trade and Investment, OEH, the Office of Water; and
- One from QCC.

Government submissions were supportive or neutral regarding the project, while community submissions raised some concerns, including some that objected to aspects of the project.

A Submissions Report was prepared in May 2011 considering and responding to the issues raised from the submission received and additional meetings were held with a number of residents and government agencies, including QCC, to discuss their concerns with the proposal.

Since construction commenced on the Stage AB works, regular updates are provided to the community are provided to keep them informed about the progress of the project. A community hotline has been established to provide an avenue for residents to raise any issues that they may have with construction activities. A log has been kept of all communication with the community in response to construction activities and the actions/responses provided.

### 5.3 ISEPP consultation

Part 2 of the ISEPP contains provisions for public authorities to consult with other public authorities prior to the commencement of certain types of development. This is detailed below in Table 5-1. The proposal does not meet any of the required criteria under Clause 14 therefore no additional consultation with public authorities is required under the ISEPP.

**Table 5-1 ISEPP Consultation required with other government agencies checklist**

ISEPP consultation with other agencies required under clause 16 of the Infrastructure SEPP?	
Are the works adjacent to a national park, nature reserve or other area reserved under the National Parks and Wildlife Act 1974?	No
Are the works adjacent to a declared aquatic reserve under the Fisheries Management Act 1994?	No
Are the works adjacent to a declared marine park under the Marine Parks Act 1997?	No
Are the works in the Sydney Harbour Foreshore Area as defined by the Sydney Harbour Foreshore Authority Act 1998?	No
Do the works involve the installation of a fixed or floating structure in or over navigable waters?	No
Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional facility or group home in bush fire prone land?	No

### 5.4 Community consultation

In July 2015, a Community Letter for the Googong Stage C Network West project was delivered to all residents of the Googong township (via letterbox drop to about 250 residents) and to all community members listed on the Googong IWC stakeholders list (about 70 listed stakeholders). The letter (refer to Appendix J) provided a brief outline of the proposal and provided an opportunity for members of the community to raise any issues or concerns that they may have with the project team. The letter also identified that a REF for the proposal is being prepared and would be available for public review in detail in that last quarter of 2015.

By early September no community members had contacted the project team to raise any issues or make any comments regarding the proposal.

## 5.5 Stakeholder consultation

In July 2015, key State and Federal agencies (as identified in the Part 3A Conditions of Approval) were consulted on the Googong township IWC Stage C Network West project. A letter was sent providing a brief outline of the project and the Part 3A Conditions to the following agencies:

- Commonwealth Department of the Environment
- NSW Department of Planning and Environment
- NSW Department of Primary Industries
- NSW Environment Protection Authority
- ACT ICON Water
- NSW Office of Water (now Department of Primary Industries – Water)
- NSW Office of Environment and Heritage
- NSW Roads and Maritime Service
- Palerang Shire Council

A number of responses were received from the above agencies. Matters raised as part of this consultation is outlined in Table 5-2 (refer to Appendix I for Agency consultation).



**Table 5-2 Issues raised through agency consultation**

Agency	Issue raised	Response
ACT ICON Water	There are no comments from ICON Water for the Integrated Water Cycle Project, Stage C Network West.	Noted
	Assume that ICON Water will be invited to comment on the Stage C Network East project? Could information regarding the timing of the Stage C Network East project please be provided?	<p>The Googong IWC Stage C Network East project is being assessed under a separate environmental assessment.</p> <p>Consultation with the relevant agencies in accordance with Part 3A Concept Plan Conditions of Approval would be undertaken as part of the Stage C Network East project. This would include inviting ICON Water to comment on that project.</p> <p>A copy of the program for the Stage C Network East project was provided to ICON Water representatives.</p>
NSW Department of Primary Industries – Fisheries	The key issues identified for assessment in Enclosure 2 (Part 3A Conditions of Approval for Concept) will cover DPI Fisheries requirements.	All Conditions of Approval outlined in the Googong Township Water Cycle Project Part 3A Concept Approval have been considered as part of this assessment and a summary is provided in Appendix B.
NSW Department of Primary Industries – Water (Formerly NSW Office of Water)	The project should be prepared consistently with Condition 2.1 of Schedule 2 of the Googong Township Water Cycle Project Part 3A Concept Approval (MP08_0236).	All Conditions of Approval outlined in the Googong Township Water Cycle Project Part 3A Concept Approval have been considered as part of this assessment and a summary is provided in Appendix B.
	An assessment be completed of the potential for groundwater to be intercepted during excavations and associated impacts in accordance with the NSW Aquifer Interference Policy. This is to also include the potential volumes, disposal requirements, management measures and licencing requirements as necessary.	The impacts of the proposal on local groundwater has been considered in Section 6.9. Impacts to groundwater for this proposal are expected to be minor.
	The pipeline proposed between the interim and the permanent reservoirs will cross a water course. It is recommended this be carried out in accordance with the <i>Guidelines for Controlled Activities on Waterfront Land</i> .	The proposal would not cross a natural drainage line but will utilise the drainage line as part of the excess water discharge point. Management measures have been included in Section 6.8.4 to manage the impacts of the proposal on local soils and hydrology. It is not expected that there would be substantial impacts on the drainage line and therefore the proposal has not been prepared in accordance with the Guidelines for Controlled Activities on Waterfront Land.

Agency	Issue raised	Response
	<p>It is recommended erosion and sediment control is carried out in accordance with the guideline, <i>Managing Urban Stormwater: Soils and Contamination</i> (Landcom 2004).</p>	<p>Management measures for erosion and sediment control are outlined in Section 6.8.4 and include reference to the preparation of an erosion and sediment management plan in accordance with the Blue Book.</p>
	<p>The proponent is continuing discussions with the Urban Water Unit of DPI Water in relation to the Section 60 approval under the Local Government Act 1993 to construct and operate water and waste water facilities. This is recommended to continue.</p>	<p>The proponent would continue these discussions throughout the ongoing development of the Googong township IWC project.</p>
NSW Roads and Maritime Services	<p>It is noted from the information provided that the proposed water main runs along the alignment of Old Cooma Road.</p>	<p>The proposed mains alignment runs within GTPL land parallel to Old Cooma Road as shown in Figure 1-1.</p>
	<p>As a condition of the DA378/2014 for the subdivision of land at Googong, the developer (CIC), is required to widen Old Cooma Road and upgrade the intersection of Old Cooma Road and Googong Dam Road.</p> <p>The EA should identify the likely impacts of Stage C of the project on the current and future road reserve of Old Cooma Road.</p> <p>The EA should identify and how the impacts on Old Cooma Road will be managed.</p>	<p>This initial upgrade under this DA number has been completed. It is unlikely that the construction of the mains pipelines would have any impacts on the operation or safety of Old Cooma Road.</p> <p>GTPL is already in discussions with regarding the master planning of NH2 and the impacts of the IWC project.</p>
	<p>It is unclear from the information provided whether direct access to/from Old Cooma Road to the water reservoir is proposed. The EA should clarify what the existing and proposed access arrangements are and how the impacts on Old Cooma Road will be managed.</p>	<p>The REF has identified in Section 3 that the temporary access road to the permanent reservoir site would be from Old Cooma Road.</p> <p>Figure 3-5 also shows how this would be achieved. This impacts of this access point have been considered in Section 6.1 and it is expected that the impacts to the operation of Old Cooma Road would be minimal given the low number of vehicle movements through the area.</p>
	<p>Roads and Maritime would appreciate the opportunity to comment on the EA upon its completion.</p>	<p>Roads and Maritime would be invited to comment on the REF during the display period.</p>
NSW Environment Protection Authority	<p>GTPL holds Environment Protection Licence (EPL) No. 20188 under the <i>PoEO Act 1997</i> in relation to the operation of the Water Recycling Plant and associated sewage reticulation infrastructure. Based on the information provided the proposal will require a variation to the existing EPL to change the location of the EPL discharge and monitoring Point 1.</p>	<p>An amendment to the existing EPL would be sought prior to operation of the permanent reservoir system and the applicable excess water discharge point.</p>

Agency	Issue raised	Response
	EPA advises that there is no requirement to monitor any discharge from the potable water reservoir however, systems will need to be in place to guard against any potential pollution of waters from any discharge of water from the potable reservoir (eg de-chlorination).	The current proposal design provides for any emergency release of excess water from the potable reservoir to be combined with the excess recycled water prior to the monitoring and dosing stations. Therefore any water released into the environment would be appropriately monitored and treated (de-chlorinated) prior to release into the environment through the discharge point.
	The EPA emphasises that all construction activities must be carried out with due diligence, duty of care, and with accordance with best environmental management practices, and considers that particular care and attention should be placed in the design and construction of controls as the receiving waters form part of a drinking water catchment. Accordingly all personnel involved should be aware of the details of the work plans, legislation and associated pollution controls and the environmental sensitivity of the receiving waters before any works commence.	The management measures outlined in section 6 of this REF identify how detailed design and construction activities would be managed to minimise the impacts of the proposal on the environment taking into account the necessary duty of care.
	We would recommend that site specific adaptive controls be developed and managed, as the project has the potential to increase sediment load to waters.	Site specific management measures for the proposal have been outlined in section 6 of this REF.
	The EPA requests that one electronic copy and one hard copy of the REF are provided to the EPA's Queanbeyan Officer for review.	EPA's Queanbeyan Office will be provided with on electronic copy and one hard copy of the REF as part of the public display of the REF for review.
	The following environmental impacts of the project should be assessed, quantified and reported on in the REF document:	
	<ul style="list-style-type: none"> <li>▪ Water The REF should provide details of the project that are essential for predicting and assessing impacts to waters including the quantity and physio-chemical properties of all potential water pollutants and the risks posed to the environment and human health, including the risks they pose to Water Quality Objectives in the ambient waters using technical criteria derived from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000).</li> </ul>	The impacts of the proposal on water have been considered in Section 6.8 and Section 6.9.
	<ul style="list-style-type: none"> <li>▪ Control of water pollution Appropriate controls should be put in place to ensure that the proposed construction works, are undertaken in a manner that does not contravene section 120 of the PoEO Act.</li> </ul>	The impacts of the proposal on water have been considered in Section 6.8 and Section 6.9.

Agency	Issue raised	Response
	<ul style="list-style-type: none"> <li>▪ Sediment and Erosion Control The EPA considers that particular care and attention should be placed in the design and construction of the proposal. The installation and appropriate use and maintenance of sediment and erosion control measures must be considered in the REF. You should consider clean water diversion around the construction site in order to reduce the volume of sediment laden water to be controlled. Any activity at the site must be carried out to ensure that any discharge from the premises complies with Section 120 of the PoEO Act. The REF should present all of the sediment and erosion control measures to be employed at the site, any operational procedures that will be required to prevent the pollution of waters, and must also demonstrate that the measures are consistent with the document “Managing Urban Stormwater – Soils and Construction” (Landcom, 2004).</li> </ul>	The impacts of the proposal on soil and erosion have been considered in Section 6.8 and Section 6.9.
	<ul style="list-style-type: none"> <li>▪ Waste management All wastes generated during the project must be managed in a manner that prevents the pollution of waters and air. Waste must be classified in accordance with the PoEO Act and <i>Waste Classification Guidelines</i> (DECCW, 2010). All waste material must be taken to a place which can lawfully receive them in accordance with the requirements of the PoEO Act.</li> </ul>	The impacts of the proposal on waste management have been considered in Section 6.11.
	<ul style="list-style-type: none"> <li>▪ Noise management Noise generated during the construction phase of the project must be managed in a manner consistent with the objectives and provisions of the <i>Interim Construction Noise Guideline</i> (DECCW, 2009) prior to commencement of construction. This includes implementing all reasonable and feasible measures to minimise noise arising from the activities, in particular from plant and equipment. This can include selection of appropriate times for the operation of noisy equipment so as not to cause a noise nuisance to the surrounding community. The amenity of residents adjacent to the site must be considered by the REF.</li> </ul>	The impacts of the proposal in noise and vibration have been considered in Section 6.3.



Agency	Issue raised	Response
	<ul style="list-style-type: none"> <li data-bbox="483 212 707 240">▪ Dust management</li> </ul> <p data-bbox="501 252 1346 347">The management of dust around the construction site is required to reduce the potential for the pollution of air and waters and to minimise the impact on the amenity of the surrounding community.</p> <p data-bbox="501 359 1346 547">The Review of Environmental Factors should describe mitigation and management options that will be used to prevent, control, abate or mitigate identified environmental impacts associated with the project and to reduce risks to human health and prevent the degradation of the environment. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.</p>	<p data-bbox="1386 212 1951 272">The impacts of the proposal on dust in the local area have been considered in Section 6.10.</p>
	<p data-bbox="483 563 1361 691">Details on the location of the proposed development, including the affected environment, to place the proposal in its local and regional environmental context including surrounding land uses, planning zonings and potential sensitive receptors should be provided.</p>	<p data-bbox="1386 563 1966 659">Consideration of the proposal as part of a local and regional context has been considered in Section 2 and for planning policies in Section 4.</p>
	<p data-bbox="483 707 1346 866">Describe mitigation and management options that will be used to prevent, control, abate or mitigate identified environmental impacts associated with the project and to reduce risks to human health and prevent the degradation of the environment. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.</p>	<p data-bbox="1386 707 1977 834">Management measures to minimise or avoid impacts to the environment as part of the proposal have been identified under each environmental issue throughout Section 6.</p>
<p data-bbox="237 882 421 978">Officer of Environment and Heritage</p>	<p data-bbox="483 882 1361 978">The Review of Environmental Factors Environmental Assessment Requirements (EARs) provided by OEH are limited to Aboriginal cultural heritage, biodiversity and flooding, stormwater and coastal erosion.</p>	<p data-bbox="1386 882 1977 1169">It is noted that as part of their submission OEH provided detailed information that needed to be considered as part of the environmental assessment for Aboriginal cultural heritage, biodiversity and flooding and stormwater (refer to Appendix I). These requirements have been considered as part of our assessment outlined in the applicable sections in section 6 (Aboriginal cultural heritage in section 6.6, biodiversity in section 6.4 and hydrology in section 6.9).</p>

Agency	Issue raised	Response
	<p>In particular the REF should:</p> <ul style="list-style-type: none"> <li>▪ Undertake an assessment of the following threatened entities, listed under the Threatened Species Conservation Act 1995 <ul style="list-style-type: none"> <li>▪ White Box Yellow Box Blakey's Red Gum Woodland EEC (referred to as Box-gum woodland).</li> <li>▪ Pink-tailed Worm Lizard (<i>Aprasis parapulchella</i>), Striped Legless Lizard (<i>Delma impar</i>), Golden Sun Moth (<i>Synemon plana</i>), Little whip snake (<i>Suta flagellum</i>), Grassland earless dragon (<i>Tympanocryptis pinguicollis</i>);</li> <li>▪ Gang-gang Cockatoo (<i>Cellocephalon fimbriatum</i>), Hooded Robin (<i>Melandryas cucullata</i>), Diamond Firetail (<i>Stagonopleura guttata</i>), Flame Robin (<i>Petroica phoenicea</i>), Scarelt Robin (<i>Petroica boodna</i>) and Esatern Bentwing-bat (<i>Miniopterus schreibersii oceanensis</i>) (Note: this bat species has been recorded within 250 metres of the proposed development).</li> <li>▪ Silky Swainson-pea (<i>Swainsona sericea</i>), Small Purple-pea (<i>Swainsona recta</i>), Button Wrinklewort (<i>Rutidosia leptorrhynchoidea</i>).</li> </ul> </li> <li>▪ Due to the presence of Aboriginal cultural heritage sites within the development footprint, and high likelihood for further sites to be present, a full archaeological assessment and application for an Aboriginal Heritage Impact Permit (AHIP) should be made.</li> </ul>	<p>Biodiversity impacts have been considered as part of the assessment outlined in section 6.4 and a biodiversity assessment has been undertaken by Biosis and is provided in Appendix E. The assessment identified that the proposal is unlikely to impact threatened species or endangered ecological communities within the are.</p> <p>An Aboriginal cultural heritage assessment has been undertaken for the proposal by Navin Officer and is provided in Appendix F. A summary of this assessment is considered in section 6.6 of this REF. The assessment identified that no Aboriginal sites will be directly impacted by the project. One Aboriginal site, GA6, is located twelve metres from the defined project area and is vulnerable to indirect and/or inadvertent impact during construction of the potable water and recycled water mains. Safeguards to minimise the potential for impacts have been identified. It has not been recommended that an AHIP is required for this proposal.</p>

## 5.6 Ongoing consultation

Prior to construction commencing a Stage C Network West Consultation Plan would be prepared in accordance with the Concept Approval Conditions of Approval number 3.2. It would outline how and when consultation would be undertaken with the local community throughout the construction period and how information about the project progress would be communicated to the community.

The existing Goongong IWC website ([www.compliance.goongong.net](http://www.compliance.goongong.net)) would be maintained throughout the Stage C construction period and kept up-to-date to provide the community with, as a minimum, the following information:

- The status of the project.
- A copy of each relevant environmental approval, licence or permit required and obtained in relation to the project.
- A copy of each approved plan, report, or monitoring program required by this approval and associated project approvals.
- A summary of the monitoring result of the project, which have been reported in accordance with the various plans and programs approved under this approval and associated project approvals.
- A summary of the monitoring results of the project, which have been reported in accordance with the various plans and programs approved under this approval and associated project approvals.
- Details of the outcomes of compliance reviews and audits of the project, to the satisfaction of the Director-General.

A community complaints register would be kept and maintained throughout construction to document any issues raised by the community and how these issues were addressed.

## 6 Environmental Assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal are considered. This includes consideration of the factors specified in the guideline *Is an EIS required?* (DUAP 1999) as required under clause 228(1)(b) of the Environmental Planning and Assessment Regulation 2000. The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 are also considered in Appendix A. Site-specific safeguards are provided to ameliorate the identified potential impacts.

### 6.1 Traffic and access

#### 6.1.1 Concept Plan Conditions of Approval

CoA #	Condition	Response
2.1 (h)	traffic and access – including details of transport routes to and from construction and operation sites and associated impacts to existing activities, including safety impacts;	Details of the temporary traffic and access routes during construction and operation are outlined below in Section 6.1.
2.1 (j)	the environmental assessment of the project must take into account relevant State Government guidelines, policies and plans	All relevant legislation for traffic and access arrangements have been considered in Sections 4 and 6.1.

#### 6.1.2 Existing environment

Old Cooma Road is a two lane (one in each direction) arterial road connecting Queanbeyan with townships to the south before connecting to the Monaro Highway. Old Cooma Road runs along the western boundary of the Googong township and includes a T-intersection with Googong Road. Old Cooma Road in the proposal location is posted at 100km per hour speed limit. It is a rural road with dirt shoulders and drains running parallel to the road. Old Cooma Road is under the control and authority of the NSW Roads and Maritime Service (RMS).

Googong Road runs north of the Googong township and connects at a T-intersection with Old Cooma Road to the west and the Googong Foreshores land to the east. A number of T-intersections connect to the south of Googong Road providing access into the Googong township. Googong Road currently is a semi rural road with minimal formal kerb and gutters along the length of the road. The majority of the road is dirt shoulders with table drains, however this would change with the ongoing development of the Googong township. The speed limit on Googong Road is 60km per hour. Googong Road is under the control and authority of QCC, however GTPL are managing the road on the behalf of QCC during development of the Googong township.

Currently there are no formal access points or roads leading to or within the Hill 800 proposal area. A dirt access track does run inside the fence on GTPL land parallel to Old Cooma Road.

Currently access into the WRP is via a formal driveway access from Googong Road. Parking for construction staff and vehicles is available within the WRP site.

Currently access to the interim reservoir site is via a formed dirt road from within the Googong township. Some informal parking space is available at the interim reservoir site.

No formal pedestrian access is provided throughout any of the proposal area sites.

Refer to Figure 6-1 for existing road and access arrangements.



### 6.1.3 Potential impacts

#### Construction

Throughout construction there will be increases in vehicle movements to, from and throughout the proposal area. These will change dependent on the stage and progress of construction activities. Construction vehicle activities would include:

- At initial set up stage – large construction plant and equipment would be delivered to the construction site using flatbed trucks, articulated trucks and low loaders up to 25 metres in length. Where feasible construction plant will be left on-site for the duration of use in order to minimise impacts to the local road network.
- Throughout construction at the WRP – vehicle movements would predominantly involve delivery of equipment and materials and staff accessing the site.
- Throughout construction at the permanent reservoirs site (including pipework between the permanent reservoirs site and the interim reservoir sites) – Peak heavy vehicle traffic movements are likely to occur during excavation and construction of the internal access roads (including the temporary access road from Old Cooma Road) and during concrete pours for the reservoir foundations. Delivery of other equipment and materials would also be required as well as construction staff accessing the site.
- Demolition and restoration of the interim reservoirs site – Truck movements to bring in plant and equipment for the demolition of the site and then additional truck movements to remove waste material from the site. Construction staff accessing the site would also be required.
- Completion of construction – large construction plant would be removed from the site.

Table 6-1 outlines the estimated number of vehicle movements per day throughout construction. These vehicle movements would not all be undertaken at the same time as construction would be progressive. In addition, the vehicles would be accessing different areas of the proposal area, reducing the cumulative traffic impacts of construction.

**Table 6-1 Peak construction vehicle movements estimated per day**

Construction activity	Peak trips per day	Construction activity
Set up/mobilisation	10	Delivery of plant and amenities to site
Earthworks	20	Fuel and materials delivery
Concrete pouring	50	Concrete truck deliveries for reservoir foundation pours
Roadworks	20	Delivery of road base materials
Mechanical/electrical works	10	Delivery and installation of reservoir and booster pump plant and equipment
Removal of waste	10	Demolition of interim reservoir site
Construction staff	20	Construction staff accessing the site

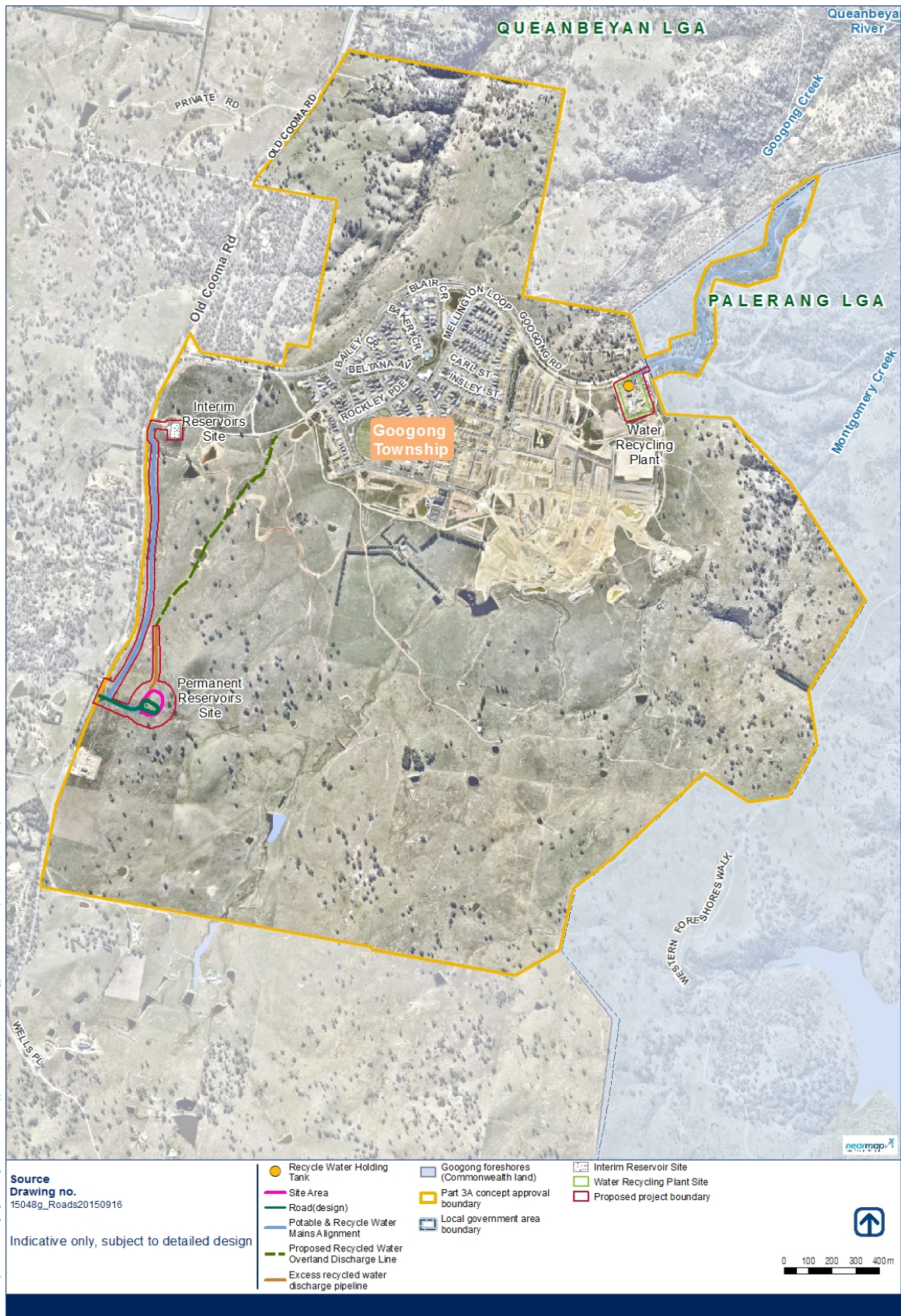


Figure 6-1 Existing road and access arrangements for the proposal area



Construction vehicles would access the various construction areas via three separate routes, including:

- The WRP – access would be via the driveway access off Googong Road (refer to Figure 3-6).
- Hill 800 reservoir site – access would be via the temporary access road and dedicated southbound deceleration and acceleration turn lanes established on Old Cooma Road as shown in Figure 3-5.
- The interim reservoir site – access to this site would be via the existing dirt access road to the site via the Googong township.

It is expected that construction traffic movements generated throughout construction would have a minor impact on the operation of the local road network. This is primarily due to the low number of vehicle movements required, three separate access points and the staging of construction activities.

The temporary access turn lanes established on Old Cooma Road to access the permanent reservoir site would be sufficient to provide for trucks slowing down and turning at 100km/h speed limit. This would minimise impacts on through traffic flow along Old Cooma Road. This access point would remain until a permanent access point is established as part of the adjacent neighbourhood of the Googong township development currently planned in 2018.

No impacts to residential property access or pedestrian access are expected as a result of the proposal.

## Operation

During operation, access to the permanent reservoirs site would be via the temporary access road established during construction. This is a temporary measure and a permanent access road to the site would be built at a later stage as further details about the surrounding development become available. The construction of this permanent access road would be subject to a separate environmental assessment as part of the next stage of the Googong township urban development.

Vehicle movements to and from the permanent reservoirs site would be limited to ongoing maintenance and service operations. The site will operate as an unmanned site. These are expected to be minor (an average of between 1–5 movements per day) and are unlikely to impact on the ongoing operation of the local road network.

The proposal is not expected to increase the number of operation vehicle movements to and from the WRP. The ongoing maintenance of the additional tank at this facility as part of this proposal would be managed as part of the overall facility management.

### 6.1.4 Management measures

#### Construction

- A detailed traffic and access management plan would be prepared prior to construction to outline all access routes to, from and within the construction zones, traffic control methods to be utilised and methods to minimise impacts on the local road network. This plan would be prepared in accordance Roads and Maritime standard Traffic Control Plan (TCP) 195 and submitted to Roads and Maritime for consultation and approval.
- All employees and contractors would be inducted into the site and would receive appropriate training to fulfil their individual and environmental responsibilities, including requirements and responsibilities under the traffic and access management plan.

- Where feasible, construction deliveries would be scheduled outside of peak periods, in particular peak residential access times.
- Access to residential properties would be maintained at all times.
- Construction staff and delivery vehicles would not park in public parking areas where supply is limited.
- Any permits required for oversize vehicles to transport plant or equipment are to be obtained from Roads and Maritime.

## Operation

- The temporary access road from Old Cooma Road to the permanent reservoirs site would be maintained until such times as approval for a permanent access road has been granted.
- The future of the temporary access road intersection on Old Cooma Road would be determined in consultation with Roads and Maritime at that time.

## 6.2 Visual amenity

A Visual Impact Assessment has been prepared by RPS (RPS, 2015) for the proposed works. A summary of the findings of this assessment are outlined below and the full report is included as Appendix C.

### 6.2.1 Concept Plan Conditions of Approval

CoA #	Condition	Response
2.1 (h)	Visual amenity – an assessment of the impact of the project on visual amenity, including future sensitive receptor areas, including residential;	Section 6.2 assesses the visual amenity impacts of the proposal including future sensitive receptor areas.
2.1 (j)	the environmental assessment of the project must take into account relevant State Government guidelines, policies and plans	All relevant legislation for visual amenity have been considered in sections 4 and 6.2

### 6.2.2 Assessment methodology

To capture the likely impact of the proposal, the following tasks were undertaken:

- A desktop analysis to ascertain the visual catchment of the project within the area, and potential receptors of the visual impact determined through general topographic analysis and geographic information systems (GIS) analysis. This provides the basis for the establishment of the visual envelope (VE) and key viewpoints.
- An on-site field inspection to confirm the visual catchment, gain an understanding of the development proposals within the context of the study area, and to identify and confirm key viewpoints.
- Identification of landscape character and determination of the sensitivity of the viewpoints are established.
- Assessment of visual impact using the matrix in Table 6-2.
- Development of recommended mitigation strategies for both the construction and operation where the impacts on visual amenity are thought to be serious enough to be warranted.



## Assessment terminology

The terms below are of fundamental importance in assessing the visual impacts and measurable non-subjective aspects of both visibility and impact (i.e. quantitative).

**Visual receivers** – Visibility is based both on static (usually longer term) and mobile (usually short term) receivers. Visual impact varies based on the type of receptor. Static visual receptors refer to the public or community with views of the subject site or area from their dwellings and/or places of work. Mobile receptors generally include vehicle drivers, pedestrians and cyclists.

**Sensitivity** – Visual sensitivity refers to the sensitivity of a landscape character zone or view and its capacity to absorb change. Combined with magnitude, sensitivity provides a measure of impact. Sensitivity refers to how sensitive the character of the setting is to the proposed change. For example a pristine natural environment would be more sensitive to change than an industrial area. Visual sensitivity refers to the “quality of the view and how sensitive it is to the proposed change”(RMS, 2013).

Visual sensitivity is related to the direction of view, the composition of the view and may include more than one character zone. The capacity to absorb development is primarily dependent on vegetation cover, landform and existing structures, the viewers, frequency of the view and the distance between the viewers and the development.

**Magnitude** -The magnitude of visual effect is the degree of change the visual landscape undergoes as a result of the proposed development. It is the measurement of the overall scale, form and character of a development proposal when compared to the existing condition (RMS, 2013). Magnitude also takes into consideration the distance between the viewer(s) and the proposal.

## Grading Matrix

The visual impact is assessed by combining the viewpoint sensitivity and the magnitude of the proposal in a table format (refer to Table 6-2). Based on the resultant rating a judgement is made as to the outcome, and the strategies for mitigating and balancing the objectives of the project with its impact on its setting.

**Table 6-2 Visual Impact Grading Matrix**

		Magnitude					
		High	High-Moderate	Moderate	Moderate-Low	Low	
Sensitivity	High	High Impact	High Impact	Moderate-High	Moderate-High	Moderate	Negligible
	High-Moderate	High Impact	Moderate-High	Moderate-High	Moderate	Moderate	Negligible
	Moderate	Moderate-High	Moderate-High	Moderate	Moderate	Moderate-Low	Negligible
	Moderate-Low	Moderate-High	Moderate	Moderate	Moderate-Low	Moderate-Low	Negligible
	Low	Moderate	Moderate	Moderate-Low	Moderate-Low	Low Impact	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Source: Roads and Maritime Services, 2013

### 6.2.3 Existing environment

The existing visual character and surrounding landscape was recorded during a site review in June 2015. The landscape character was assessed in terms of the existing built elements, landform, colour, texture and vegetation patterns.

The overall proposal area is located in a predominantly rural setting. Land uses in the area include, cleared agricultural lands (predominantly for grazing), rural and new residential development. The surrounding areas are largely modified through clearing, within a larger natural setting of mountain ranges and foothills.

The areas within the current and future Googong township are largely open fields and rolling hills with both local and more distant views possible. Existing mature *Eucalyptus species* (Gum) and other remnant trees are scattered across the landscape contrasting the low pasture grasses that provide visual continuity throughout the landscape.

Construction of the Stage Neighbourhood 1A of the residential precinct has begun with large areas under construction or recently completed. The township itself will be progressively developed over time with different construction companies involved in the construction of the residential dwellings, public buildings and public domain areas transforming the existing rural into a suburban residential character.

#### **Current Googong development (Neighbourhood 1A) in proximity to Club Googong**

The current Googong development (Neighbourhood 1A) currently consists of a display village, paved streets, paths and planting, a community centre “club”, parks and open spaces for recreation, a sports oval, as well as vacant, partially and fully constructed residential lots completed in the past 2-3 years.

#### **Water recycling plant**

The WRP is located in the northeast corner of Stage Neighbourhood 1A with future residential areas located to the south and west. Construction of the WRP is currently underway with some components nearing completion.

Surrounding residential areas have already been cleared and levelled creating open views to much of the WRP infrastructure. The industrial nature of the WRP strongly contrasts with both the natural surroundings and views to the WRP from the west and south however are to be mitigated through the use of earth mounding and planting. Much of the surrounding future residential areas will be beyond 100 meters distance.

The WRP and surrounding Stage Neighbourhood 1A areas lie within an undulating landscape that falls toward the northeast. The areas to the west of the WRP are therefore higher allowing views over the WRP whereas areas to the north and east are generally lower visually separated by both landform and vegetation. Typical existing slope gradients are 1:10 however are being modified to suite the new township.

#### **Permanent reservoirs site**

The precinct to the west of the existing Googong development (in proximity to Hill 800) is yet to be developed however is an area of important scenic value. Hill 800 is the highest point in the overall Googong township development and is both prominent and visible from the surrounding areas.

From the top of Hill 800, views are possible in all directions to the surrounding hills and mountain ranges and conversely views to the top from surrounding areas are also possible.

Masterplanning of this area currently indicates that the lower areas immediately to the west and east of the Hill 800 crest will be subdivided into residential lots. Internal streets may follow topographic contours connecting with other areas of the development in the north and south. The higher elevated areas around Hill 800 are indicated as a “Hilltop Park Lookout”.

The proposed permanent reservoirs site is to be located in the saddle between two hill tops with temporary vehicle access proposed from Old Cooma Road. There are four hill crests in close proximity limiting or preventing views of the reservoirs to areas immediately north and south. Typical existing slope gradients are 1:10 – 1:12 to the east and west of the saddle and steeper closer to the crests (up to 1:8). Levels however will likely be modified to suit the development providing level areas for dwellings and the reservoirs.

## 6.2.4 Potential impacts

### Construction

During construction the construction machinery, construction activities and excavation of the area will impact the visual amenity of the proposal area. However, given much of the Googong township is currently under development and the fact that there will be no houses near the Stage C Network West permanent reservoir site works during construction, there are expected to be minimal to negligible visual impacts.

Construction works at the WRP will be undertaken within the WRP site facility (which is currently under partial construction), therefore construction activities will be obscured by the existing infrastructure and is therefore likely to have a minimal to negligible visual impact on the adjacent residential properties.

Standard mitigation measures can be applied as outlined in Section 6.2.5.

### Operation

#### Recycled water tank within the WRP site

The extent of visual amenity impact of the proposed works is largely determined by the visual prominence of the elements proposed, the extent of view shed from the proposal, the type and number of visual receivers likely to be impacted.

A Visual Envelope Map (VEM) was generated through the use of digital terrain modelling. The mapping is indicative only as other factors, such as trees, vegetation, buildings and other factors have not been taken into account which may limit views or provide screening. The VEM was calculated using the height of the tank walls (10m) plus an additional 1.2 meters for the roof, refer to Figure 3-7.



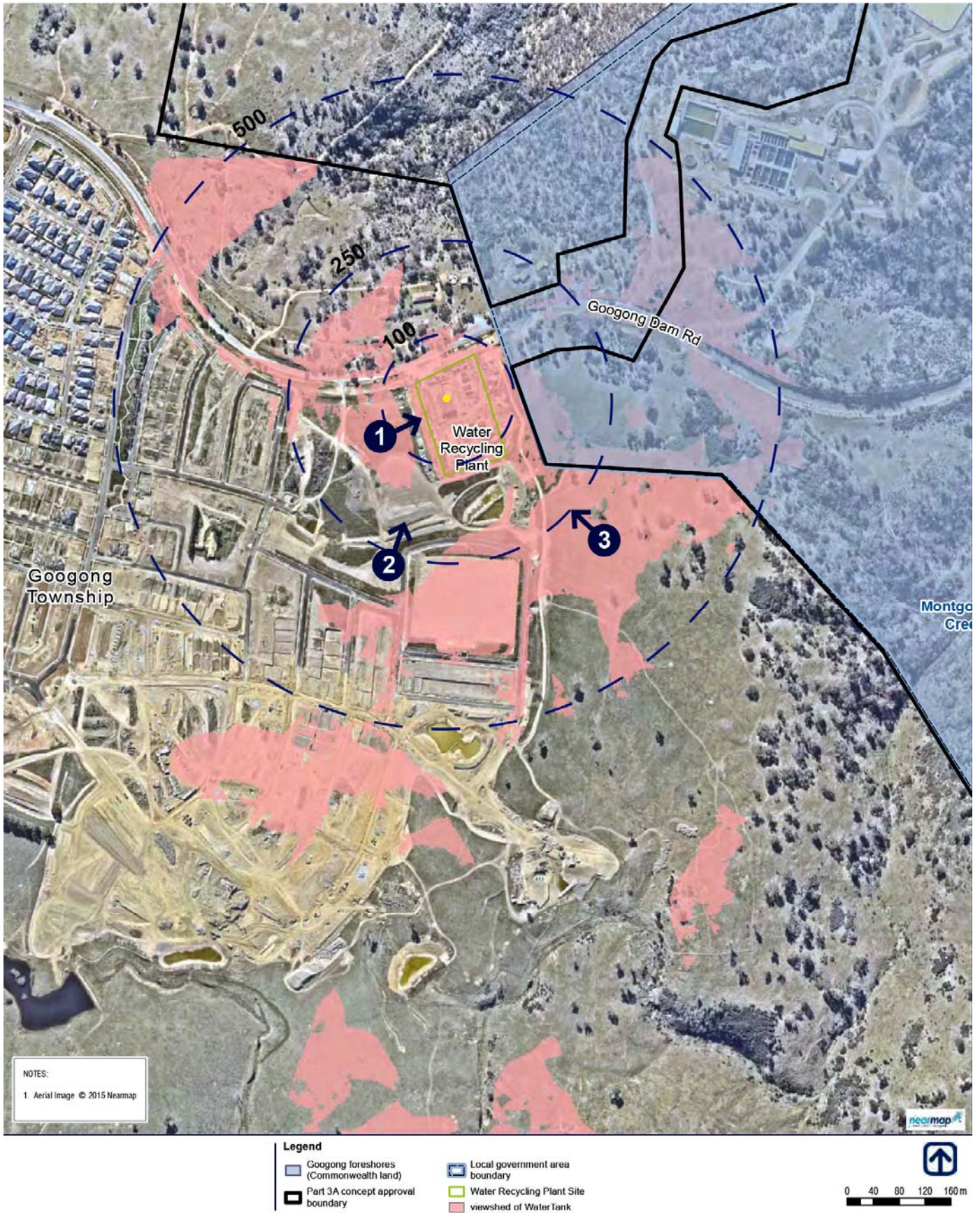


Figure 6-2 VEM for the recycled water tank within the WRP site



The VEM generally indicates that views to the recycled water tank within 250 meters are from the west and south. There are potentially more opportunities to see the tanks up to 500 meters from surrounding areas, however the relative size and scale of the tank must be considered within the context of the WRP infrastructure, the telecommunications tower and future residential subdivision areas to the south and west. Works associated with the RWPS will not be visible from outside the WRP.

*Viewpoint assessment of the recycled water tank*

Figure 6-3 and Figure 6-4 show the current existing condition and indicative future development based on an assumed subdivision development typology for Viewpoints 1 and 2 indicated in Figure 6-2.



**Figure 6-3 WRP Viewpoint 1 (looking east to the WRP site)**

Vertical elements such as the telecommunication tower, the weather station and a venting stack are prominent in the view shed. The existing administration building and landform currently hide views of the lower parts of the existing water holding tank. Future buildings within the WRP site will block views to the lower half of the new recycled water tank as will a proposed continuous landscape berm with screen planting.



**Figure 6-4 WRP Viewpoint 2 (looking north towards the WRP site)**

In viewpoint 2, the landform to the west of the WRP all but hides the top of the recycled water tank. The continuous berm and screen planting along the western and southern edge of the WRP will block all views of the tank once established.

**Permanent reservoir site**

A VEM was generated through the use of digital terrain modelling. The proposed height of the walls of the tank (10m) plus an additional 1.2 height was added for the roof as the basis for calculating the overall visual catchment.



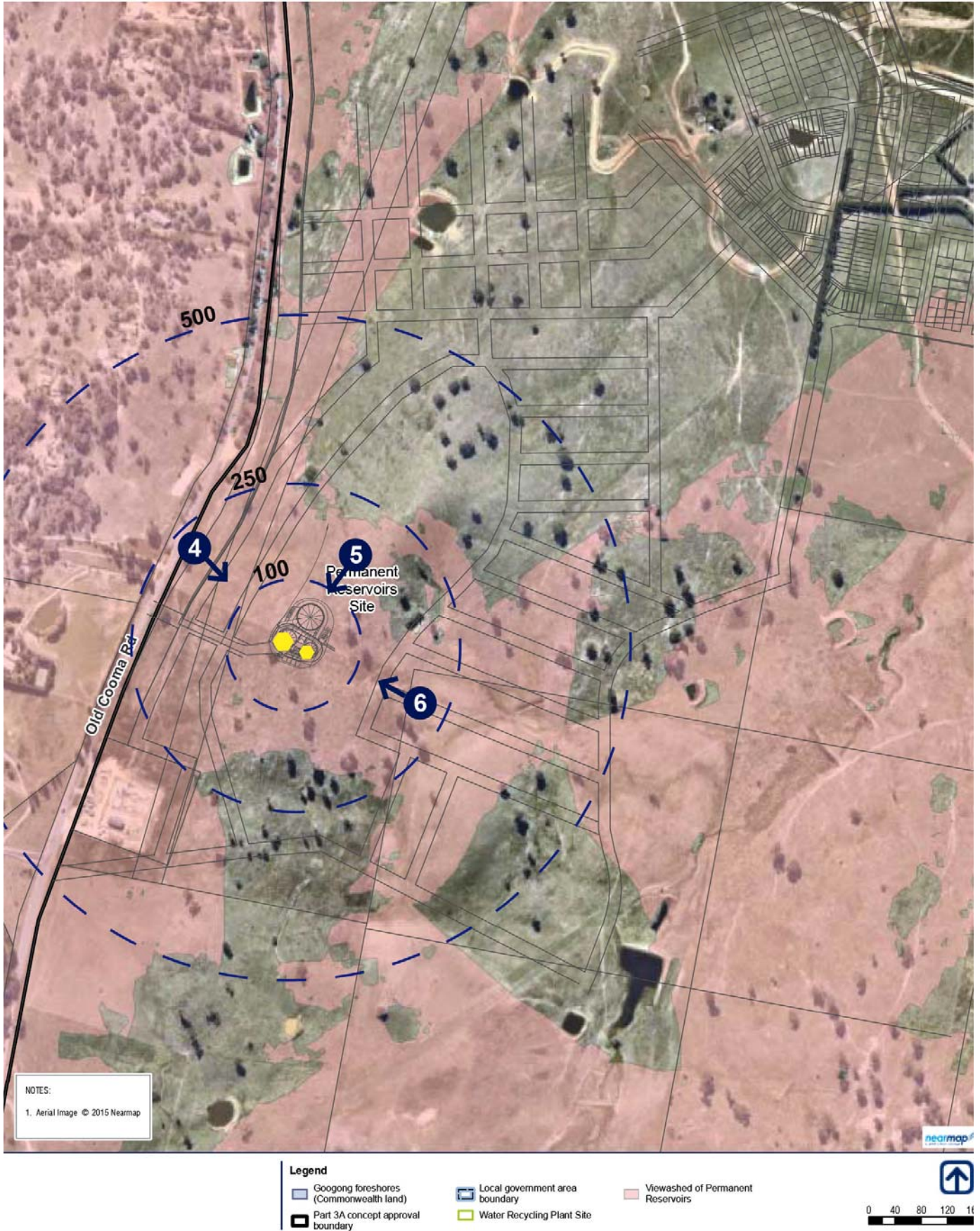


Figure 6-5 VEM for the permanent reservoirs site



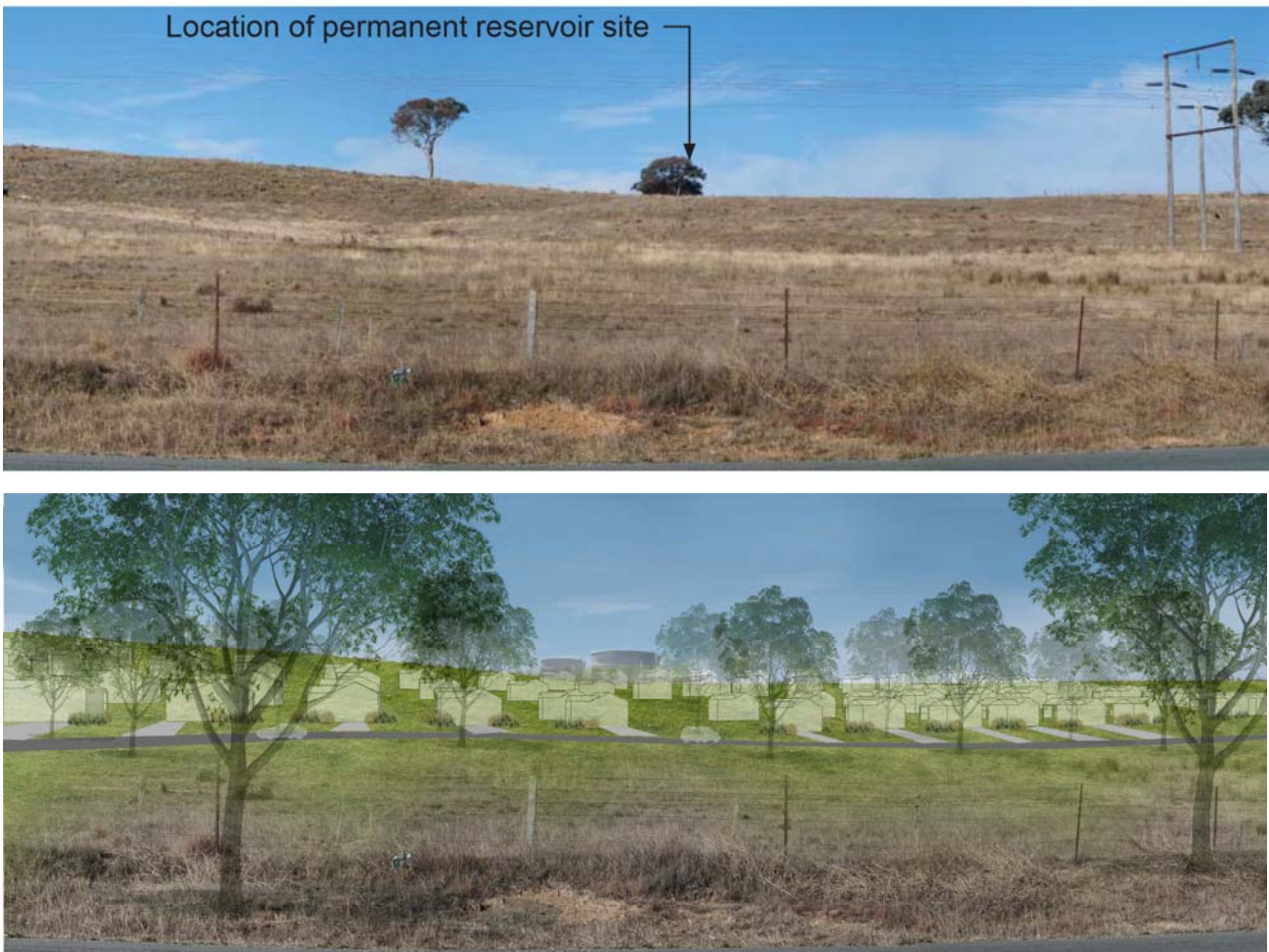
The VEM gives an indication of the main views to the permanent reservoirs site. Primary viewing opportunities are at lower development areas and Old Cooma Road to the west and future development areas to the east. Areas at higher elevations to the north and south are also able to view the permanent reservoirs site; however the peak of Hill 800 prevents viewing to the north and the Googong Township.

The permanent reservoirs site is located within an area currently shown on the masterplan as undeveloped open space labelled “Hilltop Park Lookout”. The Hilltop Park Lookout area follows a linear north-south oriented shape of the higher landform hill peaks in a north-south direction. The reservoirs are positioned near the middle of the open space and would be able to be seen from most areas within the open space.

Based on current design information, areas most visually affected are those immediately west of the reservoirs as the areas to the east are further away, at a lower elevation. The permanent reservoir site is positioned on the western edge of the saddle. Furthermore, the landform continues falling to the east, diminishing the possibility of views to the reservoirs.

*Viewpoint assessment of the permanent reservoir site*

Figure 6-6 and Figure 6-7 show the current existing condition and indicative future development based on an assumed subdivision development typology for viewpoints four and five indicated in Figure 6-5.



**Figure 6-6 Permanent reservoir viewpoint 4 (looking east from Old Cooma Road)**

The new reservoirs will sit at a higher elevation than the surrounding area and will be highly visible to much of the surrounding area given their overall size and prominence in the landscape. Future residential areas to the west between the reservoirs and Old Cooma Road may come within relative close proximity to the permanent reservoir site.



The visual amenity of any dwellings built in close proximity to the permanent reservoir site will likely be affected to some degree; however views of the reservoirs from Old Cooma Road will likely be partially screened by future development.



**Figure 6-7 Permanent reservoir viewpoint 5**

From the future Hilltop Park Lookout, initial 3D modelling suggests that without some form of visual screening, open views of the reservoirs may be possible. The model also demonstrates that dwellings to the east (left) are likely to be lower and further away than those to the west (right). Proposed mitigation measures should therefore address visual amenity impacts with regard to these potential future relationships.

An existing residence near Fernleigh Drive and Old Cooma Road will have clear views to Hill 800 and the reservoirs from the south west. The reservoirs were identified as having a High impact rating in the 2010 Visual Impact Assessment by Clouston. As there has been relatively little change to the existing conditions or to the proposed reservoir design, a rating of “High” is given for this assessment. This rating could potentially become lower over time however once areas south and west of the reservoirs are developed as part of the township. The reservoirs will ultimately form part of an overall suburban landscape character and views from this residence may be blocked or partially blocked by houses and/or landscape.

**Pipelines, pumps and decommissioning of the interim reservoirs**

None of the remainder of these elements of the proposal is expected to have significant impacts on visual amenity as they are located in areas of limited visual accessibility.

Decommissioning of the interim reservoirs will result in an improved visual amenity for the surrounding areas.

**Viewpoint analysis**

Table 6-3 presents the results of the viewpoint analysis. Note that only viewpoints 1, 2, 4 and 5 are shown in artist’s impressions. Viewpoints 3 and 6 are a desktop analysis only.

**Table 6-3 Viewpoint analysis results**

Viewpoint	Stage C Network West Infrastructure	Analysis	Impact Rating
1	Recycled water tank, recycled water pumping station	<p><b>SENSITIVITY – Moderate</b></p> <p>Visual receivers are assumed to be future residents. Visual receivers are also residents within the development using publicly accessible areas such as streets and footpaths.</p> <p><b>MAGNITUDE – Negligible</b></p> <p>Visual receivers are higher than the water tank potentially with views of the water recycling plant and to the mountain ranges beyond. Future residents will move in after the water holding tank is constructed and the screen planting will be in place therefore the magnitude of effect that would be created by the additional water tank within the context of the WRP is considered to be Negligible. The water pumping station will be screened by the WRP and therefore have no visual connection with the surrounding landscape or residential development and no impact on visual amenity.</p>	Negligible
2	Recycled water tank, recycled water pumping station	<p><b>SENSITIVITY – Moderate to Low</b></p> <p>Visual receivers are assumed to be future residents. Visual receivers are also residents within the development using publicly accessible areas and the playing fields.</p> <p><b>MAGNITUDE – Negligible</b></p> <p>Views by visual receivers will be obscured by the landscape planting and other components of the WRP such as the blower building, odour control and tertiary treatment.</p> <p>The magnitude of effect that would be created by the additional water tank within the context of the water recycling plant is considered to be Negligible.</p>	Negligible

Viewpoint	Stage C Network West Infrastructure	Analysis	Impact Rating
3	Recycled water tank, recycled water pumping station	<p><b>SENSITIVITY – Moderate</b></p> <p>Visual receivers are assumed to be residents in future homes further than 200 meters.</p> <p><b>MAGNITUDE – Negligible</b></p> <p>The magnitude of change created by the additional tank is considered to be negligible as components of the WRP such as the bioreactor and EDT will block visibility of tank.</p>	Negligible
4	Permanent reservoirs site at Hill 800	<p><b>SENSITIVITY – High</b></p> <p>Visual receivers are assumed to be both static and mobile and include; future residences west of the reservoirs, residents within the development using publicly accessible areas such as streets and footpaths and vehicles and passengers using Old Cooma Road. The surrounding landscape will likely have little capacity to visually absorb the structures.</p> <p><b>MAGNITUDE – High-Moderate</b></p> <p>The reservoirs are located in an elevated saddle above much of the immediate surrounding landscape. Their height and overall scale and higher position relative to these areas and contrasting industrial character mean they will be prominent within the landscape.</p>	High
5	Permanent reservoirs site at Hill 800	<p><b>SENSITIVITY – High</b></p> <p>Visual receivers are assumed to be mobile future users of the Hilltop Park Lookout open space with open views to the reservoir site and surrounding landscape. Viewer numbers may be small depending on accessibility however there is assumed sensitivity based on the potential for the area's use as a lookout and visual connection with the wider natural and semi-natural landscape.</p> <p><b>MAGNITUDE – High-Moderate</b></p> <p>The reservoirs are located in an elevated saddle above most of the surrounding landscape. They are large physical elements that contrast sharply with the natural character of the Park and surrounding landscape. Park Areas within the park will be able to look down over the tops of the reservoirs. The surrounding landscape may have little capacity to visually absorb the structures.</p>	Moderate to High
6	Permanent reservoirs site at Hill 800	<p><b>SENSITIVITY – High</b></p> <p>Visual receivers are assumed to be both static and mobile and include; future residences east of the reservoirs, residents within the development using publicly accessible areas such as streets and footpaths. The surrounding landscape will likely have little capacity to visually absorb the structures.</p> <p><b>MAGNITUDE – High-Moderate</b></p> <p>The reservoirs will be higher than the viewers from the east meaning they will have a strong visual presence. Their combined size and contrasting industrial character mean they will be prominent within the landscape.</p>	High



This visual assessment has determined that the impacts on visual amenity from the proposal will be High to High-Moderate near the permanent reservoirs site. The immediate surrounding area will have little visual capacity to absorb the industrial character of the large tanks elevated in the landscape. It is imperative therefore that wherever possible, measures should be implemented to visually buffer the reservoirs from the future residential areas, Hilltop Park and wider area.

The recycled water tank at the WRP site and expanded pumping station are generally of a scale and nature that will not detract from the overall visual amenity of the future residential areas and mitigation measures are therefore not warranted. The tank will be concealed from the surrounding area both by WRP infrastructure as well as the landscape berm and screen planting to the south and west.

The removal of the interim reservoirs should improve the current and future visual amenity from the removal of highly visible infrastructure of an industrial character.

## 6.2.5 Management measures

### Construction

The management of these visual impacts during the construction phase would require:

- Installation of temporary fencing at the permanent reservoirs site for security and to visually delineate the area of construction.
- The site to be kept tidy and well maintained, including removal of all rubbish at regular intervals. There should be no storage of materials beyond the construction boundaries.
- Temporary hoardings, barriers, traffic management and signage would be removed when no longer required.
- Locate construction plant, machinery and vehicle parking areas away from public or sensitive viewing areas.
- Locate any lighting needed for construction night-time activities away from public or sensitive viewing areas.
- Upon completion, revegetate residual site areas.

### Operation

#### Permanent reservoirs site

- Decrease the visual prominence of the permanent reservoirs through the use of muted colours and non-reflective surfaces.
- Effective screening of the permanent reservoirs should be provided through the use of locally endemic vegetation close to the site. Species selection should aim to inhibit views at the ground and mid levels up to 10 meters in particular on the eastern and western sides of the reservoirs. A landscape concept plan should be prepared that demonstrates how the proposed planting treatments will screen the reservoirs from surrounding areas. Planting treatments should also be sympathetic to the existing landscape in its use of plant types and their arrangements and avoid rigid, row type hedge planting.
- Monitoring of trees and vegetation should be done at permanent reservoirs site to ensure successful planting and screening is achieved. Replace trees and vegetation that are dead or dying.
- The use of light emitting diodes (LED) lighting and low angle cut-off fittings should be implemented where lighting is needed to mitigate and help reduce stray light.



### Recycled water tank and pumping station at the WRP

- Decrease the visual prominence of the recycled water tank at the WRP through the use of muted colours and non-reflective surfaces.
- Monitoring of trees and vegetation should be done at WRP site to ensure successful planting and screening is achieved. Replace trees and vegetation that are dead or dying.

## 6.3 Noise and vibration

A Noise and Vibration Assessment has been prepared by SLR Consulting (2015) for the proposed works. A summary of the findings of this assessment are outlined below and the full report is included as Appendix D.

### 6.3.1 Concept Plan Conditions of Approval

CoA #	Condition	Response
2.1 (h)	Noise and vibration – including construction and operation noise impacts in the context of planned urban development in the area;	Construction and operational noise impacts of the proposal have been considered in Section 6.3.
2.1 (j)	the environmental assessment of the project must take into account relevant State Government guidelines, policies and plans	All relevant legislation for noise and vibration have been considered in Sections 4 and 6.3.
2.1 (k)	<p>The assessments of the subsequent project stages shall take into account, but not limited to the following guidelines, as relevant;</p> <ul style="list-style-type: none"> <li>▪ <i>NSW Industrial Noise Policy (EPA, 2000)</i></li> <li>▪ <i>Interim Construction Noise Guidelines (DECC, 2009)</i></li> <li>▪ <i>Environmental Noise Management – Assessing Vibration: a Technical Guideline (DECC, 2006)</i></li> <li>▪ <i>Environment Criteria for Road Traffic Noise (EPA, 1999)</i></li> </ul>	<p>The Noise Assessment has been prepared with reference to Australian Standard AS1055:1997 <i>Description and Measurement of Environmental Noise</i> Parts 1, 2 and 3 and in accordance with the Interim Construction Noise Guidelines (DECC, 2009) and EPA NSW Industrial Noise Policy (EPA, 2000), with reference also made to the NSW Road Noise Policy (DECCW, 2010).</p> <p>The Vibration Assessment has been undertaken based on <i>Assessing Vibration: a technical guidelines</i> (OEH, 2006) and the British Standard BS7385-1993.</p>

### 6.3.2 Existing environment

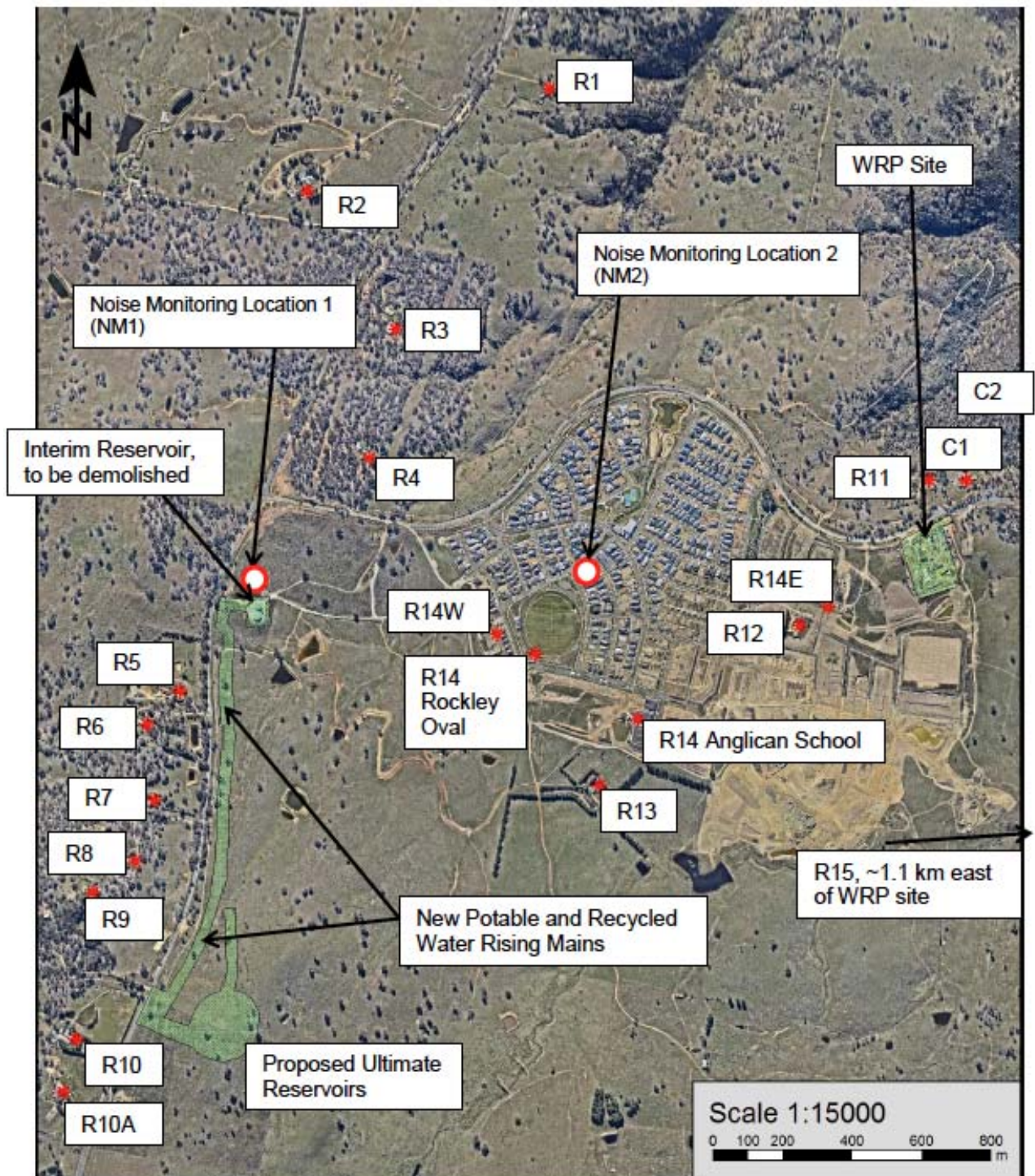
The existing landscape around the permanent reservoirs site, the interim reservoirs site and the location of new rising mains and pipes is primarily open grasslands that has previously been used as agricultural grazing land. This area is part of the Googong Township (refer to Figure 2-1) and will ultimately become part of the urban township.

Land on the western side of Old Cooma Road is open agricultural land with a small number of residential homesteads located in proximity to the road adjacent to the proposal area.

The area surrounding the WRP is part of the Googong Township development that is already under construction. Residential properties are built in the areas to the west and south of the WRP with an open space buffer zone between the WRP and properties (refer to Figure 3-3).

A total of 17 existing noise receivers are located in proximity to the proposal.

**Figure 6-8** shows these properties, with a prefix of ‘R’ referring to residential properties and ‘C’ referring to commercial properties (C2 is the existing ICON Water Googong Water Treatment Plant and C1 is a ranger station).



**Figure 6-8 Noise receivers in the vicinity of the proposal**

Noise loggers were deployed at two locations (NM1 and NM2 in

**Figure 6-8)** from 10 June to 24 June 2015. The noise loggers were programmed to record statistical noise level indices continuously in 15 minute intervals, including  $LA_{max}$ ,  $LA_1$ ,  $LA_{90}$  and  $LA_{eq}$ . A summary of the existing background noise survey is provided in Table 6-4.

**Table 6-4 Unattended continuous noise monitoring**

Location	Description	Noise Level Descriptor dB(A)			
		L <sub>1</sub>	L <sub>10</sub>	L <sub>90</sub>	L <sub>eq</sub>
NM1	Day (7am to 6pm)	62	58	38	67
	Evening (6pm to 10pm)	60	54	30	51
	Night (10pm to 7am)	55	41	25	48
NM2	Day (7am to 6pm)	63	52	35	53
	Evening (6pm to 10pm)	49	40	29	44
	Night (10pm to 7am)	38	32	25	40

The Rating Background Levels (RBLs) are the median values of the L<sub>A90</sub> levels recorded over the duration of the noise monitoring for each assessment time period. Where the RBL is found to be less than 30dBA, then it is set to 30dBA. Therefore, the RBL for assessment purposes are shown in Table 6-5. Table 6-5 also notes the estimated contribution the existing industrial noise makes to this background noise level.

**Table 6-5 Background noise levels at identified noise receivers**

Location	Description	Background LA <sub>90</sub> Noise Level, dB(A)	Estimated existing industrial LA <sub>eq</sub> contribution, dB(A)
		RBL	
R1 to R9	Day (7am to 6pm)	38	<20
	Evening (6pm to 10pm)	30	<20
	Night (10pm to 7am)	30	<20
R11 to R14	Day (7am to 6pm)	35	<20
	Evening (6pm to 10pm)	30	<20
	Night (10pm to 7am)	30	<20
R15	Day (7am to 6pm)	30	<20
	Evening (6pm to 10pm)	30	<20
	Night (10pm to 7am)	30	<20

### 6.3.3 Noise criteria

#### Construction noise

The NSW 'Interim Construction Noise Guideline' (ICNG), (DECC, 2009) contains procedures for management of noise in relation to construction activities for residential and other sensitive receivers by defining Noise Management Levels (NMLs) and how they are applied. A summary of the derivation of NMLs from the ICNG is contained in Table 6-6 for residential receivers, Table 6-7 for sensitive receivers and Table 6-8 commercial/industrial premises.



**Table 6-6 Interim construction noise guidelines (residences)**

Time of day	Management (LAeq (15min))	How to apply
Recommended standard hours: Monday to Friday: 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10dB(A)	The noise affected level represents the point above which there may be some community reaction to noise.  Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.  The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise.  Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5dB(A)	A strong justification would typically be required for works outside the recommended standard hours.  The proponent should apply all feasible and reasonable work practices to meet the noise affected level.  Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community.

Note: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

**Table 6-7 Interim construction noise guidelines for sensitive land uses**

Land use	Management Level, LAeq(15minute) (applies when properties are being used)
Classrooms at schools and other educational institutions	Internal noise level 45dB(A)
Hospital wards and operating theatres	Internal noise level 45dB(A)
Places of worship	Internal noise level 45dB(A)
Active recreation areas <sup>1</sup>	External noise level 65dB(A)
Passive recreation areas <sup>2</sup>	External noise level 60dB(A)
Community centres	Depends on the intended use of the centre.  Refer to the recommended 'maximum' internal levels in AS2107 for specific uses.

<sup>1</sup> Characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion.

<sup>2</sup> Characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example reading and meditation.



**Table 6-8 Interim Construction Noise Guidelines for commercial/industrial properties**

Land use	Management Level, LAeq(15minute)
Industrial premises	External noise level 75dB(A)
Office, retail outlets	External noise level 70dB(A)

All construction works are proposed to be undertaken within standard operation hours (between 7am to 6pm Monday to Friday and 8am to 1pm on Saturday). Therefore the LAeq(15minute) construction NML for all residential receiver locations will be a minimum of 40dBA for the ‘noise affected category, and 75dBA for industrial properties and 70dBA for commercial properties.

The Anglican School Googong is open and operating and is located on Gorman Drive on the southern side of the existing Googong township. A public Googong township school is currently under construction and may be in operation during the construction timeframe. The noise criteria that would apply if in operation would be 45dBA (internal).

**Table 6-9 Project specific construction assessment criteria**

Noise receivers	Description	LAeq ‘Noise Affected’ noise management level (NML) (RBL plus 10dB)
R1 to R9	Daytime (7am to 6pm)	48
	Evening (6pm to 10pm)	40
	Night time (10pm to 7am)	40
R11 to R14	Daytime (7am to 6pm)	45
	Evening (6pm to 10pm)	40
	Night time (10pm to 7am)	40
R15	Daytime (7am to 6pm)	40
	Evening (6pm to 10pm)	40
	Night time (10pm to 7am)	40
School classrooms	Daytime (during hours of operation)	45
C1	When in use	75
C2	When in use	70

## Operational noise

The Industrial Noise Policy (EPA, 2000) provides the framework and process for deriving noise criteria with the aim of achieving the policy objectives.

For assessing intrusiveness, the background noise level must be measured. The intrusiveness criterion essentially means that the equivalent continuous noise levels (LAeq) of the source should not be more than five decibels above the measured background levels (LA90). Where the background level is found to be less than 30dBA, then the background is set to 30dBA.

**Table 6-10 Project specific operational assessment criteria (intrusiveness)**

Residential noise receivers	Description	LAeq <sub>(15 minute)</sub> (RBL plus 5dB)
R1 to R9	Daytime (7am to 6pm)	43
	Evening (6pm to 10pm)	30
	Night time (10pm to 7am)	30
R11 to R14	Daytime (7am to 6pm)	40
	Evening (6pm to 10pm)	30
	Night time (10pm to 7am)	30
R15	Daytime (7am to 6pm)	30
	Evening (6pm to 10pm)	30
	Night time (10pm to 7am)	30
School classrooms	Daytime (During hours of operation)	45
C1	Daytime (During hours of operation)	70
C2	Daytime (During hours of operation)	65

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion value, then noise levels from new industries need to be designed so that cumulative effect does not produce noise levels that would significantly exceed the criterion.

The applicable amenity assessment criteria are outlined in Table 6-11.

**Table 6-11 Amenity criteria – Recommended LA<sub>eq</sub> noise levels from industrial noise sources**

Type of receiver	Indicative noise amenity area	Time of day	Recommended LA <sub>eq</sub> (Period) Noise Level dBA	
			Acceptable	Recommended maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
School Classrooms - internal	All	Nosiest 1 hour period when in use	35	40
Hospital wards - internal - external	All	Nosiest 1 hour period when in use	35	40
			50	55

Type of receiver	Indicative noise amenity area	Time of day	Recommended LA <sub>eq</sub> (Period) Noise Level dBA	
			Acceptable	Recommended maximum
Place of worship - internal	All	When in use	40	45
Area specifically reserved for passive recreation (e.g. National Park)	All	When in use	50	55
Active recreation area (e.g. school playground, golf course)	All	When in use	55	60
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

### Sleep disturbance

Criteria for assessing sleep disturbance has not been identified under the INP, therefore sleep arousal has been assessed using the guidelines set out in the NSW Road Noise Policy (RNP) (DECCW, 2010).

To avoid the likelihood of sleep disturbance the RNP recommends that the LA<sub>1(1 minute)</sub> noise level is the source under consideration should not exceed the background noise level (LA<sub>90</sub>) by more than 15dBA when measure outside the bedroom window of the receiver during the night-time hours (10pm to 7am). The maximum internal noise levels between 50-55dBA is applicable as it is unlikely to cause awakening reactions.

### 6.3.4 Vibration criteria

The effects of vibration in buildings can be divided into two main categories – those in which the occupants or users of the building are inconvenienced or possibly disturbed and those in which the integrity of the building or structure may be impacted.

#### *Human comfort vibration*

The EPA’s Assessing Vibration: A Technical Guide (DEC, 2006) provides guideline values for continuous, transient and intermittent events that are based on a Vibration Dose Value (VDV) rather than continuous vibration level. The VDV is dependent upon the level and duration of the short-term vibration event, as well as the number of events occurring during the daytime or night-time period.

The VDV’s recommended for vibration of an intermittent nature (i.e. construction works where more than three distinct vibration events occur) are described in Table 6-15.

**Table 6-12 Acceptable vibration dose value for intermittent vibration (m/s<sup>1.75</sup>)**

Location	Daytime (7am to 10pm)		Night time (10pm to 7am)	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas <sup>1</sup>	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Office, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

<sup>1</sup> Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative.

### *Structural damage vibration*

Structural damage vibration limits are based on Australian Standard AS 2187:Prt 2-2006, Explosives – Storage and Use – Part 2: Use of Explosives, and British Standards BS 7385 Part 2-1993 Evaluation and Measurement for Vibration in Buildings Part 2. These standards provide frequency-dependent vibration limits related to cosmetic damage, noting that cosmetic damage is very minor in nature, is readily repairable and does not affect the structural integrity of the building. The recommended vibration limits from BS7385 for transient vibration for minimal risk of cosmetic damage to residential and industrial buildings are described in Table 6-13.

**Table 6-13 Transient vibration guide values for minimal risk of cosmetic damage (BS 7385-2)**

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4Hz and above	
Unreinforced or light framed structures Residential or light commercial type buildings.	15 mm/sat 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above

### *Blasting criteria*

The EPA advocates the use of Australia and New Zealand Environment Conservation Council (ANZECC) 1990 guidelines for assessing potential blast emissions impacts at residential and other noise and vibration sensitive receivers. The ANZECC guidelines are based on human comfort levels and are much more stringent than those based on the potential for damage to structures. The ANZECC guidelines are summarised as follows:

- The recommended maximum level for air blast is 115dB Linear.
- The level of 115dB Linear may exceed on up to 5% of the total number of blasts over a period of 12 months. This level should not exceed 120dB Linear at any time.
- The recommended maximum for ground vibration is 5mm/s, Peak Vector Sum (PVS) vibration velocity.
- The PVS level of 5mm/s may be exceeded on up to 5% of the total number of blasts over a period of 12 months. This level should not exceed 10mm/s at any time.



- Blasting should generally only be permitted during the hours of 9am to 5pm Monday to Saturday. Blasting should not take place on Sundays and public holidays.
- Blasting should generally take place no more than once per day.

### Ground borne (regenerated) noise

Ground-borne (or regenerated) construction noise can be present on construction projects where vibration from activities such as rock breaking, road heading, rotary cutting and rock drilling/sawing can be transmitted through the ground and into the habitable areas of nearby buildings. Ground-borne noise occurs when this vibration in the ground and/or building elements is regenerated as audible noise within areas of occupancy inside the buildings.

The EPA ICNG defines internal ground-borne noise goals for residential receivers of 40dB(A)  $L_{Aeq(15\text{ minute})}$  during the evening 6pm to 10pm and 35dB(A) during the night-time (10pm to 7am). The goals are only applicable where ground-borne noise levels are higher than airborne noise levels.

## 6.3.5 Potential impacts

### Construction noise

A number of scenarios were modelled to account for different stages of construction associated with both the potable water and recycled water reservoirs at Hill 800 (and associated rising main and pipe works) and the recycled water tank at the WRP. These scenarios used typical construction equipment noise levels and construction scenarios to model expected noise levels at each of the sensitive receivers (worst case scenarios were used). As all works would be undertaken during standard operating hours, only this criteria has been considered in accordance with the INP.

Table 6-14 identified that predicted construction noise levels at the permanent reservoir site and Table 6-15 identifies the predicted construction noise levels at the WRP. This blue highlighted and bold figures show where the noise criteria may be exceeded.

**Table 6-14  $L_{Aeq(15\text{ minutes})}$  construction noise prediction results for permanent reservoirs site**

Receiver	Day time 'noise affected' NML	Stages of construction								
		Site establishment & amenities	Clearing and stripping	Earthworks including pipe laying	Concrete	Structures	Road works	Mechanical	Electrical	Landscaping
R1	48	<30	<30	<30	31	<30	<30	<30	<30	<30
R2		<30	<30	<30	<30	<30	<30	<30	<30	<30
R3		<30	32	35	36	<30	35	<30	<30	<30
R4		30	35	38	39	32	38	<30	<30	<30
R5		37	41	44	45	39	44	34	34	36
R6		38	43	45	47	40	45	36	35	37
R7		41	45	48	<b>49</b>	43	48	38	38	39
R8		42	47	<b>50</b>	<b>51</b>	44	<b>50</b>	40	40	41
R9		41	46	48	<b>50</b>	43	<b>48</b>	39	38	40
R10		44	40	47	48	42	47	37	37	39

Receiver	Day time 'noise affected' NML	Stages of construction								
		Site establishment & amenities	Clearing and stripping	Earthworks including pipe laying	Concrete	Structures	Road works	Mechanical	Electrical	Landscaping
R11	45	<30	<30	36	31	<30	<30	<30	<30	<30
R12		<30	33	40	37	30	36	<30	<30	<30
R13		34	39	41	43	36	42	32	32	33
R14W		<30	32	40	36	<30	35	<30	<30	<30
R14E		33	38	35	42	35	40	31	30	32
R14 – Rockley Oval	60	37	33	40	41	34	40	30	<30	31
R14 – Anglican School	55 external	37	33	40	41	35	40	30	30	32
R15	40	<30	<30	30	<30	<30	<30	<30	<30	<30
C1	75	<35	<35	<35	<35	<35	<35	<35	<35	<35
C2	70	<35	<35	<35	<35	<35	<35	<35	<35	<35

**Table 6-15**  $L_{Aeq(15minutes)}$  construction noise prediction results for WRP works

Receiver	Day time 'noise affected' NML	Stages of construction						
		Amenities	Earthworks	Concrete	Structures	Mechanical	Electrical	Landscaping
R1	48	<30	33	34	<30	<30	<30	<30
R2		<30	<30	<30	<30	<30	<30	<30
R3		<30	33	34	<30	<30	<30	<30
R4		<30	33	34	<30	<30	<30	<30
R5		<30	<30	<30	<30	<30	<30	<30
R6		<30	<30	<30	<30	<30	<30	<30
R7		<30	<30	<30	<30	<30	<30	<30
R8		<30	<30	<30	<30	<30	<30	<30
R9		<30	<30	<30	<30	<30	<30	<30
R11	45	43	50	51	45	42	40	42
R12		39	46	46	41	38	35	38
R13		31	38	38	32	30	<30	<30
R14W		36	43	44	38	35	32	35
R14E		<30	33	34	<30	<30	<30	<30

Receiver	Day time 'noise affected' NML	Stages of construction						
		Amenities	Earthworks	Concrete	Structures	Mechanical	Electrical	Landscaping
R14 – Rockley Oval	60	<35	<35	<35	<35	<35	<35	<35
R14 – Anglican school	55	<35	<35	<35	<35	<35	<35	<35
R15	40	31	37	38	32	<30	<30	<30
C1	75	30	37	38	32	<30	<30	<30
C2	70	45	51	52	46	44	41	43

**Figure 6-9 Construction noise predication results for construction of rising mains and demolition of Interim Reservoir**

Receiver	Day time 'noise affected' NML	Stages of construction	
		Rising main pipe laying activities	Demolition of Interim Reservoir
R1	48	37	33
R2		<30	<30
R3		45	41
R4		54	46
R5		57	52
R6		54	48
R7		55	45
R8		55	42
R9		51	41
R10		50	40
R11	45	36	31
R12		40	35
R13		45	39
R14W		40	34
R14E		48	44
R14 – Rockley Oval	60	46	42
R14 – Anglican school	55 external	44	38
R15	40	30	<30

Receiver	Day time 'noise affected' NML	Stages of construction	
		Rising main pipe laying activities	Demolition of Interim Reservoir
C1	75	<40	<30
C2	70	<40	31

Based on the results presented above, the earthworks and concrete work stages at the WRP have the potential to cause exceedance of the 'Noise Affected' NMLs at R11 and R12. In addition, the concrete works at the permanent reservoir site have the potential to exceed the 'Noise Affected' NMLs at R7, R8 and R9 by up to 3dBA, and the road works have the potential to exceed 'Noise Affected levels at R8. For the construction of the rising mains there is potential construction activities will exceed the 'Noise Affected' criteria at eight properties, and demolition of the Interim Reservoir would exceed criteria levels at one property.

However, due to the transient nature of many of the activities, the predicted maximum noise levels are only likely to be sustained at any one receiver for a relatively short period of time. All predicted construction noise levels are below the 'highly noise affect' NML target of 75dBA.

There is potential the construction traffic movement to, from and within the site may result in an increase at sensitive receivers, however this increase is expected to be temporary with vehicles passing quickly. On average the impact of construction vehicle movement may increase background noise levels by up to 1dBA, which is not perceptible to the human ear. Therefore the impact of construction traffic is minor.

### Operational noise

Based on the proposed acoustically significant equipment to be used as part of the operation of the reservoirs at Hill 800, it was predicted that noise levels associated with the operation of the pumps would be less than 25dBA at all identified noise receivers. In addition, the potential for one or two noise events per night, with maximum internal noise levels of 65-70dBA, are not likely to affect health and wellbeing significantly. Therefore, the ongoing operation of the reservoirs is unlikely to pose any acoustic risk to nearby sensitive receivers.

In addition to the identified potential sensitive receivers, it is also understood that later stages of the Googong township development will be in close vicinity of the permanent reservoir. Based on a conservative estimation, a distance of approximately 150 metres is likely to be required in order to meet the operational noise criteria for night time operation. However, with the implementation of noise barrier and/or enclosure of the proposed pumps at the reservoir site, a noise reduction of at least 10 to 15 dB can readily be achieved. This would have the potential of reducing the buffer zone distance to approximately 50 metres from the location of the noise source. For daytime operations, it is expected that the average background noise levels of an urban area would exceed the operational noise levels of the pumps and therefore would not exceed criteria at adjacent properties.

### Construction vibration

There are no major vibration sources associated with general construction activities that are expected to induce ground vibration at the nearest sensitive receivers. However, there are vibration sources which have the potential to induce ground vibration over short distances to existing structures. A review of proposed construction equipment has identified the following potential sources of vibration emissions:



### Compaction activities (vibratory rollers)

Ground vibration levels caused by vibratory rollers can be up to 1.5mm/s at 25 m. Table 6-16 below outlines safe working distances for the use of vibratory rollers adjacent to buildings (both to prevent building damage and minimising human discomfort).

**Table 6-16 Safe working distance for vibratory rollers**

Roller class	Weight range	Centrifugal force range	Distance from building	
			Building damage	Human comfort
I Very light	Less than 1.25 tonnes	10 – 20kN	3m	no effect
II Light	1 to 2 tonnes	20 – 50kN	5m	no effect
III Medium	2 to 4 tonnes	50 – 100kN	6m	12m
IV Medium Heavy	4 to 6 tonnes	100 – 200kN	12m	24m
V Heavy	7 to 11 tonnes	200 – 300kN	25m	50m
VI Very Heavy	12 tonnes and over	Over 300kN	25m	50m

To prevent adverse impacts to human comfort during the operation of vibratory machinery, very heavy rollers should not be operated within 50 metres of a building and to minimise potential for building damage should not be operated within 25 metres of a building.

All of the identified sensitive receivers are generally located at least 50 metres from the proposal construction area. The only area where works may be within 50 metres is for the installation of the in-ground water mains near the western boundary of the Googong township.

### Heavy vehicle movement –

Heavy trucks passing over normal road surfaces generate relative low vibration levels, typically ranging from 0.01mm/s to 0.2mm/s at the footings of buildings located 10m to 20m from a roadway.

Very large surface irregularities (or dirt roads) can cause levels up to 5 to 10 times higher (i.e. up to 2mm/s). These levels are lower than the criteria levels outlined above. Therefore, as the closest sensitive receivers are at least 75m away from the construction access point (Googong Road and Old Cooma Road), heavy truck traffic is not expected to cause building damage.

### Rock breaking –

The typical maximum levels of ground vibration at various distances from rock breaking operations are listed in Table 6-17. Construction would be likely to be rock breaking at the permanent reservoir site. However all sensitive receivers are a minimum of 50 metres from this location, therefore the predicted vibration level would be no higher than 0.1mm/s. This is below the criteria levels therefore the use of rock breakers is not likely to cause significant vibration impacts.

**Table 6-17 Indicative maximum ground vibration levels for rock breaking**

Distance	5m	10m	20m	30m	40m	50m
Peak Vibration Level (mm/s)	4.5	1.3	0.4	0.2	0.14	0.1

### Operational vibration

No operational vibration impacts are expected as a result of the proposed works.

### 6.3.6 Management measures

- A Construction Noise and Vibration Management Plan would be prepared for all construction activities and included in the Construction Environment Management Plan (CEMP). It would outline measures to minimise construction noise and vibration impacts on sensitive receivers. This would also include an action plan to be followed if complaints are received.
- Works (including delivery of plant and equipment) would be limited to standard working hours of:
  - Monday to Friday 7:00am to 6:00pm
  - Saturday 8:00am to 1:00pm
  - No works on Sunday or public holidays.
- All impacted residents would be notified of the proposed works, including the nature and duration of construction activities, predicted noise levels and contact details should they have any issues with the construction activities.
- Construction schedule would provide for respite periods when noisy activities are being undertaken, and the distance between noise construction activities and sensitive receivers would be maximised where feasible and reasonable.
- Construction plant and equipment would be well maintained (including noise reduction fittings where feasible) and would be turned off when not in use to minimise noisy emissions.
- Where feasible reversing equipment would use ‘quacker’ alarms or would be minimised to prevent causing a nuisance.
- Loading and unloading would be undertaken away from sensitive receivers.
- During operation plant and machinery would be well maintained in order to minimise operational noise emissions.
- The use of vibratory rollers would not be used within 50 metres of residential properties.
- Rock breaking activities are not to be undertaken within 50 metres of sensitive receivers.

## 6.4 Biodiversity

A Flora and Fauna Assessment has been prepared by Biosis (Biosis, 2015) for the proposed works. A summary of the findings of this assessment are outlined below and the full report is included as Appendix E.

### 6.4.1 Concept Plan Conditions of Approval

CoA #	Condition	Response
2.1 (h)	Flora and fauna – including terrestrial riparian and aquatic, with accurate estimates of vegetation disturbance associated with the project;	Section 6.4 of this REF has considered the impacts of the proposal on terrestrial, riparian and aquatic biodiversity. Estimates of vegetation disturbance as a result of the proposal are outlined in section xxx.
2.1 (j)	the environmental assessment of the project must take into account relevant State Government guidelines, policies and plans	All relevant legislation for biodiversity arrangements have been considered in Sections 4 and 6.4.

## 6.4.2 Existing environment

The study area is highly modified, having previously been largely cleared for pastoral use and grazed intensively for many years. This intensive and prolonged grazing has resulted in the removal of all but the most resilient native flora species and prevented the establishment and regeneration of native trees and shrubs.

### Flora

Eight EPBC Act listed threatened flora species and 41 TSC Act listed threatened flora species are identified as 'species or species habitat likely to occur within area'. However, no threatened flora species were recorded during the field survey. An assessment of the 'Likelihood of Occurrence' was undertaken for all species and found that no threatened flora species are considered to have a 'moderate' or higher likelihood of occurrence within the proposal area.

Twenty four trees are located within the proposal area, including (refer to Figure 6-10):

- Apple Box (*Eucalyptus bridgesiana*)
- Blakely's Red Gum (*Eucalyptus blakelyi*)
- Bundy/Long-leaf Box (*Eucalyptus nortonii* and/or *goniocalyx*)
- Candlebark (*Eucalyptus rubida*)
- Yellow Box (*Eucalyptus polyanthemos*)

The area does not form an important vegetation/habitat link for flora and fauna. Whilst the isolated paddock trees are likely to provide some connectivity for common birds and bats, their isolation and the lack of habitat features (mid storey, ground cover diversity and fallen timber etc) reduces the value of the habitat to less mobile or more specialised fauna.



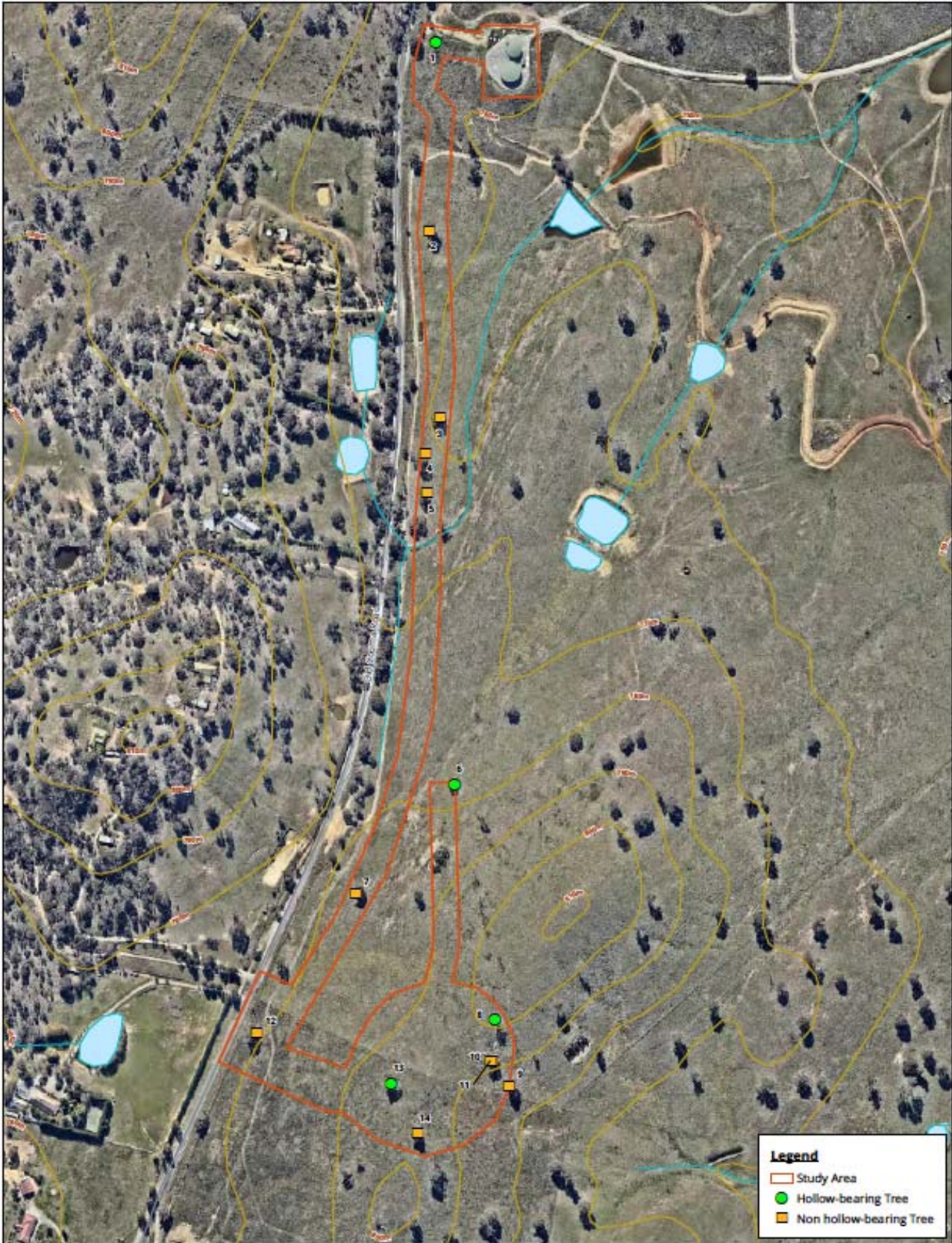


Figure 6-10 Trees located within the proposal area



## Fauna

Sixteen EPBC Act listed threatened fauna species are identified as ‘species or species habitat likely to occur within the area’. A further 18 species listed solely on the TSC Act have the potential to occur within the proposal area. An assessment of all 34 species for their likelihood to occur within the proposal area has been undertaken (refer to Appendix E) with ten species identified as having a moderate or high likelihood of occurring within the proposal area. Assessments of these ten species identified that the proposal impact would be minor and therefore no further assessment under the EP&A Act was required.

Eleven migratory marine, terrestrial or wetland birds species are listed on the EPBC Act Protected Matters Search Tool as potentially occurring within the proposal area. There is some potential for periodic occurrence of migratory species through the area, however, due to the highly modified and disturbed nature of the proposal area, it is unlikely that the proposal area would contain any important habitat for migratory birds and none are likely to breed in the area.

During the field survey all fauna sightings were recorded, including 25 native birds species were recorded, one native mammal species (the Eastern Grey Kangaroo) and the introduced Red Fox. Three of the birds species observed are listed on the TSC Act as ‘vulnerable’, including the Scarlet Robin (*Petroica boodang*), the Flame Robin (*Petroica phoenicea*) and the White-fronted Chat (*Epthianura albinfrons*). Both the robin species were recorded multiple times outside of the proposal area and the White-fronted Chat was recorded once. None of the three species were recorded within the proposal area.

There are five hollow-bearing trees within the proposal area (refer to Figure 6-10), with a total of six hollows (three small, one medium and two large). None of these hollows showed signs of use, such as chew marks or rounded lips etc. A number of tree species within the proposal area, such as the Yellow Box and Red Box provide valuable foraging and nesting resources for local fauna. In addition, during the field surveys, two stick nests were recorded in one tree and Mistletoe (Box Mistletoe *Amyema miquelii*) was recorded in two trees providing an important habitat resource for native fauna as well as nectar and nesting resources.

## Threatened ecological communities

Two threatened ecological communities were identified on the EPBC Act Protected Matters Search Tool and the TSC Act as potentially occurring within the proposal area. These threatened ecological communities and their potential for occurrence (based on the field surveys) are outlined below:

- Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory
  - EPBC Act – Listed as endangered
  - TSC Act – Listed as endangered
  - Potential for occurrence – None. Given the position of the landscape and presence of scattered remnant eucalyptus, the entire proposal area is likely to have comprised lowland woodland and dry sclerophyll forest communities.
- White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland
  - EPBC Act – Listed as critically endangered
  - TSC Act – Listed as endangered
  - Potential for occurrence – The areas of ‘native pasture pre 1750 Box Gum Woodland’ are highly likely to meet the criteria for the community under the EPBC Act and the TSC Act in ‘moderate/good condition’. It has been identified that no EPBC Act listed threatened ecological communities exist within the proposal area, however 0.18ha of the TSC listed threatened ecological community exists within the proposal area (refer to Figure 6-11).

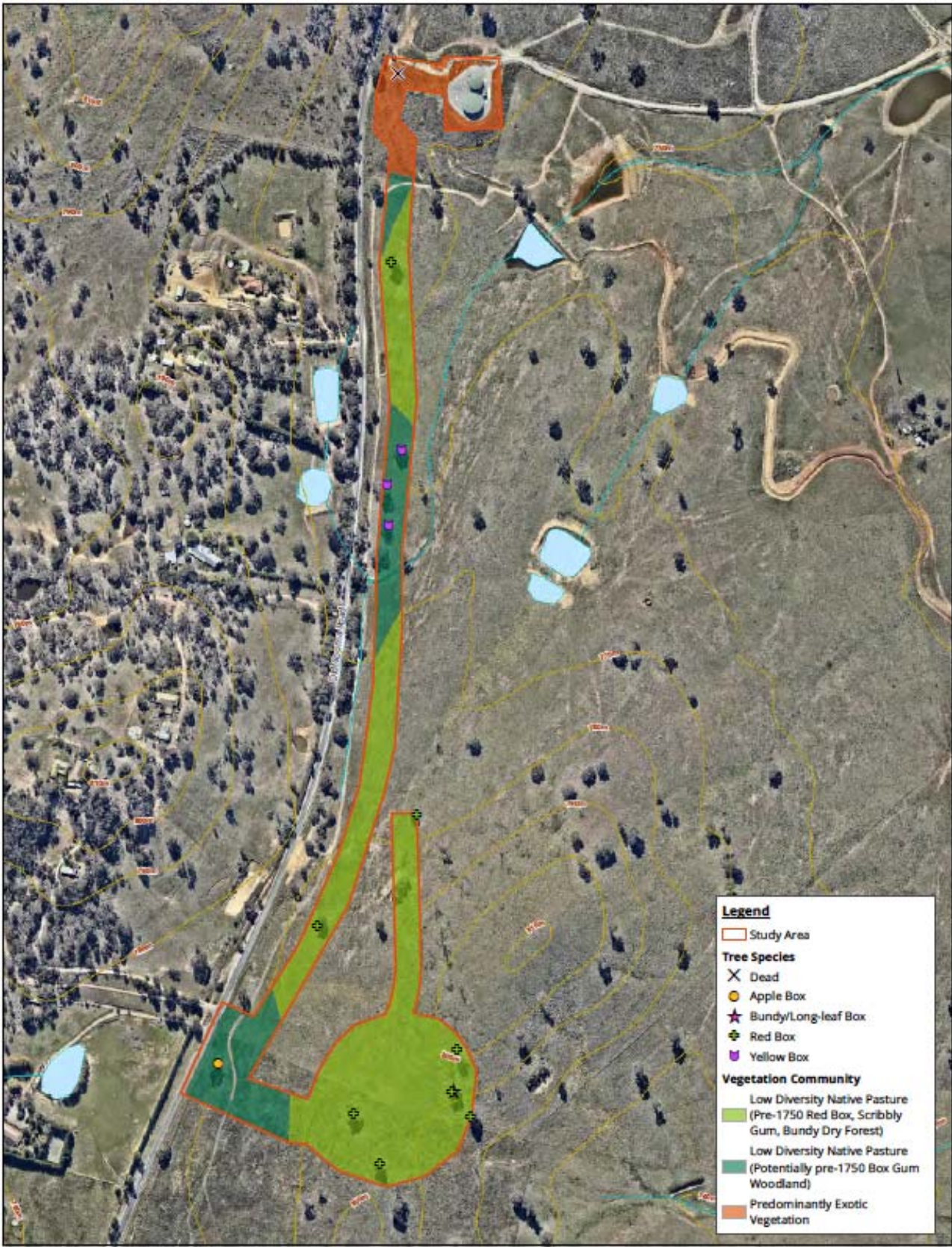


Figure 6-11 Vegetation communities within the proposal area



## Weeds

Six species listed as Class 4 noxious weeds for the Queanbeyan LGA were recorded within or adjacent to the proposal area, including:

- African Love Grass (*Eragrostis curvula*)
- Bathurst Burr (*Xanthium spinosum*)
- Blackberry (*Rubus fruticosus*)
- Paterson's Curse (*Echium plantagineum*)
- Serrated Tussock (*Nassella trichotoma*)
- Sweet Briar (*Rosa rubiginosa*)

Under the *Noxious Weeds Act 1993*, Class 4 'Locally Controlled Weeds' require that the 'growth of the plant must be managed in a manner that reduces its numbers, spread and incidence and continuously inhibits its reproduction'.

### 6.4.3 Potential impacts

The proposal is not likely to impact on any threatened flora or fauna species, endangered ecological communities or migratory species.

About 0.18ha of the TSC Act threatened ecological community Box Gum Woodland would be cleared as a result of the proposal. However this community is highly modified within the proposal area and is not likely to have a significant impact. A total of five trees within this Box Gum Woodland would be removed as a result of the proposal. A seven part test has been undertaken for this impact on this ecological community and identified that a significant impact is unlikely and therefore a Species Impact Statement is not required.

Construction activities and the disturbance of soils may encourage the spread of noxious weeds throughout the proposal area and potentially into adjacent areas.

### 6.4.4 Management measures

- Only trees within the proposal boundary, as identified on Figure 6-10, would be cleared and only if required as part of the proposed works. Trees required for removal would be clearly marked. Any trees not to be removed as part of the works that are within the proposal boundary would be flagged/fenced with tape to ensure they are not impacted by the proposed works.
- An ecologist would be on site for the clearing of any trees from the proposal site to ensure the trees are free from local fauna prior to felling.
- Where feasible and reasonable, removal of trees would be undertaken between August and March.
- Where feasible, the landscaping plans should provide for replanting of local species, in particular tree species that provide habitat and foraging opportunities (such as Yellow Box and Red Box).
- The CEMP would include measures to treat and manage all noxious weeds on site at the start of and throughout construction to limit the growth, spread and reproduction of these species.

## 6.5 Bushfire assessment

A Bushfire Assessment has been prepared by EcoLogical (Ecological, 2015) for the proposed works. A summary of the findings of this assessment are outlined below and the full report is included as Appendix G.

### 6.5.1 Policy setting

The NSW Rural Fire Service document Planning for Bush Fire Protection (PBP) (RFS, 2006) is the guideline controlling development on bushfire prone land. The document focuses on habitable development (such as dwellings) and Special Fire Protection Purpose (SFPP) development such as schools, hospitals and other similar uses. It does not address development associated with infrastructure such as reservoirs and plant.

As stated within Section 4.3.6.f of PBP, the Building Code of Australia (BCA) does not provide for any bushfire specific performance requirements for the type of development proposed. As such, the asset protection zone and building construction requirements specified within PBP and AS 3959-2009 Construction of buildings in bushfire-prone areas (Standards Australia 2009) do not apply as deemed-to-satisfy provisions for bushfire protection.

Practice notes have been prepared by NSW Rural Fire Service to provide a position or guidance on specific developments that may not be covered by PBP. One such example is telecommunication towers (Practice Note 1/11 Telecommunication Towers in Bush Fire Prone, Version 0.2 February 2012), however a position or requirement has not been prepared for water supply infrastructure or the like. Typically the owner of the asset takes responsibility of the level of bushfire risk management applied.

This assessment compares the requirements of other infrastructure installations imposed by NSW Rural Fire Service and the expectation of PBP for non-habitable development.

The works have been divided into three components based on vulnerability to the impacts of fire and geographical location. The components are:

1. Rising mains will be underground and the interim reservoirs are to be decommissioned and therefore will not be impacted by fire. These components do not require further assessment;
2. The permanent reservoirs site on Hill 800 and the associated above ground infrastructure (pumping station and MCC cabinet); and
3. New recycled water holding tank and expansion of the RWPS located within the WRP.

### 6.5.2 Existing environment

A bushfire assessment is typically required when a development is proposed within bushfire prone land as mapped by the local council. The development site is not identified as bushfire prone land by QCC as shown on Figure 6-12; therefore there is no statutory requirement to provide a bushfire assessment of the project. Additionally, the Concept Approval does not require the preparation of a bushfire assessment; however GTPL has recognised an assessment of bushfire protection to be an important aspect to address for the IWC Project in the same way that it has been identified for the design of the Googong Township.



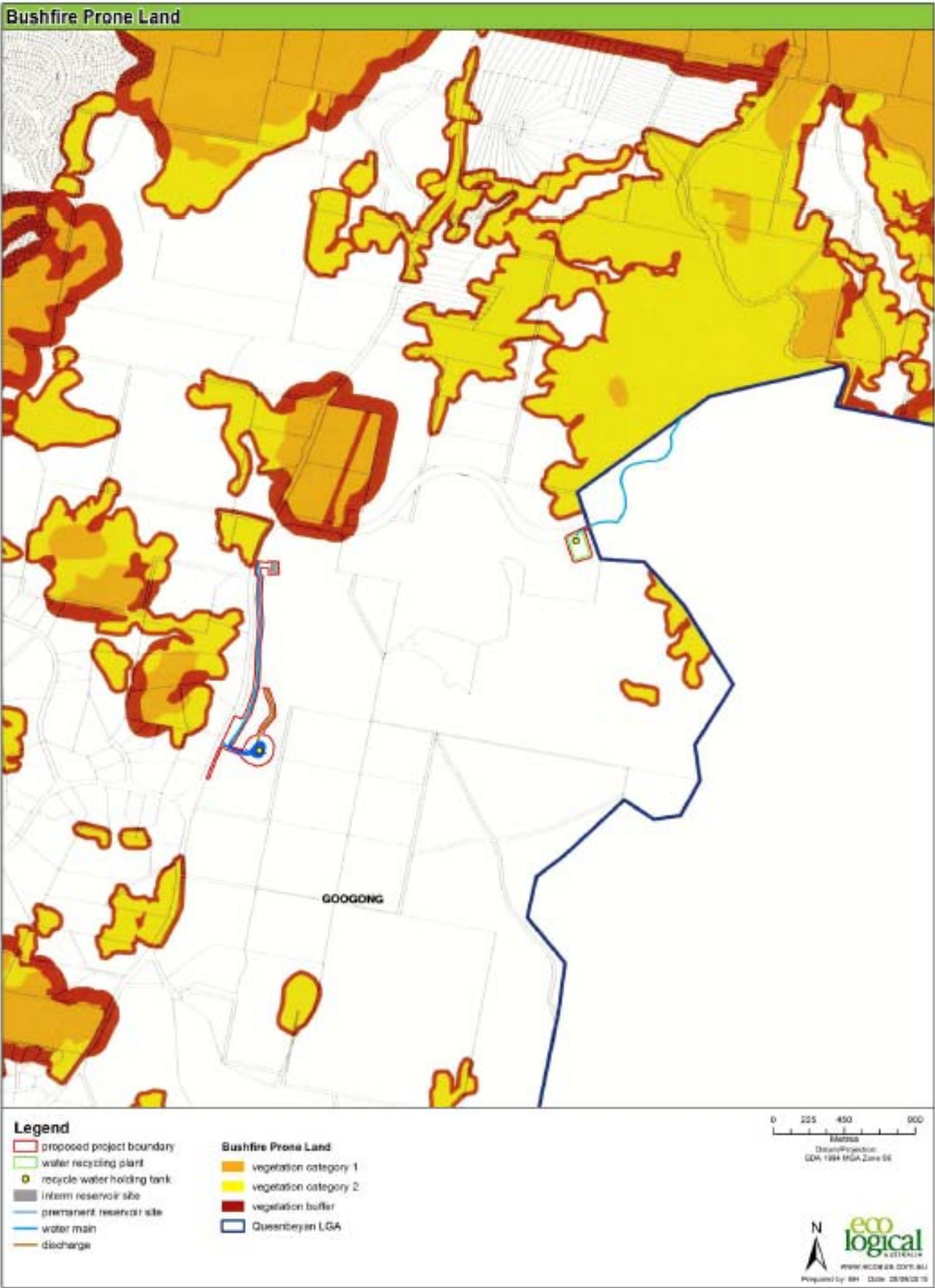


Figure 6-12 Bushfire prone areas surrounding the proposal

## Vegetation communities influencing bushfire

The predominant vegetation influencing fire behaviour approaching the development site has been assessed in accordance with the methodology specified within Appendix 2 of PBP. PBP requires a structural classification of the vegetation that predominates in area and severity over a distance of at least 140 m from the asset being assessed. PBP assigns a worst case equilibrium fuel load based on vegetation structure.

Bushfire behaviour is influenced by fuel load and the availability of the fuel which is mostly determined by the arrangement of the fuel and its moisture content. Fuel load and availability affects the rate of spread and intensity of a bushfire.

The land surrounding both the permanent reservoirs site and the WRP have been extensively grazed in the past such that there is minimal wooded vegetation remaining. Both sites are discussed below.

The land surrounding the permanent reservoirs site at Hill 800 is denuded of wooded vegetation and is characteristic of the sheep grazing land of the surrounding district. The bushfire hazard consists of pasture interspersed with native grass and is in a minimal condition such that it would not present a hazard. In a worst-case scenario, grazing practices, growth and curing rates could change such that a grassland hazard could eventuate. Therefore the predominant vegetation has been assessed as “grassland”. It’s worthy to note that grazing is likely to occur until such time that the later stages of the Googong Township develop the lower flanks of the hill effectively removing the majority of the bushfire threat in years to come.

The land surrounding the WRP consists of partially cleared land with scattered trees to the north and west resembling an open woodland, and cleared land under development for the Googong Township to the west and east.

The open woodland to the north is at least 60 m away separated by the management surrounding the plant and Googong Dam Road, and the open woodland to the east is 100 m away from the proposed recycled water holding tank and water pumping station separated by the remainder of the plant.

## Slopes influencing bushfire

The effective slope influencing fire behaviour has been assessed in accordance with the methodology specified within Appendix 2 of PBP. This is conducted by measuring the slope that would most influence fire behaviour where the vegetation occurs over a 100 metre transect measured outwards from the asset.

Steeper slopes significantly increase the rate of spread of fires, whereby each 10 degree increase in slope corresponds to doubling in the rate of spread.

The grassland surrounding the permanent reservoirs site is on downslopes ranging from the PBP slope class of 5-10° downslope to 10-15° downslope whilst the open woodland to the north and east of the WRP ranges from 5-10° downslope to 0-5° downslope, respectively.

### 6.5.3 Potential impacts

Based on the hazard assessment in Section 6.5.2, likely fire behaviour and level of impact can be predicted. There is the potential for a grassfire to spread towards the permanent reservoirs site and WRP. This potential is limited by the availability of fuel influenced by season (rainfall, rates of growth and curing) and grazing by sheep. Grazing pressure would need to be significantly reduced to allow fuel accumulation to occur.

Should the fuel be available to allow rapid spread, a fire initiating along the roadside, for example, could impact on each of the sites. The intensity at the asset would be limited by the fuel load available within the grassland and would be of short duration during passing of the fire front (residence time), most likely less than 5 seconds based on the available fuel load present at time of site inspection.

Above ground assets and infrastructure at both sites are rated to be of low vulnerability primarily due to the nature of construction and external materials used. The reliance on steel (non-combustible) construction and the fact that the asset is not habitable or offering protection for human life, coupled with the low consequence of impact, means that the risk of significant or costly damage, or disruption to capacity, is low.

### Permanent reservoirs site

It is proposed to construct and maintain 5 m wide maintenance tracks to service and loop the proposed reservoirs. These tracks and the associated cleared area will ensure that the reservoirs will have a minimum 10m defensible space that can be accessed by tankers if required.

The proposed defensible space is considered adequate for the reservoirs and associated infrastructure, particularly as the external materials will be non-combustible and the hazard is grassland in a grazed and minimal condition that will for the most part be removed.

### Water recycling plant

The proposed works to the WRP site will be internal to the partially constructed plant and therefore are surrounded by other existing components of the plant and maintenance roads. In addition to this, the plant is further separated from any bushfire hazard by Googong Dam Road to the north and the advancing stages of the Googong Township to the south. The proposal will be separated from the nearest bushfire hazard of open woodland to the north by at least 60 m.

## 6.5.4 Management measures

- All access roads surrounding the infrastructure is maintained as a defensible space and grasses and vegetation should be managed adjacent to these roads.
- Emergency access to the access roads around the facilities should be maintained at all times.
- The pumping station should have a maintenance track between it and the grassland to the east.

## 6.6 Aboriginal heritage

A Due Diligence Archaeological Assessment has been prepared by Navin Officer (Navin Officer, 2015) for the proposed works. A summary of the findings of this assessment are outlined below and the full report is included as Appendix F.

### 6.6.1 Concept Plan Conditions of Approval

CoA #	Condition	Response
2.1 (h)	Aboriginal Heritage – including an assessment of Aboriginal sites affected by the proposed development, their cultural value and the significance of these values for Aboriginal people	Section 6.5 provides the results of an Aboriginal Heritage assessment which was undertaken to identify any Aboriginal sites affected by the proposal.
2.1 (j)	the environmental assessment of the project must take into account relevant State Government guidelines, policies and plans	All relevant State Government guidelines, policies and plans have been considered and referenced where required.

## 6.6.2 Assessment methodology

A cultural heritage assessment for the proposal has been undertaken according to the NSW Office of Environment and Heritage *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (NSW DECCW 2010).

A range of archaeological data was reviewed for the proposed project boundary and its surrounds. This literature and data review was used to determine if known Aboriginal sites were located within the proposal and to facilitate site prediction on the basis of known regional and local site patterns, and to place the area within an archaeological and heritage management context. The review of documentary sources included:

- Heritage registers and schedules, in particular the Aboriginal Heritage Information Management System (AHIMS) search results. One hundred and sixteen Aboriginal recordings are listed on the Office of Environment and Heritage (OEH) AHIMS for the area around the Googong Township. Sites comprise:
  - 106 artefact scatters;
  - Eight Potential Archaeological Deposits (PADs);
  - One modified tree; and
  - One cultural feature.
- Previous research within the Googong township area which included local histories and archaeological reports.

No field inspections were conducted for this Due Diligence assessment. All area within the proposed project boundary has been included in previous heritage assessments.

## 6.6.3 Assessment results

### **Sites in proximity to the IWC Stage C Network West proposed project boundary**

The proximity of all registered Aboriginal heritage sites are shown in Figure 6-13 and Figure 6-14.



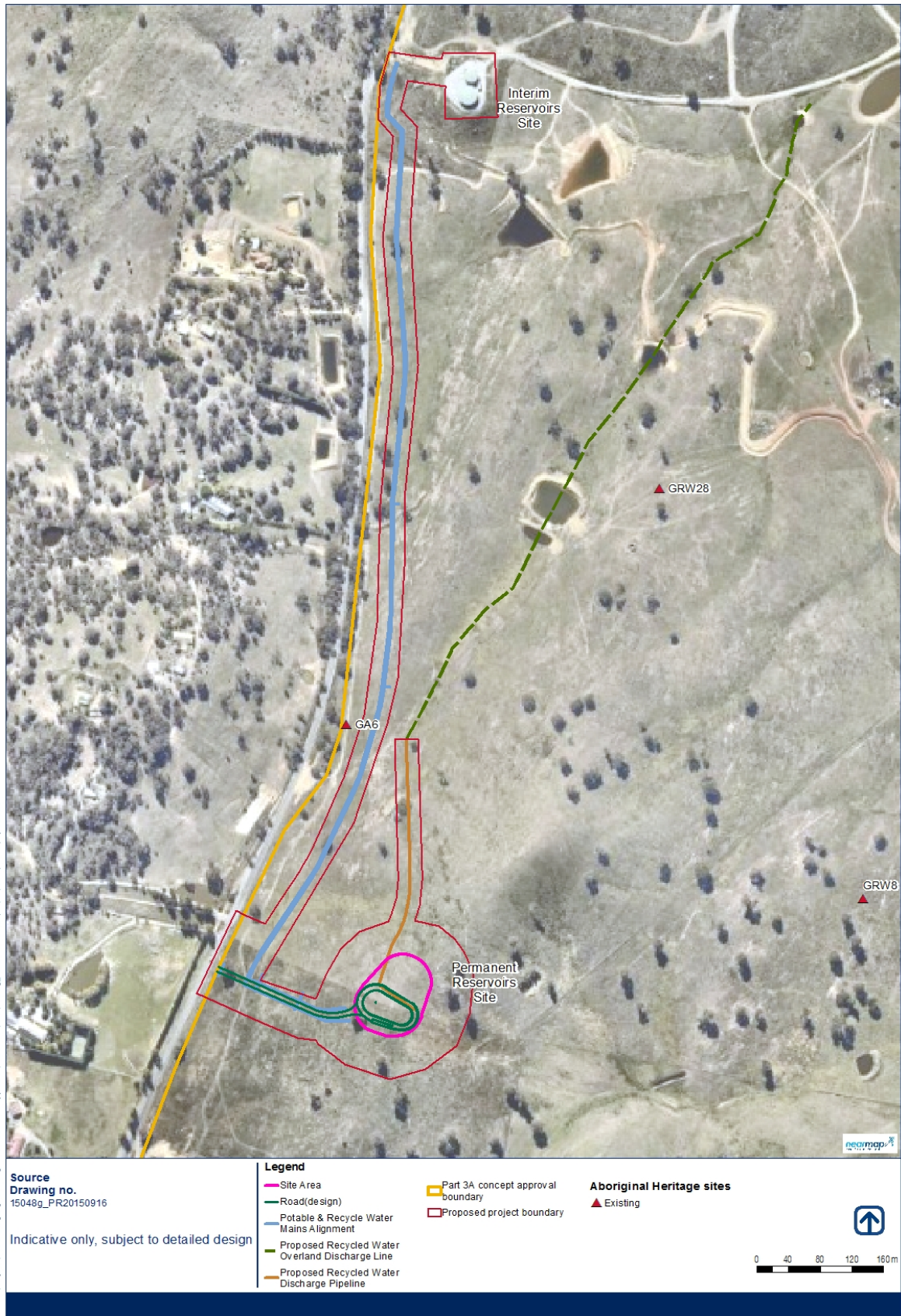


Figure 6-13 Aboriginal heritage sites in proximity to Stage C Network West works adjacent to Old Cooma Road



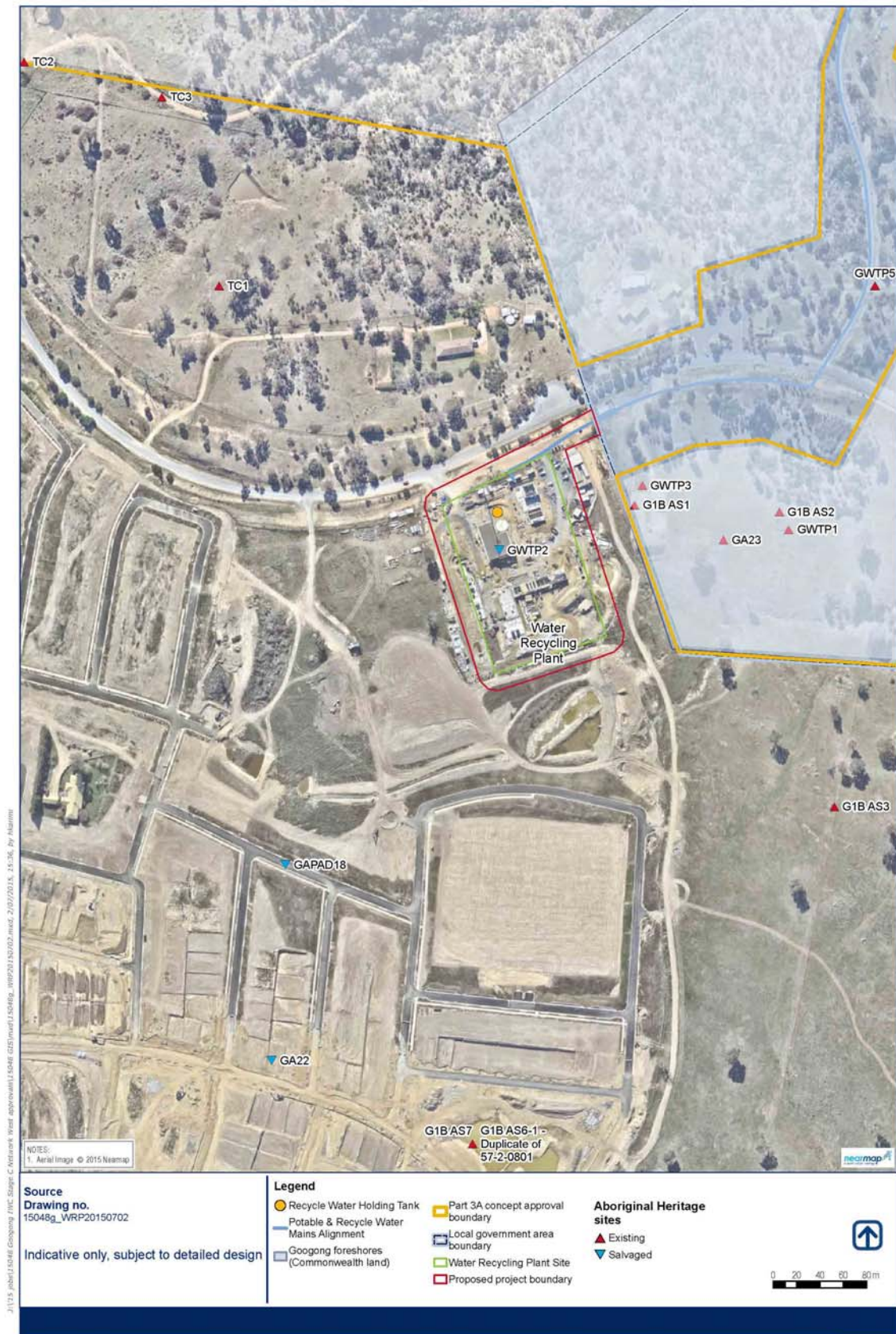


Figure 6-14 Aboriginal heritage sites in proximity to Stage C Network West works adjacent to or within the WRP

One Aboriginal site, GA6, is located within twelve metres of the defined proposed project boundary.

Site GA6 is an artefact scatter, with two identified artefacts on a minor spur crest within a wide saddle to the east of Old Cooma Road. The artefacts are approximately 200 metres apart, located in an exposure formed by the recent installation of a Telstra cable. The exposure is about 2 metres wide and surface visibility within it is around 50%, while the surrounding visibility is approximately 2-5%.

Six Aboriginal sites are located within 200m of the proposed project boundary.

Additionally, further management measures may be required for overland water discharges from where the proposed excess recycled water discharge pipeline finishes and recycled water is discharged into the environment (refer to Figure 6-17). Management measures as identified in section 6.9.4 would be applied to ensure the natural water lines in the landscape are not impacted by potential scouring due to the water discharge. This work is not included within the proposed project boundary but has been considered (with a 15m buffer around the alignment to ensure all known heritage items near all works have been considered. Site GRW28 is located within approximately 100m of the farm dams where additional scour protection measures may be implemented.

These sites are outlined in Table 6-18.

**Table 6-18 Registered Aboriginal sites located within 200m of the proposed project boundary**

Aboriginal heritage site	Site description
GA7	<p>Artefact scatter</p> <p>Three artefacts located on an exposure formed by a recent Telstra cable installation running to the east of Old Cooma Road. Topographic context is a gently sloping spur slope with a south easterly aspect. Surface visibility within the exposure is 30% while the surrounding visibility is 2-5%.</p> <p>Disturbance to the site is only moderate in that it is contained to a narrow corridor, however the deposit is a skeletal brown clayey loam with a high gravel content. So while there is a moderate to high potential for the site to be larger than recorded, there is a generally low potential for subsurface deposits.</p>
GA23	<p>Isolated find</p> <p>A single artefact located on moderate gradient slopes on the eastern side of a spur above a minor creek line located approximately 100 m to the south. Visibility in the locality was in the vicinity of 5-10%.</p> <p>Local deposit is brown sandy silt. Potential for further artefacts or subsurface deposits is considered to be moderate to low; potential is lowered by the gradient of the slope.</p>
G1BAS1	<p>Artefact scatter</p> <p>Five stone artefacts across approximately 19 metres by 12 metres on a low gradient ridge crest. The artefacts appear to result from procurement of locally occurring quartz.</p> <p>The soil across the ridge is shallow brown gravelly loam with some bedrock exposures. General surface visibility was 10%, with visibility in exposures of approximately 30%. Potential for the site to be larger than recorded is low to moderate, and the potential for subsurface deposits is low.</p>
GRW28	<p>Isolated find</p> <p>An isolated find located in erosion in a lower slope context.</p> <p>There was &lt;5% exposure incidence with 10% visibility within those exposures. There is no potential for there to subsurface archaeological deposits.</p>

Aboriginal heritage site	Site description
G1BAS2	<p>Isolated find</p> <p>An isolated grey volcanic hammerstone with pitting at one end. The site is located in a grassy, cleared area within a mid-slope/crest landform. The surface visibility was 10% while the surrounding visibility was 30%. The brown, gravelly soil appears to be quite shallow given the outcropping of bedrock at the site.</p> <p>Potential for the site to be larger than recorded is low to moderate, and the potential for subsurface deposits is low.</p>
GWTP1	<p>Artefact scatter</p> <p>Four artefacts located on a slight rise above a gully. Ground surface exposure in the area was approximately 30%, with visibility in exposures of approximately 40% owing to the occurrence of natural gravels.</p>
GWTP3	<p>Artefact scatter</p> <p>Eight artefacts located on a rocky spur crest above dry creek and gully. Ground surface exposure in the area was approximately 30%, with visibility in exposures of approximately 40%.</p>

### Sites within the IWC Stage C Network West proposed project boundary

One Aboriginal site, GWTP2, has been previously recorded in the proposed project boundary, specifically within the WRP site (refer to Figure 6-13).

This site was an artefact scatter comprising six stone artefacts. It was originally recorded in 2009.

A surface salvage collection of artefacts was conducted at site GWTP2 in 2013 under an approval to salvage issued by the OEH. The location has subsequently been impacted by the construction of the WRP and a site impact recording form was submitted to OEH relative to this collection.

## 6.6.4 Potential impacts

### Construction activities

The proposal will disturb the ground through the following construction activities:

- The excavation of new potable water and recycled water rising mains;
- Excavation for the installation of the two permanent reservoirs on Hill 800;
- Excavation for the continued potable water pipeline from the Googong Foreshores to the WRP; and
- Excavation for the recycled water tank and the expansion of the recycled water pumping station at the WRP site.

Potential impacts relating to the proposal's construction activities are outlined below:

- It has been determined that no Aboriginal sites will be directly impacted by the project.
- One Aboriginal site, GA6, is located twelve metres from the defined project area and is vulnerable to indirect and/or inadvertent impact during construction of the potable water and recycled water mains.
- Six Aboriginal sites are located within 200 m of the defined project area and one Aboriginal site is located within 200m of proposed bank stabilisation measures. These sites may be inadvertently impacted during construction of the proposal.



## Operation activities

It has been determined that the operational activities related to proposal will not impact the identified Aboriginal sites.

### 6.6.5 Mitigation measures

The following mitigation and management measures are proposed to reduce the likelihood of any indirect or inadvertent impacts during construction:

- Site GA6 will be fenced for the duration of construction activities associated with the proposal. The construction of the fence should be conducted with on-site advice from the project archaeologist.
- The location of the site GA6 should be clearly marked on all site plans and maps utilised for the proposal.
- The location of sites GA7, GA23, G1B AS1, GRW28, G1B AS2, GWTP1 and GWTP3 should be clearly marked on all site plans and maps utilised for the proposal.
- The protocols for the unanticipated discovery of archaeological material and suspected human remains (presented in Appendix F) should be implemented if necessary.

## 6.7 Non-Aboriginal heritage

### 6.7.1 Concept Plan Conditions of Approval

CoA #	Condition	Response
2.1 (h)	Heritage – both Aboriginal and non-Aboriginal, including an assessment of Aboriginal sites affected by the proposed development, their cultural value and the significance of these values for Aboriginal people;	Section 6.6 provides the results of a Non-Aboriginal desk top review which was undertaken to identify any Non-Aboriginal sites affected by the proposal.
2.1 (j)	the environmental assessment of the project must take into account relevant State Government guidelines, policies and plans	All relevant State Government guidelines, policies and plans have been considered and referenced where required.

### 6.7.2 Previous findings and existing heritage sites

In 2003, NOHC conducted a cultural heritage assessment of the proposed Googong Township as part of a Local Environmental Study (LES). The assessment involved a comprehensive surface survey of approximately 1,000 hectares. Seven historical sites (GH1-7) were identified during this survey.

In 2014, NOHC conducted a cultural heritage assessment of the remaining areas of the Googong Township not assessed south of Googong Dam Road. Five additional European sites (Grwh1-5) were recorded during this additional survey.

These sites are shown in Figure 6-15.

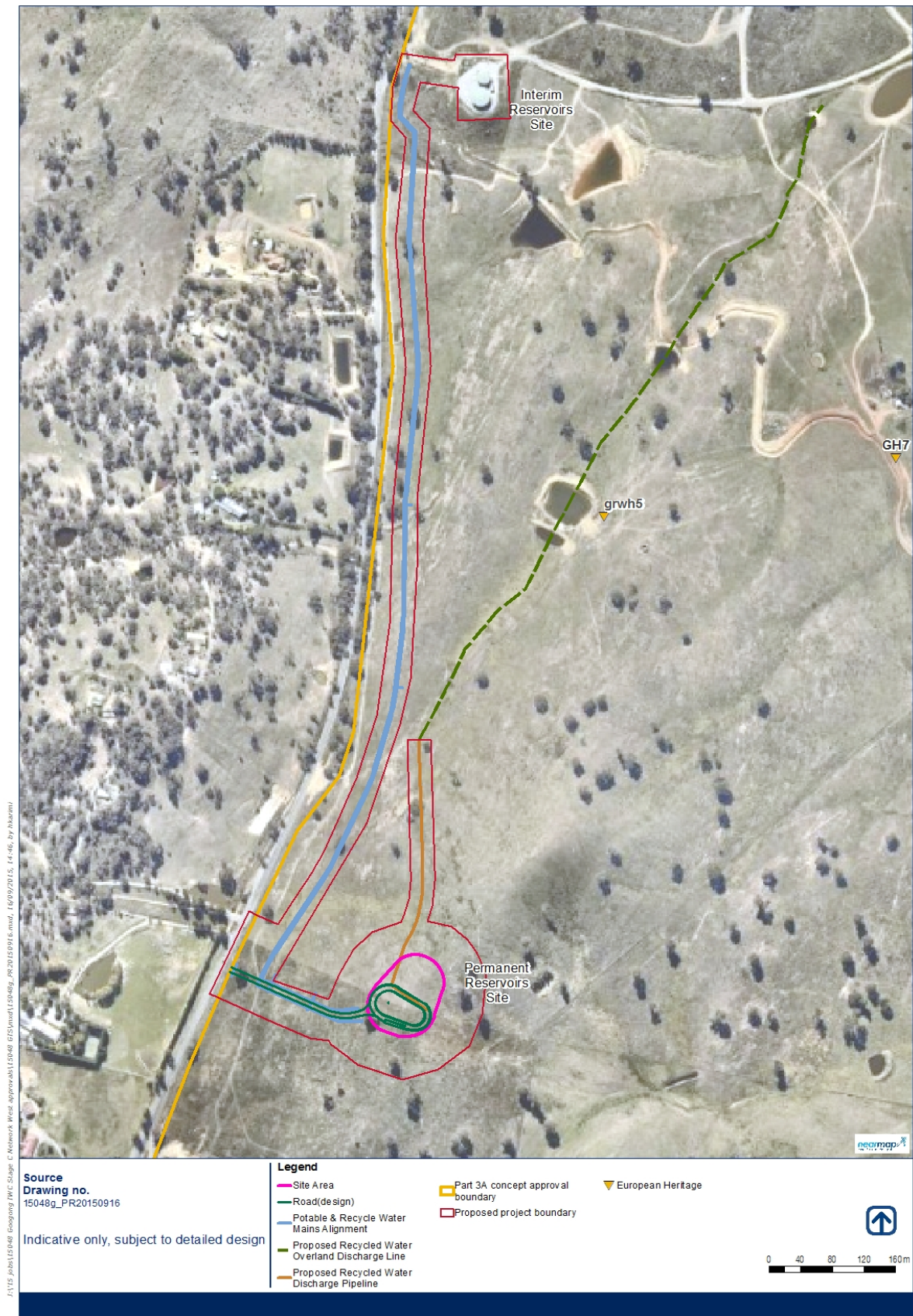


Figure 6-15 European heritage sites in proximity to Stage C Network West works adjacent to Old Cooma Road

There are no European sites within the proposed project boundary.

However, site GRWH5 is located adjacent to a farm dam that is downstream of the excess recycled water discharge point. It has therefore been considered as part of this assessment and a significance assessment on the site was completed.

### 6.7.3 Significance assessment for site GRWH5

#### Site description

GRWH5 is a ruined windmill.

#### Significance Assessment

A significance assessment has been completed on site GRWH5 using the NSW heritage assessment criteria to determine the items level of significance and analyse the management implications of the item's level of significance and any constraints the site may have for the proposed works. An item will be considered to be of State (or local) heritage significance if it meets one or more of the following NSW Heritage Assessment Criteria outlined in Table 6-19.

**Table 6-19 Significance assessment results for heritage site GRWH5**

NSW Heritage Assessment Criteria definition		Significance assessment results
(a)	An item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area).	This item is not important in the course of local or state cultural history; there are no known historical associations with this site. It is assessed as not having significance against this criterion.
(b)	An item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area).	There are no known strong or special associations between this item and particular individuals or groups. It is assessed as not having significance against this criterion.
(c)	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).	This item is not known to be valued in terms of its aesthetic or technical characteristics. It is assessed as not having significance against this criterion.
(d)	An item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons.	There are no known strong or special community associations for this item; it is assessed as not having significance against this criterion.
(e)	An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area).	This item does not display potential to yield substantial information relating to this form of site due to its modern age. It is assessed as not having significance against this criterion.
(f)	An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area).	This item is not uncommon locally or within NSW. It is assessed as not having significance against this criterion.
(g)	An item is important in demonstrating the principal characteristics of a class of NSW's: <ul style="list-style-type: none"> <li>▪ Cultural or natural places; or</li> <li>▪ Cultural or natural environments (or a class of the local area's</li> <li>▪ Cultural or natural places; or</li> <li>▪ Cultural or natural environments.</li> </ul>	This item is not considered to be an exemplar site and as such it is assessed as having no significance against this criterion.

## 6.7.4 Potential impacts

Site GRWH5 does not meet the criteria for heritage listing and does not meet a threshold of local significance. In addition it is unlikely that the proposed works would have direct impacts on the identified heritage item and the item would likely be removed in the near future as part of the development of the Googong township. Therefore potential impacts on non-Aboriginal heritage are negligible.

## 6.7.5 Mitigation measures

In order to minimise potential impacts to the local heritage features of this area it is recommended that the following precautionary management measures are followed during construction:

- Site staff would be advised of the location and presence of Site GRWH5 and the need to avoid impacts to the area. The site should be included on all maps and plans as a no-go zone both on and off site.
- If direct impact is necessary no permits to impact are required for this site.

## 6.8 Soils and landscape

### 6.8.1 Concept Plan Conditions of Approval

Air quality Part 3A Concept CoAs

CoA #	Condition	Response
2.1 (h)	Soils and landscape – including potential soil contamination, erosion risks, irrigations and rehabilitation;	Potential construction and operation impacts on the soil landscape for the proposal was considered, including potential soil contamination, erosion risks and rehabilitation.
2.1 (j)	the environmental assessment of the project must take into account relevant State Government guidelines, policies and plans	All relevant State Government guidelines, policies and plans have been considered and referenced where required.

### 6.8.2 Existing environment

#### Landform

The area that makes up the Googong township comprises approximately 850 hectares of undulating terrain bordering a series of relatively steep gullies.

Land elevations vary from approximately 600 metres Australian Height Datum along the Queanbeyan River to 816 metres at Swan Hill, which forms part of a low series of ridges that run northwest to southeast through the centre of the wider Googong project area.

The western half of the IWC Stage C Network West proposed project boundary is located on a drainage line and the slopes and crest of Hill 800. The eastern half, i.e. the WRP, is located on upper slopes and an ephemeral drainage line.

#### Geology and soils

The soils are typically shallow and contain large quantities of bedrock gravels and cobbles, with bedrock also frequently exposed at ground level on crests and ridge slopes, or as outcrops along the creek lines and steeper ridge slopes. However, on the low gradient basal slopes and creek flats deposits tend towards deeper sandy or loamy soils.



Soils extend to a depth of approximately 0.2 to 1.1 metres until bedrock is encountered. Erosion is apparent on spur crests where bedrock is exposed, this is however uneven across these landforms and pockets of deeper soil do exist. Soils are deeper and relatively stable closer to creek lines, some bank erosion is evident within creek lines.

The proposed project boundary is predominantly located within the Burra soil landscape and Anembo soil landscape. The soil landscape characteristics for these soil types are detailed in Table 6-20.

**Table 6-20 Soil landscape characteristics**

Soil landscape	Characteristics	Erosion potential
Burra	This landscape is characterised by undulating to rolling hills and alluvial fans associated with the weathering of the underlying Silurian volcanic units, with the ground surface almost completely cleared of woodland. The soils are described as strongly acidic with low fertility and low available water-holding capability. Subsoils also have low permeability.	Concentrated flows–moderate erosion potential.
Anembo	This landscape is characterised by undulating rises and flats over granitic material. The ground surface typically exhibits extensively cleared, open to tall open forest with woodland and low woodland in frost hollows. The area of Anembo soil landscape has been extensively cleared. Soils are with gravely low fertility and low water-holding capacity and are prone to waterlogging. Some subsoils have very low permeability.	Non-concentrated flows–moderate erosion potential. Concentrated flows–high to very high erosion potential.

Source: CIC, Manidis Roberts, *Googong Township Water Cycle Project Environmental Assessment*, 2009

Additionally, two geotechnical investigation test pits were undertaken at the permanent reservoir site in 2009 with results outlined in Table 6-21.

**Table 6-21 Geotechnical investigation test pit results at the**

Parameter	Test Pit 1	Test pit 2
Strata overlying rock	Top soil to 0.05m Silty sandy gravel to 0.3m Sandy clay to 0.7m	Silty sandy gravel to 0.3m
Depth to rock	0.7m	0.3m
Depth to refusal	1.2m	0.6m
Rock type	Low to medium strength, highly weathered, brown medium grained DACITE, hard excavation.	Low to medium strength, high weathered, brown medium grained DACITE, hard excavation.

Source: Douglas Partners, *Report on Geotechnical Investigation – Proposed Residential Subdivision, Googong Dam Road, Googong*, 2009

## Contamination

Coffey Geosciences undertook an initial contamination investigation (Stage 1 investigation) in 2004 to identify Areas of Environmental Concern (AECs) for the Googong Township Water Cycle Project Environmental Assessment. No AECs were identified in proximity to the Stage C Network West proposed project boundary.

A site survey to confirm the presence of any actual or potential contamination sites was carried out in July 2012. No additional areas of potential or actual contamination were identified.

## 6.8.3 Potential impacts

### Construction activities and potential impacts

Construction activities that may affect soil include:

- Vegetation clearance, topsoil stripping and soil disturbance.
- Trenching and soil excavation.
- Soil contamination.

#### Vegetation clearing, topsoil stripping and soil disturbance

Clearing of vegetation and topsoil stripping may result in the exposure of soil horizons that are susceptible to erosion. This can lead to erosion of exposed areas; deposition of eroded sediment in waterways increasing turbidity and smothering benthic habitat and organisms.

#### Trenching and soil excavation

Trenching activities will be required for the installation of mains from the interim reservoir site to the permanent reservoir site, which is approximately 1.5km in length and the installation of the potable rising main to the WRP, which is approximately 150m in length. The approximate volume of spoil excavation excavated for this construction activity will be approximately 4000m<sup>3</sup>.

Additionally, the recycled water and potable water reservoirs are proposed to be founded on competent rock which will require the excavation of rock and spoil of approximately 12,000m<sup>3</sup>. This material is planned to be used as fill around the site to create roads etc, using approximately 2,400m<sup>3</sup>. Therefore, there will be approximately 9,600m<sup>3</sup> excess spoil. The intention will be to use any excess spoil as fill material for other areas of the Googong development.

Soil erosion is most likely to occur during excavation works, particularly during any trench construction. Erosion can be from water (creating inter-rill erosion, rill and gully erosion and tunnel erosion) and wind. Potential impacts include the erosion of exposed areas, damage to retained vegetation due to eroded soils, and sedimentation of waterways increasing turbidity.

The erosion potential and excavation constraints of soil would be considered during construction planning. As noted above, the proposal is situated on the Burra or Anembo soil landscapes, which have moderate and high erosion potential respectively.

#### Soil contamination

As previously noted, no AECs were identified in proximity to the proposed project boundary, however there is always the potential for trenching and grading activities to disturb unidentified contaminated land and adversely impact existing soil characteristics if not managed appropriately. In addition, there is the potential during construction to contaminate soils through fuel or chemical spills. Risks include contamination of soil profiles, adverse impacts on human health and consequential effects on the groundwater quality.

## Operational activities and potential impacts

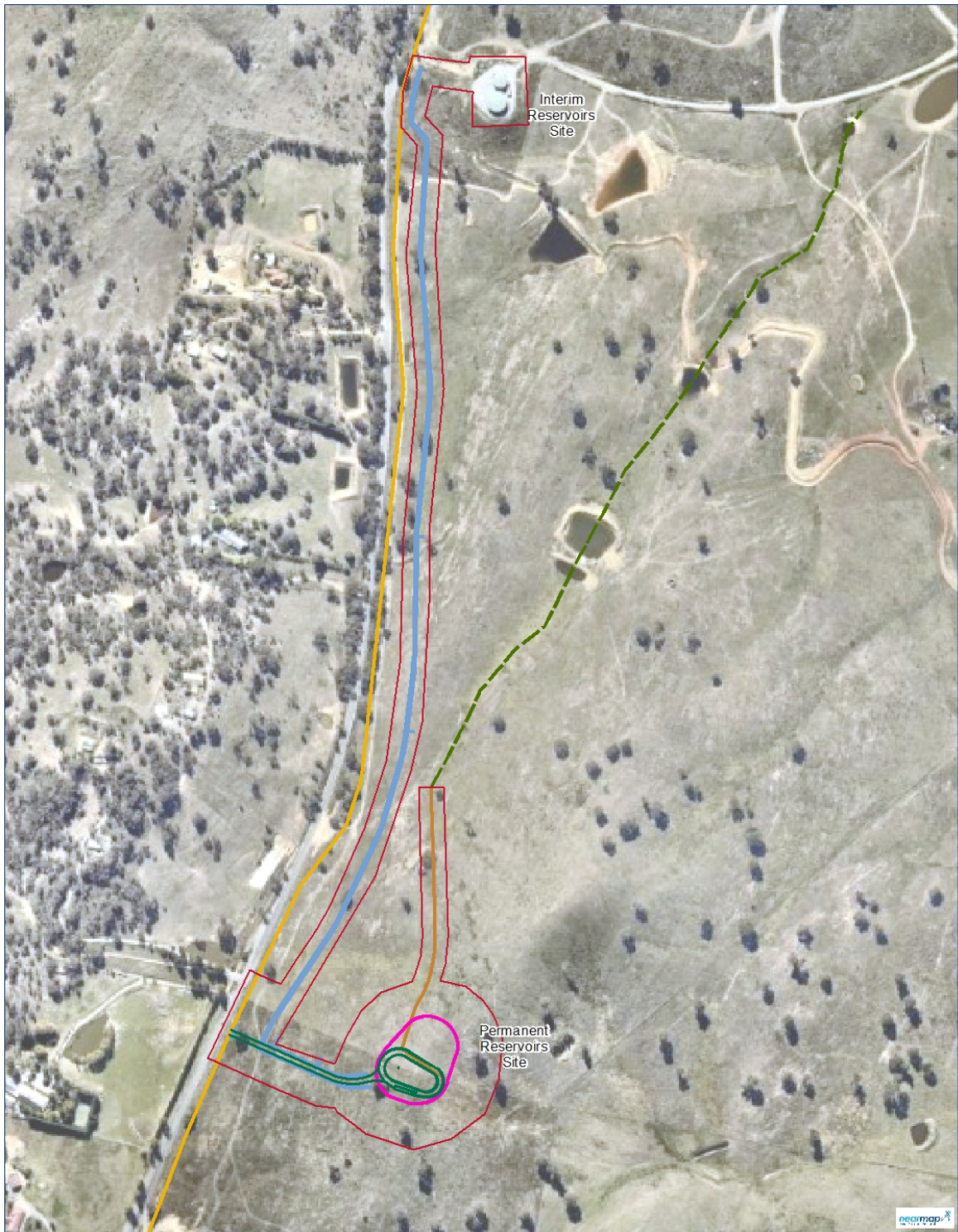
### Excess recycled water discharge to Googong Creek catchment

The key operational activity related to the Stage C Network West scope of works which has the potential to impact on the existing soil landscape is the discharge of excess recycled water from the recycled reservoirs site. Discharge would be via the excess recycled water discharge pipeline. Emergency discharges of potable water and recycled water in the event of a malfunction of telemetry and controls within the IWC system would also discharge from this pipeline.

As described in Section 3.5, the excess recycled water discharge pipeline will traverse underground for approximately 300m to the northwest of the permanent reservoirs site. The excess recycled water will then be discharged via a headwall and an energy dissipation structure and will follow the natural drainage line to a series of existing farm dams and a construction sediment basin. From here, excess recycled water would flow into the existing stormwater management system operating within the Googong township to Beltana Pond and onto to Googong Creek. The currently approved location for the discharge of excess recycled water at the interim reservoirs site is also within this catchment.

To mitigate these potential, temporary impacts of the discharge of excess recycled water, GTPL proposes to:

- Install an energy dissipation structure immediately downstream of the discharge location.
- Monitor the drainage line on a monthly basis following the commencement of operations to identify any areas of erosion along the drainage line and any impacts on the existing farm dams and sediment pond.
- In the event that impacts are identified, additional measures will be considered. These would include the provision of:
  - Additional energy dissipation structures along the drainage line.
  - Diversion structures around the farm dams or strengthening these structures.
  - Additional sediment basins or the modification of the existing basin.

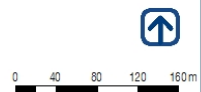


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**Source**  
**Drawing no.**  
 15048g\_PR20150916

Indicative only, subject to detailed design

- Legend**
- Site Area
  - Road (design)
  - Potable & Recycle Water Mains Alignment
  - - - Proposed Recycled Water Overland Discharge Line
  - Proposed Recycled Water Discharge Pipeline
  - Part 3A concept approval boundary
  - Proposed project boundary





**Figure 6-17** shows the route that the excess recycled water would follow once discharged and **Figure 6-16** shows an example of the proposed headwall and energy dissipation structure to be installed at the permanent reservoirs site.

The excess recycled water discharged into the environment will meet the water quality requirements of the Project Approval for Stage 1 and the requirements that are expected to be included in the EPL for the operation of the IWC Project. Modelling has been undertaken to predict the volumes of excess recycled water that would be discharged from the permanent reservoirs site. The results of this modelling are detailed in Section 3.5.4, but in summary:

- Up to a maximum of 986kL of excess recycled water could be discharged in a day, but on some days no excess recycled water would be discharged. The average daily discharge is predicted to be about 159kL.
- On a monthly basis, January is predicted to have the lowest volume of excess recycled water discharged – 0.018ML or 18kL – as demand is predicted exceed supply on most days during the hottest months. July is predicted to have the highest volume of excess recycled water discharged – 11.978 ML – as demand in the colder months is predicted to be lower than supply.

Discharge of excess recycled water at these volumes has the potential to cause erosion and scouring of the drainage line between the energy dissipation structure and the township's stormwater management system. The existing farm dams and sediment basin located in the drainage line could also be damaged by excess recycled water discharges if their capacity is exceeded.

The impact of any erosion or scouring of the drainage line would be minimised by:

- The presence of the existing farm dams and sediment basin that would capture sediment washed down the drainage line in the excess recycled water flows.
- The existing stormwater management system operating within the township would capture and treat sediments prior to discharge of water to Googong Creek. This system has been designed to cater for stormwater generated from the catchment as well as the predicted excess recycled water discharges.

- This drainage line is located within one of the as yet undeveloped neighbourhoods of the Googong township. At the early stages of the development of this neighbourhood, GTPL will reprofile the landscape and establish enabling infrastructure for subdivision, including a stormwater management system that will integrate with the existing system downstream. Therefore, the drainage line (including the farm dams and the sediment basin) will be reconfigured as part of the new stormwater management system and thus any impact on the existing drainage line will be temporary. The stormwater management system will be designed to treat the predicted excess recycled water discharges.

Given these factors, as well as the measures outlined in Section 6.9.4, it is considered that the impacts on the drainage line would be low.



**Figure 6-16 Indicative design of discharge point headwall and dissipation mattress**

## 6.8.4 Management measures

### Management and mitigation measures during construction

#### Soil erosion

Erosion potential for the proposal would be managed by the following measures:

- Maintaining surface and soil stability at all times during cut-and-fill excavation activities (particularly in relation to trenching and the excavation of soil at the permanent reservoir site) by implementing standard erosion and sediment control techniques in construction areas like berms and sedimentation fencing. Site-specific Erosion and Sediment Control Plans (ESCPs) will be prepared progressively to include the management strategies and controls for all activities with the potential to impact on sediment loss and erosion.
- Erosion within the trench would be mitigated by using trench plugs (i.e. trench/sack breakers) at appropriate intervals. These measures are in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004 – also referred to as ‘The Blue Book’).
- Measures to ensure limited tracking of dirt off site will be implemented at access points. Where required the controls may include exit rumble grids at all points of egress onto public (sealed) roads, and/or stabilisation of site roads/tracks with aggregate where appropriate.
- Erosion and sedimentation controls will be inspected prior to and after each rain period and during periods of prolonged rainfall. Any defects will be rectified immediately.
- Sediment basins will be designed and constructed in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) and located as specified in relevant ESCPs.
- All runoff from disturbed areas within the work site will be directed to sediment basins (or other appropriate sediment control structures). Sediment basins will only be discharged to receiving waters when confirmed as complying through field tests/laboratory analysis tests with discharge guidelines.
- Erosion and sediment measures to secure the stockpile areas (e.g. diversions, sediment fences) will be installed prior to the commencement of spoil stockpiling activities.
- Stockpiles will be checked for stability weekly and after heavy rainfall.
- Topsoil will be conserved, where reasonable and feasible, for use in site rehabilitation/revegetation.

Furthermore, during the restoration and clean-up of construction sites, the following measures would be applied to stabilise the soils:

- The site would be re-profiled to achieve soil stability and congruity with the surrounding landscape. This would be done in consideration of the landscape and open space strategy for the Googong Township development.
- Re-seeding would be undertaken, and geotextile materials used as required.
- Trenches would be backfilled and compacted in layers.
- Access to the site would be managed (including site restrictions) to assist with site recovery.
- There will be progressive revegetation, stabilisation and restoration works of earthworks areas in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004).

## Potential Soil contamination

To prevent the contamination of soils and in the event that contamination is encountered during construction, the following measures would be implemented:

- Works in the vicinity will be stopped or modified and will not recommence until the material has been analysed, the hazard has been assessed and appropriate action has been taken (including delineating areas of concern as required until earthworks can resume safely).
- Storage areas for fuels, oils and chemicals used during construction will be covered and contained within an impervious bund to retain any spills of more than 110% of the volume of the largest container in the bunded area. Any spillage will be immediately contained and absorbed with a suitable absorbent material. The contaminated material will be disposed of according to manufacturers and OEH requirements.
- Where possible, all refuelling would occur at designated fuel distribution points. These distribution points would be underlain by compacted earth to prevent the significant loss of fuel into the ground in the event of a spill. They would also be bunded to contain any large spills that may occur as a result of machinery or tank failure.
- Spill response procedures and equipment for containment and recovery would be available on site.
- Workforce training would be conducted on the transport, storage, handling and disposal procedures relating to chemicals.

## Operation

### Excess Recycled water discharge pipeline

To mitigate these potential, temporary impacts of the discharge of excess recycled water, GTPL proposes to:

- Install an energy dissipation structure immediately downstream of the discharge location.
- Monitor the drainage line on a monthly basis following the commencement of operations to identify any areas of erosion along the drainage line and any impacts on the existing farm dams and sediment pond.
- In the event that impacts are identified, additional measures will be considered. These would include the provision of:
  - Additional energy dissipation structures along the drainage line.
  - Diversion structures around the farm dams or strengthening these structures.
  - Additional sediment basins or the modification of the existing basin.



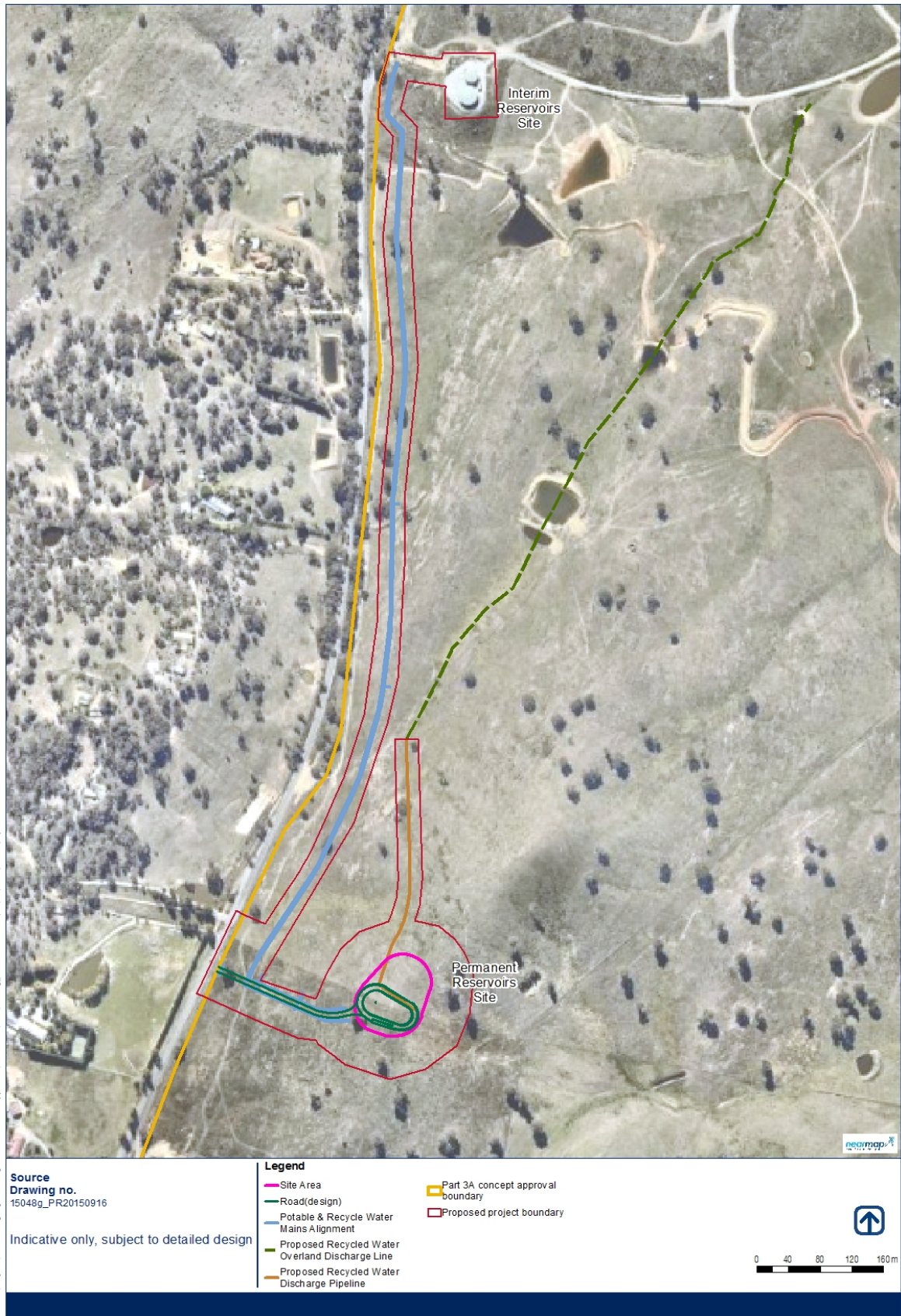


Figure 6-17 Excess recycled water and potable water discharge pipeline and overland alignment

## 6.9 Water quality and hydrology

### 6.9.1 Concept Plan Conditions of Approval

**Table 6-22 Soil and hydrology Part 3A Concept CoAs**

CoA #	Condition	Response
2.1 (h)	Surface Water – including potential water quality impacts on local creeks and rivers and impacts on surface water flows, as a result of construction and operation of the project;	The potential impacts to surface water quality have been considered in Section 6.8 and 6.9.
	Groundwater – including potential impacts on local recharge levels, contamination risks, groundwater mounding, isolated waterlogging of soils and impacts on groundwater quality.	The potential impacts to ground water quality have been considered in Section 6.8 and 6.9.
2.1 (j)	the environmental assessment of the project must take into account relevant State Government guidelines, policies and plans	All relevant legislation for water quality and hydrology have been considered in Sections 4 and Section 6.8 and 6.9.
2.1 (k)	The assessments of the subsequent project stages shall take into account, but not limited to the following guidelines, as relevant; <ul style="list-style-type: none"> <li>▪ <i>National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000).</i></li> <li>▪ <i>National Water Quality Management Strategy – Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Natural Resource Management Ministerial Council, Environment Protection and Heritage Council and Australian Health Ministers Conference 2006)</i></li> </ul>	These guidelines have been considered as part of the design of the proposal and assessment outlined in Section 6.9 and 6.8.

### 6.9.2 Existing environment

#### Surface water drainage

Drainage in the area consists of a number of small ephemeral and semi-permanent creeks, farm dams and depressions, shown in Figure 6-18. Records show that the area has a mean annual rainfall of just less than 600 mm, with summer thunderstorms and drought as common features. There are four main catchments in the area:

- Googong Creek catchment.
- Jerrabomberra Creek catchment.
- Montgomery Creek catchment.
- Googong Dam catchment.

These are all sub-catchments of the Queanbeyan River catchment.

## Groundwater environment

According to SMEC (2015a), groundwater is hosted in a regionally extensive fractured-rock aquifer. Minor alluvial aquifers are located along the alignments of locally significant waterways, but these are expected to have minimal storage and not to be of significance to the assessment of the potential groundwater impacts of the IWC Project. The depth to bedrock across much of the site is expected to be between about one to two metres, with fresh bedrock encountered at shallower depths at higher elevations, and marked changes of slope. Shallow groundwater is expected to migrate along the interface between the soil horizons and relatively fresh bedrock, and to discharge to surface water streams across the site.

## Existing discharge locations

The currently approved discharge location for excess recycled water is at the interim reservoirs site, which flows into Googong Creek via the stormwater management system. This discharge location is marked as 'Discharge Point 1' in Figure 6-18. The recycled water will be de-chlorinated (at the reservoirs) and discharged into the first of the stormwater ponds, it will then flow through the stormwater management system (including Beltana Pond) and into Googong Creek.

Emergency discharges from the WRP will discharge into Montgomery Creek and is marked as 'Discharge Point 2' in Figure 6-18. This discharge point would only be used in emergency events. Emergency discharges into Montgomery Creek would contain de-gritted and screened sewage. In the extremely unlikely event that the pumps at the sewage pumping stations were running at flood head (i.e. nominally wet weather in excess of one in ten years annual return interval (ARI)) and the manual screen in the inlet works was blocked, the sewage would be de-gritted only.

Excess recycled water produced by the WRP that does not meet the RWQMP criteria (i.e. during the process verification phase in commissioning before it is approved for use in the Township, or during the failure of a CCP during operation) will be diverted to an Off-Spec Water Tank at the WRP and then pumped along a pipeline that runs along Googong Road. The off-spec recycled water will then be discharged into Googong Creek via the existing chamber and outlet structure at Beltana Park, immediately downstream of Beltana Pond. This discharge location is marked as 'Discharge Point 3' in Figure 6-18. It is an EPA-licensed discharge point and recycled water discharged at this location will be required to meet the effluent criteria in CoA D5 and the other relevant conditions of the EPL.



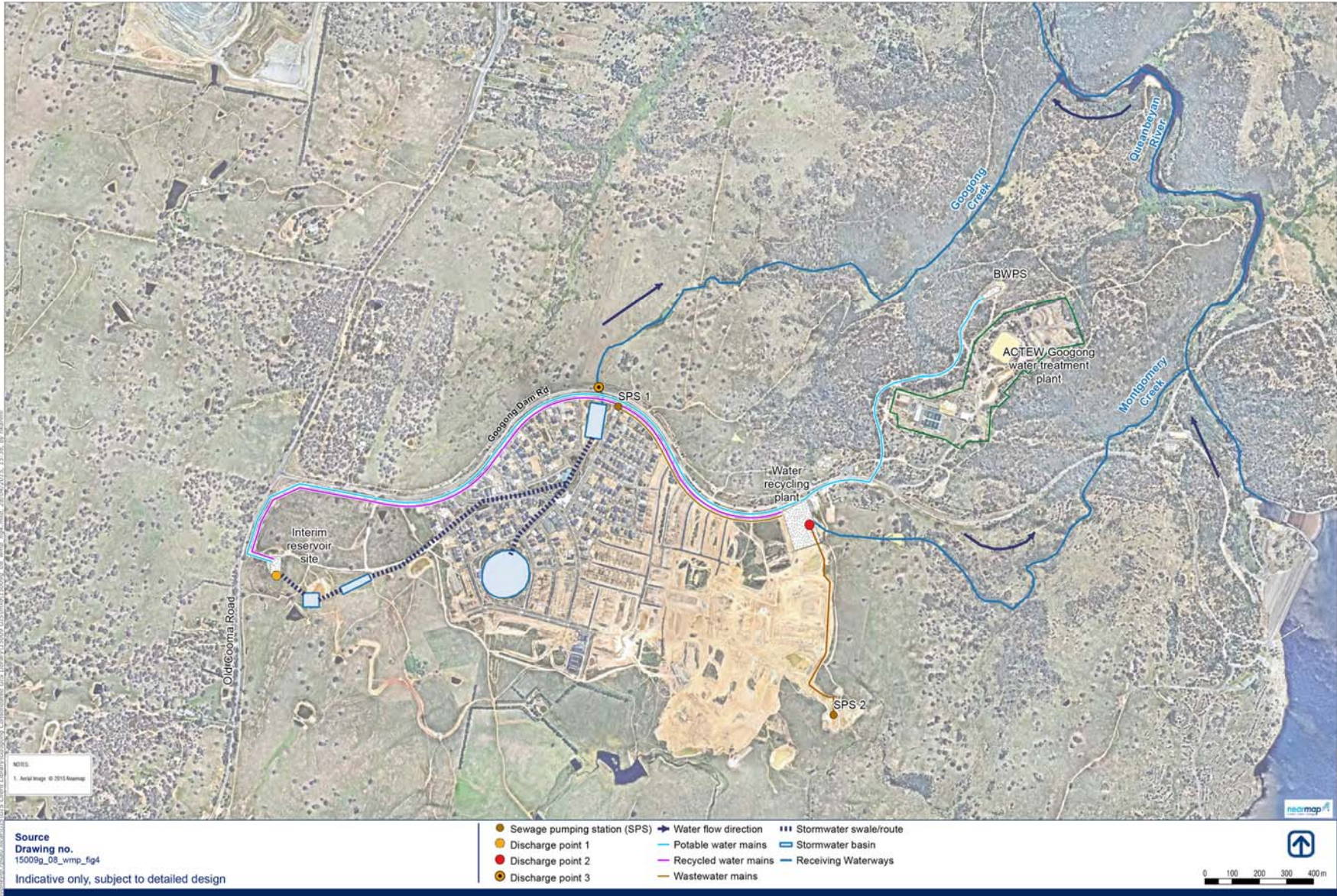


Figure 6-18 Existing discharge points



## Existing plans to manage and protect water quality and aquatic ecology throughout the operational life of the IWC Project

The WRP has been designed to meet the requirements of Conditions outlined in the Part 3A Project Approval. The key objective of the WMP is to manage potential impacts on surface water and groundwater systems during operation of the IWC Project. To realise this objective the following will be undertaken:

- Ensure appropriate measures are implemented to address the relevant CoA and SoC, and safeguards detailed in the EA and submissions report (refer Sections 3.3 and 3.4 of the EIS).
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements (refer Section 3 of the EIS).
- Ensure appropriate controls and procedures are implemented during the operation of the IWC Project to avoid or minimise potential adverse impacts to receiving waters and surrounding landscapes (refer Sections 4 and 5 of the EIS).
- The Googong IWC Water Management Plan (WMP) (refer to section 6.12 of this REF).

### 6.9.3 Potential impacts

#### Construction

- Construction activities would require the disturbance and excavation of soils. During rain events this may cause erosion and sedimentation of drainage channels which may impact on water quality downstream. Refer to section 6.8 for further information.
- There is potential for accidental spills from plant or activities (e.g. hydraulic fluid or cement) during construction, which may enter the natural drainage lines causing pollution of the local waterways.
- There is potential for water used during construction activities (such as wash down bays) to run-off the construction site and enter the natural drainage lines causing pollution of the local waterways.
- The compound site would generate waste water that would need to be disposed of offsite, with the potential to spill off site and enter the local drainage lines causing pollution of the waterways.
- There would be no impacts to groundwater during construction activities as construction activities are not expected to be deep enough to impact groundwater levels.
- It is not expected that there would be any impacts to the ongoing operation of the WRP or the interim reservoir site as a result of the construction activities.

#### Operation

- An amendment of the EPL will be sought and the Water Management Plans will be updated for the operation of the Stage C Network West project prior to operation.
- The Stage C Network West works would not have any additional impacts or increase the flow of recycled water to the environment from the IWC Stage 1 Project. In fact, the additional recycled water storage volumes provided at the WRP and the permanent reservoirs site will reduce the volume and frequency of excess recycled water discharged to the environment until the Stage C WRP is operational. This would be assessed as part of the separate Stage C WRP approval and have therefore has not been assessed in this REF.

- The discharge of excess recycled water from the permanent reservoirs site is in the Googong Creek catchments, the same point as the interim reservoirs site. Therefore there would be no increases to water flows within Googong Creek. However, between the discharge point at the permanent reservoirs site and the discharged water would follow the natural drainage lines downhill, through existing farm dams. Currently this drainage line is primarily dry. Therefore there is potential for erosion and sedimentation of this drainage line due to the increase flows from the existing. In particular there is potential for scour at the exit point of the farm dam. This would cause increase sediments, and potentially increased turbidity in the stormwater management system.
- The potable and recycled water quality discharged to the environment from the permanent reservoirs site would be tested prior to leaving the site. Water quality of the discharged water is expected to be consistent with the current licence requirements for water discharge into the environment. Any impacts to water quality downstream of the IWC project will be monitored and managed in accordance with the requirements of the Water Management Plan.

## 6.9.4 Management measures

Construction water quality and erosion and sediment control management measures are outlined in section 6.8.4.

Operational water quality and hydrology management measures would be outlined in the Googong IWC Water Management Plan.

## 6.10 Air quality

### 6.10.1 Concept Plan Conditions of Approval

**Table 6-23 Air quality Part 3A Concept CoAs**

CoA #	Condition	Response
2.1 (h)	Air quality – including dust and odour impacts.	Dust and odour impacts are addressed in Section 6.10.
2.1 (j)	the environmental assessment of the project must take into account relevant State Government guidelines, policies and plans	All relevant State Government guidelines, policies and plans have been considered and referenced where required.
2.1 (k)	the assessments of the subsequent project stages shall take into account, but not limited to the following guidelines, as relevant: <ul style="list-style-type: none"> <li>▪ <i>Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC, 2005)</i></li> </ul>	Air quality impacts are addressed in Section 6.10.

### 6.10.2 Existing environment

The proposal is located within a rural landscape characterised by large rural landholdings, that is gradually changing into a suburban area with the ongoing development of the Googong Township. The surrounding area is predominantly characterised by low-intensity grazing, bushland and rural residential land uses; no intensive agricultural activities are known to occur.

Googong is located within a temperate climate, distinctively characterised by dry (and warm) summers and cold winters. Mean temperatures are within the range of 13–27°C during summer and 0.5–12°C in winter. Uniform rainfall is experienced throughout the year with an average of 615.5 millimetres received per annum.

The ambient air quality of the study area is affected by the predominantly agricultural use of the surrounding area, and is considered to be good. (There are minimal odour impacts from the agricultural uses due to the low-intensity farming.) Quantitative analysis of the air quality has not been deemed necessary given the absence of prevailing factors that would alter the air quality from its relatively benign state.

Various external factors would occasionally have impacts on air quality in the area. These include:

- Construction activities related to the ongoing development of the Googong Township.
- Seasonal bushfires, burn-offs and hazard reduction burning, which produce smoke and ash.
- Extreme weather events combined with drought, which can cause dust or particulates from the ongoing construction activities related to the development of the Googong Township.

### 6.10.3 Potential impacts

#### Construction

Construction would generate minor dust impacts. Principal dust and particulate matter emissions from construction activities would be associated with bulk earthworks. The extent of the impact would vary depending upon soil type, soil moisture, ground cover and the prevailing wind conditions at a given location.

The following construction activities are potential sources of dust generation:

- Vegetation clearing, trenching, backfilling and reinstatement.
- Wind erosion from stockpiling of excavated topsoil and trench spoil.
- Movement of vehicles and construction machinery, both within and in/out of the construction site.
- Drilling and blasting of hard rock areas.

Construction of the pipelines would involve only minimal surface disturbance at any one time as the excavation works and rehabilitation would happen progressively.

During construction, it is unlikely that there would be any odour impacts that would affect air quality, as construction plant and vehicles are the only sources and any odour emissions would be negligible within the context of the open areas used for construction.

#### Operation

During operation, it is unlikely that particulate matter (dust) would affect air quality within the study area. The site would be rehabilitated after construction, minimising the potential for dust generation. Dust issues arising from vehicle and equipment movement during maintenance operations are considered to be negligible and should not create any long-term or permanent impact on air quality in the region.

Odour impacts associated with the proposal are also likely to be negligible. All chemicals stored at the permanent reservoir site do not have potential odour impacts.

### 6.10.4 Management measures

#### Construction

The following dust suppression measures would be implemented to minimise nuisance dust:

- Speed limits would be reduced during high dust/windy conditions.
- Clearing of vegetation and topsoil would be limited to the designated footprint required.

- Disturbed areas would be progressively reinstated with suitable stabilising agents or revegetation.
- Water trucks would be used to reduce dust in dry, windy conditions.
- Working practices would be modified during periods of high winds by limiting the use of some machinery and by reducing travel speeds.
- The burning of material on site would be prohibited, except under the instruction of NSW Rural Fire Services.

These dust suppression measures are based on standard construction industry measures based on the ‘Blue Book’ (Landcom, 2004) and would be sufficient to adequately manage dust during the construction phase.

## 6.11 Waste management

### 6.11.1 Concept Plan Conditions of Approval

**Table 6-24 Waste Management Part 3A Concept CoAs**

CoA #	Condition	Response
2.1 (h)	Waste Management – including the likely waste quantities and qualities generated during the construction (including spoil generation) and operation of the project.	Waste assessment and management for the project is considered in section 6.11.
2.1 (j)	the environmental assessment of the project must take into account relevant State Government guidelines, policies and plans	As outlined in Section 6.11.2, the <i>Waste Avoidance and Resource Recovery Act 2001</i> and the <i>Protection of the Environment Operations Act 1997</i> have been considered when assessing waste management for the proposal.

### 6.11.2 Policy setting

Waste management would be undertaken in accordance with the *Waste Avoidance and Resource Recovery Act 2001*. The objectives of the Act that are applicable to the proposal are:

- to encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development
- to ensure that resource management options are considered against a hierarchy of the following order:
  - avoidance of unnecessary resource consumption
  - resource recovery (including reuse, reprocessing, recycling and energy recovery)
  - disposal of waste
- to provide for the continual reduction in waste generation
- to minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste, to assist in the achievement of the objectives of the *Protection of the Environment Operations Act 1997*.



### 6.11.3 Potential impacts

#### Construction

Waste streams from construction activities will vary depending on the construction activities being undertaken at any one time. General expected waste streams would include:

- Vegetation waste from clearing and stripping activities – estimated 1600m<sup>2</sup>
- Excess spoil from excavation – an estimated 9,600m<sup>3</sup> of primarily virgin excess spoil (refer to section 6.8)
- Spent fuel and chemical containers
- Packaging waste from delivery of construction materials and plant and equipment
- General construction waste such as excess concrete, formwork, pipe offcuts, cabling and wiring
- Contaminated soil material caused by accidental fuel and chemical spills
- General waste from site amenities including food waste, office waste and waste water
- Disused environmental controls such as sediment fences, straw bales, gravel socks etc.

Generally waste to be produced would be in minimal quantities and would be disposed of at an appropriately licenced facility. It is not expected that any contaminated waste (except as a result of accidental spills) would be produced as a result of the proposed construction activities.

The interim reservoir site would be demolished and completely removed as a part of the proposed works. This would result in all the existing materials being removed and disposed of as waste. This would include the existing tanks, pumps, pipes, shed materials and concrete foundations.

Section 3.4 outlines a list of materials that would be required for the proposal. Resources would be sourced from local suppliers where feasible and volumes required would be minimised where possible. No materials required for the proposal are likely to become in short supply in the near future.

#### Operation

Operation is not expected to generate any substantial amounts of waste. The likely types of waste would include:

- Empty bottles and storage containers from the treatment chemicals
- General waste from staff attending the operation of the facility.

Therefore impacts from operational waste are expected to be minor and suitable standard operational procedures would be implemented to manage any operational waste produced.

It is expected that every 5 – 10 years maintenance on the potable and recycled water reservoirs would be required. This would include allowing the tanks to empty to about one third full. This lower layer may be heavily silted. Therefore it would be pumped out into a temporary sedimentation basin and treated in accordance with a management plan to ensure it is of a suitable quality prior to being released into the discharge points within the facility. The remaining silt/sediment left at the bottom of the basin would then be manually removed from site and disposed of at a licenced facility. The infrastructure is being built as part of the proposed works to provide for this in the future.

### 6.11.4 Management measures

- Resource management hierarchy principles are to be followed (in particular in the removal and disposal of the existing interim reservoir site):
  - Avoid unnecessary resource consumption as a priority
  - Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery)
  - Disposal is undertaken as a last resort at a licenced waste facility  
(in accordance with the *Waste Avoidance and Resource Recovery Act 2011*).
- Waste materials, other than (re-used) landscaped vegetation and/or tree mulch, is not to be left on site once the works are complete
- Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day
- A standard operating procedure (SOP) would be developed for the ongoing management of the reservoir facilities, including management of waste at the site as part of the OEMP.
- Independent separate work approvals are to be sought for any maintenance works on the reservoir tanks. Any works which impact the quality of water leaving the facility through the discharge point would be prepared in consultation with the EPA.
- No waste is to be burnt on site.

### 6.12 Hazards and Risks

A hazardous good storage assessment for the operations of the permanent reservoir site was prepared by Whamcorp (Whamcorp, 2015). Information relevant to the proposal is outlined below and the full report can be found in Appendix K.

#### 6.12.1 Concept Plan Conditions of Approval

**Table 6-25 Hazards and risks and human health Part 3A Concept CoAs**

CoA #	Condition	Response
2.1 (h)	Hazards and risk – including details of hazardous materials used or kept on the premises during the construction and operation phases of the project	Hazards and risks for the proposal are assessed in Section 6.12 of this REF.
	Human Health – inducing impacts arising from the application of recycled water and discharges of wastewater and recycled water.	Impacts to human health from the proposal are considered Section 6.12.5.

#### 6.12.2 Assessment methodology

All Stage C Network West components were considered by the project team as to whether any hazardous materials would be kept on the premises during the construction and operation phases of the project.

It was determined that during construction, standard hazards and risks and management and mitigation measures would apply.

For operation, hazardous materials would be stored at the permanent reservoir site. Whamcorp (Whamcorp, 2015) undertook a hazardous goods storage assessment for the operations at this site. The assessment included the following:

- The classifications and maximum quantities of the three nominated treatment chemicals
- The relevant Australian Standards for storage and handling and any fire protection requirements specified in them or in legislation
- Building Code of Australia requirements
- NSW Department of Planning guidelines relevant to determining whether a Preliminary Hazard Analysis (PHA) is required.

### 6.12.3 Potential impacts

#### Potential impacts during construction

Potential construction hazards and risks would be associated with:

- Workplace health and safety of construction personnel, as well as the safety of passersby.
- Construction activities on and in the vicinity of roads (including the delivery of equipment materials etc). Potential impacts on traffic safety have been considered in Section 6.1 of this report
- Construction near powerlines and other existing services.
- Environmental events, such as major storms, bushfires and the like.

These construction hazards and risks are considered typical of such projects and would generally be adequately managed by standard industry practices and procedures.

#### Potential impacts during operation

##### Hazards and risks associated with chemical storage and transport

During operation, there will be three chemicals stored at the southern end of the permanent reservoir site, as shown in Figure 3-4 and detailed in Table 6-26.

**Table 6-26 Chemical details stored at the permanent reservoirs site and assessment results**

Chemical details				Assessment	
Name	Concentration	Volume stored (kL)	Purpose	Assessment comments	Classified as 'dangerous goods'?
Sodium Hypochlorite	12.5 to 15% wt/wt supplied	6.4	Disinfection of potable and recycled water entering reservoirs with further disinfection as water leaves the reservoirs	Aqueous solution	Class 8 corrosive liquid
Sodium Meta Bisulphite	Approx 38%	1	De-chlorination for any excess potable water or recycled water discharged from the site.	Aqueous solution	Class 8 corrosive liquid

Chemical details				Assessment	
Name	Concentration	Volume stored (kL)	Purpose	Assessment comments	Classified as 'dangerous goods'?
Sulphuric Acid	98.5%	1	Treatment of high pH of potable water to meet drinking water guidelines and improve effectiveness of disinfection. This is only required when the pH of the potable water is high. It is anticipated that acid dosing will be required only one week every year or so.	Aqueous solution	Not a dangerous good

All three chemicals are classified as all aqueous solutions of chemicals, two of which are classified as “dangerous goods” under transport legislation harmonised throughout the Commonwealth (e.g. NSW Dangerous goods (Road and Rail Transport) Regulation 2009) or as “Schedule 11 hazardous chemicals” under NSW Work Health and Safety Regulation 2011 because they are “corrosive liquids”. None of these chemicals are flammable or combustible.

The relevant Australian Standard for the storage Class 8 dangerous goods, including fire protection requirements, is AS 3780:2008 “The storage and handling of corrosive substances”. As all three are not flammable or combustible, there are no prescribed fire protection equipment requirements for any of them under any of the applicable legislation or AS 3780.

The assessment concluded there are no requirements for hydrants, hose reels or sprinklers for the proposed chemical storage.

#### Hazards and risks associated with emergencies or maintenance activities

Potential operational hazards and risks associated with emergencies or maintenance activities include:

- Spills of chemicals or fuels.
- Recycled or potable water discharge from the reservoirs into the s, either through dewatering of reservoirs for maintenance or unplanned overflows.

In addition, there would be general occupational health and safety issues for maintenance and operational personnel.

### 6.12.4 Management measures

#### Construction

Mitigation measures that would be implemented during construction would be outlined in the CEMP and would include (but not limited to):

- Implementation of appropriate safety and training procedures, such as safe work method statements, safety management plan(s), auditing of contractors’ safety management and approval of construction equipment.
- Risks register and risk minimisation process.
- Implementation of a traffic management plan (see Section 13.1.6).



- Liaison with local emergency services, in particular regarding high fire-danger periods.
- Installing exclusion fencing where appropriate.

## Operation

A variety of measures would be implemented to manage the operational risks of the storage and delivery of chemicals associated within the project. These measures would be outlined in the OEMP and are typical of those applied at similar facilities and include:

- Storing quantities of certain chemicals on site that are within the relevant thresholds.
- Undertaking activities in accordance with the relevant material and safety data sheets.
- Installing bunded areas for the storage and delivery of chemicals in accordance with Australian Standard AS 3780:2008 and the relevant material and safety data sheets.
- Developing and implementing appropriate procedures for delivering, handling and accidental spills of chemicals.

Measures associated with the management of risks from emergency or maintenance events associated with the system are largely incorporated in the design. These measures include:

- Implementing back-up procedures should power to infrastructure be interrupted.
- Installing appropriate management measures at the recycled water discharge pipeline at the permanent reservoirs site.
- Implementing emergency management plans and undertaking ongoing liaison with the local emergency services.

### 6.12.5 Human health arising from the application and discharge of recycled water

The Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (AGWR) (NRMCC, EPHC and AHMC, 2006) is a set of national guidelines that can be applied to the management of both human and environmental risks associated with the application and discharge of recycled water. The central principle of the AGWR is that all recycled water schemes require a risk management plan.

QCC have developed an Essential Sewage and Recycled Water Quality Management Plan (RWQMP) (QCC, 2013), for Stage 1 of the Googong Township IWC, which is being continuously evaluated and reviewed to assure safety throughout the project lifecycle.

Stage C Network West works will provide infrastructure to increase the storage capacity of the current IWC Project under the RWQMP. The proposal will also result in the relocation of the potable water and recycled water reservoirs from the interim to the permanent reservoirs site. These changes will not alter the uses of recycled water in the township (i.e. for use by residents on their properties or for the irrigation of open space). The location of the discharge of excess recycled water within the catchment of Googong Creek will change, but this intermittent discharge will still pass through the township's stormwater management system, including Beltana Pond, before any discharge to Googong Creek. Therefore, the potential impacts of the proposal on human health related to the use and discharge of recycled water are not predicted to change from those already approved and addressed in the RWQMP and the Water Management Plan (WMP) (RPS, 2015).

Prior to Stage C Network West commencing operations, the RWQMP and the WMP will be updated to incorporate the new assets. Table 6-27 illustrates how the RWQMP meets the 12 elements of the AGWR's Framework for the Management of Recycled Water Quality and Use.

**Table 6-27 Approach and outcome in meeting the 12 AGWR Elements for the Googong Township RWQMP**

AGWR element	Approach and outcome
<b>1. Commitment to responsible use and management</b>	
1.1. Responsible use of recycled water	<p>The development of the scheme involved collaboration between QCC, GTPL, NSW Department of Health, NSW Office of Water (NoW), NSW Environmental Protection Agency (EPA).</p> <p>Googong Township is designed around the IWC Project, which aims to cut the potable water consumption up to 60%. Amongst the uses of the recycled water are toilet flushing, irrigation of parks and other public domain features in the township.</p>
1.2. Regulatory and formal requirements	<p>Regulatory and guideline requirements identified include in particular the <i>Local Government Act 1993 – Section 60</i>, Part 3A of the EP&amp;A Act, PoEO Act, Australian Drinking Water Guidelines, WSAA Water Supply and Sewerage Code of Australia.</p> <p>A Register of regulatory and formal requirements is maintained and updated regularly.</p>
1.3. Partnerships and engagement of stakeholders (including the public)	<p>Engagement of stakeholders is generally between QCC, GTPL, state environmental protection agencies, health departments and other relevant government entities. Other stakeholders are local community, plumbers and builders and the general public.</p> <p>A stakeholder register, which provides information on entity type, roles in recycled water management, nominated personnel and contact details, is maintained and updated regularly by QCC</p>
1.4. Recycled water policy	<p>QCC supports and promotes the responsible management and use of recycled water and the application of a multi-barrier management approach.</p> <p>QCC maintains recycled water management systems to effectively manage risks to public and environmental health.</p> <p>The recycled water policy is signed by the QCC General Manager and is reviewed at least annually.</p>
<b>2. Assessment of the recycled water system</b>	
2.1. Source of recycled water, intended uses, routes of exposure, receiving environments and routes of exposure	<p>The source of recycled water is the Googong WRP, which treats domestic sewage from Googong Township as an essential service. The sewage has some commercial content from activities such as schools and shops.</p> <p>Intended uses include public domain water features, toilet flushing, washing machines, irrigation of sports fields and parks, washing pavements/cleaning of public domain areas, residential garden use, residential car washing; and fire fighting.</p> <p>Receiving environments include groundwater, surface water, plants, soils, and air.</p>
2.2. Recycled water system analysis	<p>The design of the water recycling scheme includes a 4 stage Chemical Phosphorus removal membrane bioreactor (MBR) process with the capability to operate as a 5 stage Biological Phosphorus removal MBR process. Biological phosphorous removal (BPR) has been included to serve as a back-up system should there be a failure or non-compliance in the total dissolved solids (TDS) levels from the chemical phosphorus removal system.</p>
2.3. Assessment of water quality data	<p>The Township is a greenfield project and as such historical data is not available for analysis. Design criteria for raw sewage and influent have been determined and are described at Table 0-9 of the RWQMP.</p>

AGWR element	Approach and outcome
<p>2.4 Hazard identification and risk assessment</p>	<p><b>Human health</b></p> <p>Hazard identification and risk assessment for human health found that the microbial hazards for humans include enteric bacteria, viruses and protozoa.</p> <p><b>Environmental performance</b></p> <p>Hazard identification and risk assessment for the environment found the following:</p> <ul style="list-style-type: none"> <li>▪ Preliminary risk assessment identified surface water, groundwater, landscape and garden plants as potential environmental endpoints for hazards</li> <li>▪ Preliminary screening identified TDS, nitrogen, phosphorus, hydraulic flow, oil and grease, turbidity, chlorine and pathogens as high to very high risks</li> <li>▪ All key hazards required preventive measures to lower risks to acceptable levels</li> </ul> <p>A risk assessment identified a range of preventive measures (see Element 3) that aim to reduce risks to an acceptable level (i.e. low). A Risk Register is maintained that covers catchment to customer end use as well as unintended uses and users. Residual risk ranking is generally low or as low as reasonably practical. Key findings on the risk assessment are:</p> <ul style="list-style-type: none"> <li>▪ The assessment resulted in the identification of 78 hazards</li> <li>▪ The uncontrolled risks assigned 27 very high risks, 42 high risks, 4 moderate risks, 3 low risks. (There were two risks that were not assessed)</li> <li>▪ After preventive measures were assessed, only 7 high risks, 21 moderate risks, 46 low risks remained. (Four risks are yet to be assessed when further information is available.)</li> </ul>
<p><b>3. Preventive measures for recycled water management</b></p>	
<p>3.1. Preventive measures and multiple barriers</p>	<p><b>Human health</b></p> <p>Preventive measures to manage risks to human health include:</p> <ul style="list-style-type: none"> <li>▪ Secondary and tertiary treatment and disinfection, providing log reduction of protozoa, bacteria and viruses.</li> <li>▪ Backflow prevention and cross-connection control.</li> <li>▪ Restricting public access during irrigation.</li> <li>▪ Colour coded pipework and signage at site indicating that recycled water is being used</li> </ul> <p><b>Environmental performance</b></p> <p>Preventive measures to manage risks to the environment include:</p> <ul style="list-style-type: none"> <li>▪ TDS of the recycled water entering the recycled reticulation system kept below 700 mg/L.</li> <li>▪ Nutrient control in the recycled water via secondary treatment and chemical phosphorus removal</li> <li>▪ Education programs on irrigation practices.</li> <li>▪ Irrigation schedule devices and controls to monitor and/or control water application rates, soil moisture, water movement through the soil.</li> <li>▪ Nutrient content of recycled water to be considered when determining fertilising requirements.</li> </ul>

AGWR element	Approach and outcome
3.2. Critical control points	<p><b>Human health</b></p> <p>Critical control points related to human health were identified as follows:</p> <ul style="list-style-type: none"> <li>▪ Preliminary treatment</li> <li>▪ Secondary biological treatment</li> <li>▪ MBR</li> <li>▪ Ultra-Violate disinfection.</li> <li>▪ Chlorination.</li> <li>▪ Final effluent (diversion can occur).</li> <li>▪ Re-chlorination.</li> </ul> <p><b>Environment performance</b></p> <p>Critical control points related to the environment were identified as follows:</p> <ul style="list-style-type: none"> <li>▪ Secondary nutrient removal.</li> <li>▪ Chemical phosphorus removal.</li> <li>▪ Balancing phosphorus removal processes to maintain required TDS levels in effluent.</li> </ul>
<b>4. Operational procedures and process control</b>	
4.1. Operational procedures	<p><b>Human health</b></p> <p>Operational procedures are identified for all processes and activities associated with the system including the operation of the treatment processes. Documented procedures are available to all operations personnel and available for inspection anytime.</p> <p><b>Environmental performance</b></p> <p>Irrigation procedures will be established to minimise salinity impacts, maintain nutritional levels and minimise leaching and impacts on groundwater quality and quantity</p>
4.2. Operational monitoring	<p><b>Human health</b></p> <p>Monitoring requirements in relation to human health:</p> <ul style="list-style-type: none"> <li>▪ Standard wastewater plant requirements – Biological oxygen demand (BOD), Suspended Solids, etc</li> <li>▪ Turbidity of filtered water (continuous) – <i>critical limit set</i></li> <li>▪ Disinfection (continuous) – <i>critical limit set</i></li> <li>▪ On-site auditing of controls (signage, backflow prevention, etc.)</li> </ul> <p><b>Environmental performance</b></p> <p>Monitoring requirements in relation to the environment:</p> <ul style="list-style-type: none"> <li>▪ Recycled water TDS, Total Nitrogen (TN), Total Phosphorus (TP)</li> <li>▪ Pressure sensors in the reticulation system to identify pipe bursts and automatic cessation of supply once detected</li> <li>▪ Moisture sensors or other monitoring tools will be used to maximise irrigation efficiency.</li> </ul>
4.3. Operational corrections	The plant operation and maintenance manual will include troubleshooting guides or procedures for corrective actions when operational parameters are not met.
4.4. Equipment capability and maintenance	Critical operational monitoring instruments will be inspected every day and calibrated regularly as per manufacturer’s recommendations or at a suitable frequency based on operational experience.
4.5. Materials and chemicals	Quality assurance of materials and chemical will be applied to ensure that they do not introduce contaminants into the recycled water system.



AGWR element	Approach and outcome
<b>5. Verification of recycled water quality and environmental performance</b>	
5.1. Recycled water quality monitoring	A verification monitoring plan proposed for the Googong WRP. This includes both essential sewage management, operational needs, Construction Certificate Plans and verification of design and modelling. Stage A monitoring (once built) will provide input to Stage C and D design and construction.
5.2. Application site and receiving environment monitoring	A monitoring plan proposed for the Googong WRP. The receiving environment includes surface water, groundwater, soils and air.
5.3. Documents and reliability	System operation and procedures manuals, relevant drawings and risk management plans will all be kept on site. Performance logs will be maintained by the system on site.
5.4. Satisfaction of users of recycled water	Satisfaction of users of recycled water is monitored by QCC. QCC will also carry out an annual customer satisfaction survey which will be used to generate trends and improve the preventive actions for the recycled water scheme.
5.5. Short-term evaluation of results	Sampling results are provided routinely to NSW EPA, NoW and NSW Health. Exceedances of set guideline values are reported immediately, in accordance with an agreed incident procedure.
5.6. Corrective responses	Corrective responses involve investigation of plant performance records to confirm normal operation and additional testing to confirm exceedances and identify source. If the target criteria are exceeded, preventive measures will be reassessed and corrective actions taken to ensure that environment performance is improved.
<b>6. Management of incidents and emergencies</b>	
6.1. Communication	Communication protocol has been defined which include emergency contact details of relevant agencies and stakeholders
6.2. Incident and emergency response protocols	<p>The Incident Management Plan outlines the processes for initiation, management and reporting on incidents and details the time frame and responsibilities for actions under the Plan.</p> <p>The Recovery Action Plan sets out the actions required to maintain or restore system operations in the event of incident.</p>
<b>7. Operator, contractor and end user awareness and training</b>	
7.1. Operator, contractor and end user awareness and involvement	The plant will be operated by appropriately trained and skilled personnel. The minimum skill level required will be Certificate 3 in Water Industry Operations. It is anticipated that 2 full time equivalent personnel will be required to operate the sewage management and recycled water plan.
7.2. Operator, contractor and end user training	Education programs and campaigns will be carried out to the users of recycled water. Information packages dealing with authorised uses, best practices for irrigation, restrictions and responsibilities will be provided to Googong residents and plumbers.
<b>8. Community involvement and awareness</b>	
8.1. Consultation with users of recycled water and the community	Googong community will be given an opportunity to participate in local decision making of the Council at all levels.
8.2. Communication and education	Residents will be informed of the authorised uses of recycled water and its limitations through printed materials, media advertisements, community briefings and workshops.

AGWR element	Approach and outcome
<b>9. Validation, research and development</b>	
9.1. Validation of processes	Validation is continued during the first few years of operation of the recycling plant to ensure that seasonal variations are met. The Stage A/B verification and validation monitoring will inform Stages C and D design and construction.
9.2. Design of equipment	Testing will be undertaken to validate the efficiency of the tertiary MBR and UV to achieve log reduction of protozoa, bacteria and viruses. The capacity of the chlorination system will also be assessed via chlorine contact time and residual chlorine.
9.3. Investigation of studies and research monitoring	Programs will be established to increase understanding of the recycled water supply system, and use this information to improve management of the recycled water supply system. This will also inform validation of design loadings and modelling.
<b>10. Documentation and reporting</b>	
10.1. Management of documentation and records	All operating procedures are documented with controlled copies maintained. All results including printouts from continuous monitoring system will be recorded and stored.
10.2. Reporting	Reports are prepared on a regular and agreed basis to regulatory authorities and QCC. A Reporting register is maintained and regularly updated.
<b>11. Evaluation and audit</b>	
11.1. Long-term evaluation of results	An annual report on compliance with licence conditions is submitted to regulatory authorities. Evaluation is also against industry benchmarks and looks for trends of concern that may require additional preventive measures.
11.2. Audit of recycled water quality management	Audits will be done both internally and externally. All monitoring results are analysed as part of annual audit undertaken by an independent third party auditor. On completion of the audit, an Internal Audit report is prepared, noting compliance or non-compliance.
<b>12. Review and continuous improvement</b>	
12.1. Review by senior managers	Performance of the essential sewage and recycling plant and customer complaints/satisfaction are reviewed by senior managers.
12.2. Recycled water quality management and improvement plan	Management systems will be reviewed and evaluated. Plans will be established for introduction of potential improvements identified from operating experience. An Improvement Plan will be maintained and is provided in Appendix E (of the RWQMP) for the current version.

**Source:** Table 0-1 of the QCC Googong Township Essential Sewage and Recycled Water Quality Management Plan, May 2013

## 7 Conclusion

### 7.1 Justification

The proposal is justified because it would provide an important component of the next stage of the Googong township IWC Project. Stage 1 of the IWC Concept Plan is currently under construction and partially operational with a capacity of 3,600 EP. The development of the Googong township is to reach this capacity by late 2016, therefore the next stage of infrastructure is required to continue servicing the local community.

### 7.2 Objects of the EP&A Act

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	The proposal would involve temporary impacts to traffic, noise and air quality throughout construction. The proposal would also require some removal of trees and vegetation within a highly degraded environment as a result of past use.  However, the proposal would provide an integral part of the Integrated Water Cycle supply water and management of sewage for the Googong township. The township is expected to reach its current population capacity by late 2016 and therefore this next stage of infrastructure is required to provide for the ongoing development of the township.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The proposal provides for the ongoing development of the Googong township.
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	Not relevant to the proposal.
5(a)(iv) To encourage the provision of land for public purposes.	Not relevant to the proposal
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	The proposal would provide an integral part of the Integrated Water Cycle supply water and management of sewage for the Googong township.
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	The proposal would have minimal impacts within the local area with many of the impacts being temporary in nature throughout construction. The proposal would provide infrastructure for the future management of waste water and provision of recycled water for ongoing use within the township.
5(a)(vii) To encourage ecologically sustainable development:	Ecologically sustainable development is considered below in sections 7.2.1 to 7.2.4.
5(a)(viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the proposal
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	The proposal has been developed by and on behalf of QCC and in consultation with relevant State agencies.

Object	Comment
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	<p>Section 5 of this Review of Environmental Factors outlines the community consultation that has been undertaken for this proposal and as part of the overall Googong IWC Concept Approval.</p> <p>In addition, this REF will be placed on public display for the community to provide feedback about the proposal. Any feedback received would be considered by QCC is deciding whether to approve the proposal.</p>

### 7.2.1 The precautionary principle

The precautionary principle upholds that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

When applying the precautionary principle public and private decisions should be guided by:

- Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment.
- An assessment of risk-weighted consequences of various options.

A precondition for the operation of the precautionary principle is that there are threats of serious or irreversible environmental damage. This REF has predicted that such threats are not present for the proposal.

Regardless, the proposal has sought to take a precautionary approach to minimise environmental impacts. This has also been applied in the development of safeguards and management measures. Best available technical information, environmental standards and measures have been used to minimise identified environmental risks of the proposal.

Conservative ‘worst case’ scenarios were considered while assessing the environmental impact of the proposal. For example conservative estimates were used for volumes of water to be discharged to the environment, the precaution of discharge of potable water in an emergency, and consideration of impacts of the proposal on the future development of Googong township. Worst case construction times were also assessed.

Specialist advice in noise and vibration, heritage, ecology, landscape character and visual impact and bushfire management were incorporated for a detailed understanding of the existing environment and assessment of impacts.

Planning for the proposal involved a risk assessment process that evaluated the environmental risks of the Stage C Network West proposal on the local environment, the community and the overall concept plan delivery.

### 7.2.2 Intergenerational equity

The principle of intergenerational equity upholds that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The proposal would benefit both existing and future generations in the following ways:

- Providing an environmentally sustainable integrated water cycle system for the whole of the Googong township, which would reduce the use of potable water by up to 60 per cent.



- Maintaining the local environment and implementing safeguards and management measures to protect the environmental values the Googong area.
- Providing for future development of the Googong township.

The proposal has integrated short and long-term social, financial and environmental considerations so that any foreseeable impacts are not left to be addressed by future generations. Issues with potential long term implications such as the consumption of non renewable resources, waste disposal and water quality have been avoided and/or minimised through construction planning and the application of safeguards and management measures described at Section 6.

### 7.2.3 Conservation of biological diversity and ecological integrity

The principle of biological diversity upholds that the conservation of biological diversity and ecological integrity should be a fundamental consideration.

The construction planning outcomes and safeguard and management measures described at Section 6 would minimise the impacts of the proposal on aquatic and terrestrial biodiversity and the ecological integrity of the Googong Creek catchment.

### 7.2.4 Improved valuation, pricing and incentive mechanisms

This principle upholds that environmental factors should be included in the valuation of assets and services, such as:

- Polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement.
- The users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.
- Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

Environmental issues have been considered in the strategic planning for the proposal. The preservation of social, environmental and economic values of the Googong township assist in justifying the need for the proposal. The environmental goals of the proposal have been pursued in the most cost effective way through the construction planning process.

Safeguards and management measures identified at Section 6.11 for avoiding, reusing, recycling and managing waste during construction and operation would be implemented.

## 7.3 Statement of Commitments

**Table 7-1 Statement of commitments**

SoC #	Management measure / commitment	Issue	Responsibility
<b>Construction</b>			
C1	<ul style="list-style-type: none"> <li>A detailed traffic and access management plan would be prepared prior to construction to outline all access routes to, from and within the construction zones, traffic control methods to be utilised and methods to minimise impacts on the local road network. This plan would be prepared in accordance RMS standard Traffic Control Plan (TCP) 195 and submitted to RMS for consultation and approval.</li> </ul>	Traffic and access	Contractor
C2	<ul style="list-style-type: none"> <li>All employees and contractors would be inducted into the site and would receive appropriate training to fulfil their individual and environmental responsibilities, including requirements and responsibilities under the traffic and access management plan.</li> </ul>	Traffic and access	Contractor
C3	<ul style="list-style-type: none"> <li>Where feasible, construction deliveries would be scheduled outside of peak periods, in particular peak residential access times.</li> </ul>	Traffic and access	Contractor
C4	<ul style="list-style-type: none"> <li>Access to residential properties would be maintained at all times.</li> </ul>	Traffic and access	Contractor
C5	<ul style="list-style-type: none"> <li>Construction staff and delivery vehicles would not park in public parking areas where supply is limited.</li> </ul>	Traffic and access	Contractor
C6	<ul style="list-style-type: none"> <li>Any permits required for oversize vehicles to transport plant or equipment are to be obtained from Roads and Maritime.</li> </ul>	Traffic and access	Contractor
C7	<ul style="list-style-type: none"> <li>Installation of temporary fencing at the permanent reservoirs site for security and to visually delineate the area of construction.</li> </ul>	Visual amenity	Contractor
C8	<ul style="list-style-type: none"> <li>The site to be kept tidy and well maintained, including removal of all rubbish at regular intervals. There should be no storage of materials beyond the construction boundaries.</li> </ul>	Visual amenity	Contractor
C9	<ul style="list-style-type: none"> <li>Temporary hoardings, barriers, traffic management and signage would be removed when no longer required.</li> </ul>	Visual amenity	Contractor
C10	<ul style="list-style-type: none"> <li>Locate construction plant, machinery and vehicle parking areas away from public or sensitive viewing areas.</li> </ul>	Visual amenity	Contractor

SoC #	Management measure / commitment	Issue	Responsibility
C11	<ul style="list-style-type: none"> <li>Locate any lighting needed for construction night-time activities away from public or sensitive viewing areas.</li> </ul>	Visual amenity	Contractor
C12	<ul style="list-style-type: none"> <li>Upon completion, revegetate residual site areas.</li> </ul>	Visual amenity	Contractor
C13	<ul style="list-style-type: none"> <li>A Construction Noise and Vibration Management Plan would be prepared for all construction activities and included in the Construction Environment Management Plan (CEMP). It would outline measures to minimise construction noise and vibration impacts on sensitive receivers. This would also include an action plan to be followed if complaints are received.</li> </ul>	Noise and vibration	Contractor
C14	<ul style="list-style-type: none"> <li>Works (including delivery of plant and equipment) would be limited to standard working hours of:               <ul style="list-style-type: none"> <li>Monday to Friday 7:00am to 6:00pm</li> <li>Saturday 8:00am to 1:00pm</li> <li>No works on Sunday or public holidays.</li> </ul> </li> </ul>	Noise and vibration	Contractor
C15	<ul style="list-style-type: none"> <li>All impacted residents would be notified of the proposed works, including the nature and duration of construction activities, predicted noise levels and contact details should they have any issues with the construction activities.</li> </ul>	Noise and vibration	Contractor
C16	<ul style="list-style-type: none"> <li>Construction schedule would provide for respite periods when noisy activities are being undertaken, and the distance between noise construction activities and sensitive receivers would be maximised where feasible and reasonable.</li> </ul>	Noise and vibration	Contractor
C17	<ul style="list-style-type: none"> <li>Construction plant and equipment would be well maintained (including noise reduction fittings where feasible) and would be turned off when not in use to minimise noisy emissions.</li> </ul>	Noise and vibration	Contractor
C18	<ul style="list-style-type: none"> <li>Where feasible reversing equipment would use 'quacker' alarms or would be minimised to prevent causing a nuisance.</li> </ul>	Noise and vibration	Contractor
C19	<ul style="list-style-type: none"> <li>Loading and unloading would be undertaken away from sensitive receivers.</li> </ul>	Noise and vibration	Contractor
C20	<ul style="list-style-type: none"> <li>The use of vibratory rollers would not be used within 50 metres of residential properties.</li> </ul>	Noise and vibration	Contractor
C21	<ul style="list-style-type: none"> <li>Rock breaking activities are not to be undertaken within 50 metres of sensitive receivers.</li> </ul>	Noise and vibration	Contractor
C22	<ul style="list-style-type: none"> <li>Only trees within the proposal boundary, as identified on Figure 6-10, would be cleared and only if required as part of the proposed works. Trees required for removal would be clearly marked. Any trees not to be removed as part of the works that are within the proposal boundary would be flagged/fenced with tape to ensure they are not impacted by the proposed works.</li> </ul>	Biodiversity	Contractor

SoC #	Management measure / commitment	Issue	Responsibility
C23	<ul style="list-style-type: none"> <li>An ecologist would be on site for the clearing of any trees from the proposal site to ensure the trees are free from local fauna prior to felling.</li> </ul>	Biodiversity	Contractor
C24	<ul style="list-style-type: none"> <li>Where feasible and reasonable, removal of trees would be undertaken between August and March.</li> </ul>	Biodiversity	Contractor
C25	<ul style="list-style-type: none"> <li>Where feasible, the landscaping plans should provide for replanting of local species, in particular tree species that provide habitat and foraging opportunities (such as Yellow Box and Red Box).</li> </ul>	Biodiversity	Contractor
C26	<ul style="list-style-type: none"> <li>The CEMP would include measures to treat and manage all noxious weeds on site at the start of and throughout construction to limit the growth, spread and reproduction of these species.</li> </ul>	Biodiversity	Contractor
C27	<ul style="list-style-type: none"> <li>All access roads surrounding the infrastructure is maintained as a defensible space and grasses and vegetation should be managed adjacent to these roads.</li> </ul>	Bushfire	Contractor
C28	<ul style="list-style-type: none"> <li>Emergency access to the access roads around the facilities should be maintained at all times.</li> </ul>	Bushfire	Contractor
C29	<ul style="list-style-type: none"> <li>The pumping station should have a maintenance track between it and the grassland to the east.</li> </ul>	Bushfire	Contractor
C30	<ul style="list-style-type: none"> <li>Site GA6 will be fenced for the duration of construction activities associated with the proposal. The construction of the fence should be conducted with on-site advice from the project archaeologist.</li> </ul>	Aboriginal heritage	Contractor
C31	<ul style="list-style-type: none"> <li>The location of the site GA6 should be clearly marked on all site plans and maps utilised for the proposal.</li> </ul>	Aboriginal heritage	Contractor
C32	<ul style="list-style-type: none"> <li>The location of sites GA7, GA23, G1B AS1, GRW28, G1B AS2, GWTP1 and GWTP3 should be clearly marked on all site plans and maps utilised for the proposal.</li> </ul>	Aboriginal heritage	Contractor
C33	<ul style="list-style-type: none"> <li>The protocols for the unanticipated discovery of archaeological material and suspected human remains (presented in Appendix F) should be implemented if necessary.</li> </ul>	Aboriginal heritage	Contractor
C34	<ul style="list-style-type: none"> <li>Site staff would be advised of the location and presence of Site GRWH5 and the need to avoid impacts to the area. The site should be included on all maps and plans as a no-go zone both on and off site.</li> <li>If direct impact is necessary no permits to impact are required for this site.</li> </ul>	Non-Aboriginal heritage	Contractor



SoC #	Management measure / commitment	Issue	Responsibility
C35	<ul style="list-style-type: none"> <li>Maintaining surface and soil stability at all times during cut-and-fill excavation activities (particularly in relation to trenching and the excavation of soil at the permanent reservoir site) by implementing standard erosion and sediment control techniques in construction areas like berms and sedimentation fencing. Site-specific Erosion and Sediment Control Plans (ESCPs) will be prepared progressively to include the management strategies and controls for all activities with the potential to impact on sediment loss and erosion.</li> </ul>	Soil erosion	Contractor
C36	<ul style="list-style-type: none"> <li>Erosion within the trench would be mitigated by using trench plugs (i.e. trench/sack breakers) at appropriate intervals. These measures are in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004 – also referred to as 'The Blue Book').</li> </ul>	Soil erosion	Contractor
C37	<ul style="list-style-type: none"> <li>Measures to ensure limited tracking of dirt off site will be implemented at access points. Where required the controls may include exit rumble grids at all points of egress onto public (sealed) roads, and/or stabilisation of site roads/tracks with aggregate where appropriate.</li> </ul>	Soil erosion	Contractor
C38	<ul style="list-style-type: none"> <li>Erosion and sedimentation controls will be inspected prior to and after each rain period and during periods of prolonged rainfall. Any defects will be rectified immediately.</li> </ul>	Soil erosion	Contractor
C39	<ul style="list-style-type: none"> <li>Sediment basins will be designed and constructed in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004) and located as specified in relevant ESCPs.</li> </ul>	Soil erosion	Contractor
C40	<ul style="list-style-type: none"> <li>All runoff from disturbed areas within the work site will be directed to sediment basins (or other appropriate sediment control structures). Sediment basins will only be discharged to receiving waters when confirmed as complying through field tests/laboratory analysis tests with discharge guidelines.</li> </ul>	Soil erosion	Contractor
C41	<ul style="list-style-type: none"> <li>Erosion and sediment measures to secure the stockpile areas (e.g. diversions, sediment fences) will be installed prior to the commencement of spoil stockpiling activities.</li> </ul>	Soil erosion	Contractor
C42	<ul style="list-style-type: none"> <li>Stockpiles will be checked for stability weekly and after heavy rainfall.</li> </ul>	Soil erosion	Contractor
C43	<ul style="list-style-type: none"> <li>Topsoil will be conserved, where reasonable and feasible, for use in site rehabilitation/revegetation.</li> </ul>	Soil erosion	Contractor
C44	<ul style="list-style-type: none"> <li>The site would be re-profiled to achieve soil stability and congruity with the surrounding landscape. This would be done in consideration of the landscape and open space strategy for the Googong Township development.</li> </ul>	Site stabilisation	Contractor
C45	<ul style="list-style-type: none"> <li>Re-seeding would be undertaken, and geotextile materials used as required.</li> </ul>	Site stabilisation	Contractor
C46	<ul style="list-style-type: none"> <li>Trenches would be backfilled and compacted in layers.</li> </ul>	Site stabilisation	Contractor

SoC #	Management measure / commitment	Issue	Responsibility
C47	<ul style="list-style-type: none"> <li>Access to the site would be managed (including site restrictions) to assist with site recovery.</li> </ul>	Site stabilisation	Contractor
C48	<ul style="list-style-type: none"> <li>There will be progressive revegetation, stabilisation and restoration works of earthworks areas in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004).</li> </ul>	Site stabilisation	Contractor
C49	<ul style="list-style-type: none"> <li>Works in the vicinity will be stopped or modified and will not recommence until the material has been analysed, the hazard has been assessed and appropriate action has been taken (including delineating areas of concern as required until earthworks can resume safely).</li> </ul>	Soil contamination	Contractor
C50	<ul style="list-style-type: none"> <li>Storage areas for fuels, oils and chemicals used during construction will be covered and contained within an impervious bund to retain any spills of more than 110% of the volume of the largest container in the banded area. Any spillage will be immediately contained and absorbed with a suitable absorbent material. The contaminated material will be disposed of according to manufacturers and OEH requirements.</li> </ul>	Soil contamination	Contractor
C51	<ul style="list-style-type: none"> <li>Where possible, all refuelling would occur at designated fuel distribution points. These distribution points would be underlain by compacted earth to prevent the significant loss of fuel into the ground in the event of a spill. They would also be banded to contain any large spills that may occur as a result of machinery or tank failure.</li> </ul>	Soil contamination	Contractor
C52	<ul style="list-style-type: none"> <li>Spill response procedures and equipment for containment and recovery would be available on site.</li> </ul>	Soil contamination	Contractor
C53	<ul style="list-style-type: none"> <li>Workforce training would be conducted on the transport, storage, handling and disposal procedures relating to chemicals.</li> </ul>	Soil contamination	Contractor
C54	<ul style="list-style-type: none"> <li>Speed limits would be reduced during high dust/windy conditions.</li> </ul>	Air quality	Contractor
C55	<ul style="list-style-type: none"> <li>Clearing of vegetation and topsoil would be limited to the designated footprint required.</li> </ul>	Air quality	Contractor
C56	<ul style="list-style-type: none"> <li>Disturbed areas would be progressively reinstated with suitable stabilising agents or revegetation.</li> </ul>	Air quality	Contractor
C57	<ul style="list-style-type: none"> <li>Water trucks would be used to reduce dust in dry, windy conditions.</li> </ul>	Air quality	Contractor
C58	<ul style="list-style-type: none"> <li>Working practices would be modified during periods of high winds by limiting the use of some machinery and by reducing travel speeds.</li> </ul>	Air quality	Contractor
C59	<ul style="list-style-type: none"> <li>The burning of material on site would be prohibited, except under the instruction of NSW Rural Fire Services.</li> </ul>	Air quality	Contractor

SoC #	Management measure / commitment	Issue	Responsibility
C60	<ul style="list-style-type: none"> <li>All dust suppression measures are to be based on standard construction industry measures based on the 'Blue Book' (Landcom, 2004) and would be sufficient to adequately manage dust during the construction phase.</li> </ul>	Air quality	Contractor
C70	<ul style="list-style-type: none"> <li>Resource management hierarchy principles are to be followed (in particular in the removal and disposal of the existing interim reservoir site):               <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, recycling and energy recovery)</li> <li>Disposal is undertaken as a last resort at a licenced waste facility</li> </ul> </li> </ul> (in accordance with the Waste Avoidance and Resource Recovery Act 2011).	Waste management	Contractor
C71	<ul style="list-style-type: none"> <li>Waste materials, other than (re-used) landscaped vegetation and/or tree mulch, is not to be left on site once the works are complete</li> </ul>	Waste management	Contractor
C72	<ul style="list-style-type: none"> <li>Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day</li> </ul>	Waste management	Contractor
C73	<ul style="list-style-type: none"> <li>No waste is to be burnt on site.</li> </ul>	Waste management	Contractor
C74	<ul style="list-style-type: none"> <li>Mitigation measures that would be implemented during construction would be outlined in the CEMP and would include (but not limited to):               <ul style="list-style-type: none"> <li>Implementation of appropriate safety and training procedures, such as safe work method statements, safety management plan(s), auditing of contractors' safety management and approval of construction equipment.</li> <li>Risks register and risk minimisation process.</li> <li>Implementation of a traffic management plan (see Section 13.1.6).</li> <li>Liaison with local emergency services, in particular regarding high fire-danger periods.</li> <li>Installing exclusion fencing where appropriate.</li> </ul> </li> </ul>	Hazards and risks	Contractor
<b>Operation</b>			
O1	<ul style="list-style-type: none"> <li>The temporary access road from Old Cooma Road to the permanent reservoirs site would be maintained until such times as approval for a permanent access road has been granted.</li> </ul>	Traffic and access	GTPL / QCC
O2	<ul style="list-style-type: none"> <li>The future of the temporary access road intersection on Old Cooma Road would be determined in consultation with Roads and Maritime at that time.</li> </ul>	Traffic and access	GTPL / QCC

SoC #	Management measure / commitment	Issue	Responsibility
O3	<ul style="list-style-type: none"> <li>Decrease the visual prominence of the permanent reservoirs through the use of muted colours and non-reflective surfaces.</li> </ul>	Visual amenity	GTPL / QCC
O4	<ul style="list-style-type: none"> <li>Effective screening of the permanent reservoirs should be provided through the use of locally endemic vegetation close to the site. Species selection should aim to inhibit views at the ground and mid levels up to 10 meters in particular on the eastern and western sides of the reservoirs. A landscape concept plan should be prepared that demonstrates how the proposed planting treatments will screen the reservoirs from surrounding areas. Planting treatments should also be sympathetic to the existing landscape in its use of plant types and their arrangements and avoid rigid, row type hedge planting.</li> </ul>	Visual amenity	GTPL / QCC
O5	<ul style="list-style-type: none"> <li>Monitoring of trees and vegetation should be done at permanent reservoirs site to ensure successful planting and screening is achieved. Replace trees and vegetation that are dead or dying.</li> </ul>	Visual amenity	GTPL / QCC
O6	<ul style="list-style-type: none"> <li>The use of light emitting diodes (LED) lighting and low angle cut-off fittings should be implemented where lighting is needed to mitigate and help reduce stray light.</li> </ul>	Visual amenity	GTPL / QCC
O7	<ul style="list-style-type: none"> <li>Decrease the visual prominence of the recycled water tank at the WRP through the use of muted colours and non-reflective surfaces.</li> </ul>	Visual amenity	GTPL / QCC
O8	<ul style="list-style-type: none"> <li>Monitoring of trees and vegetation should be done at WRP site to ensure successful planting and screening is achieved. Replace trees and vegetation that are dead or dying.</li> </ul>	Visual amenity	GTPL / QCC
O9	<ul style="list-style-type: none"> <li>During operation plant and machinery would be well maintained in order to minimise operational noise emissions.</li> </ul>	Noise and vibration	GTPL / QCC
O10	<ul style="list-style-type: none"> <li>All access roads surrounding the infrastructure is maintained as a defensible space and grasses and vegetation should be managed adjacent to these roads.</li> </ul>	Bushfire	GTPL / QCC
O11	<ul style="list-style-type: none"> <li>Emergency access to the access roads around the facilities should be maintained at all times.</li> </ul>	Bushfire	GTPL / QCC
O12	<ul style="list-style-type: none"> <li>The pumping station should have a maintenance track between it and the grassland to the east.</li> </ul>	Bushfire	GTPL / QCC
O13	<ul style="list-style-type: none"> <li>To mitigate these potential, temporary impacts of the discharge of excess recycled water, GTPL proposes to:                             <ul style="list-style-type: none"> <li>Install an energy dissipation structure immediately downstream of the discharge location.</li> <li>Monitor the drainage line on a monthly basis following the commencement of operations to identify any areas of erosion along the drainage line and any impacts on the existing farm dams and sediment pond.</li> </ul> </li> </ul>	Excess recycled water discharge	GTPL / QCC



SoC #	Management measure / commitment	Issue	Responsibility
O14	<ul style="list-style-type: none"> <li>▪ In the event that impacts are identified, additional measures will be considered. These would include the provision of:               <ul style="list-style-type: none"> <li>▪ Additional energy dissipation structures along the drainage line.</li> <li>▪ Diversion structures around the farm dams or strengthening these structures.</li> <li>▪ Additional sediment basins or the modification of the existing basin.</li> </ul> </li> </ul>	Excess recycled water discharge	GTPL / QCC
O15	<ul style="list-style-type: none"> <li>▪ Operational water quality and hydrology management measures would be outlined in the Googong IWC Water Management Plan.</li> </ul>	Water quality	GTPL / QCC
O16	<ul style="list-style-type: none"> <li>▪ A standard operating procedure (SOP) would be developed for the ongoing management of the reservoir facilities, including management of waste at the site as part of the OEMP.</li> </ul>	Waste Management	GTPL / QCC
O17	<ul style="list-style-type: none"> <li>▪ Independent separate work approvals are to be sought for any maintenance works on the reservoir tanks. Any works which impact the quality of water leaving the facility through the discharge point would be prepared in consultation with the EPA.</li> </ul>	Waste Management	GTPL / QCC
O18	<ul style="list-style-type: none"> <li>▪ A variety of measures would be implemented to manage the operational risks of the storage and delivery of chemicals associated within the project. These measures would be outlined in the OEMP and are typical of those applied at similar facilities and include:               <ul style="list-style-type: none"> <li>▪ Storing quantities of certain chemicals on site that are within the relevant thresholds.</li> <li>▪ Undertaking activities in accordance with the relevant material and safety data sheets.</li> <li>▪ Installing bunded areas for the storage and delivery of chemicals in accordance with Australian Standard AS 3780:2008 and the relevant material and safety data sheets.</li> <li>▪ Developing and implementing appropriate procedures for delivering, handling and accidental spills of chemicals.</li> </ul> </li> </ul>	Hazards and risks	GTPL / QCC
O19	<ul style="list-style-type: none"> <li>▪ Measures associated with the management of risks from emergency or maintenance events associated with the system are largely incorporated in the design. These measures include:               <ul style="list-style-type: none"> <li>▪ Implementing back-up procedures should power to infrastructure be interrupted.</li> <li>▪ Installing appropriate management measures at the recycled water discharge pipeline at the permanent reservoirs site.</li> <li>▪ Implementing emergency management plans and undertaking ongoing liaison with the local emergency services.</li> </ul> </li> </ul>	Hazards and risk	GTPL / QCC

## 7.4 Conclusion

The proposed construction of the Googong IWC Stage C Network West is subject to assessment under Part 5 of the EP&A Act, with consideration of the Part 3A Concept Approval issued by the NSW Minister for Planning in 2010. This REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity. This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, joint management and biobanking agreements under the TSC Act, wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants.

The proposal is unlikely to affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required. The proposal is also unlikely to affect Commonwealth land or have a significant impact on any matters of national environmental significance.

A number of potential environmental impacts from the proposal have been avoided or reduced during design development. The proposal as described in the REF best meets the project objectives and is consistent with the Part 3A Concept Approval, but would still result in some impacts on visual amenity, traffic, aquatic, noise and air quality. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts and they are not considered to be significant. The proposal would also provide important infrastructure to provide the integrated water cycle system for the Googong township. On balance the proposal is considered justified.

## Terms and abbreviations

4WD	Four wheel drive vehicle
ACT	Australian Capital Territory
AEC	Areas of Environmental Concern
AGWR	Australian Guidelines for Water Recycling
AHD	Australian height datum
AHIMS	Aboriginal Heritage Information Management System
ANZECC	Australian and New Zealand
ARI	Annual return interval
AS	Acid sulfate
BCA	Building Code of Australia
BOD	Biological oxygen demand
BWPS	Bulk water pumping station
CEMP	Construction environmental management plan
CIC	Canberra Investment Corporation
CoAs	Part 3A Conditions of Approval
d	diameter
dBA	Decibels A-weighted
EP	Equivalent population
EPA	Environment Protection Authority NSW
EP&A Act	Environment Planning and Assessment Act 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPL	Environment Protection Licence
ESCP	Erosion and sediment control plan
EWP	Elevated working platforms
GIS	Geographic information system
GTPL	Googong Township Proprietary Limited
ICNG	Interim Construction Noise Guidelines (DECC, 2009)
IHO	Interim heritage order
ISEPP	State Environment Planning Policy (Infrastructure) 2007
IWC	Integrated water cycle
KL	Kilo Litres
LA <sub>10</sub>	The percentile sound pressure level exceeded for 10% of the measures period with 'A' frequency weighted calculated by statistical analysis.
LA <sub>90</sub>	The percentile sound pressure level exceeded for 90% of the measure period with 'A' frequency weighting calculated by statistical analysis.
LA <sub>eq</sub>	Equivalent continuous sound pressure level with 'A' frequency weighting.
LA <sub>max</sub>	The maximum of the sound pressure levels recorded of a measurement period.

LES	Local environmental study
m	metres
ML	Mega Litres
mm	millimetres
NML	Noise management levels
NPW Act	National Parks and Wildlife
NSW	New South Wales
PADs	Potential Archaeological Deposit
PBP	Planning for Bushfire Protection
PHA	Preliminary Hazard Analysis
PoEO Act	Protection of the Environment Operations Act 1997
QCC	Queanbeyan City Council
OEH	Office of Environment and Heritage
RBL	Rating background level
REF	Review of Environmental Factors
RMS	NSW Roads and Maritime Services
RNP	Road Noise Policy
RWQMP	Recycled Water Quality Management Plan
RWPS	Recycled Water Pumping Station
s	seconds
SEPP	State Environmental Planning Policy
SHR	State Heritage Register
SOP	Standard Operating Procedure
SPS	Sewage Pumping Station
TCP	Traffic Control Plan
TDS	Total dissolved solids
TN	Total nitrogen
TP	Total phosphorous
TSC Act	Threatened Species Conservation Act
VDV	Vibration Dose Value
VE	Visual envelope
VEM	Visual envelope map
WRP	Water Recycling Plant



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# Appendix A

## EP&A Act Clause 228 and Matters of National Significance checklists









## Appendix B

### EP&A Act Part 3A Conditions of Approval checklist









# Appendix C

## Visual impact assessment









# Appendix D

## Noise and vibration assessment









# Appendix E

## Flora and fauna assessment









# Appendix F

## Aboriginal heritage impact assessment







# Appendix G

## Bushfire assessment









# Appendix H

## Concept design report









# Appendix I

## Agency consultation









# Appendix J

## Community consultation









# Appendix K

## Hazards Assessment







# Appendix L

## Risk Assessment





