

CAMELLIA-ROSEHILL PLACE STRATEGY

Utilities Implementation Report

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Utilities Implementation Report

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EXECUTIVE SUMMARY

New South Wales Department of Planning, Industry & Environment (DPIE), in collaboration with City of Parramatta Council (Council), industry, the community and State agencies, is leading the development of the Camellia-Rosehill Place Strategy and Master Plan for the Camellia –Rosehill Precinct (the Precinct). The Precinct is defined by Parramatta River to the north, Duck River to the east, the M4 Motorway to the south and James Ruse Drive to the west, all of which form physical boundaries to the Precinct.

The Camellia Rosehill Precinct (the Precinct) plays a strategic role in the Greater Parramatta and the Olympic Peninsula (GPOP), and previous investigations have identified the area should be retained for urban service land with a town center. This Place Strategy and Master Plan is being prepared for the whole Precinct and draws on previous work including ongoing collaboration with industry, the community and state agencies.

The overarching objective of the place strategy is to provide an integrated 20-year vision, which recognizes the strategic attributes of the Precinct, guides future land use and infrastructure investment decisions and which can be delivered with the support of State and local agencies.

DPIE has engaged Arcadis to deliver technical studies for Package D (Infrastructure), which will inform the Place Strategy. This Implementation Report has been prepared as a part of the Utility Strategy component of the infrastructure package, with the following scope of work:

- Identify the existing condition and capacity of infrastructure assets, including:
 - water, stormwater and wastewater services
 - wastewater management and recycling, and infrastructure to support wastewater recovery
 - electricity and natural gas
 - enabling telecommunications and internet connectivity.
- Identify any required augmentation to service, required extensions, upgrades or new infrastructure or services to support the growth outlined in the master plan
- Identify the site requirements and infrastructure corridors in the precinct to deliver the enabling infrastructure and services to support the master plan
- Identify and develop other innovative solutions or strategic concepts that could be implemented across the precinct to achieve the precinct vision and objectives.

An Enquiry by Design (EbD) process was undertaken to inform the preparation of the Place Strategy. The EbD was an interactive process which explored a number of master plan options for Camellia-Rosehill which could deliver the vision for the precinct and resulted in a draft master plan which was the subject of public consultation as part of the Camellia-Rosehill Directions Paper. The draft master plan was further refined following exhibition of the Directions Paper and consideration of the submissions received.

Key constraints/opportunities

The reviews of the project area have indicated the Camellia-Rosehill precinct has a unique set of constraints that undoubtedly applies to all future developments in the area. The constraints that have been identified specific to the provision of utilities include:

- Water features and ecological constraints such as rivers/creeks and protected mangroves around Camellia-Rosehill.
- Reduced road corridor options and, therefore, utility corridors.
- The legacy of the industrial land uses in the area, i.e., soil contamination, need for infrastructure corridors

- Soil contamination and coordination with treatments as the service trenches would be the lower excavations
- Infrastructure constraints are relative to the proximity of the Precinct to sensitive roads and motorways, limiting avenues to install new utilities.
- Existing infrastructure is set up for heavy industry and will require conversion.

Key findings

In order to facilitate future development envisaged under the Master Plan the following will be required to be installed:

- Greater reticulation networks for both water and electrical to cater to the increased densities and smaller lot sizes, particularly in the western residential zone
- A low-pressure gas network will be required with pressure reduction facilities to tee off of the high-pressure network.
- Sydney Water is undertaking investigations for locating a recycled water facility as part of Sydney Water's strategy for the greater Sydney region. This may come in the form of the small existing facility, or a new scalable installation for the long-term development.
- An upgrade to the telecommunications network and capacity will be required to bring the Precinct in line with the data demands of current residential and industrial needs.
- Ongoing consultation with all utility providers to monitor and ensure capacity in the networks and safeguard against future expansion.

1 INTRODUCTION

1.1 Overview

The NSW Department of Planning, Industry and Environment (DPIE) is leading the development of the Camellia-Rosehill Place Strategy, in collaboration with Council, industry, the community and State agencies. Accordingly, DPIE has engaged Arcadis Australia Pacific (Arcadis) to undertake a review of the proposed scenario and the impact of the existing and future utilities, which includes a Utilities Implementation Report (this report) for the Precinct, which focuses on the servicing component of the master plan. This report is to identify demands the scenario will place on the existing infrastructure and to propose what augmentation will be required to meet these needs.

This report assesses the land use and requirements derived from the Master Plan from a utility perspective.

1.2 Vision statement and utilities and infrastructure aspirations

1.2.1 Overarching Vision

Camellia-Rosehill has an important strategic role as an industry and employment hub within the Greater Parramatta and Olympic Peninsula (GPOP) Economic Corridor. By 2041, the precinct will be enhanced, with service and circular economy industries, and new recreational and entertainment facilities, all enabled by better transport access via light rail, active transport and road connections.

A well-designed town centre next to the light rail stop will be the focus of community activity.

New homes will be close to public transport supported by walking and cycling paths and new public spaces including the Parramatta River foreshore.

Key environmental areas such as Parramatta River, Duck River and their wetlands will be protected and enhanced. Camellia's rich heritage will be interpreted, celebrated and promoted.

Country and culture will be valued and respected with the renewal guided by Aboriginal people.

The precinct will set a new standard for environmental sustainability with embedded renewable energy networks, integrated remediation and water management strategies, circular economy industries and a commitment to achieve net zero by 2050.

Recycled water will be connected to all residences, businesses and public spaces and will support the integrated network of green infrastructure.

Camellia will be a showcase of recovery and restoration – a place of economic prosperity but also a place where people love to live, work and visit.

1.3 Objectives and scope of this report

The objectives of the Utilities Implementation Report are listed below:

- Identify the existing condition and capacity of infrastructure assets, including:
 - water, stormwater and wastewater services
 - waste management and recycling, and infrastructure to support waste recovery
 - electricity and natural gas
 - enabling telecommunications and internet connectivity.
- Identify any required augmentation to service, required extensions, upgrades or new infrastructure or services to support the growth outlined in the master plan

- Identify the site requirements and infrastructure corridors in the precinct to deliver the enabling infrastructure and services to support the master plan
- Identify and develop other innovative solutions or strategic concepts that could be implemented across the precinct to achieve the precinct vision and objectives.

The following objectives have been recognised from a utilities and infrastructure perspective to ensure the success of the Place Strategy:

- Build on and further develop sustainable water and recycled water uses
- Make use of renewable energies to supplement the demand on the existing electrical infrastructure.
- Integration of new technology to monitor peak demands and make use of stored energies.

A number of key risks have been identified during the assessment of the scenarios which include:

- Integrating the utility expansions with the Utility Authorities' longer-term plans
- Lead times to design and install larger infrastructure in conjunction with the residential developments
- Higher costs of construction due to the treatment and disposal of contaminated soils when trenching for new service installations.

1.4 Report structure

The remainder of this report is structured as follows:

- **Precinct Context and Overview**
Outlines the proposed land uses and layout of the scenario, including proposed transport corridors.
- **Methodology**
Description of the process used for undertaking the study, and list of stakeholders involved, and information relied upon as part of the study.
- **Key findings and assessment**
This includes the findings from the utilities baseline analysis which was undertaken and current demands and capacities of different networks.
- **Master Plan Assessment**
Review of the Master Plan against the vision and aspirations of the Place Strategy from the context of electrical, water, sewer, and telecommunications assessment and comparison of the electrical, water, sewer, and telecommunications demand estimates from new businesses in the land-areas necessary to support the development of the scenario.
- **Opportunities and Constraints**
List of the Opportunities and Constraints found during the utilities study for consideration in the electrical, water, sewer, and telecommunications demand estimates from new and existing land uses.
- **Delivery Plan**
Recommendations for the staged implementation of the electrical, water, sewer, and telecommunications opportunities and upgrades of the utilities infrastructure.
- **Conclusions**
Summary of recommendations.

2 CONTEXT AND PROJECT OVERVIEW

2.1 Land use and Planned layout

The master plan is shown in Figure 1 Integrated Master Plan and forms the basis of the Place Strategy.

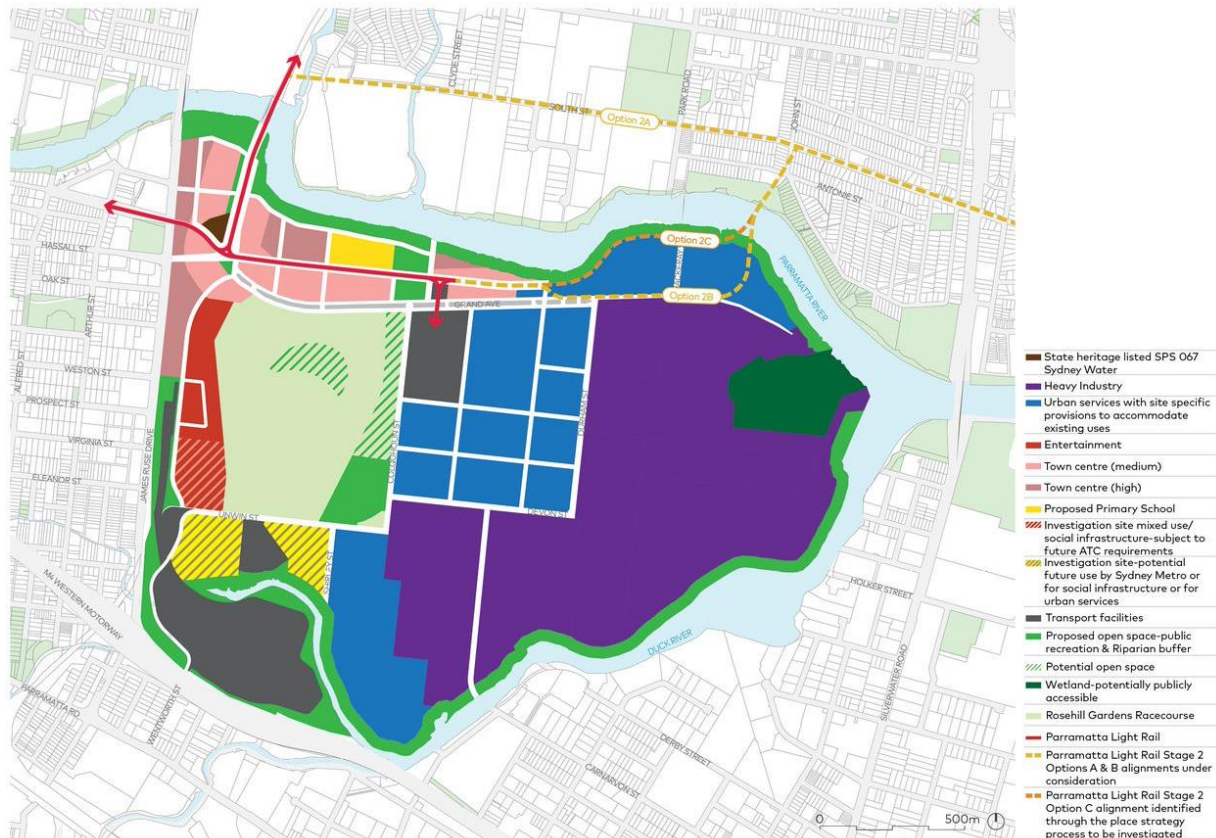


Figure 1 Integrated Master Plan

Key features of the master plan include:

- Provision for approximately 10,000 dwellings within a Town Centre serviced by light rail
- Provision for approximately 14,500 jobs
- A new primary school and primary and secondary high school
- District and regional open space facilities
- Introduction of a new entertainment precinct and an urban services area
- Initiatives to Care for Country and continued protection of heritage listed sites
- Retention of the existing state heritage sewerage pumping station (SPS) 067 within the town centre
- Measures to mitigate land use conflicts and risks including buffers and setbacks from existing fuel pipelines and between the existing sewerage pumping station and future surrounding residential uses
- Access to the Parramatta River, Duck River and Duck Creek foreshores and potentially the wetland

- New transport infrastructure including a local road network, potential bus services, additional connections into and out of the precinct, and opportunities to integrate Parramatta Light Rail Stage 2
- An extensive active transport network
- A comprehensive remediation strategy
- A sustainability strategy and integrated water cycle management strategy.

3 METHODOLOGY

The following has been undertaken to inform this Utilities Implementation Report.

3.1 Review of existing studies

A number of utility reports and information have been reviewed to inform this assessment. This has included but not limited to the following:

- Sydney Water Growth Servicing Plan 2019-2024
- Camelia Precinct – Land Use and Infrastructure Analysis Volume 2 2015
- Camellia Town Centre Master Plan – Planning Report 2018
- SP0067 Upgrade and Wet Weather Overflow Options Preferred Options Report, Sydney Water (26 June 2020)

3.2 Desktop review

A desktop analysis and consultation with utility authorities has been undertaken to identify the existing capacity and conditions on the infrastructure, within and feeding the precinct. This has included an assessment of the opportunities and for the following services infrastructure:

- Electricity
- Potable water
- Recycled water
- Wastewater
- Data and communications
- Gas.

The details of existing infrastructure found in this report are based on drawings and data provided by Dial Before You Dig (DBYD) and the utility authority consultation.

This information would need additional confirmation through site investigations before any other utility design commencement, including utility authorities' approvals. As this is an existing heavy industry area, there are several existing utility services in throughout the site which are discussed in detail in this report.

3.3 Existing assets and procedures

A review of existing assets and procedures relating to electrical, water and sewerage infrastructure has been undertaken. A summary of key considerations is detailed below.

3.3.1 Endeavour Energy and TransGrid

While further analysis will be undertaken in the subsequent sections, any future work that is to be carried out on the electrical network, whether it be business connections or augmentation of the network, will need to follow Endeavour Energy procedures. Any work that is to be carried out, or impacts the electrical network would need to consider:

- Electrical supply to new developments within the Precinct will be assessed by Endeavour Energy via a connection application process based on the customer electricity demand.
- From the required load at each land use, developments or commercial premises would typically connect to the network as low voltage customers.

- Existing 11kV network capacity may not be sufficient, which would require a contestable project to upgrade the existing distribution network particularly around the residential area. This will take the form of underground conduits and pillars in the residential area and overhead poles in the industrial area,
- Endeavour Energy 132kV feeder 233, 93F/2, 93J/2B and 9J8 are located within the Precinct, along Unwin Street, connecting the bulk supply point to the Zone Substation-Rosehill.

3.3.2 Water and sewer

Any work that is to be carried out within the investigation area would need to consider the impact to Sydney Waters existing assets as well as incorporate expansions that are required. Particular consideration would be required around the following:

- Sydney Water has significant trunk water mains traversing the Camelia-Rosehill Precinct from the south-western end to the north-eastern end and on Grand Avenue (sized between 900mm to 1500mm). These mains are a critical component of the network and provide water to the Camelia-Rosehill Precinct and Paramatta CBD, as well as over 600,000 customers in the Northern Suburbs. While the majority of these mains are in road reserves, any construction in the vicinity would require engineering assessments.
- Location of Sydney Water Land within the investigation area and their uses in the wider water and wastewater network. Land uses includes pump stations, valve chambers and easements. (Refer to section 4 for specific locations)
- Determination of sewer demand and capacity of the wastewater pumping stations. On-site sewer management facilities can be utilised to reduce the pipe run and make the servicing strategy more economically feasible. Sewer mining has the potential to reduce volume of flows into SP0067. Each type of industrial development should be investigated further on a case-by-case basis to confirm the sewer demand.
- Advice from Sydney Water during Enquiry by Design workshops that the existing sewer pumping station (SP0067) has sufficient capacity to service initial land development in the Precinct. Sydney Water has carried out studies on the capacity and condition of the pump station, and the role it plays within their future plans for the wider catchment. Further consultation with Sydney Water will be required.

A recycled water service's viability has been investigated for non-drinking purposes, with a new resource recovery facility indicatively located within Camellia-Rosehill. This is currently being considered as part of the Greater Sydney Water Strategy. Sydney Water have undertaken their greater Sydney growth plan (Sydney Water Growth Servicing Plan 2019 – 2024), in which Camellia Town Centre and Camellia Industrial Area are identified with the Servicing Plan as areas that have existing adequate trunk capacity for drinking water. Options planning for wastewater infrastructure to service these areas is underway. Options planning involves the identification of the preferred high-level servicing options and considers the ideal location, route, staging and size, however commitment to delivery of the wastewater infrastructure is currently not available.

4 KEY FINDINGS AND EXISTING INFRASTRUCTURE

The following reflects the findings based on investigations, which assessed the current Utilities Infrastructure facilities in Camellia-Rosehill and the surrounding area.

4.1 Existing electricity network

TransGrid and Endeavour Energy operate the transmission network which passes through the precinct. Endeavour Energy also operates the distribution network. The majority of TransGrid's transmission occurs above ground through powerlines and a series of conductors supported by structures to maintain a safe electrical clearance to the ground. At transmission and distribution substations, high voltages are reduced for further transmission or local distribution. Transmission feeder lines are more significant than 132 kV while distribution feeder lines are less than 132 kV. The substations are located on the southern end of Colquhoun Street and are incorporated in the open space on the land use scenario.

4.1.1 Existing transmission network near Camellia

The transmission network surrounding the Camellia Precinct is shown in *Figure 2 Electrical Network in the Parramatta Area Source: Endeavour Energy*. The investigation area is serviced from the 132 kV transmission and 33 kV sub-transmission networks via several substations owned by TransGrid and Endeavour Energy. Within the Precinct there are oil filled / insulated underground cables from Endeavour Energy's Camellia Transmission Substation that are of various ages and end of life require replacing. As part of any proposed significant development activity in the Precinct, Endeavour Energy need to be consulted to consider if there are opportunities to replace these cables or install new cable ducts.

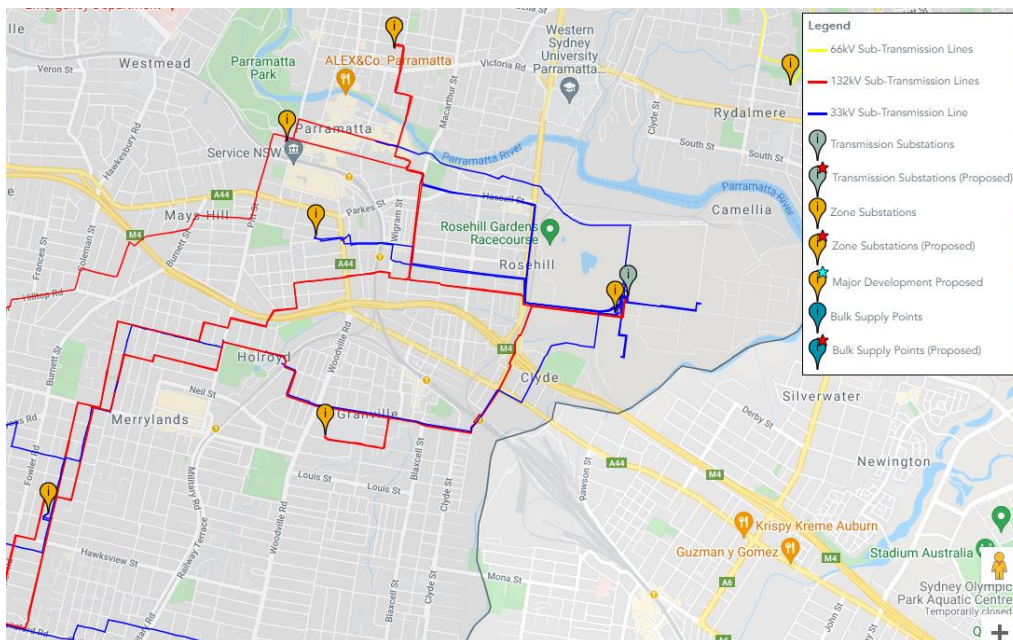


Figure 2 Electrical Network in the Parramatta Area Source: Endeavour Energy

The loads and low voltage/ high voltage (LV/ HV) consumers are supplied via the 33 kV and 11 kV distribution networks owned by Endeavour Energy from various 132/33 kV and 33/11 kV Zone Substations as listed below:

- Guildford 132/33 kV
- Camellia 132/33 kV

- Rosehill 33/11 kV
- Lennox 33/11 kV
- West Parramatta 132/11 kV
- North Parramatta 132/11 kV.

The Endeavour Energy Rosehill 33/11 kV Zone Substation located at the south-east corner of racecourse is the only substation that directly supplies the Precinct, with all other substations being outside of the investigation area. This substation is the sole supply for the investigation area, and assessment is carried out on its capacity in section 5.1.

4.1.2 Existing TransGrid 132 kV transmission lines

Bulk power for the Camellia-Rosehill investigation area is supplied from the TransGrid bulk supply point (Holroyd BSP 500/132 kV substation), which is fed by two TransGrid 500 kV feeders 93F and 93L.

The two Endeavour Energy 132 kV feeders to Camellia-Rosehill are located along Unwin Street to the south of the Racecourse. These are located within the road reserve, and impacts will require significant investigation and planning if modifications are required for future works.

Their location under the road pavements allows them to remain in place in line with the road alignments proposed in the Master Plan. The feeders are being protected as part of the Sydney Metro works in the area to avoid relocations.

4.1.3 Existing load demand (winter and summer)

The demand for electricity for the Camellia-Rosehill Precinct is generally higher in summer than in winter. This is evident from the Load Forecasts from Endeavour Energy's Distribution Annual Planning Report (DAPR) for the substations and distribution feeders servicing the region.

Report Data for Rosehill ZS

Technical Specifications

Voltage Levels	Transformer Description (MVA)	Installed Capacity Total 'N' (MVA)	Firm Rating Secure 'N-1' (MVA)	95% Peak Load Exceeded (hours)	Embedded Generation (MW)
33/11kV	3 x 25	75	50	8	0.61

Forecast Data Summer

Forecast PF	Actual (MVA)				Forecast (MVA)		
	2019	2020	2021	2022	2023	2024	2025
0.979	21.2	18.7	19.5	29.2	29.1	33.3	22.3

Forecast Data Winter

Forecast PF	Actual (MVA)				Forecast (MVA)		
	2019	2020	2021	2022	2023	2024	2025
0.994	18.1	17.6	18.5	26.0	25.9	32.0	23.2

Identified Network Limitations

Project	Network Constraint	Year	Investigation / Non-network alternatives	Potential Credible Options
No Data Available				

Augmentation RIT-D Projects

Project	Existing Capacity (firm) MVA	2021/22 Demand Forecast (MVA)	Construction Date	Original Construction Date	RIT-D Start Date	Limitation Details	Load Type
No Data Available							

Figure 3 Rosehill Zone Substation

Report Data for Camellia TS

Technical Specifications							
Voltage Levels	Transformer Description (MVA)	Installed Capacity Total 'N' (MVA)		Firm Rating Secure 'N-1' (MVA)	95% Peak Load Exceeded (hours)	Embedded Generation (MW)	
132/33 kV	3 x 120	360		240	0	1.48255	
Forecast Data Summer							
Forecast PF	Actual (MVA)			Forecast (MVA)			
	2019	2020	2021	2022	2023	2024	2025
	0.985	46.1	52.8	92.0	105.5	107.1	111.2
Forecast Data Winter							
Forecast PF	Actual (MVA)			Forecast (MVA)			
	2019	2020	2021	2022	2023	2024	2025
	0.980	34.6	44.4	73.4	85.6	87.6	92.9
Identified Network Limitations							
Project	Network Constraint		Year	Investigation / Non-network alternatives		Potential Credible Options	
Lennox ZS	Lennox ZS will exceed its firm transformer capacity of 50MVA.		2027	Monitor forecast and timeframes for anticipated developments in the short term. Investigate options for the conversion to a 132kV substation and feasible non-network options.		Continue to monitor	
Augmentation RIT-D Projects							
Project	Existing Capacity (firm) MVA	2021/22 Demand Forecast (MVA)	Construction Date	Original Construction Date	RIT-D Start Date	Limitation Details	Load Type
No data to be reported							

Figure 4 Camellia Transmission Substation

The present load forecast, as used by Endeavour Energy for its network planning purposes, has a steady increase, year-on-year, as shown in the above, largely due to the construction of major infrastructure projects such as the Parramatta light rail stage 1, as well as the Sydney Metro West, both including the stabling yards.

Current capacity exists in these substations, with the Rosehill ZS having an installed capacity of 75MVA with current forecast demand peaking at 33MVA in 2024, and the Camellia TS having an installed capacity of 360MVA, with current forecast demand peaking at 111.2MVA in 2024. The calculated demand from section 5, based on the master plan, forecasts a total demand of 147MVA.

Endeavour Energy load data suggests a current utilisation of less than 50 per cent of its summer rating with a potential ability to service new load.

The Existing Endeavour Energy 11 kV and LV Distribution Networks have been provided within the Camellia-Rosehill investigation area from the GIS data obtained from Endeavour Energy. As the substation cannot be moved, current Master Plan shows the surrounding area as proposed open space and urban services, which is similar to the current situation. There are no additional constraints to surrounding land uses as existing layout is sufficiently setback from the property boundaries.

4.2 Existing potable water services

Sydney Water manages the potable water supply scheme, which is fed from Prospect Reservoir. The existing potable water network servicing the precinct has been identified based on DBYD records and Sydney Water's Hydra GIS network. The main sources of water for Camellia (refer to Figure 6) is the trunk mains (sized between 1200mm-1500mm) that run up Unwin Street and traverse the site on the north-eastern corner, where they cross a utility bridge along Thackeray Street over the Parramatta River. This crossing is supported by a series of valves and maintenance holes house in a shed at 41 Grand Avenue (Lot 1 DP615549) to assist in the operation of the water flow through a tunnel under the river.

Figure 6 below details the size and complexity of the existing trunk mains that utilise the utility bridge crossing Parramatta River. These mains service the surrounding suburbs and any would pose a constraint to any works requiring their relocation.



Figure 5 Valve house at 41 Grand Ave

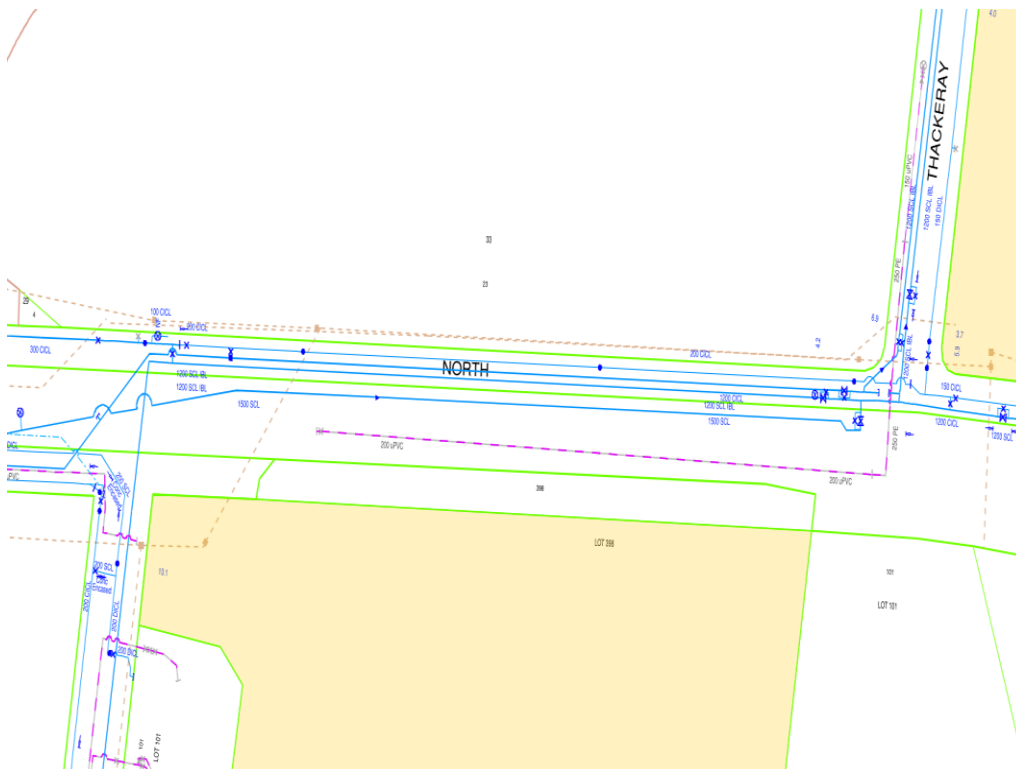


Figure 6 Trunk Potable Water mains between Durnham and Thackeray St

4.3 Existing Recycled Water System

A recycled water system is in place within the Precinct, that is limited in size and scope. A private entity, Water Utilities Australia, operates a reservoir on the corner of Durham St and Grand Avenue.

This reservoir is part of Water Utilities Australia's Rosehill Recycled Water Scheme, receiving recycled water from its recycled water treatment plant at Fairfield.

The Rosehill Recycled Water Scheme supplies recycled water for industrial and irrigation purposes within Fairfield, Cumberland and Parramatta LGAs. Within the Camellia-Rosehill Precinct, the scheme supplies a small number of industrial businesses and the Racecourse. The current supply for the Precinct is 1,279 ML/year as shown in Figure 7 Recycled Water supply below.

As there is only a single reservoir and small pumps to distribute, the infrastructure is not in place to increase capacity. Any major developments in the Precinct will need to look at increasing the capacity of the reservoir, including pumps and a reticulated pipe network, or the construction of a recycling plant in lieu of the Fairfield complex.

Ownership of this expansion will need to be looked at by Sydney Water or continuing under the current private arrangement.

As part of Sydney Waters strategy for securing Greater Western Sydney network capabilities, investigations are underway for a major wastewater treatment facility for the precinct. The installation of a facility such as this would present an opportunity to partner it with a recycled water scheme to supply the Greater Parramatta area in addition to Camelia and Rosehill.

Sydney Water is also investigating the viability of providing recycled water service for non-drinking uses, including greening and cooling, to the Greater Parramatta and the Olympic Peninsula (GPOP) with a new resource recovery facility indicatively located within the Camellia-Rosehill precinct.

Abundant availability of recycled water would be able to service the new residential uses and business and also enable large-scale planting through the precinct to mitigate heat-island impacts, reduce dust and air pollution, and improve local amenity generally. Any planting strategy would also need to consider contamination and remediation as key issues.

Recycled water scheme	Water Recycling Plant	Recycled water (ML/year)	Water savings (ML/year)	Type of use
Kiama Golf Course	Bombo	42	-	Irrigation, golf course
BlueScope Steel	Wollongong	5,609	5,609	Industrial
Port Kembla Coal Terminal	Wollongong	235	235	Industrial
Wollongong Golf Club	Wollongong	45	45	Irrigation, golf course
Wollongong City Council	Wollongong	5	5	Irrigation, parks, sports fields
Warwick Farm Racecourse	Liverpool	62	-	Irrigation, racecourse
Liverpool Golf Club	Liverpool	72	54	Irrigation, golf course
Industrial Foundation and Rosehill Racecourse	Rosehill	1,279	1,279	Industrial, racecourse
Hickeys Lane	Penrith	23	-	Irrigation, parks, sports fields
Penrith Council parks	Penrith	22	22	Irrigation, parks, sports fields
Stonecutters Ridge Golf Club	Quakers Hill	-	-	Irrigation, golf course
Agricultural release	Quakers Hill	365	-	Agricultural release
Rouse Hill residential	Rouse Hill	2,748	2,748	Residential, commercial
Castle Hill Golf Course	Castle Hill	86	-	Irrigation, golf course
Dunheved Golf Course	St Marys	102	5	Irrigation, golf course

Figure 7 Recycled Water supply. Sydney Water Annual Water Conservation Report 2018-2019

4.4 Existing Sewer System

Sydney Water manages the sewerage network as shown previously on Figure 6 .

Camellia-Rosehill is serviced by a combination of conventional gravity sewerage systems and areas of pressurised systems. Due to the large lot sizes and flat nature of the site, a number of the larger industrial areas have their own private pump system which is connected up to Sydney Waters gravity network. The existing sewerage network servicing in the investigation area has been identified based on DBYD records and various Sydney Water reports.

The Camellia Pump Station SP0067 is located at the northwestern end of the Precinct adjacent to Grand Avenue. This pump station services a catchment of approximately 240,000 people (based on 2017 population numbers) and was initially established in 1929-30 as part of the Northern Suburbs Ocean Outfall Sewer

(NOOS). SP0067 was designed to receive wastewater from a large area of Parramatta, Bankstown and surrounding areas and pump to the NOOS.

Flows to SP0067 are predominantly fed through two submains, Parramatta Low Level Submain (711 mm x 1066 mm) and Lidcombe Auburn Granville Submain (1725 mm x 1700 mm), that traverse the western side of the Camellia-Rosehill Precinct. Flows are transferred from SP0067 to the NSOOS through dual rising main to the north along the Parramatta Light Rail Stage 1 alignment.

To service the on-going growth and expansion of Western Sydney and maintain operational standards, the mechanical, electrical and hydraulic infrastructure has been continually upgraded, with major amplification works carried out in the 1950's and 1960's.



Figure 8 SP0067 Sydney Water Pump Station

Sydney water also owns and operates two smaller pump stations, SP0371 on Tennyson Street and SP0141 on Shirley Street. These pump stations are only sized to transfer the local lots to the gravity network that feeds into SP0067.

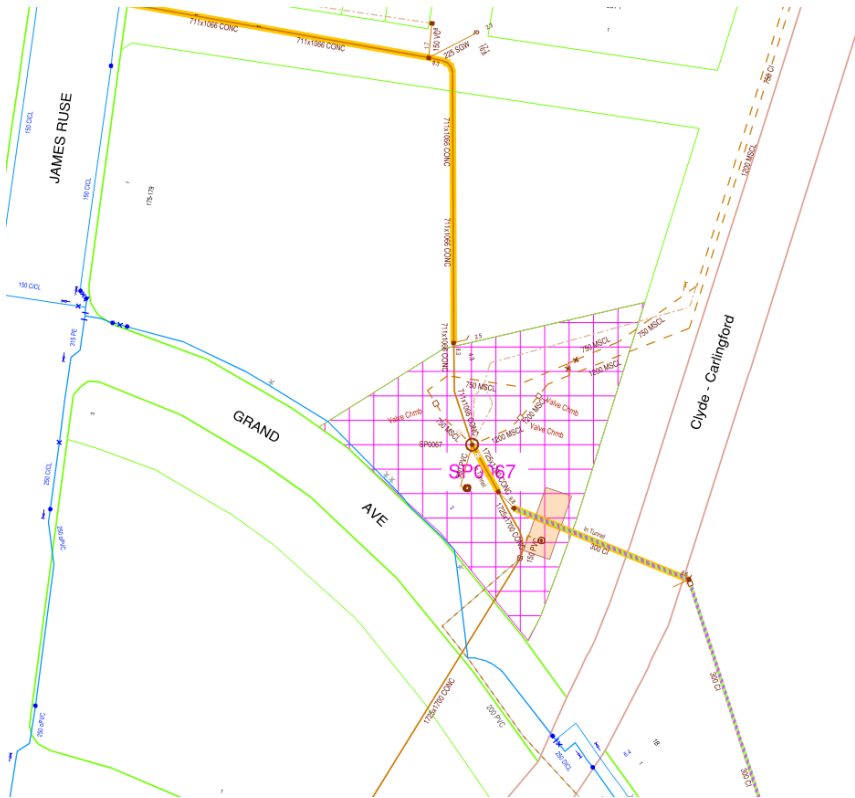


Figure 9 SP0067 and connecting mains

From the Sydney Water commissioned report into the SP0067 condition assessment and capacity for future growth the current demands on the pumping station are shown in Table 4 below.

Table 1 SP0067 Sewer Supply System details

Item	Existing Load	Units
Average Dry Weather flow (ADWF)*	820	L/s
Peak wet weather flow (PWWF)*	1,420	L/s
Current capacity	Up to 2100 L/s	L/s
System pipe reticulation sizes	150-375	mm

*Estimated 2021

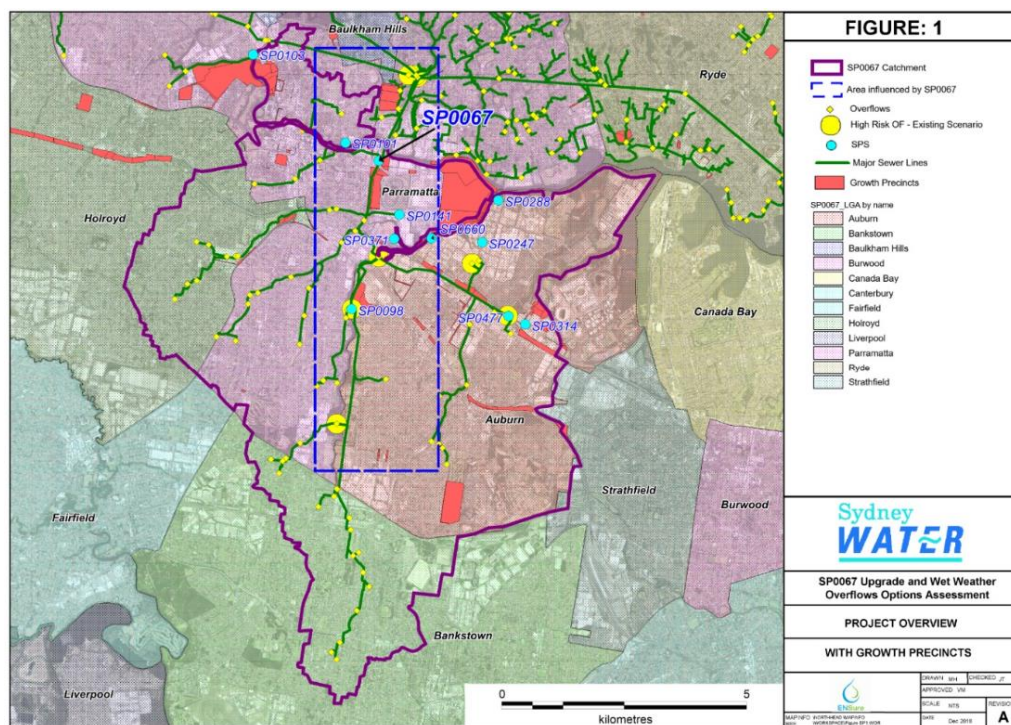


Figure 10 SP0067 Catchment – Sydney Water SP0067 Options Assessment

4.5 Existing telecommunication service

The communication providers include their conduits, cables and optic fibre around or within the Camellia-Rosehill investigation area. The site investigation in the next design phase would confirm if any assets are within Telstra conduits: The telecommunication providers available around or within the area are:

- Telstra
- NBN
- Optus
- Fibreconex
- TPG.

While there is an existing communications network reticulated throughout the Camillia-Rosehill Precinct, it is designed to cater for existing industry uses.

The network is predominantly made up of a copper network to carry lower levels of information and calls. This network would not be suitable for a higher density of dwellings or would attract any form of new business that required higher volumes of data.

Conduit capacity is limited, so new conduits would have to be installed along with fibre optic cabling. This conduit capacity would also have to be sized to allow an additional carrier to expand their network to new customers.

4.6 Existing gas service

The industrial demand and the refinery location have facilitated the Jemena network to be installed entirely with high pressure mains.

These supply the industries, who then reduce pressure and reticulate within their own sites at medium pressure. The high-pressure mains have strict controls around them regarding construction, and any work required is to be undertaken by Jemena only. The mains are located within the road reserves, and 1m setbacks would be required for new service installations running parallel to them. Any buildings or structural elements would need to avoid placing additional loads on the pipes.

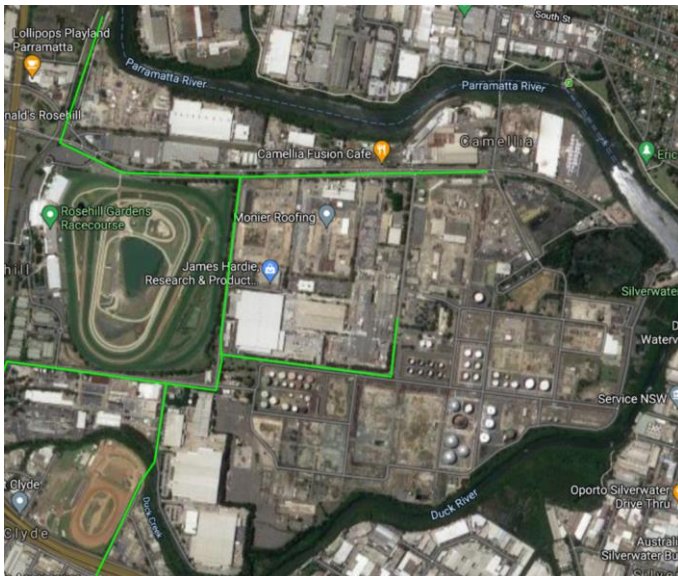


Figure 11 Jemena High Pressure Network

There will need to be a low-pressure network installed for the development as the new business would not require a High-Pressure supply. Jemena would need to install a number of pressure reduction stations to feed this new reticulation.

With this scenario's combination of heavy industry along with more mixed use and residential, there will be an over capacity in the network. This has the opposite effect in terms of infrastructure requirements and the existing network is not suitable for the low demand user.

A full low pressure reticulation network would be required to be installed throughout the entire Precinct with a number of pressure reduction facilities. This low-pressure network will allow the connection for all domestic and commercial uses.

5 MASTER PLAN

The Camellia-Rosehill investigation area is predominantly a brownfield site with significant utility infrastructure. This report assesses the ability of the existing utility infrastructure to cater for the proposed development, as identified in the master plan. This section of the report provides an overview of the master plan and estimates associated utility demands and assesses the capacity of the local and broader regional infrastructure to service the Precinct.

5.1 Anticipated land uses, type and size

The proposed land uses, area, and the proposed employment figures are summarised in Table 2 Proposed land use and employment

Table 2 Proposed land use and employment

Land use type	Area (ha)	Jobs	Population
Residential/Mixed use (medium)	12.43	760	13,469
Residential/Mixed use (high)	8.28	618	10,960
School	2.08	100	
Wetland	9.84	-	
Open space/public recreation	7.75	-	
Heavy industrial	106.1	2,653	
Urban services	59.70	7,463	
Entertainment	5.27	2,639	
Sydney Metro West and Parramatta Light Rail Stabling Yards	2.19	-	
Total		14,522	24,429

The land use types, and examples of industries are shown below which assist in identifying the likely demands that will be placed on the utility infrastructure.

Table 3 Potential industries to develop

Potential industries	Description (indicative)	Typical Land Uses (indicative)
Freight & Logistics	Areas developed to facilitate the storage or transfer of goods that are in-transit, or to provide freight and logistics services on behalf of third parties.	Warehouses: storage areas for goods (covered or uncovered); transfer facilities; hard stand areas for parking and assembly; buildings for offices and administration purposes; ancillary activities

Potential industries	Description (indicative)	Typical Land Uses (indicative)
	These areas are typically focused on the transfer and transport of goods by and between trucks.	(fuel storage, repairs, driver facilities, etc.).
Resource Recovery	Areas primarily developed to facilitate the processing of waste materials, which may be transported by road from other locations and separated into their constituent materials, transformed into new materials and goods and potentially including residual non-recoverable materials which are aggregated for disposal locally or transported elsewhere for disposal. Focused on the achievement of 'circular economy' outcomes.	Intermodal facilities; resource recovery facilities; waste transfer stations; storage area; waste processing facilities; micro-factories (specific recycling products); industrial uses; refuse storage; waste to energy production; landfill.
Bioenergy	The processing of organic waste from animals or plants to produce energy, heat, liquid fuel or biogas.	Intermodal facilities; waste collection and storage; waste processing; energy production, storage and transfer.
Energy/ Solar	Energy generation by way of solar energy or other forms of energy, potentially hydrogen production.	Solar farms, energy production facilities. Power-to-Gas (P2G) Facility and associated infrastructure: - production of hydrogen (convert water to hydrogen gas using electrolysis) (P2G Facility). - store hydrogen gas in a high-pressure storage and separate buffer storage pipeline on site for bus refueling at a hydrogen refueling station (HRS).
Enterprise/ Industrial	Light industrial and service-oriented industries which aggregate near rural/regional centers to support agricultural and urban activity.	Offices; showrooms; service centers; warehouses; bulky goods retailing; activity centers; recreation facilities; light industry; industrial retail outlets; rural supplies; vehicle and body repairs; etc.
Residential	High density population	Multi story, high density dwellings for residents,

Potential industries	Description (indicative)	Typical Land Uses (indicative)
		commercial and retail spaces.
Recreation	Green and community spaces to provide leisure and relaxation spots for residents and visitors	Parks, museums, sports grounds and green corridors for walking or cycling
Hub	Small aggregation of uses to provide localized services to support workers, visitors and businesses in the surrounding area.	Food and beverage; retail; training and education; community use; offices, etc.

5.2 Land-use area, estimated electricity demand and supply analysis

5.2.1 Electrical service assumptions of the proposed development

Arcadis elected to use data from the Business Energy Advisor portal which utilises information obtained from energy surveys by the US Energy Information Administration (EIA) as a similar database or repository of energy demand information for various businesses and industry in Australia is not available,

Subjectivity was considered when reviewing the data before use in the energy demand estimates for the Precinct.

In addition, load and energy demand estimates from relevant previous projects which Arcadis had worked on, were also used.

- A manufacturing facility or processing plant uses 95.1 kWh of electricity per square foot each year on average, or **1,023 kWh/m² p.a.**, although actual consumption can vary widely across various industrial subsectors and plant types.
- Negligible solar energy or bio-energy generation from industrial plants has been assumed, on basis of determining impact to existing infrastructure capacity.
- Average load demand of **21 VA/m²** for a warehouse lot.

5.2.2 Development Electrical demand

Based on the Master Plan - Land Yields, Table 4 outlines the land areas of different sub-precinct types and future maximum demands.

The respective electricity maximum demand estimates for each land use area are also shown below. These energy demands would inform the assessments of a network usage plan from utilities' perspectives.

Table 4 Electrical Maximum Demands

Land use type	Area (Ha)	Total Maximum Demand (MVA)	Diversity Factor	Diversified Load (MVA)
Residential/Mixed use (medium)	10.89	22	0.8	17.60
Residential/Mixed use (high)	9.11	23	0.8	18.40
School	2.23	2	0.6	1.20
Potential School	5.12	4	0.6	2.40
Wetland	9.84	2	0.9	1.80
Open Space/Public Recreation	12.94	2	0.9	1.80
Potential open space	10.29	1	0.9	0.90
Heavy Industry	79.13	120	0.75	90.00
Innovation and Industry	60.50	60	0.7	42.00
Urban Services	26.68	2	0.9	1.80
Entertainment	2.87	4	0.8	3.20
Sydney Metro and PLR Stabling yard	2.19	4	0.8	3.20
Further Diversity Factor between different load profiles				0.8
Total (MVA)				147.44

The information about the business type and allocation details are in line with the recommended land use from the Master Plan, and has used a set of assumptions for the developments within each land use precinct, along with business types considered to be likely, etc.

The large developments in the Central and Southern part of the Precinct away from heavy industry would be serviced from the existing zone substation. The current substation has been space proofed with the capacity to increase power output by installing an additional transformer to augment the existing ones. This may be required in the long term forecast in the long-term staging of 10-20+ years.

5.2.2.1 Proposed 11 kV distribution network reticulation

Further to the power supply from zone substation an enhancement of the existing 11 kV distribution network will be required to facilitate the specific planning scheme. Smaller 11kV distribution substation kiosks and transformers will be required for larger individual developments, with LV supply coming off them for the end customer.

The proposed road network as shown in Figure 1 Integrated Master Plan, is assumed to accommodate Endeavour Energy distribution assets.

Depending on development locations, new connections may require installation of a new pole-mounted transformer or an underground cable from the future overhead mains to supply the new pad-mounted transformer.

Endeavour Energy may require any new large industrial customers to connect to the network as high voltage customers. This process usually requires more detailed technical studies into network strength and stability. Existing customers will maintain their supply as it.

5.3 Land-use area, estimated water demand and supply analysis

5.3.1 Water service assumptions of the proposed development

In the absence of being provided with more specific information on the likely new businesses that would be attracted to Camellia-Rosehill and their likely water demands, Arcadis established assumptions for viable businesses, and to estimate the respective water demands, using the methodology outlined below:

- Arcadis determined the estimates of water demand, based on:
 - the allotted land use areas
 - assumptions of development footprint (as a percentage of the allotted land) within which facilities or premises would be established
 - assumptions of industrial use of potable water demand in accordance with Sydney Water's "average daily water use" guide.
 - Project knowledge of similar land use – e.g., for industrial facilities, warehousing and logistics hubs, etc.
- The estimates of water generation have been determined based on:
 - Assumptions of wastewater treatment and reuse for non-potable demand.
 - Assumptions of rainwater collection and reuse for non-potable demand

Further assumptions per development type are shown in **Error! Reference source not found..**

Table 5 List of Water Assumptions

Precinct type	Assumptions
Industrial	Average potable water demand has been estimated based on

Precinct type	Assumptions
	- Development area - Light Industrial Use 40kL/NHa/day for potable water supply. Source: Water Planning Guideline Section 3: Water Demand and Growth (Sydney Water, 2014) Table 3-2 and 3-8 - Employment - 80L/person/day in addition to the light industrial use. Maximum potable water demand is 1.6 of the average demand as per Water Supply Code of Australis WSA03 Further assumption has been made as follows: - Net hectare (floor area of future building development) has been calculated based on % of total land area.
Commercial	Average potable water demand has been estimated based on - Development area - Commercial Use 41kL/NHa/day Source: Water Planning Guideline Section 3: Water Demand and Growth (Sydney Water, 2014) Table 3-2 and 3-8 - Employment - 80L/person/day in addition to the commercial use. Maximum potable water demand is 1.6 of the average demand as per Water Supply Code of Australis WSA03 Further assumption has been made as follows: - Net hectare (floor area of future building development) has been calculated based on % of total land area. Percentage of the area has been assumed based on Arcadis experience with similar industrial land development. - Recycled water has been calculated on a factor of the total potable water consumption.
Residential	Water demand calculated based on a calculated number of dwellings for the area. Dwelling assumed to be apartment/home unit 2 bedrooms
School	. Water demand calculated based on number of staff + pupils. Based on scenario with Primary and a secondary school with 1500 staff + pupils per 25000m². Demand has been calculated for both potable and recycled consumption, with toilets and irrigation using recycled water

5.3.2 Development water demand

Potable and recycled water demand has been calculated for taking into consideration above-mentioned assumptions based on area and population.

The recycled demand is in addition to the potable for primary uses in irrigation, toilet flushing and industrial uses.

Table 6 Potable Water demand

Precinct Name	Area (ha)	Build up % %	Building area (NHa)	Average day L/s	Peak Day L/s	Peak Hour L/s
Residential/Mixed use (medium)	10.89			24.37	38.99	63.35
Residential/Mixed use (high)	9.11			24.91	39.86	64.77
School	2.23			0.13	0.21	0.34
Potential School	5.12			0.30	0.49	0.79
Wetland	9.84			-	-	-
Open space/public recreation	12.94			-	-	-
Potential open space	10.29			-	-	-
Heavy industrial	79.13			19.62	29.43	39.24
Innovation and Industry	60.50			9.00	13.50	18.00
Urban services	26.68			1.98	2.98	3.97
Entertainment	2.87			0.21	0.32	0.43
Sydney Metro West and Parramatta Light Rail Stabling Yards	2.19			0.16	0.24	0.33
Cultural/Food and Beverage Destination	0.00			-	-	-
Total daily water demand, L/s				80.69	126.01	191.22
Total daily water demand, ML/d				6.97	10.89	16.52

Table 7 Recycled Water Demand

Precinct Name	Area (ha)	Build up % %	Building area (NHa)	Average day L/s	Peak Day L/s	Peak Hour L/s
Residential/Mixed use (medium)	10.89			11.49	18.38	29.87

Precinct Name	Area (ha)	Build up %	Building area (NHa)	Average day L/s	Peak Day L/s	Peak Hour L/s
Residential/Mixed use (high)	9.11			11.75	18.80	30.54
School	2.23			0.06	0.10	0.16
Potential School	5.12			0.14	0.23	0.37
Wetland	9.84			-	-	-
Open space/public recreation	12.94			1.89	2.83	3.77
Potential open space	10.29			1.50	2.25	3.00
Heavy industrial	79.13			9.25	13.88	18.50
Innovation and Industry	60.50			4.24	6.37	8.49
Urban services	26.68			0.94	1.40	1.87
Entertainment	2.87			0.10	0.15	0.20
Sydney Metro West and Parramatta Light Rail Stabling Yards	2.19			0.08	0.12	0.15
Cultural/Food and Beverage Destination	0.00			-	-	-
Total daily water demand, L/s				41.44	64.50	96.94
Total daily water demand, ML/d				3.58	5.57	8.38

Calculated water demand based on area-based assumptions was done on high-level estimation and considered conservative. It includes industrial demand however excludes irrigation water requirements. Water demand based on the employment is considerably lower and input from the potential future businesses in the area are recommended to confirm employment and potable water use requirements.

While the current supply for the Precinct is in line with meeting the demands for the proposed scenario, increases to the distribution network will be required throughout the division of all the new lots, as well as transport corridors to reach the new buildings.

Potable water demand calculated can be fully covered by the Sydney Water's potable water provision. Confirmation of reliability of the data for services' demands calculations is advisable to ensure sufficient water resource allocation to the development. Staged growth information will be required to assess if trunk amplification would be required in the future.

Sydney Water will require a breakdown of the proposed annual and ultimate growth yields for dwellings and jobs to effectively plan and stage infrastructure delivery to meet development needs.

It is proposed to reticulate the new potable water pipework within the future road reserves to each industrial Precinct as required. The pipe sizes would depend on the simultaneous demand of each lot.

Sydney Water is investigating the viability of providing recycled water service for non-drinking uses, including greening and cooling, to the Greater Parramatta and the Olympic Peninsula (GPOP) with a new resource recovery facility indicatively located within the Camellia-Rosehill precinct.

The additional open spaces and recreation facilities, coupled with increased residential on top of the existing customers such as the Australia Turf Club, Concrete Recyclers and Viva Energy create a sustainable demand that would validate any investment in recycled infrastructure.

The existing recycled water scheme could be incorporated into the strategy, as a number of customers are currently serviced by it. It is envisaged that a 20-hectare site in suitable zoned land, such as the southern portion of the Precinct, would be required to enable the potential resource recovery facility.

5.4 Land-use area, estimated wastewater demand and supply analysis

5.4.1 Wastewater service assumptions of the proposed development

Without specific information on the likely new businesses that would be attracted to Camellia-Rosehill, their likely sewer demands cannot be specifically identified. Therefore, Arcadis set about to establish an assumptions list of businesses considered to be likely, and to estimate the respective demands, using the methodology outlined below:

- Arcadis had not determined the load compositions of individual facilities which could be developed within each land use area nor undertaken any detailed assessments of services load of typical plant and equipment which could be installed by land users. This would invariably change depending on the exact nature, size and scale of the facility that is ultimately developed/constructed.
- Arcadis determined the estimates of sewer demand, based on:
 - the allotted land use areas
 - estimated potable water demands
 - assumptions of development footprint (as a percentage of the allotted land) within which facilities or premises would be established
 - assumptions sewerage flow estimation for developed areas are based on planning in accordance with Sewerage Code of Australia WSA02-2002-2.2.
 - project knowledge of similar land use – e.g., for industrial facilities, warehousing and logistics hubs.

Wastewater demand has been calculated based on potable water demand usage.

The rate of return for each end use does differ, in line with estimations from previous project knowledge. The return for residential use is 70%.

Table 8 Estimated Sewer Demand highlights the details of sewer demands of each Precinct.

Table 8 Estimated Sewer Demand

Precinct name	ADWF Average Daily Waste Flow L/s	PDW F Peak Daily Waste Flow L/s	GW I Ground Water infiltration L/s	RDI Rainfall Dependen t Inflow L/s	Design Flow (PDWF + GWI + RDI) L/s
Residential/Mixed use (medium)	25.06	46.75	0.14	13.00	59.89
Residential/Mixed use (high)	21.35	39.84	0.11	10.88	50.83
School	0.30	0.57	0.03	1.16	1.76
Potential School	0.70	1.30	0.06	2.67	4.04
Wetland	0.00	0.00	0.00	0.00	0.00
Open space/public recreation	0.44	0.82	0.16	6.76	7.74
Potential open space*	0.35	0.65	0.13	5.38	6.16
Heavy industrial	20.18	37.64	0.99	41.33	79.97
Innovation and Industry	15.43	28.78	0.76	31.60	61.14
Urban services	3.40	6.35	0.33	13.94	20.62
Entertainment	0.37	0.68	0.04	1.50	2.22
Sydney Metro West and Parramatta Light Rail Stabling Yards	0.56	1.04	0.03	1.14	2.21
Cultural/Food and Beverage Destination	-	-	-	-	-
Total sewer flow (L/s)	88.14	164.42	2.77	129.37	296.56

*Assumed requirement for some ablution facilities.

Calculated sewerage demand was done on high-level estimation and considered to be conservative. Sewer demand based on the employment is considerably lower, and input from the potential future businesses in the area are recommended to confirm employment and usage requirements.

Existing pumping station average inflow is 820 L/s. The existing sewer pumping station has approximately 40 per cent additional capacity. Further investigation or documentation should be provided to support this statement and confirm if the sewerage flow from the proposed development can be partially directed to this plant.

Area-based calculations suggest that sewer demand can be covered by the existing Camellia pumping station. Further investigations are required on the development demand, to determine a staged approach to assess the future wastewater strategy and growth of the wider catchment area. This would be in line with Sydney Water Growth Servicing Plan, and whether this pumpstation would process a larger catchment or new facility as mentioned earlier.

Each type of industrial development should be investigated further on a case-by-case basis to confirm sewer demand and location of the wastewater generated areas. On-site sewer management facilities can be utilised in distant parts of the development with low sewer generation to reduce the pipe run and make the servicing strategy more economically feasible.

5.5 Land-use area, estimated communication service demand and supply analysis

5.5.1 Proposed communication service

Telstra major optical fibre assets and Telstra exchange are located in the vicinity of the investigation area.

Due to the differing requirements for the land uses the digital connectivity is considered for the end users. The high development of the western section of the Precinct with high density residential as well as an innovation precinct in the centre will both call for high volumes of data to facilitate their everyday use.

It is proposed that the development of the Precinct cater for the installations of more conduits along all the upgraded road corridors to increase cable capacity and reticulation coverage. Connection to the new residential and mixed-use business would be left to the developers to process the applications with the communications carriers. This will work in conjunction with a digital connectivity standard linked to the land use as part of the planning process.

 Residential bandwidth demand (up to Mbps)					
% of premises	2013	2018	2023	2030 (estimate)	2035 (estimate)
70%	10	16	38	76	125
15%	17	31	40		
10%	23	34	42		
5%	25+	35+	43+	76+	125+

 Business bandwidth demand (up to Mbps)				
% of premises	2015	2025	2030 (estimate)	2035 (estimate)
70-75%	8	35	50-75	100+
12-16%	18	45	60-85	120+
4-8%	30	85	100-140	150+
1%	70+	100+	150+	180+

Source: Communications Chambers 2015, *The Broadband Requirements of Small Businesses in the UK*; Communications Chambers 2014, *Domestic Bandwidth Requirements in Australia, A forecast for the period 2013-2023*

Figure 12 Broadband speed demands

Telstra and NBN have been consulted regarding the proposed development. Telstra has made the following recommendations:

- The developer to complete Telstra developer application forms located at the website: <https://www.telstra.com.au/smart-community>

- The proposed final Master Plan would be required to be registered with NBN Co and Telstra for NBN Co and Telstra. NBN Co and Telstra would accordingly plan for future communication service requirements.
- NBN Co would assess the application and contact the developer to discuss the options.
- The Telstra Developer Application Forms and Application for Reticulation (AFR) would be required to be completed to agree with Telstra's Terms and Conditions. Telstra would undertake the design work based on the information provided by the developer. Refer to the website <https://www.telstra.com.au/content/dam/tcom/external/telstra-smart-community/Terms-and-Conditions-All-Development-Types.pdf>

5.6 Proposed gas service

Due to the extent of the existing high-pressure network, there are no requirement to develop supply of gas. To facilitate the lower demand users such as the mixed use industrial and the residential buildings an extensive low-pressure network will be required to be installed.

Pressure reduction stations at the tee off locations plus a reticulation of 7-50mm pipework will be required throughout the subdivisions of the larger lot sizes and will be concentrated in the north-western area of the site.

No additional requirements will be needed in the existing heavy industrial areas to the East and south.

The gas pipeline proposal and further investigations into the supply of gas are required as this work progresses. Further consultation would be required between developers and Jemena.

5.7 Summary of key findings

Error! Reference source not found. below provides a summary of the findings of utility infrastructure investigation.

Table 9 Summary of existing issues

Master Plan	Existing Network	Proposed Network Upgrade Plan
Electrical	Existing supply is adequate for this scenario with adjustments required due to the increased distribution area and lower load requirements of the end user	While existing capacity and supply is adequate to meet the required demands, large changes to the distribution infrastructure would be required due to the lower individual loads, The changes would likely result in additional Transformers to drop the voltage from to 11kV for customer connection, with a larger and more dense distribution network.
Water	Existing Camillia Water Supply System has capacity to service projected growth.	A large increase to the reticulation network involving more DN100 & 150 mains in the new roads within the subdivided lots being created. These would be installed in connecting roads to the dwellings and businesses established there.
Sewer	Existing Camellia sewerage treatment plant (STP) has capacity to service projected growth, based on building	Amplification of SP0067 site may be required in the future to accommodate additional flow due to growth or to divert flows for recycling. This can be

Master Plan	Existing Network	Proposed Network Upgrade Plan
	size and connecting infrastructure. Pumps can be increased in size as part of their replacement due to asset life..	accommodated by replacement of the existing pumps and connection of pipe to recycled. A large increase to the local smaller pipe network to service the increased dwellings would be required due to existing setup for large lot industries. Adjustment to the existing pump station will be required due to its location in the high-density residential zone, by way of updating odour controls. Relocation of SP0067 will be a highly complex and costly exercise due to the significance of the asset, the topography of the Camellia-Rosehill Precinct and the risks associated with contamination, flooding and ground conditions. The proposed land use changes will require the existing Odour Control unit (OCU) at SP0067 to be replaced with a new OCU (i.e., Activated Carbon or Biotrickling filter). Additional odour control measures may also be required depending on the extent of proposed development to contain 2 OU odour contours away from residential land.
Recycled Water	There is an existing recycled water system within the Precinct and opportunities are there to extend supply to limited customers and this would be explored.	The existing tanks and pump system may be upgraded to allow additional customers to connect to recycled water. Sydney Water is also investigating a new treatment facility nearby and this will provide opportunity to provide recycled water service to the entire proposed development in the future.
Communications	Minor communications and optic fibre cables within the Precinct. Existing infrastructure catering specifically to the current needs.	Additional capacity would be required to be installed throughout the Precinct. New conduits and pits would be required along all major roads with Fibre optic cabling installed to cater for the increased demands. New mobile antennae would be installed ideally on top of the proposed residential/mixed use buildings or low-lying areas would require stand-alone towers. NBN Rollout has been completed in this area, but cables likely to require upgrading to cater for increased demand.

6 OPPORTUNITIES AND CHALLENGES

Based on the information provided of the master plan, a list below has been created to summarise some opportunities to either lower demand on the existing infrastructure or to identify large impact constraints that may limit potential developments.

6.1 Electrical

6.1.1 Opportunities

- Large scale solar farms can be distributed throughout the site with the installation of battery farms for storage reducing reliance on the grid.
- Coordination with Endeavour Energy is recommended to seek further clarification and confirmation of network planning and electricity capability information, transmission lines route and any other requirements.
- Upgrade of existing distribution network likely will be required at 11 kV overhead conductors through the mixed use zones and installation of new UG network as required within the residential area.
- Electrical supply to new LV voltage customers within the Precinct will be assessed by Endeavour Energy via a connection application process that considers consumer demand and network capacity.
- Commercial premises will typically be able to connect to the network as low voltage customers.

6.1.2 Challenges

- Endeavour Energy 132 kV feeders are located within the Camellia-Rosehill precinct, connecting the Zone Substation. Relocation of these feeders can be cost and time prohibitive. Suitable alignments would have to be found outside the road reserve, and creation of easements.
- Existing Rozelle ZS and Camellia TS will be required to be maintained in their current locations at the corner of Unwin, Colquhoun and Devon Streets.

6.2 Water and Wastewater

6.2.1 Opportunities

The opportunities for the Camellia-Rosehill investigation area have been listed below:

- Improvement of the existing water and sewer infrastructure efficiency through adequate maintenance and monitoring.
- Non-potable water supply systems such as rainwater harvesting, greywater reuse, treated wastewater or recycled water reticulation, can be utilised to reduce requirements on the network.
- New services proposed to reticulate are to be located within the new road reserves to avoid the creation of easements and impacts to other developments.
- Abundant availability of recycled water would enable large-scale planting through the precinct to mitigate heat-island impacts, reduce dust and air pollution, and improve local amenity generally.

6.2.2 Challenges

- Significant Sydney Water existing infrastructure is throughout the site, with major constraints on settlement and loadings.
- Building Over Assessments (BOA) required to be approved by Sydney Water for building over or adjacent to their assets, that are impacted by any construction.
- Sydney Water has advised that no buildings are able to be constructed over the LAG submain along James Ruse Drive
- Consideration of the Sydney Water's operational and augmentation needs.

6.3 Gas

6.3.1 Opportunities

- The proposed High-Pressure gas supply covers the entire site with overcapacity in the network.

6.3.2 Constraints

- Minimal Low Pressure gas service is presently available. New pipework reticulation will be required, and pressure reduction facilities.
- Construction required when along the high-pressure mains. There are also existing easements that limit use of the areas next to the pipelines.

6.4 Telecommunications

6.4.1 Opportunities

- Various telecommunication assets are present within the investigation area available for connection.
- New towers and/or building mounted Antennae to cater for 5G network to reduce demand on inground infrastructure
- Fibre to the premises (FTTP) to be employed for greater speed and connectivity.

6.4.2 Constraints

- New communications (Telstra/NBN) pit and pipe system will be required to provide service to the future development as current supply cannot cater for high Data use.
- Additional mobile towers/aerials would be required to increase coverage.

7 DELIVERY PLAN

7.1 Design and costs

The infrastructure upgrade works identified in the previous section would be required to be designed and cost as part of the development of the Delivery Phase. The concept design stage of the Camellia-Rosehill precinct will have to focus on the design and cost of identified utilities.

The proposed utilities are to be laid in the road reserves behind the verge in line with the NSW Streets Opening Coordination Council. This will allow allocations for providers to either install or upgrade their services without impacts to other utility providers.

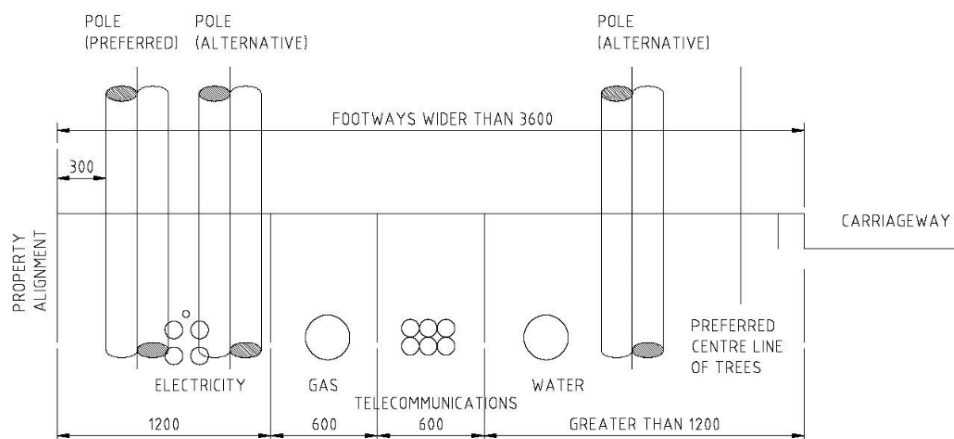


Figure 13 – NSW Road Opening Conference service allocations

7.2 Proposed staging of works

7.2.1 Electrical distribution network capacity with 20-year and 40-year required power supply load

The proposed Camellia-Rosehill Place Strategy has planned a large development area that would have various types of industry in each Precinct which potentially requires a power supply for different types of manufacturing and residential activities.

Current spare capacity of the Endeavour Energy Rosehill (33/11 kV) substation is only able to service a portion of new load. The design of the substation has catered for the addition of a new transformer to allow it to operate at its maximum designed supply. The additional load of developments will require this to be installed in the long term staging of 10-20+ years, in line with Endeavour Energy forecasts. This load does not take into account renewable resources, which should contribute sufficient supply to avoid and substation upgrades.

7.2.2 Potable water demand comparison with the supply required water supply

Potable water demand calculated based on the area component that can be fully covered by Sydney Water's potable water provision. Confirmation of reliability of the data for services demand calculations is advisable to ensure sufficient allocation of the water resource to the development.

It is proposed to reticulate the new potable water pipework within the future road reserves to each industrial lot as required. The pipe sizes will depend on the simultaneous demand of each lot throughout the Precinct.

During the initial stage of the proposal, the existing recycled network and pumps operated by Water Utilities Australia can continue to service the immediate customers. As development progresses into the longer-term staging of 10-20+ years, a larger recycled water scheme will need to be implemented. This will be met by Sydney Waters strategy for the wider area. Sydney Water are exploring whether this is through a facility located

7.2.3 Sewerage demand comparison with the supply required sewerage supply

The existing Pumping Station SP0067 has sufficient capacity to handle anticipated development.

Area based calculations suggest that sewer demand can be covered by the existing Pump Station for the development. Each type of industrial development should be investigated further on a case-by-case basis to confirm sewer demand and location of the wastewater generated areas. On-site sewer management facilities can be utilised in distant parts of the development with low sewer generation to reduce the pipe run and make the servicing strategy more economically feasible.

Sewer service reticulation is proposed to follow future roads, depending on pipe/ground falls and location for connection requirements. As each development is proposed, connectivity assessments will be undertaken to extend the network to the connection points.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Electrical

There are four 132 kV feeders owned by Endeavour Energy supplying the Camellia 132/33 kV Transmission substation and multiple 33/11kV lines from the Roselle ZS along with Low Voltage overhead / underground lines within the Precinct.

To provide power supply to the future Precinct, the existing electricity distribution network will require to establish a dense 11kV and LV reticulation network due to the subdivision of the lots and addition of road corridors.

The exact pinch points of zone substation and distribution electrical assets should be coordinated and identified with Energy Authorities. It is suggested that a concept design plan with proposed alterations to the existing electrical network be prepared and presented to each of the utilities for comment and requirements to allow progression to detailed design, as the impacts of each development are quantified. This will include allowances for Kiosk Transformers at distribution zones.

8.2 Potable water and wastewater

It has been identified that the locations on the master plan within the identification area are currently well serviced by multiple utilities, providing opportunities for extension of services to the development area.

A recycled water scheme will be required to meet demands of the precinct growth in line with recommendations including it as a non-negotiable in the workshop forums.

Sewer flow from the precinct development can be accommodated by the existing Pump Station with spare capacity. Sydney water is investigating a Regional Treatment facility considering the catchment that flows through the current pump station. Use of private on-site treatment facilities can reduce the load on the infrastructure but will require further investigations in relation to timing/staging. This will limit future expansion, with the business being responsible for ongoing maintenance.

Further details on development such as services requirements, equivalent population, location and size of the facilities within each lot, and roads can refine services plans and form a basis for infrastructure and lead-in reticulation.

Further engagement and consultation with Sydney Water will be required in regard to implementing procedures for ongoing maintenance and replacement program is recommended.

Further coordination with the utility authorities will confirm the lead-in infrastructure requirements and routes during the next stages aligns with preferred Master Plan.

8.3 Gas and Telecommunication

The High-Pressure gas supply currently over caters for the demand withing the Precinct. This demand is due to reduce with the loss of some of the larger industrial businesses in the last decade, primarily in the shutdown of the refinery and conversion to a storage terminal. New Low pressure and reduction facilities are required to service the new lower demand buildings such as the residential, mixed use and schools.

Various communication assets are available adjacent to the Precinct with new infrastructure required by Telstra and NBN Co to service the higher data demanding customers.

An increased population density will also require additional mobile towers for greater wireless coverage.