infrastructure & development consulting

North Appin Infrastructure Servicing Strategy

Ingham Property Group

26 June 2023

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Project Number	22-511	**Date**	26 June 2023
Project Name	North Appin Precinct	**Status**	Final
Client	Ingham Property Group	**Revision**	F
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1 Introduction

1.1 Overview

This Planning Proposal has been prepared by Urbis Pty Ltd on behalf of Ingham Property Group (**the proponent**) and seeks to amend *State Environment Environmental Planning Policy (Precincts - Western Parkland City)* (**Precincts SEPP**) for the site located at 345 Appin Road, Appin (**the site**).

The Planning Proposal seeks to rezone the site comprising of approximately 301 hectares of land in the North Appin (part) Precinct which forms part of the Greater Macarthur Growth Area (**GMGA**). The NSW Government Department of Planning and Environment (**DPE**) has identified the site to deliver approximately 3,000 new homes and secure and implement a koala corridor along Ousedale Creek.

To facilitate this outcome, on 2 November 2022 the Planning Secretary, as delegate of the NSW Minister for Planning notified the proponent that under section 3.32(2)(a) of the Environmental Planning and Assessment Act 1979 the site is of environmental planning significance to the Western District of the Western Parkland City and therefore the Planning Secretary has been appointed as the planning proposal authority for the proposed instrument.

In a further media announcement on 2 November 2022, the Minister for Planning and Minister for Homes Anthony Roberts said the Government was fast-tracking the assessment of three large, complex and interrelated proposals as part of the Government's $2.8 billion package to improve housing supply in NSW.

The site is under the single ownership of Ingham Property Group (**IPG**) and forms the majority of the North Appin Precinct allocated by the Greater Macarthur 2022 Plan. As such the site presents an immediate opportunity to deliver 3,000 new homes as part of an integrated and holistically planned precinct.

The intended outcome of this Planning Proposal is to amend *State Environmental Planning Policy (Precincts – Western Parkland City) 2021* (**Precincts SEPP**) with a new Appendix to include the site and rezone the land to the following:

- UD Urban Development
- SP2 Infrastructure
- C2 Conservation.

The proposed amendments will put in place a site-specific planning framework that will support the transition of the site into a new thriving residential community that builds on the NSW government's vision and aspirations established under the Western Sydney Growth Area program and GMGA.

The North Appin Precinct is one of the three critical planning precincts within the GMGA, along with Stage 2 Gilead to the north and Appin (part) Precinct to the south of the site. As part of the NSW Government's $2.8 billion package to improve housing supply in NSW, all three planning proposals are to be assessed by DPE given the complexity and significance of the precincts and

their potential to realise strong housing and environmental outcomes for the state. The North Appin Precinct has been identified as capable of delivering 5,000 new dwellings and a population of 15,000 residents. The site is also strategically located, forming a natural extension of the Appin Township, and is approximately 35km north of Wollongong and 15km south of the Campbelltown-Macarthur Metropolitan Cluster.

The precinct has long been identified as one of the key greenfield planning areas within southwest Sydney suitable for urban development and infrastructure to meet growth and housing supply need. In 2018 DPE published *Greater Macarthur 2040 – An interim plan for the Greater Macarthur Growth Area* (**Interim Plan**) to set a vision for the growth area and provide a framework for land release and urban renewal. Since the release of the Interim Plan, DPE have undertaken further technical studies and consultation with various stakeholders. Most recently in November 2022, DPE released the Greater Macarthur 2040 Structure Plan and Accompanying Guide. The Structure Plan and Accompanying Guide build upon the planning framework set out in the Interim Plan to provide a clear strategic framework to inform the rezoning of land to achieve highly connected and accessible new communities.

In line with the NSW Government's vision for the GMGA, the Planning Proposal will deliver a precinct that:

- Delivers a significant quantum of high-quality housing choices and creates a precinct and community that embodies strong connecting with country principles and reinforces the rural village character of Appin;
- Has a genuine connection to the site's cultural history, natural assets and the existing Appin township;
- Is holistic and supported by access and utility infrastructure, economic investment and a range of suitable local services; and
- Has 30-minute proximity to employment and key centres such as Campbelltown-Macarthur, Wollongong, and Camden; and
- Delivers much needed investment in and upgrades to Appin Road, future public transport projects and social infrastructure.

The vision for the site is to unlock the opportunity the site provides to enable the delivery of high-quality housing choice with a genuine connection to the site's cultural history, natural assets and the existing Appin township. To recognise and respond to the natural significance of the land to create a holistic community supported by access and utility infrastructure, economic investment, and a range of suitable local services.

The planning, design and delivery of the Precinct is to be underpinned by the Government Architect NSW *Connecting with the Country Framework*. IPG has engaged Yerrabingin as Indigenous cultural heritage consultants to identify opportunities to meaningfully implement the Framework through the proposal.

IPG has also engaged a suite of technical experts to guide and inform the preparation of this Planning Proposal to assist in creating a liveable and thriving new community within Greater Macarthur and North Appin.

1.2 Site Description

The land to which this Planning Proposal relates to is 345 Appin Road, Appin. The site is accessed via Appin Road and is located within the North Appin Precinct. It is more broadly situated in the GMGA within southwest Sydney. The majority of the site is located with the Wollondilly local government area (LGA), while a small northwest portion is located in the Campbelltown LGA.

The site is irregular in shape and can be characterised as predominantly cleared pastoral land that has access to significant natural assets and corridors. The key features of the site are summarised in the table below.

Table 1 - Site Description

Feature	Description
Street Address	345 Appin Road, Appin, NSW
Legal Description	Lot 105 in Deposited Plan 1188670
Site Area	Approximately 301 hectares
Site frontage	>1km frontage to Appin Road
Easements and Restrictions	The site is bisected north-south by three utility easements: ▪ Electrical for 66kV/330kV power lines ▪ Water easement for 1,200mm trunk water main ▪ Gas easement containing the Eastern Gas Pipeline.
Site Topography	The site has extensive topography ranging from a large level area along the eastern edge, which then slopes down towards the Nepean River as the site extends west.
Vegetation	The site is largely cleared. However, the periphery along the west is heavily vegetated. The vegetation is comprised of Cumberland Plain Woodland which aligns with the streams and creeks that converge along the site's western boundary and feed into the Nepean River. The remainder of the site is largely unencumbered by Cumberland Plain Woodland.
Bushfire	The site is affected by bushfire, largely associated with the protected Cumberland Plain Conservation corridors to the south and west site boundaries.
Existing Services and Utilities	▪ Potable water: There is an existing 125mm main running along Appin Road as well as the 1,200mm Trility main that burdens the site. ▪ Electrical: There are existing electrical feeds along Appin Road as well as the 66kV/330kV feeder lines that burden the site. ▪ Wastewater: Currently wastewater servicing is available via extension of the existing trunk main located on Appin Road that provides connectivity to the Glenfield wastewater treatment plant. ▪ Telecommunications: 3G & 4G coverage, with sporadic 5G coverage. NBN fibre connectivity is available via the nearest Fibre Access Point at the corner of Armstrong and Appin Roads. ▪ Gas: Gas servicing is yet to be determined.

Hydrology	The overland flow path associated with the 1 in 100 chance per year flood event is largely limited within the watercourse gorges given they are generally deep. The western portion of the site is characterised by creeks and waterways that flow into the Nepean River further to the west.
Heritage	The site is bordered by European Heritage to its west. Specifically, the Upper Canal System associated with the Upper Nepean scheme. The Upper Canal System is listed on the State Heritage Register (No. 1373) and as item I16 under Schedule 5 of the *Wollondilly Local Environment Plan 2011* (**WLEP 2011**). Four extant Aboriginal Heritage sites, registered on the Aboriginal Heritage Information Management System (**AHIMS**) are located to the west and south of the site and are associated with Ousedale Creek.

1.3 Existing Development and Uses

The site is mostly cleared of any built structures. A sealed east-west road traverses through the centre of the site, providing the site with access to Appin Road.

Historically, on the site, Inghams Enterprises ran the largest broiler chicken operation in the southern hemisphere from the 1970's through until the early 2000's. The pads for the poultry sheds and associated structures are still visible through aerial imagery.

Following the decommissioning of the broiler operation, the site was converted into a cattle breeding operation in 2018. Some minor fencing structures associated with the cattle operation can be seen across the site. A number of small farm dams also sporadically characterise some of the eastern portion of the site towards Appin Road.

The western boundary of the site is also partly bounded by the Upper Canal System associated with the Upper Nepean Scheme. The Upper Canal System is of historic significance and is associated with Edward Moriarty and 1880s Sydney Water Supply and Upper Nepean Scheme.

1.4 Site Context

1.4.1 Regional Context

The site is located on the Metropolitan fringe of southwest Sydney, within one of the regions key greenfield planning areas. The majority of the site is located in Wollondilly LGA, with a small north-west portion extending into Campbelltown LGA.

The site is approximately 73km southwest of Sydney CBD and 60km southwest of Parramatta CBD. The site is also in proximity to the Campbelltown-Macarthur Metropolitan Cluster, approximately 15km to the north, as well as approximately 35km south of the Aerotropolis and Western Sydney Airport. The Campbelltown-Macarthur Metropolitan Cluster is developing into one of southwest Sydney's key health and education centres and has the potential to accommodate 31,000 jobs by 2036, while the Aerotropolis is anticipated to provide the potential for 100,000 jobs once fully developed.

Greater Macarthur Growth Area

The GMGA was established in 2019 through an amendment to *State Environmental Planning Policy (Sydney Region Growth Centres) 2006*, now *State Environmental Planning Policy (Precincts – Western Parkland City) 2021*. The Precincts SEPP establishes the strategic framework for the precinct planning and development of southwest Sydney and builds on the northwest and southwest growth areas established in 2006 through the Western Sydney Growth Areas program. The GMGA intends to build on the critical role of the Campbelltown-Macarthur Metropolitan Cluster, by providing new jobs and homes for the residents of southwest Sydney.

The GMGA is divided into 12 precincts, which are being progressively rezoned under the Precincts SEPP to accommodate future urban development, new housing, employment, transport and social infrastructure. The GMGA Structure Plan provides an indicative plan for the how area will evolve and identifies urban capable land, various centres, employment lands, open space and flood affected land.

North Appin Precinct

North Appin is one of the 12 precincts established within the GMGA and is situated in between the Gilead and West Appin Precincts. It is located adjacent to the existing Appin township and will form a natural extension of the town once fully developed. The Precinct is allocated to deliver 5,000 new dwellings (or 15,000 new residents) supported by a local centre, transport connections and open space.

1.4.2 Local Context

The site is largely surrounded by existing rural and agricultural activities, with the Appin township, an existing rural local centre, located to the south. The site is surrounded by the following:

- **North:** Rural and agricultural land, that is bisected by the east-west flowing Mallaty Creek, a tributary of the Nepean River, beyond which is land currently subject to the Gilead Stage 2 rezoning. Approximately 15km further north is the Campbelltown-Macarthur Metropolitan Cluster, a major employment, health and education hub.
- **East:** Appin Road bounds the site to the east and serves as the main connector road for the region. Further east is dense bushland followed by Georges Rives and the Wedderburn Airport.
- **South:** Located to the immediate southwest along the site's boundary is Ousedale Creek, another tributary of the Nepean River. Immediately south along Brian Road is also the Macarthur Motorcycle Complex. Along Appin Road to the immediate southeast is the existing rural Appin township which consists primarily of low-density residential land uses, supported by local retail, business services and Appin Public School. Further south is rural and agricultural land currently subject to the Appin (part) (Precinct) rezoning.
- **West:** The western boundary is partly bounded by the heritage listed water supply infrastructure associated with the Upper Nepean Scheme. Further west is the Nepean River and further agricultural and rural land.

Transport

The key existing transport corridor that services the site is Appin Road. The Planning Proposal contemplates that upgrades to Appin Road will be undertaken such that capacity is available for the orderly development of the site. The site can also be further contextualised through the following proposed future transport corridors:

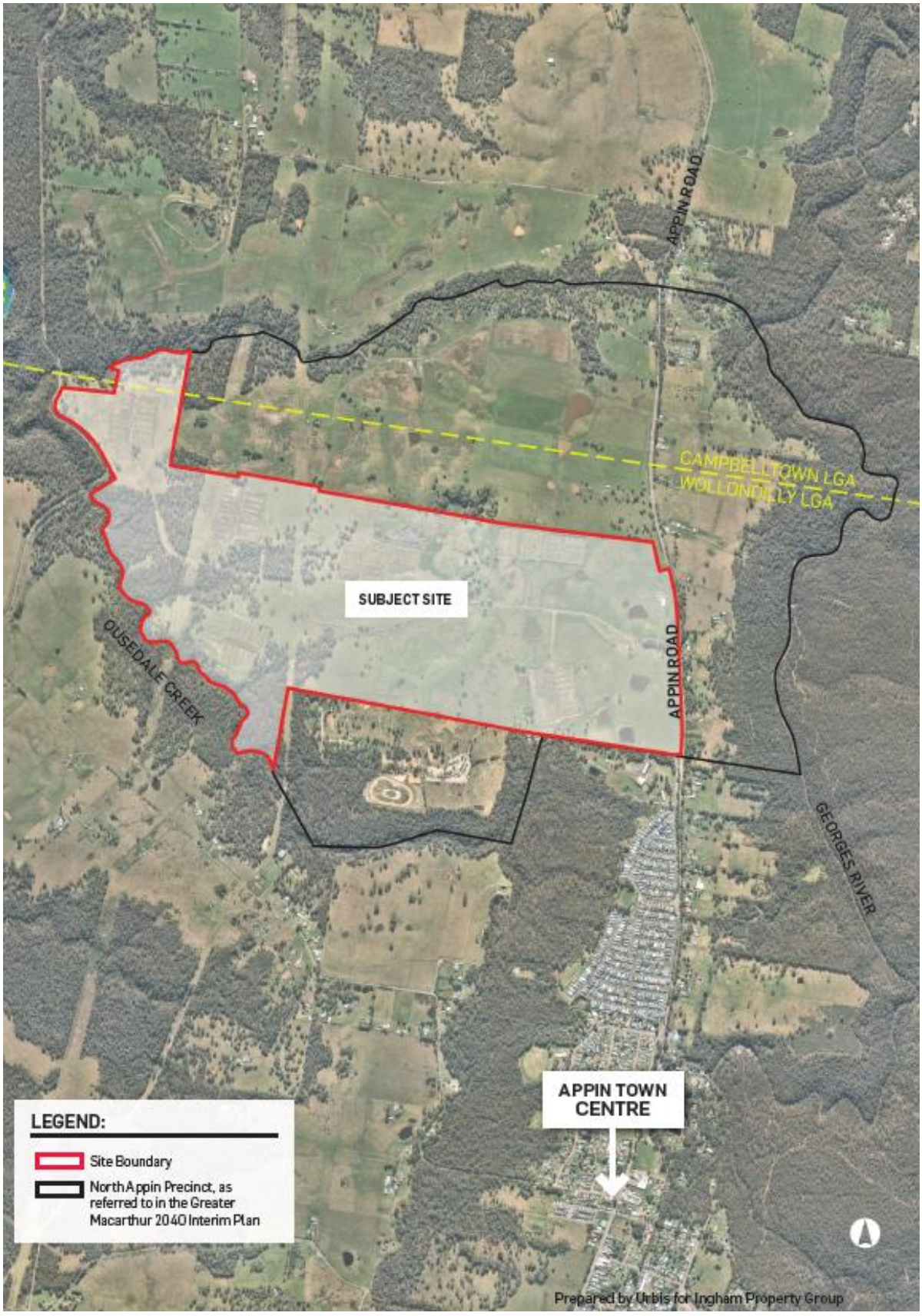
- The Greater Macarthur north-south transport corridor, which will traverse through the centre of the site and could accommodate multi-modal transit.
- The Outer Sydney Orbital (stages 1 & 2), which once developed, will connect the Western Sydney and Illawarra-Shoalhaven region by passing through the GMGA.

Biodiversity

The site and surrounding context are partly characterised by various ecological communities, riparian and biodiversity corridors. Along the south-western site boundary is the Ousedale Creek riparian corridor, which the Cumberland Plain Conservation Plan 2022 (CPCP) identifies as areas of native vegetation for conservation as well as a corridor for the movement of koalas. These areas of native vegetation are partly comprised of Cumberland Plain Woodland.

The site boundary is shown in Figure 1.

Figure 1 - Site Context



1.5 Utilities Servicing Strategy

Infrastructure & Development Consulting (IDC) have been engaged by IPG to prepare a utilities infrastructure servicing strategy to support the proposed rezoning of their development site at North Appin.

This report outlines a potential strategy for the provision of utility services for the site. Specifically, this report will outline:

- Existing services within the vicinity of the site
- Current and planned utility projects
- Implications of the above and potential servicing strategies for the proposed development of the site

1.6 Draft Structure Plan

The subject site will be rezoned to provide a mix of development typologies. The IPG site will provide approximately 3,000 new dwellings as well as a town centre, school, parks and playing fields. The proposed draft structure plan for the North Appin (part) Precinct is shown in Figure 2.

Figure 2 - North Appin Draft Structure Plan

1.7 Development Staging

Based on Urbis' market analysis for this Planning Proposal, it is expected that the annual lot yield will on average be approximately 300 dwellings with non-residential GFA (e.g. local centre) to be delivered at various stages of the development. Using an anticipated rezoning milestone of end of 2023 the following key milestones would apply for Stage 1:

Stage 1 Milestone	Anticipated Date
Development Application Lodged	Q1 2025
Development Application Approved	Q3 2025
Subdivision Works Certificate Approved	Q4 2025
Subdivision Works Complete	Q2 2026
Lots Registered	Q3 2026
Homes Occupied	Q3 2027

From the above it follows that the enabling infrastructure will be required to be completed in time for the lot registration, expected by around Q3 2026. The "base case" growth scenario for the IPG site would therefore be:

Year	Homes Occupied
2027	300
2028	600
2029	900
2030	1,200
2031	1,500
2032	1,800
2033	2,100
2034	2,400
2035	2,700
2036	3,000

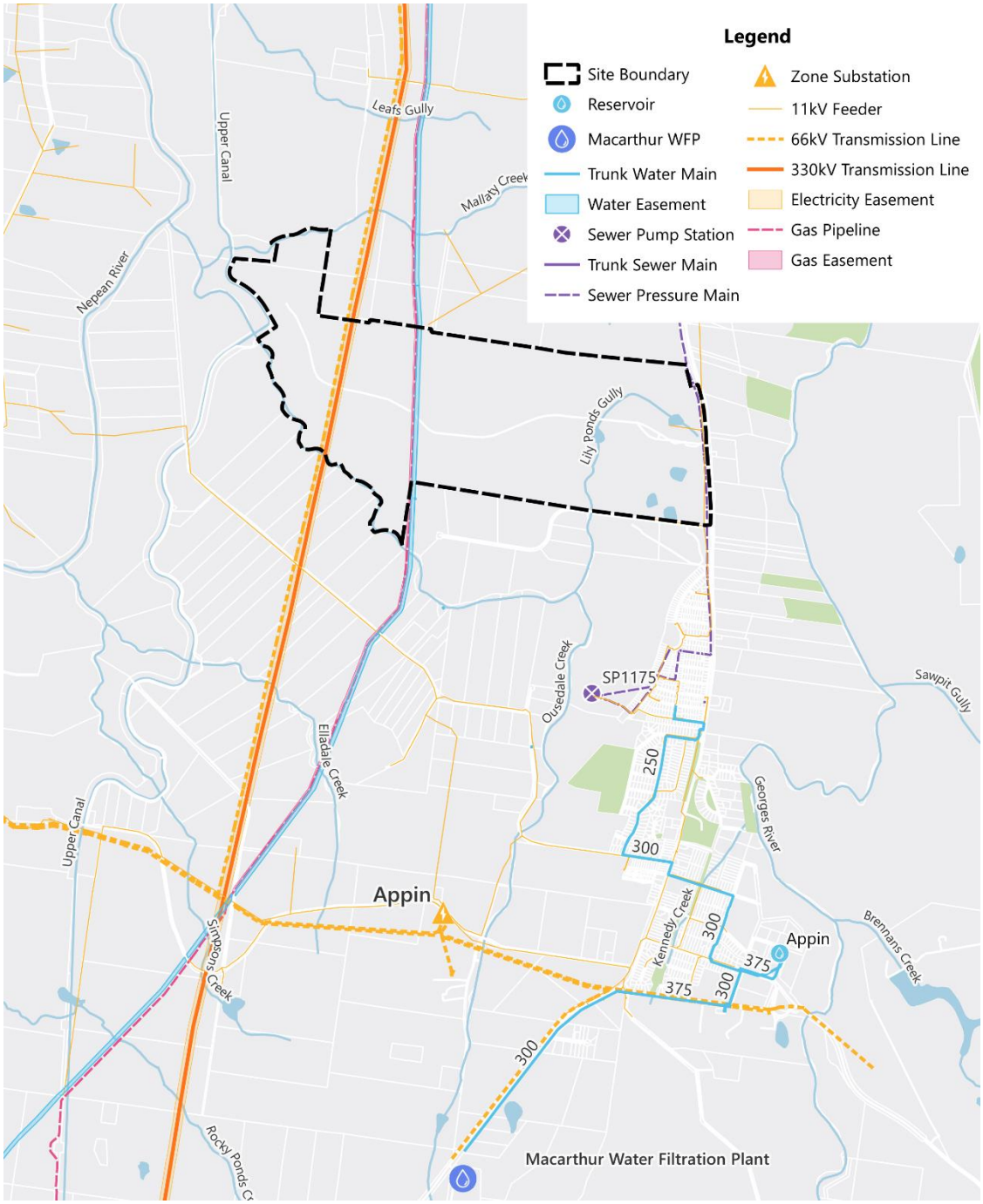
The following infrastructure strategy is based on this growth rate, bearing in mind that there may be other developments occurring during this 10-year period. It is likely that some infrastructure discussed in this report will be sized to cater for development outside of the IPG site, potentially including sites directly to the north and south. This will be agreed with the utility authorities during the concept design phase.

1.8 Existing Services

The existing site contains a number of trunk utility services that will present both opportunities and constraints on the development. The opportunity of connecting to, and using latent capacity in existing trunk services has been explored (i.e. electricity, water and sewer) as well as the affect the numerous utility easements on servicing opportunities and land use impacts.

Figure 3 below shows the existing services on and around the site while a more detailed discussion is provided in the following sections for each service type.

Figure 3 - Existing Services



2 Drinking Water

2.1 Existing Infrastructure

The Greater Macarthur Region receives potable water supply from the Macarthur Water Filtration Plant (WFP), located on Wilton Road, approximately 4.5km south of the site. Raw water is extracted from the Broughton Pass Weir located on the Cataract River and transferred to storage tanks at the WFP via a series of pumps and filters which treat the water during the transfer process. It is understood that Sydney Water are currently in the process of upgrading the Macarthur WFP to improve reliability and support growth in the Wilton & Greater Macarthur area. Sydney Water advice is that these works are due to be completed by 2026.

A 1,200mm diameter trunk water main bisects the site in a north-south direction. This main is owned by TRILITY and leased to Sydney Water. TRILITY operates the Macarthur WFP and associated pipelines and infrastructure. This includes the 1,200mm water main, which extends from the WFP to a connection point with the Sydney Water network at Sugarloaf. The trunk main is located within a 24.4m wide easement.

Existing development within the vicinity of the site is serviced via the Appin Reservoir, located 3km south of the subject site. A 300mm trunk water main extends from the reservoir along Kerr Street to supply dwellings to the north within the existing Appin township. This main is located some distance from the subject site and these services are not suitable to be extended to the site without significant augmentation.

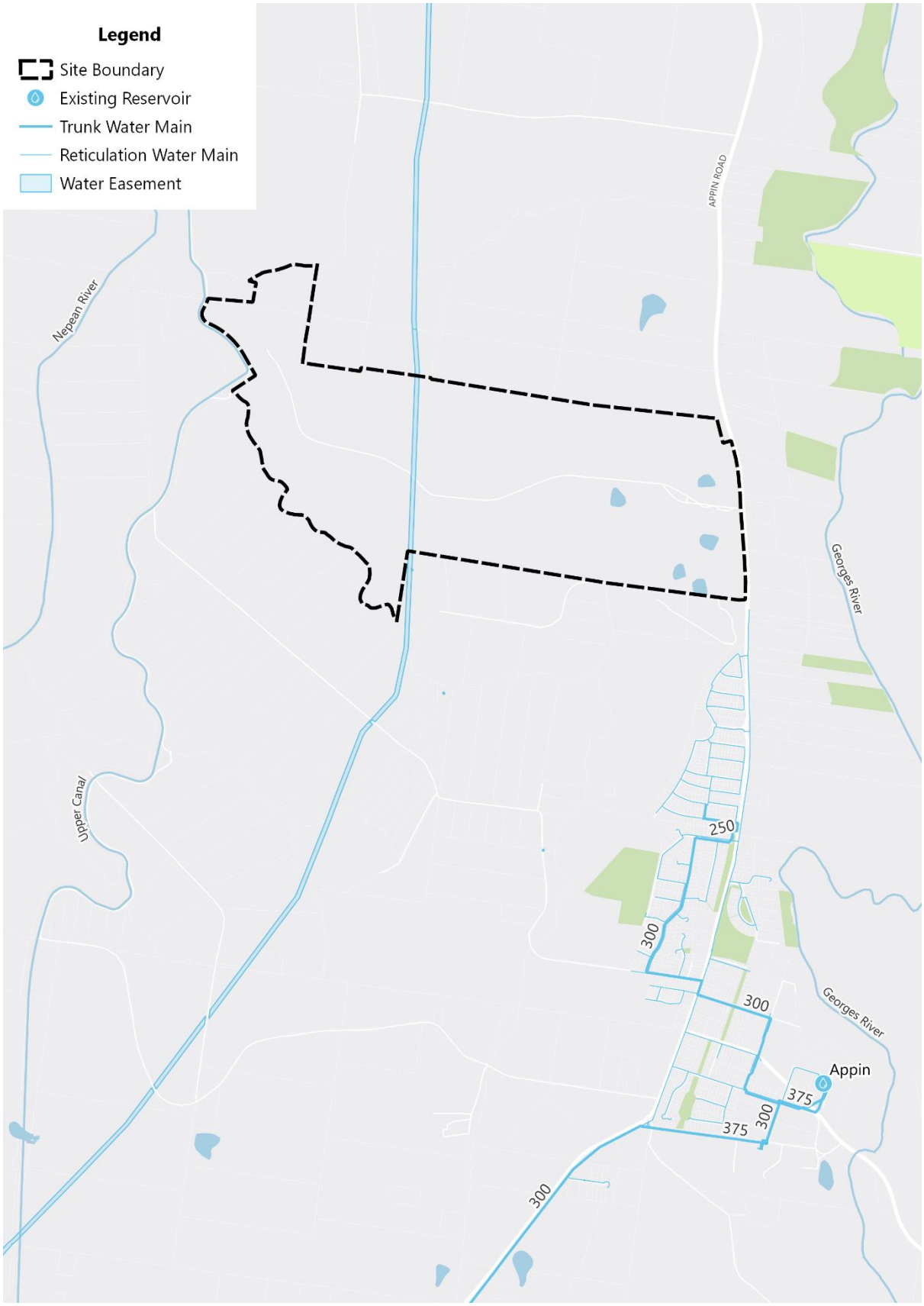
The subject site itself is not currently serviced by the potable water network. A 125mm diameter reticulation main which extends along the eastern verge of Appin Road terminates approximately 50m south of the site's southern-most boundary.

The existing potable water infrastructure within the vicinity of the site is shown in Figure 4.

2.2 Sydney Water Growth Servicing Plan

Sydney Water's 2022 Growth Servicing Plan (GSP) outlines the servicing strategy to support planned growth in Greater Sydney up to 2027. The GSP indicates that infrastructure to support the Appin and North Appin Precincts is in the strategic planning phase, with limited existing trunk capacity available. No date is provided for the delivery of the ultimate trunk infrastructure required to support growth in these precincts.

Figure 4 - Existing Water Infrastructure



2.3 Feasibility Application

A Feasibility Application was lodged with Sydney Water in January 2023 to determine the servicing requirements for the site, a response was received on 23rd March 2023.

The response notes that Sydney Water does not currently service the site. The Appin Water Supply Zone will be augmented to support the proposed development and development in the surrounding area. This augmentation will include construction of new mains and amplification of existing mains, pumps and storage.

Sydney Water are planning two stages of upgrades to the Macarthur WFP. Stage 1 of the upgrades is forecast for delivery by 2025/26 to service the short-term growth in the region. Stage 2 of the upgrade will be dependent on the longer-term servicing options, which are currently being assessed as part of a wider Bulk Water Supply Augmentations study.

Sydney Water notes that the proposed development site is forecast to have potable water servicing from 2028 onwards, and that a water main extension will need to be constructed to supply the site.

2.4 Proposed Servicing Strategy

2.4.1 Recycled Water

At this stage there are no plans for recycled water on site as it will not be available until the Upper Nepean Treatment Plant is operational in around 2031-2032.

To future proof the site and facilitate future reticulated recycled water, we are proposing to construct the purple pipe recycled water reticulation throughout the site with a temporary cross connection to the potable water network.

2.4.2 Drinking Water

A high-level assessment was undertaken using the Water Supply Code of Australia (WSA) to determine the trunk infrastructure requirements to support the proposed development. This involved calculating the peak-hour demand to estimate the likely trunk main size required.

The maximum water demand rates were extracted from the WSA. These rates were used to determine the peak hour demand for each land use type. The results of this assessment are provided in Table 2.

Table 2 - Proposed Water Demand Calculations

Land Use	Max Demand Rate (kL/Unit/Day)	Unit	Peak Demand (L/s)
Low Density Residential (<25 dw/ha)	1.4	Per Dwelling	41.1
Low/Medium Density Residential (>25 dw/ha)	60	Per Net Ha	65.9
K-12 School (Assumed 1,000 Pupils)	0.18	Per Student	4.2
Commercial	41	Per Net Ha	3.1
Ovals	7	Per Ha	0.1
			114.3

Based on the above assessment, a main of approximately 350mm diameter could support the proposed development. Given the uncertainty around the future upgrades to the Macarthur WFP, and Sydney Water's advice that the site may not be serviced until 2028, a temporary reservoir may be required on the site to provide initial potable water supply. A potential location for a reservoir is shown in Figure 6 below that suits the site topography and anticipated staging of development. Delivery timing for this reservoir will be negotiated with Sydney Water.

There is potential that this reservoir may be located permanently on the site to support additional growth beyond the subject site in the future. This may be determined in conjunction with Sydney Water's planning team throughout the anticipated options analysis in future.

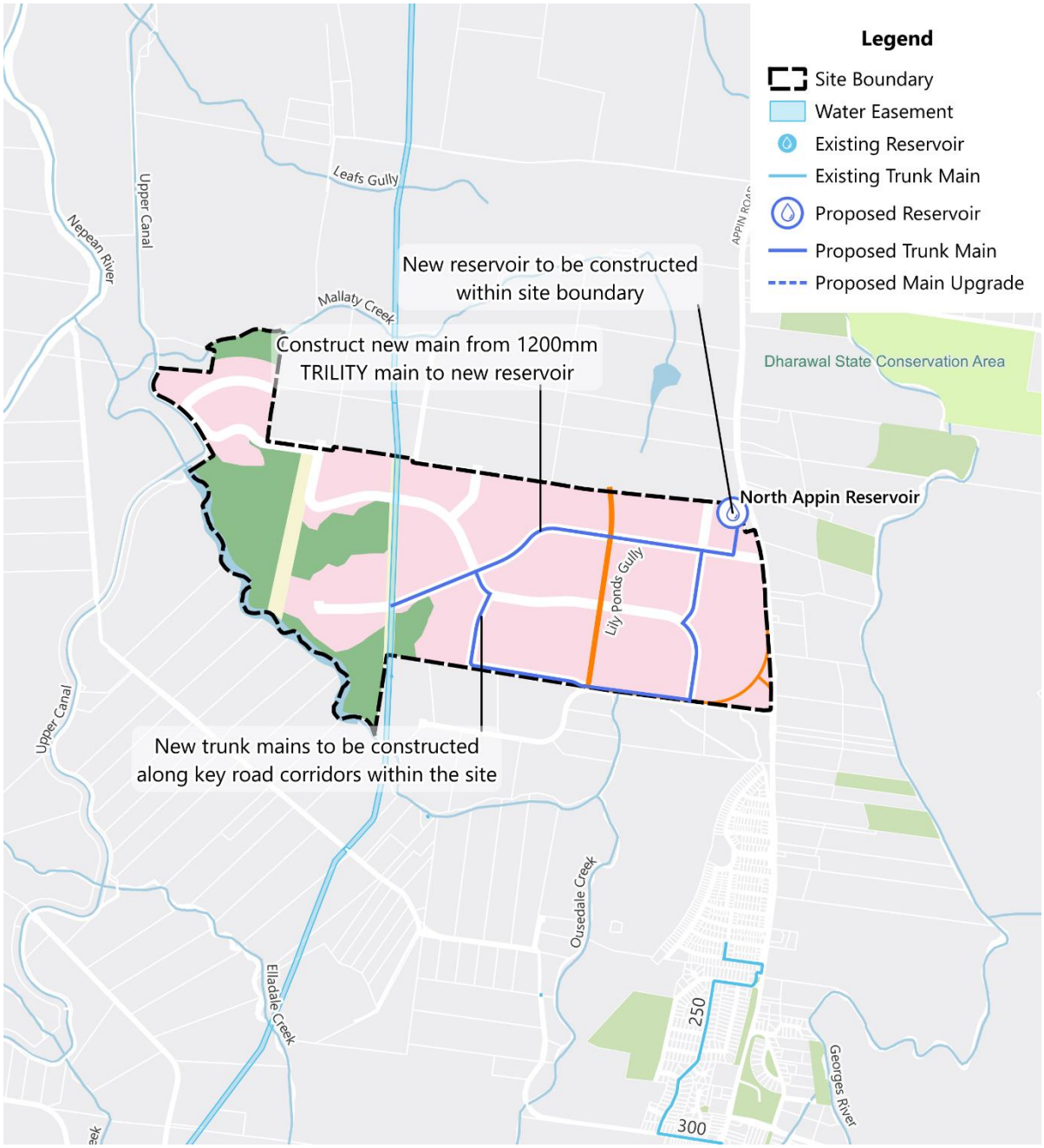
There are several potential options to connect the proposed reservoir to the existing Sydney Water network. Two options are discussed further below.

Option 1 – Connect Reservoir to 1200mm TRILITY Main

To supply the initial stage of development ahead of 2028, the 1200mm trunk main which bisects the site could potentially provide a connection point for the proposed reservoir. A new main would extend from the 1200mm main to the proposed reservoir location in the north east corner of the site. The feasibility of connecting to the TRILITY main will be confirmed with Sydney Water.

New 300-375mm diameter mains would then extend from the reservoir along key road corridors throughout the site to supply the proposed development. This option is shown in Figure 5 below.

Figure 5 - Water Strategy Option 1

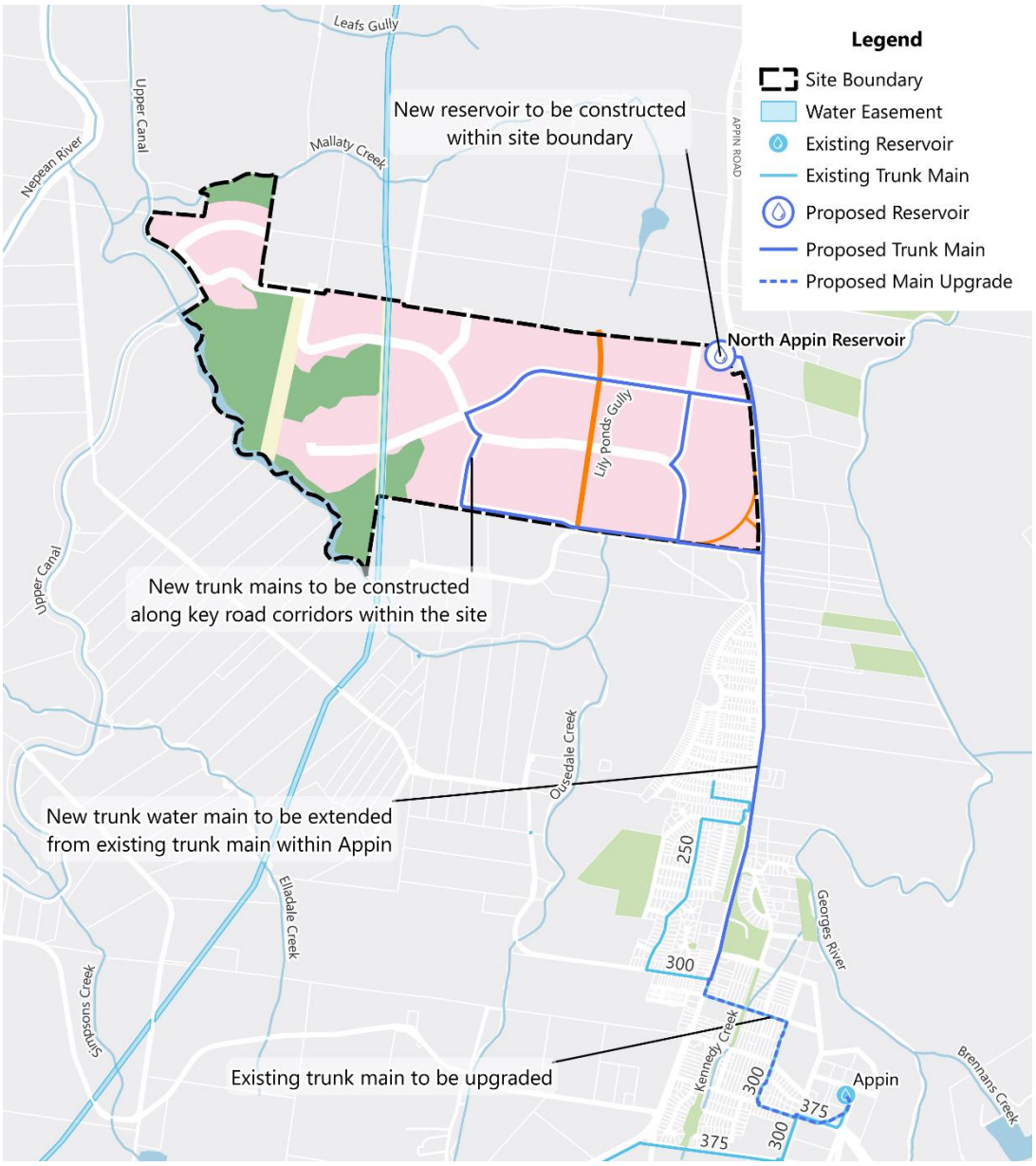


Option 2 – Connect Reservoir to Existing Appin Reservoir

Alternatively, the proposed reservoir could connect to the existing Appin Reservoir via construction of new and upgraded water mains. A new water main would be constructed along Appin Road from the proposed reservoir to the existing trunk main at the intersection of Appin and Macquariedale Roads. The length of existing main from the Macquariedale Road intersection to the Appin Reservoir would be upgraded. Within the site, it is expected that new 300mm - 375mm diameter mains will extend along key road corridors to supply development.

Given the constraints in the network, the proposed reservoir on the site would be topped up during off-peak times to ensure supply for the initial stage of development could be achieved without compromising supply to the existing dwellings connected to the network. This option is shown in Figure 6.

Figure 6 – Water Strategy Option 2



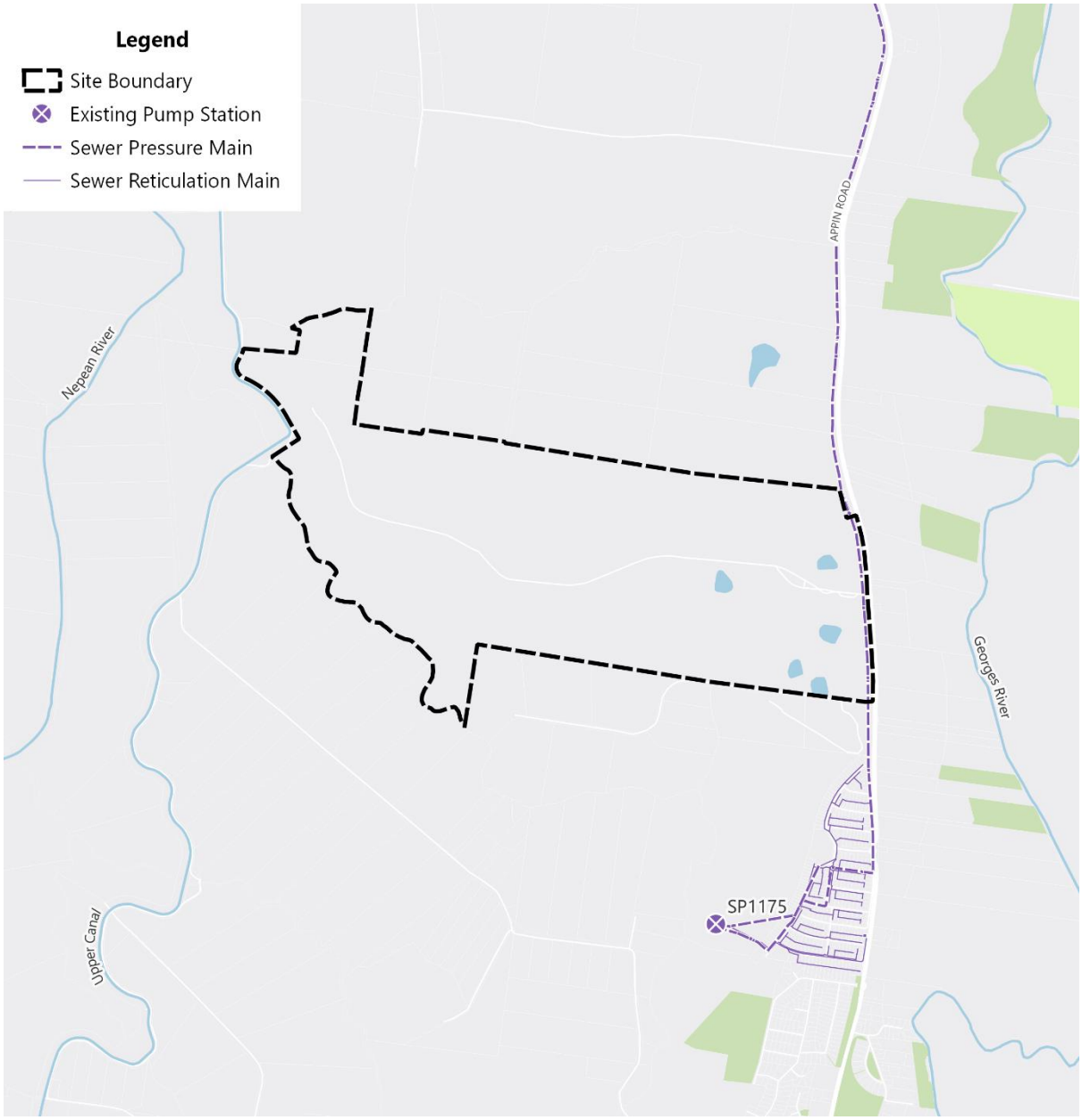
3 Sewer

3.1 Existing Infrastructure

Existing development in the Appin township is serviced by the Glenfield Water Recycling Plant (WRP), located approximately 23km northeast of the subject site. Reticulation sewer drains to a sewer pump station (SP1175), located 1.2km south of the site, where flows are pumped to the Glenfield WRP via Rosemeadow. Sydney Water has previously indicated that there is no spare capacity in SP1175 to service additional dwellings.

The site is not currently serviced by the Sydney Water sewer network. Existing infrastructure within the vicinity of the site is shown in Figure 7.

Figure 7 - Existing Sewer Infrastructure



3.2 Sydney Water Growth Servicing Plan

Sydney Water's GSP indicates that trunk sewer infrastructure to support the Appin and North Appin Precincts is in the strategic planning phase. No date is provided for the delivery of the ultimate trunk infrastructure required to support the planned growth in these precincts.

3.3 Feasibility Application

A Feasibility Application was lodged with Sydney Water in January 2023 to determine the servicing requirements for the site, a response was received on 23rd March 2023.

The response notes that Sydney Water does not currently service the site. The site will be serviced via the Glenfield system in the interim up to 2031. Sydney Water is currently planning for a new treatment plant to support development across the Greater Macarthur Growth Area. The Upper Nepean Advanced Water Recycling Centre (AWRC) is forecast to be online by 2031 to service growth across Appin, subject to further planning and approvals.

3.4 Proposed Servicing Strategy

As mentioned above, Sydney Water are currently planning the Upper Nepean AWRC which will support development across the Greater Macarthur Growth Area. Sydney Water have indicated that in the short to medium term, sewer flows from new dwellings will be treated at the Glenfield WRP. It is unclear what extent of infrastructure upgrades will be required between the proposed rising main and Glenfield WRP but given that this is a combined strategy for all of Greater Macarthur, it is expected that these works will be provided by Sydney Water.

This arrangement is likely to operate for up to 10 years, until the new treatment plant has been commissioned. No location or delivery date has been confirmed for the Upper Nepean AWRC at this stage.

3.4.1 Interim Servicing Strategy

In the interim, sewer flows will be transferred to the Glenfield WRP. As discussed in Section 3.1, there is insufficient capacity in the existing pump station servicing Appin to support future growth in the precinct. New infrastructure will therefore be required to transfer flows from the site to the existing sewer catchment area to the north in Rosemeadow. A number of potential servicing options exist to support development of the site in the short term. These options are described below. These options will be subject to further ongoing discussions with Sydney Water.

Option 1 – Construct infrastructure within site boundary to transfer flows to Glenfield WRP

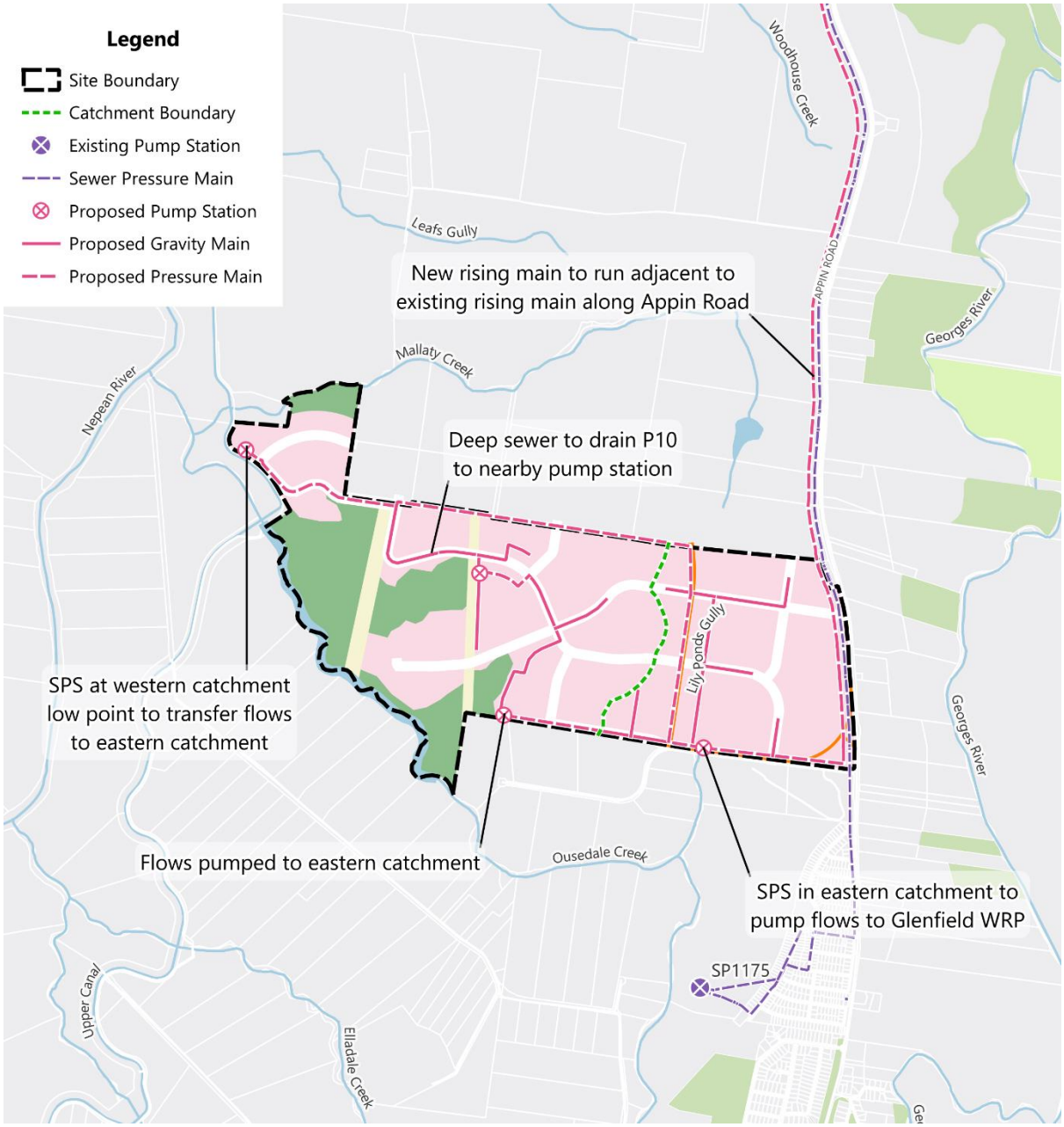
A series of pump stations and rising mains could be constructed within the subject site to transfer flows to the Glenfield WRP. This would include a rising main which could follow a similar alignment to the existing rising main located on the western side of Appin Road to SP0076 behind Lavender Court in St Helens Park. This interim arrangement is likely to operate for up to 10 years. Based on market analysis undertaken by Urbis, this infrastructure would need to treat approximately 10,000 additional dwellings across Greater Macarthur.

The site falls into two main sewer catchments, separated by a crest which runs generally in a north-direction through the site. The eastern catchment drains to Lily Ponds Gully, a tributary of Ousedale Creek. Lily Ponds Gully bisects the catchment in a north-south direction and drains southwards away from the site. The western catchment drains to Ousedale Creek which traverses the western site boundary.

To provide sewer servicing to the site in isolation, four new sewer pump stations will be required. Within the western catchment, a new pump station will be provided at the low point of development in each sub-catchment to transfer flows to the eastern catchment.

Within the eastern catchment, a pump station will be provided at the catchment low point and will transfer flows to the existing sewer infrastructure to the north via a new rising main. This arrangement is shown in Figure 8.

Figure 8 - Proposed Interim Sewer Servicing Strategy



Option 2 – Transfer flows to Glenfield WRP via regional infrastructure

We understand that a Planning Proposal has been lodged for the Appin (Part) Precinct, which is located to the south of the subject site.

There may be opportunities to co-locate a pump station and rising main to transfer flows to the Glenfield WRP. This infrastructure could be sized to cater for both proposed development sites, and would reduce the number of rising mains provided along Appin Road.

Should this option be progressed, the pump station and associated rising main shown within the eastern catchment on Figure 8 would be provided in a location which suits the development

patterns of both the subject site and the Appin (Part) Precinct. This would likely be south of the site, near the existing Appin pump station (SP1175). A suitable location for this infrastructure will be further explored during a subsequent stage of development, through discussions with Sydney Water.

Option 3 – Interim On-Site Package Plant

Alternatively, an on-site packaged wastewater treatment plant run by a third party could also be utilised until the Upper Nepean AWRC is operational. Wastewater is collected from dwellings via reticulation sewer mains and is pumped to a local treatment and water recycling plant.

Biosolids from the plant could be recycled as fertilizer for agricultural pursuits in the Sydney basin and recycled water disposed of on-site via above or below ground irrigation or other re-use scheme.

A high-level analysis was undertaken on the potential land take of an above-ground sewer irrigation system. Based on a recent project undertaken within the Wollondilly LGA, and utilising Sydney Water wastewater generation rates, assumed soil parameters and climate data from the Australian Bureau of Meteorology, we would expect an irrigation area of approximately 640m^2 per dwelling would be required. The parameters used in this assessment are summarised in Table 3.

Table 3 - Irrigation Application Area Parameters

Parameter	Adopted Rate
Persons/dwelling	3.0
Design flow (ADWF)	150L/person/day
Design Irrigation Rate (for medium to heavy clays)	2mm/day
Rainfall runoff factor	1.0
Mean monthly rainfall data	Extracted from Douglas Park Station (68200)
Mean monthly pan evaporation data	Prospect reservoir (067019)

This option could provide a feasible interim servicing strategy for initial stages of development. However given the large land take required, it is unlikely that this option could support development of the whole site.

It should be noted that the required irrigation area is extremely sensitive to the soil type. Should this option be further progressed, detailed on-site soil testing will be conducted in accordance with AS1547 and to the satisfaction of Sydney Water.

As an alternative to irrigation, waste from the plant could be transported via truck to the nearest pump station to convey flows to the Glenfield WRP. An Interim Operating Procedure (IOP) would need to be entered into with Sydney Water for this arrangement. This option may prove more economical from a land efficiency perspective than an on-site irrigation system and can be pursued with Sydney Water as more detailed investigations are undertaken.

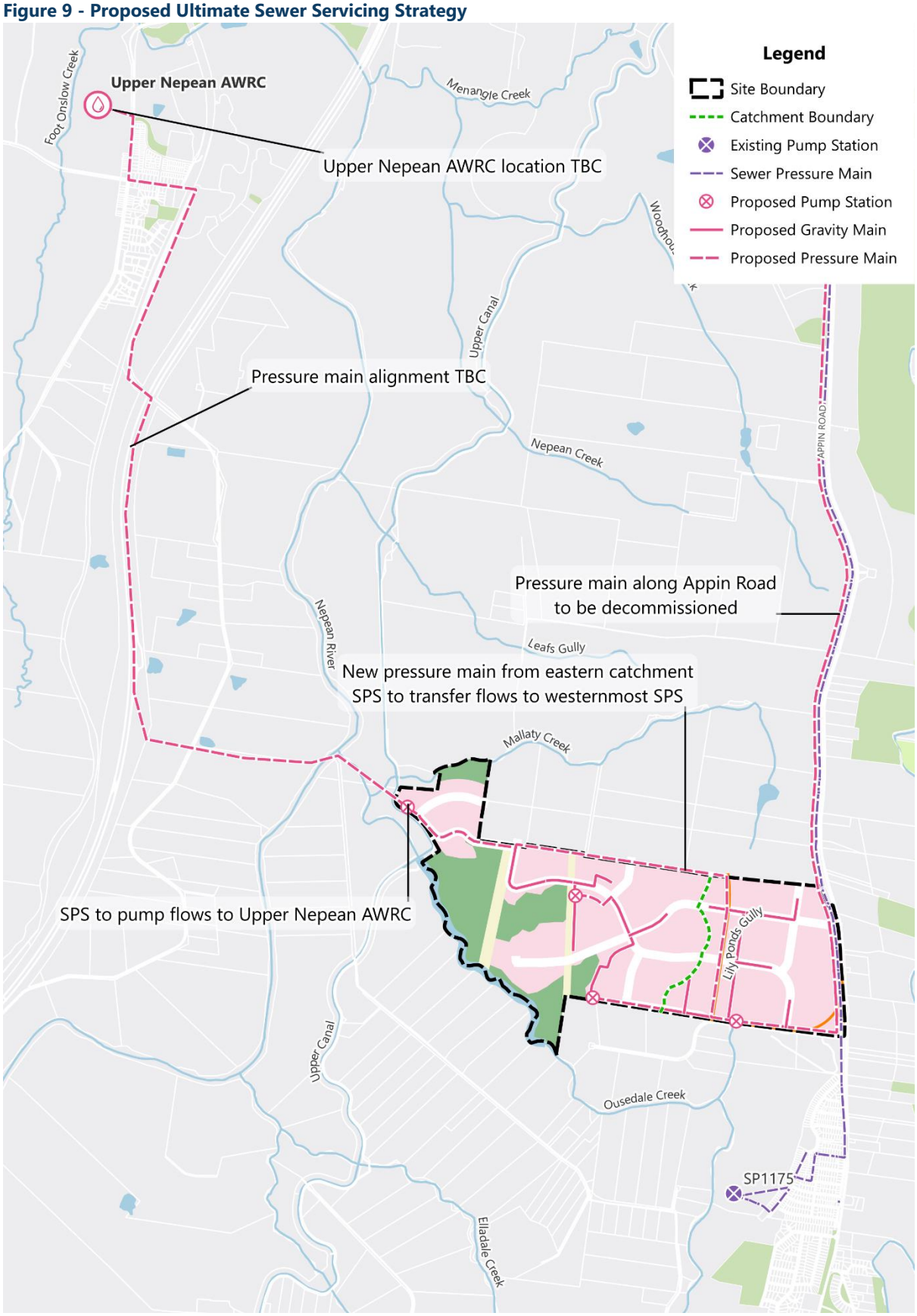
3.4.2 Ultimate Servicing Strategy

Once commissioned, all sewer from the proposed development will be treated at the Upper Nepean AWRC. A location for this infrastructure has not been confirmed at this stage, however for the purpose of this assessment, an indicative location near the Nepean River is shown in Figure 9. Please note this location is indicative only and the final location will be subject to detailed assessment by Sydney Water.

The SPS constructed at the westernmost point of the site will be used to transfer flows to the Upper Nepean AWRC, with a new rising main constructed along a future road corridor linking the site to the Hume Highway to the west, and then following the alignment of the highway. It is expected this rising main would need to cross the rail corridor, depending on the final location of the AWRC. A preferred configuration for this connection will be confirmed by Sydney Water and could be potentially located further to north to support adjacent developments. The eastern catchment pump station will be used to transfer flows to the western catchment. The rising main connecting the eastern catchment SPS to Rosemeadow will be decommissioned.

A potential ultimate servicing arrangement is shown in Figure 9, however it should be noted that the final arrangement will be subject to further discussions with Sydney Water.

Figure 9 - Proposed Ultimate Sewer Servicing Strategy



4 Electricity

4.1 Existing Network

The site is located within the Endeavour Energy (EE) electrical supply zone. The closest zone substation (ZS) to the site is the Appin ZS, located 2.7km to the south which has a firm capacity of 15MVA.

The site is bisected by two transmission lines. a 66kV transmission line, operated by EE, connects the Appin ZS to the Macarthur Bulk Supply Point (BSP), located approximately 9km north of the site. A 330kV transmission line, operated by TransGrid, runs parallel to the 66kV transmission line. These transmission lines are located within a 60m wide easement which runs in a north-south direction through the site.

The existing electrical infrastructure within the vicinity of the site is shown in Figure 10.

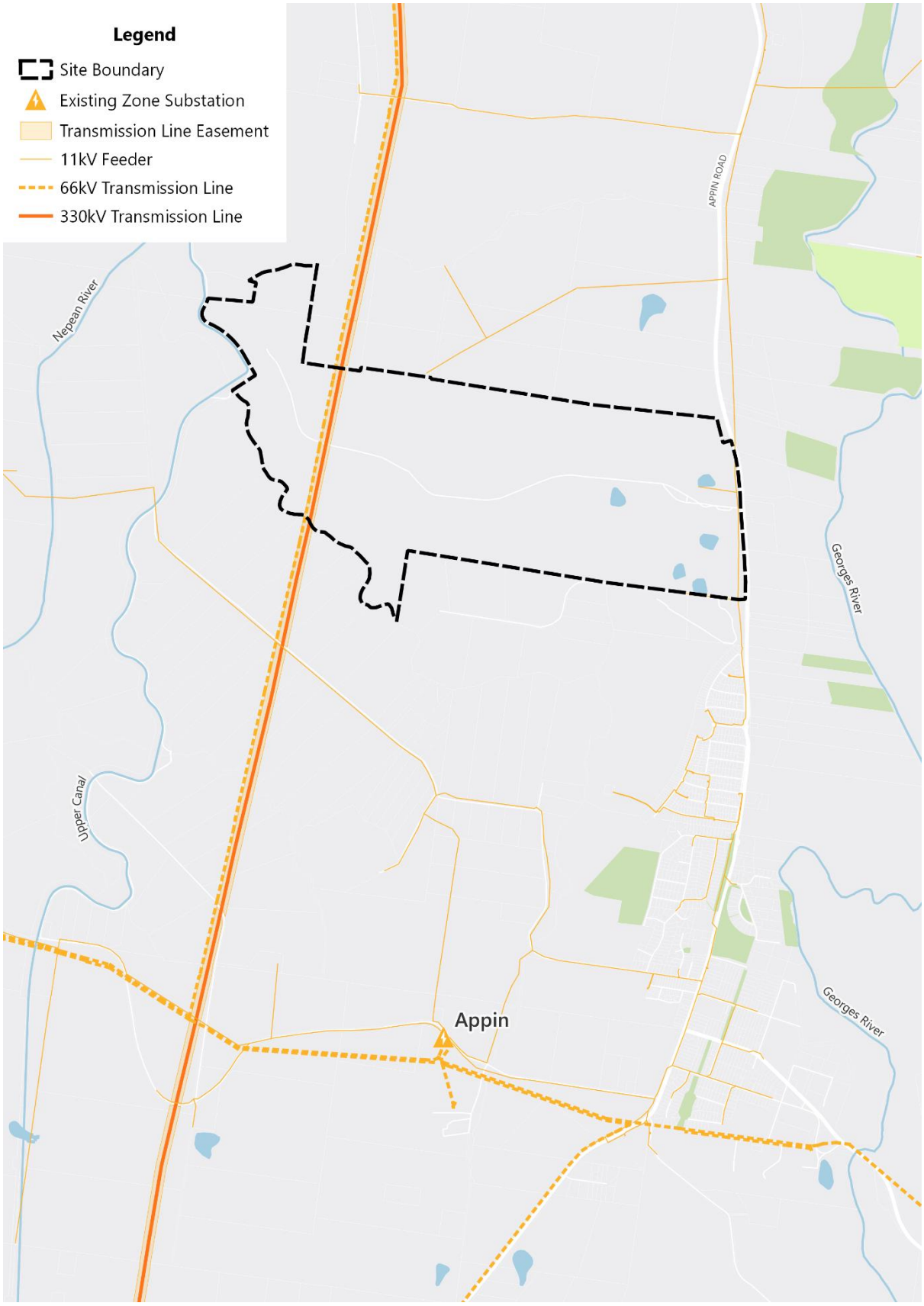
4.2 Growth Servicing Plan

Endeavour Energy's 2018 *Growth Servicing Plan* estimates that development within the GMGA will produce over 60,000 new dwellings with an estimated network demand in excess of 300MVA. Over a five-year period from 2019-2024, EE will invest approximately $33 million on growth projects to ensure continuing connection capacity is available within the growth area. This will include a new ZS at Mt Gilead, which is currently planned for delivery in 2027.

In addition, EE's Distribution Annual Planning Report (DAPR) identifies the need for a new ZS to service residential development within Appin.

The DAPR also notes that EE have initiated discussions with TransGrid to investigate the feasibility of establishing a BSP at Appin to address emerging constraints in EE's 66kV network in the area arising from a need to service substantial new residential developments. The need for a new BSP is not expected to pose a constraint to development.

Figure 10 - Existing Electrical Infrastructure



4.3 Proposed Servicing Strategy

IDC met with EE in December 2022 to discuss the project and the proposed electrical servicing strategy for the site. A Technical Review request was lodged with Endeavour Energy after this meeting, and a response was received on 10th March 2023.

The response notes that the total estimated demand for the development is approximately 18.4MVA, which will ultimately be supplied from four new 11kV feeders. There is currently 2MVA spare capacity on two 11kV feeders which supply the Appin Village to the south of the site, and rural properties to the north. These feeders could supply approximately 350 new dwellings.

The Appin ZS currently has 7.5MVA spare capacity, which could supply up to 1,400 additional dwellings. It should be noted that spare capacity cannot be reserved for future development and this capacity is expected to reduce over time as future developments connect to EE's network.

However, given that development in this area is expected to consist of minor infill development in the Appin Village and potentially the Appin (part) Precinct rezoning, we would expect that some latent capacity will be available for the initial stage/s of North Appin (part) Precinct. Once this limit is reached, a new zone substation will be required.

EE's current plan is to deliver a new zone substation in Appin, to be located to the west of the existing substation that is unsuitable for upgrades. New zone substations will also be delivered in Gilead (Lendlease) and in North Appin. Given that the existing transmission lines run through the subject site, EE consider that the subject site is a suitable location for the North Appin ZS. A possible location for this infrastructure is shown in the Draft Structure Plan.

EE currently own three mobile zone substations that are able to be deployed much faster, albeit with lower capacity than the permanent fixed zone substations. The three mobile zone substations have different ratings suitable for the 33kV, 66kV and 132kV network areas, respectively. The North Appin (part) Precinct is located within the 66kV network area. It is possible that the 66kV mobile zone substation could be used to bridge the gap between initial supply from existing feeders and the permanent zone substation. However, initial feedback from EE is that this mobile zone substation is currently being utilised at Menangle and is therefore unlikely to be available to support the site on an interim basis. We therefore recommend that a permanent zone substation site is pursued.

EE have advised that a 92m x 85m site would be required for an indoor substation, while a 105m x 114m site would be required for an outdoor substation. Both site dimensions include a 10m landscape buffer around the substation infrastructure. The proposed location on the site and the required build type and site dimensions will be confirmed during a subsequent phase of development.

4.4 Proposed Electricity Demand

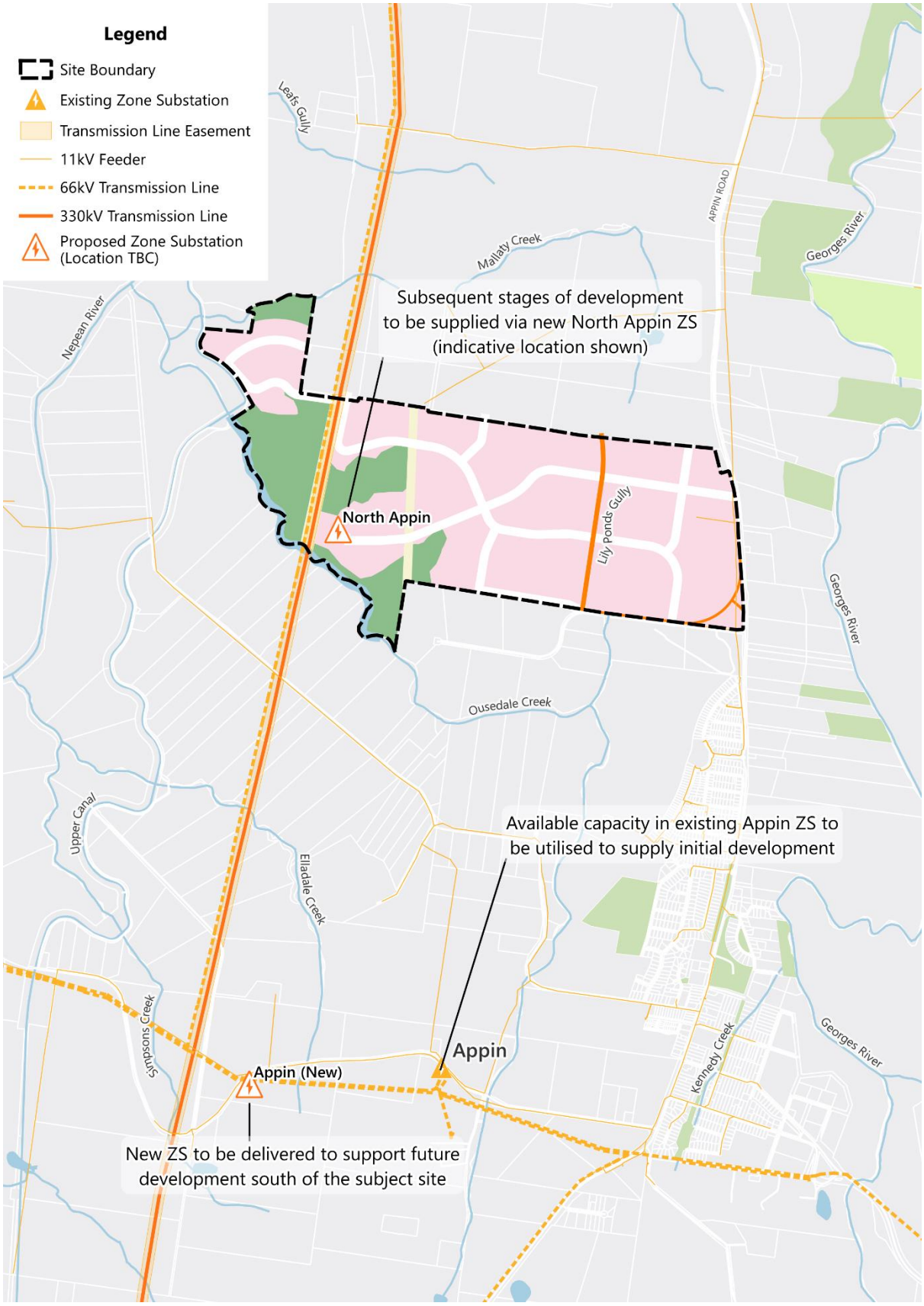
A high-level assessment was undertaken to determine the electrical servicing requirements for the site. The electrical demand generated by the proposed development was calculated using electrical demand rates provided by Endeavour Energy. The results are tabulated below.

Land Use	Indicative Dwellings/GFA	Load/Unit (VA)	Diversified Load (MVA)
Low/Medium Density (Lots>350m^2)	2,006	5,000	10.0
Low Density (Lots<350m^2)	1,125	6,500	7.3
School	10,000	85	0.7
Commercial	5,000	100	0.4
Total		**Total**	**18.4**

Based on the assumption that a single 11kV feeder can supply approximately 5MVA, the proposed development would likely require 4 x 11kV feeders to supply all development over time. These feeders will likely originate from the new ZS planned for the site, however there may be opportunities to utilise available capacity in existing feeders, to bring feeders from nearby substations should they be delivered ahead of development, or to construct new feeders from the existing Appin ZS to support initial stages of development.

It is also important to note that we would usually expect a new zone substation to be able to support around 10,000 homes. This facility will be able to be used as an enabler for surrounding development in Greater Macarthur to leverage power supply.

Figure 11 - Proposed Electrical Servicing Strategy



5 Gas

5.1 High Pressure Gas Pipeline

The site is bisected by the Moomba to Sydney Ethane Pipeline, which is owned and operated by APA. The high-pressure transmission pipeline operates at 10MPA and has a minimum easement width of 6m, however the pipeline sits within a 20m easement corridor which allows for an additional pipeline to be constructed in future where required.

The Moomba to Sydney Ethane Pipeline has an associated Measurement Length (ML) of 600m. The ML is the area of consequence in the extremely unlikely event of a full-bore rupture plus the gas being ignited. Any sensitive land uses within the ML will trigger the requirement for a Safety Management Study (SMS), which assess the risks of the pipeline to any proposed development.

Sensitive land uses include aged care facilities, retirement villages, childcare centres, schools, hospitals, cinemas, prisons and corrective institutions, places of worship and higher density residential uses (above 50 dwellings per hectare). APA's preference is for sensitive land uses to be located outside the ML.

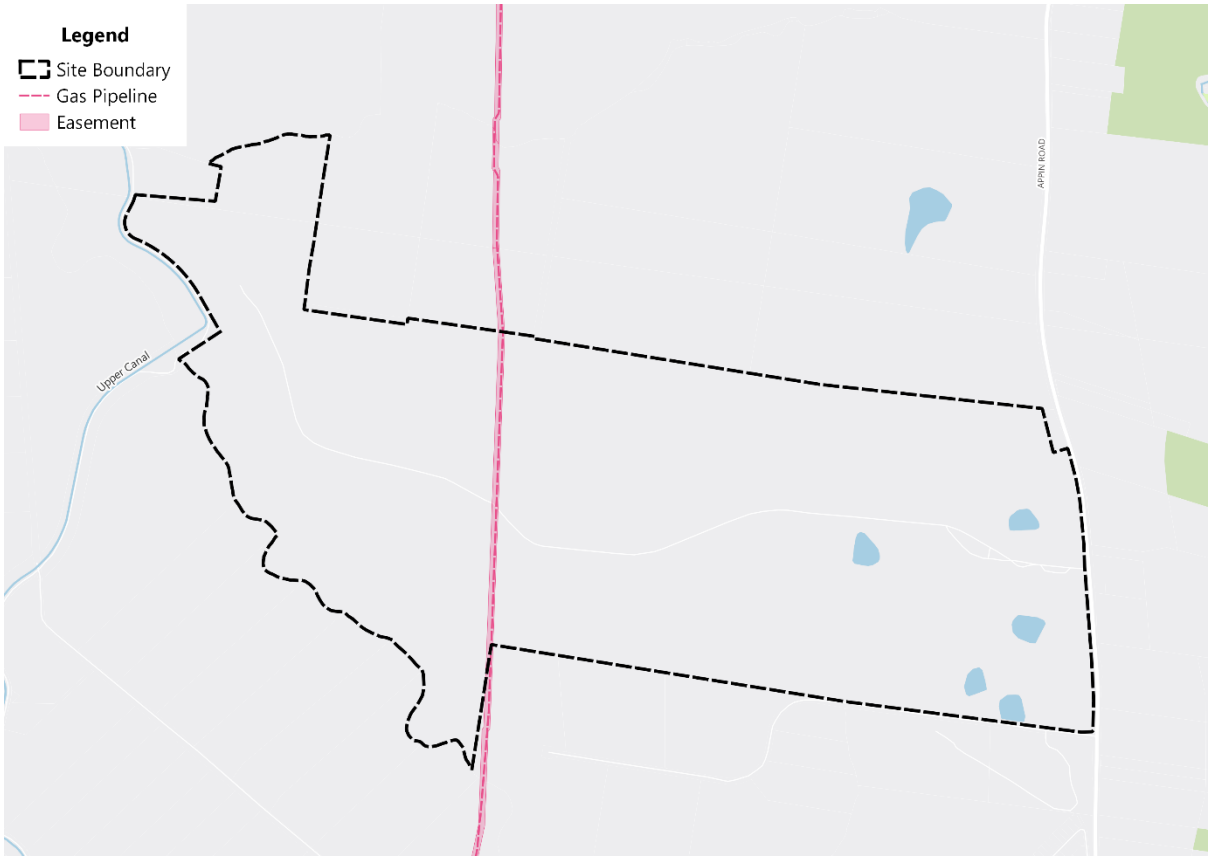
The proposed school and town centre is not located within the pipeline ML, however given the scale of the development and the land use change from rural to residential, an SMS will likely be required for the site. The SMS would be completed during the next phase of the project.

APA's *Site Planning and Landscape National Guidelines* note that APA's preferred position is for easements to be utilised as linear green spaces which ultimately become council public reserves and open spaces.

Within the site boundary, the Draft Structure Plan includes a linear landscape reserve which runs the full length of the gas pipeline easement. The linear park will include an active transport connection which extends across the North Appin (part) Precinct. One crossing of the gas pipeline is proposed to provide a connection to the development parcel in the north west corner of the site. This crossing will include all utilities infrastructure required to support this development.

Future detailed design of the linear park will be in accordance with the *Site Planning and Landscape National Guidelines*. The location of the gas pipeline and associated easement are shown in Figure 12.

Figure 12 - Gas Pipeline & Easement



5.2 Reticulation Gas

The site is not currently serviced by the Jemena natural gas network. Gas infrastructure supplies dwellings to the south of the site, within the existing Appin township. Should the site require gas infrastructure, Jemena will support the demand generated by development as required. Generally, there will be little demand for gas infrastructure generated by non-residential development.

Should gas be required for the proposed residential development, it is likely trunk infrastructure will be extended from existing infrastructure within Appin to the site. The gas servicing requirements for the site will be confirmed by Jemena.

6 Telecommunications

6.1 Telstra Optic Fibre

Telstra operate a major Sydney to Melbourne optic fibre cable which is located within the eastern side verge of Appin Road. This cable forms part of Telstra's high integrity fibre network and is of significant value and importance.

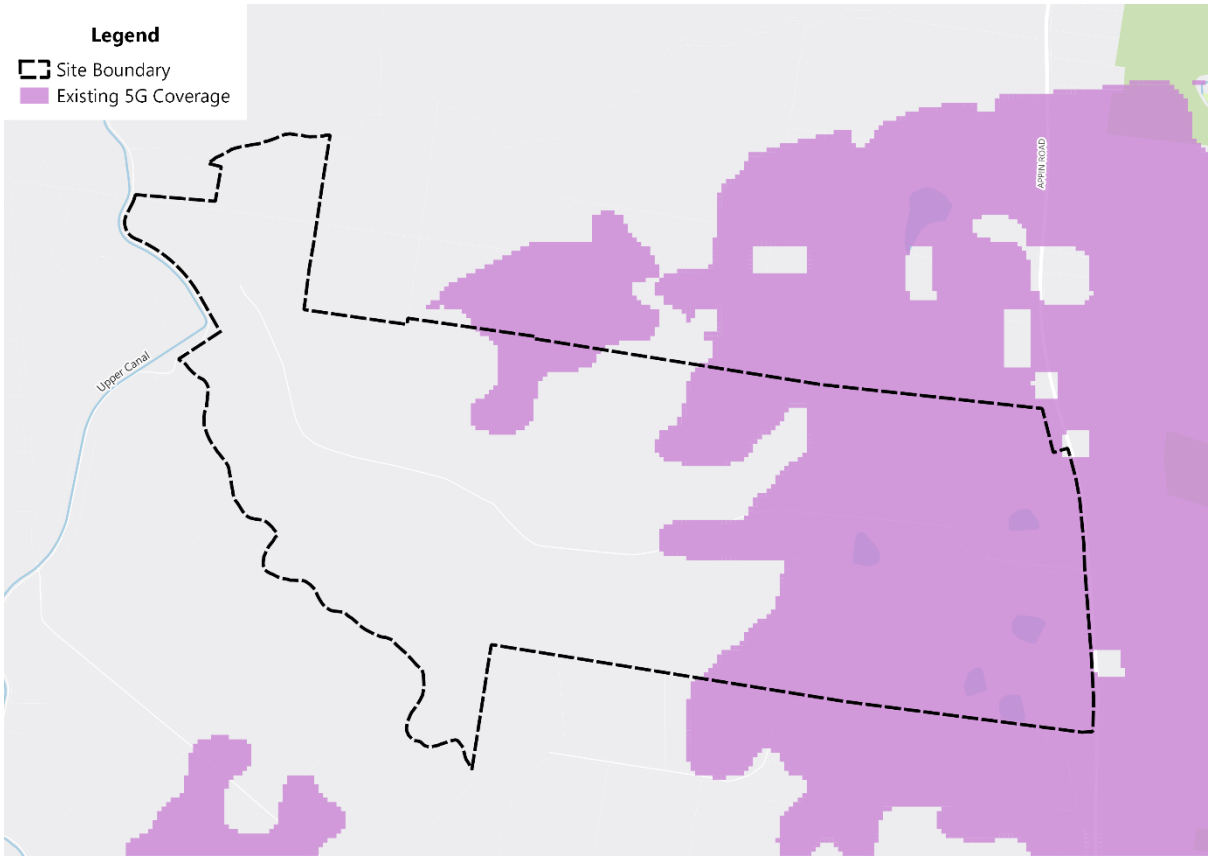
Whilst it is unlikely that the site would be serviced from this infrastructure, it may need to be relocated when Appin Road is widened to provide two travel lanes in each direction. Should the cable be relocated, the entire length of cable would need to be replaced between existing joints, which are typically located at 5km intervals. It would therefore be prudent, should IPG be responsible for delivery of any part of the upgrade of Appin Road, to explore opportunities for cost sharing of these works, or the inclusion of works in kind credits.

6.2 Telstra 5G Network

Telstra have existing blanket 4G coverage across the site. The progressive roll-out of Telstra's 5G network has commenced across the GMGA. The eastern areas of the site, nearest Appin Road, can already access 5G coverage while areas in the west are not currently serviced by the network.

Figure 13 shows the existing 5G network coverage. Future infrastructure rollout across the GMGA will be staged to match the pace of development. It is expected that 5G network coverage will extend across the entire site and North Appin Precinct over time.

Figure 13 – Existing 5G Coverage



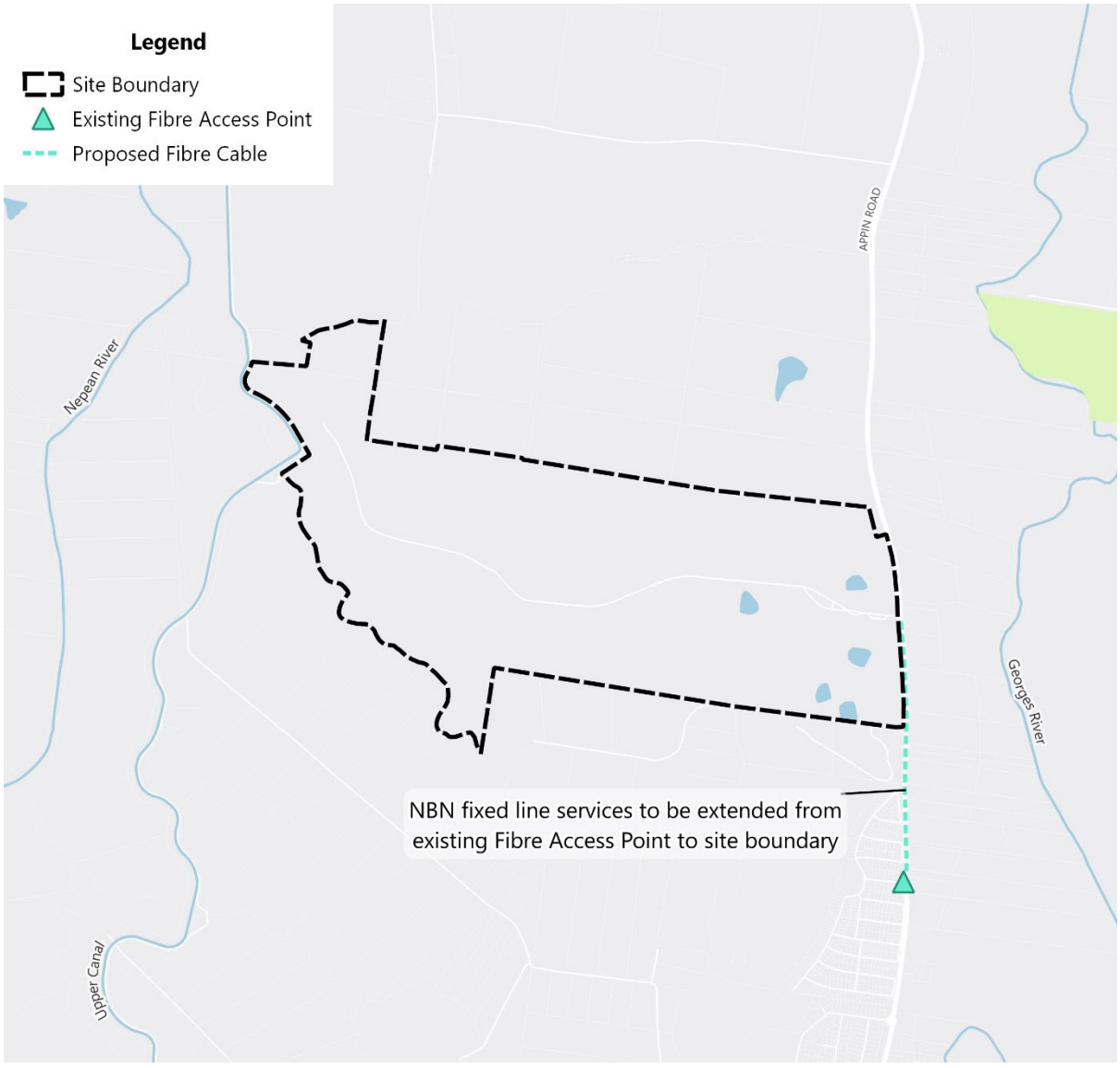
6.3 NBN

The site is currently serviced by a mix of NBN fixed wireless and satellite technology. Fixed wireless technology utilises transmission towers, which can be located up to 14km away from a premises, to transmit data to a rooftop antenna. This technology is generally deployed in rural areas with large distances between residential dwellings.

Existing dwellings within the Appin township utilise fixed line NBN services. The site is located approximately 300m from NBN's fixed line footprint and is 750m from the nearest Fibre Access Point (FAP) at the corner of Armstrong and Appin Roads. It is likely that a lead-in service will be required to be brought to the site from this point (refer Figure 14).

NBN Co. policy requires developers to provide pit and pipe infrastructure within their standard road reserve allocation for all subdivisions. The NBN reticulation will likely follow the road patterns for each stage of development.

Figure 14 - Proposed NBN Infrastructure



7 Summary of Infrastructure Requirements

The trunk infrastructure requirements for the North Appin (part) Precinct as discussed in the previous sections of this report are summarised in the table below and shown in Figure 15.

Table 4 - North Appin (Part) Precinct Utility Requirements

Utility	Item	Delivery Timing
Water	New Reservoir	A temporary reservoir may be required to support initial stages of development, ahead of Sydney Water completing upgrades to the Macarthur WFP.
Sewer	New Gravity Mains, SPS and Pressure Mains	Connection to the existing sewer network at Rosemeadow via new gravity mains, pump stations and pressure mains to be delivered at start of development.
	New Pressure Mains	Connection to future Upper Nepean AWRC via new pressure mains to transfer flows from the site to the west to be delivered once the new AWRC is operational (circa 2031).
Electricity	New Zone Substation	New ZS on the site to be delivered once capacity at Appin ZS has been exhausted.
	4 x 11kV Feeders	Four new feeders from either the existing Appin ZS (subject to available capacity) or new North Appin ZS to supply development.
Gas	Gas Pipeline	Gas pipeline to be retained in green corridor. Two road crossings over easement to be provided, with reticulation infrastructure to be co-located with new roads.
Telecommunications	NBN Infrastructure	Subject to confirmation by NBN Co., fixed line infrastructure will be extended to the site from the existing Fibre Access Point
	Telstra 5G Network	It is anticipated Telstra's 5G network rollout will continue across the site as development progresses.

Figure 15 - Proposed Utilities Servicing Strategy