Cherrybrook Town Centre Masterplan
Grimshaw Architects Pty LTD
29-May-2015

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Cherrybrook Gateway Rezoning

Infrastructure Capacity Assessment

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Infrastructure Capacity Assessment

Client: Grimshaw Architects Pty LTD

ABN: N/A

Prepared by

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Quality Information

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Revision	Revision Date	Details	Authorised	
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Executive Summary

This report has been commissioned by Grimshaw Architects on behalf of the Cherrybrook Landowners Group and Toplace Pty Ltd and presents an assessment of services infrastructure requirements for the proposed development of land holdings owned by the Cherrybrook Landowners Group.

In producing this report AECOM has reviewed the following services;

- Potable Water – Sydney Water
- Sewer – Sydney Water
- Electricity – Endeavour Energy
- Gas – Jemena
- Communications – NBN
- Stormwater

AECOM has previously undertaken a preliminary analysis of the utility demands based on residential growth development projections provided by Grimshaw Architects in June 2014. Since this assessment the scale of the development has changed and revised demands have been calculated based on the apartment numbers provided on 13th May 2015. These apartment numbers have been translated into revised utility demand estimates and have formed the basis for revised feasibility applications to each utility authority listed above. The total number of units has decreased since the last development update which deems the previous utility assessments still feasible. Updates have been undertaken for some providers but the feedback is analogous to the past assessments.

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1.0 Introduction

1.1 Project Description

This report has been commissioned by Grimshaw Architects on behalf of the Cherrybrook Landowners Group and presents an assessment of services infrastructure requirements for the proposed development of land holdings owned by the Cherrybrook Landowners Group.

The Cherrybrook Landowners Group is a collective of landowners within a precinct bounded by Castle Hill Road, Glenhaven Road and Highs Road in Cherrybrook. The precinct is located opposite to the proposed Cherrybrook Railway Station.

As part of the planning for the North West Rail Link, Transport for NSW and NSW Planning have undertaken Structure Planning studies for each of the proposed stations, including Cherrybrook Station. The Structure Plans identify land suitable for rezoning and redevelopment to increase population densities in the vicinity of these new stations.

The Cherrybrook Station Structure Plan (Transport for NSW and NSW Planning – September 2013) identifies a large precinct opposite the station for potential medium density development. The land owned by the Cherrybrook Landowners Group is located within this precinct and is currently instigating a rezoning application through The Hills Shire Council for their land.

Figure 1 identifies the precinct identified for potential medium density development.

Table 1 identifies the address and lot details of the land holdings to be developed and summarises the projected residential growth presently proposed as received from Grimshaw Architects (27 May 2015). It is anticipated that the developments will be constructed between 2017 and 2021.

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Figure 1: Site locality map and proposed development plan

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Table 1 Projected Residential Growth to be Delivered (Based on Grimshaw Architects February 2015)

Stage	Address	Building Number	Proposed Approximate GFA m^2	Proposed Units
1A	2 Glenhope	1	25,625	315
	4 Glenhope	2		
1B	1 Glenhope	3	26,357	324
	5+7 Glenhope	4		
2A	125 Castle Hill	5	63,697	783
	131 Castle Hill, 18a	6		
	123 Castle Hill	7		
	9 Glenhope	8		
	11 Glenhope	9		
	17-19 Carioca	10		
2B	127+129 Castle Hill	11	51,169	629
	18 Carioca	12		
	3+5 Matthew	13		
	Woodleaf	14		
	16 Carioca	15		
	Glenhope	16		
	115A-B Castle Hill	17		
3A	Matthew Sites	18	30,913	380
	15 Matthew	19		
	141B, 143B, 145A Castle Hill	20		
3B	145B Castle Hill	21	28,635	352
4	6-8B Highs	22	55,481	682
	133 Castle Hill	23		
	6-8A Highs	24		
	135, 137 Castle Hill	25		
	Carioca	26		
	1 Matthew	27		
	109 Castle Hill	28		
TOTAL			**281,877**	**3465**

1.2 Objectives of the Report

The objectives of this report are to:

- Identify and document the existing Service Authority's infrastructure available to the site, consisting of:
  - Potable Water (Sydney Water);
  - Sewer (Sydney Water);
  - Electricity (Endeavour Energy);
  - Gas (Jemena);
  - Communications (NBN Co); and
  - Stormwater

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- Identify potential service clashes with the proposed development and recommend measures to mitigate the impacts through diversion, protection or augmentation of alternative routes.
- Undertake an assessment of the proposed development and its associated Service demands.
- Liaise with each Service Authority, communicating the estimated demands to gather an understanding of the existing service capacity and assess the required infrastructure upgrades to support the development.
- Provide a concept service reticulation plan

1.3 Project Inputs

The findings of this report are based on the following inputs:

1) Residential growth development projections provided by Grimshaw Architects (dated 27th May 2015) (see Table 1).
2) Proposed development plan provided by Grimshaw Architects (see Figure 1).
3) Dial Before You Dig (DBYD) applications (dated 17th February 2015) with responses received from the following utility organisations:
    a) Endeavour Energy & Ausgrid;
    b) Sydney Water;
    c) Optus, PIPE Networks, and Telstra; and
    d) Jemena.
4) Consultation with Service Authorities as documented in Appendix A.

1.4 Report Assumptions

The following provides a list of assumptions made in the preparation of this report:

- No provision for flood mitigation infrastructure has been considered in this report.
- In order to account for variation in usage across the development, a diversity factor is generally applied to most utilities covered by this assessment. The diversity factors commonly applied vary depending upon the utility type and the potential reduction due to the variation in peak demand. Consideration of this factor has not been included for the purpose of this assessment as this is usually defined by the Utility provider in detailed design stages.
- Existing 132kV overhead transmission line to the eastern boundary of the site does not impact the feasibility of the development and as such does not require relocation works.
- It is noted that a number of ESD targets has been identified in a separate report undertaken by Arup. The implementation and impact of the ESD targets on the estimated demands should be considered further as the development progresses.

2.0 Consultation with Service Providers

As part of the services infrastructure assessment, AECOM has consulted with relevant services authorities regarding the capacity of existing services infrastructure to supply the precinct and potential augmentation requirements based on the previous development scenario. An informal record of this consultation is provided in Appendix A. Outcomes are discussed in more detail in Sections 3.0 to 7.0.

Revised feasibility applications have been submitted to each Utility Authority and this report will be updated based on the revised advice.

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3.0 Potable Water

Sydney Water is the service authority responsible for the operation and maintenance of the existing local potable water infrastructure within the Cherrybrook precinct. The precinct is located within Sydney Water's West Pennant Hills Water Supply Zone.

3.1 Existing Infrastructure

Based on the results of the DBYD application, the precinct is currently serviced by an Ø250mm Cast Iron Cement Lined (CICL) trunk water main along the southern side of Castle Hill Road, and through the northern end of Highs Road which borders the western edge of the proposed development. This feeds an Ø100mm CICL water main along the eastern side of Glenhope Road; Ø100mm Ductile Iron Cement Lined (DICL) water main along Carioca Way; and an Ø100mm DICL water main along the eastern side of Staley Circuit. Properties fronting Matthew Way appear to be currently serviced by Ø250mm DICL water main along the northern side of Matthew Way.

In addition to the above infrastructure, there is an Ø500mm CICL trunk water main that runs within the precinct, parallel to its southern border.

The Cherrybrook area is not currently serviced by a recycled water network.

A feasibility application was submitted to Sydney Water for the previous development scenario and a response was received on the 4th August 2014. A revised feasibility application has been prepared and submitted to Sydney Water for the new development scenario.

3.2 Demand Assessment

Design demand estimates for the proposed residential development has been calculated based on *Design Criteria Guidelines Supplement for Single Reticulation System* (Water Supply Code of Australia WSA03-2011-3.1 Sydney Water, 2012). The design criteria are based on maximum daily demand and include allowance for top-up of rainwater tanks. For high density multi-unit type development the design demand rates do not include allowance for irrigation of the surrounding landscape.

Table 2 lists the adopted water demand unit rates from this code.

Table 2 Water demand unit rates (WSA 03-2011-3.1 Table SW 2.1 and SW 2.2)

Adopted WSA 03-2011-3.1 Zoning Category	Maximum Day Potable Water Demand	Unit
Multi-unit (30-60 units/net ha)	1.35	kL/unit/day
Multi-unit (61-100 units/net ha)	1.09	kL/unit/day
Multi-unit (101–140 units/net ha)	0.88	kL/unit/day
Multi-unit (>140 units/net ha)	0.8	kL/unit/day

Table 3 presents the estimated maximum daily potable water demand for each site.

Table 3 Estimated maximum daily potable water demand

Stage	Proposed Estimated Demand kL/day
1A	252.0
1B	259.2
2A	628.8
2B	526.1
3A	308.9

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Stage	Proposed Estimated Demand kL/day
3B	281.6
4	554.2
TOTAL	**2810.9**

It should be noted that the design of water main upgrades will need to apply a peaking factor to the maximum daily demand to get the required maximum hour demand. The peaking factor will vary depending on the size of the upstream catchment. For the purpose of this report, no allowance for diversity has been included.

The total daily maximum potable water demand is estimated to be 2.8 ML/d for the entire precinct.

This water demand may be offset by the use of recycled water for non-potable water purposes within the precinct or the adoption of other sustainable technologies. Under BASIX requirements, proposed residential developments in Sydney are required to reduce mains-supplied potable water consumption by up to 40 percent compared to the average NSW dwelling.

3.3 Reticulation Network

An updated feasibility application has been submitted to Sydney Water to identify the existing capacity of Sydney Water's local networks to accommodate the proposed development, and the infrastructure augmentations likely required to service the development. We are still in the process of hearing back from them.

A feasibility letter response has been received (dated 4th August 2014) for the previous development scenario. Because the amount of units has increased since the last application, the information provided by Sydney Water is provided for information only. This response outlined the following;

- The drinking water main available for connection is the 250mm dia main on the Northern Side of Castle Hill Road.
- No Recycled water service is available

As noted above there is currently no recycled water infrastructure servicing the precinct, and it is uncertain what proposals there are in place to expand the existing Sydney Water recycled water network. As the implementation of such infrastructure is non-development critical, i.e. not essential for the development of land, this has not been included in the assessment.

As per the requirements of the Water Services Association of Australia, given that the proposal plans for the development of multi-storey unit block that will likely be greater than 8 storey, the water main is likely to be 200mm or larger. The size of water main/s will be governed by Sydney Water.

Booster pumps may potentially be required at each development for firefighting requirements. On site storage tanks could be provided to reduce the demand on mains water supply during emergency firefighting scenarios. The sizing of storage tanks and booster pumps will depend on the final layout and size of each development.

Within the developments, there will be a separate connection for potable water and fire water supply along with any fire booster requirements and storage tanks into each building.

The space allocated for each pump and tank will need to be confirmed; however a preliminary estimate of 25m^2 is considered likely to be conservative.

3.4 Future Work Plan

As noted a revised feasibility application has been submitted to Sydney Water. Typically in 6-8 weeks a response will be received outlining the potential connection points for the proposed development.

Following receipt of this feasibility application the next step will be to apply for a Section 73 Certificate. The Section 73 Certificate is typically required from the development authority if development consent is granted. It is applied for through the Sydney Water accredited Water Servicing Coordinator. Sydney Water will then provide

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either a Notice of Requirements and Works Agreement or a Certificate which is a definitive statement of Sydney Water's requirements and commentary on any upsizing, easement and funding.

Given the development is likely to be constructed in stages; a new application will need to be submitted for each stage.

4.0 Sewer

Sydney Water is the service authority responsible for the operation and maintenance of the existing local sewer reticulation water infrastructure. The precinct is located within Sydney Water's West Hornsby wastewater catchment.

4.1 Existing Infrastructure

Based on the results of the DBYD application, the existing sites are serviced from a network of Ø150mm Vitrious Clay (VC) and PVC gravity mains, which extend along the northern side of Matthew Way, along the eastern side of Carioca Way and Carioca Circuit, and along the eastern side of Glenhope Road; reticulating out to service each individual lot within the precinct. There are various segments of mains within the network that are concrete encased, concrete bedded or steel sleeved.

The above network connects into a Ø225mm trunk sewer main located along Salisbury Downs Drive located approximately 300m south of the site.

A feasibility application was submitted to Sydney Water for the previous development scenario and a response was received on the 4th August 2014. A revised feasibility application has been prepared and submitted to Sydney Water for the new development scenario.

4.2 Demand Assessment

An assessment on the proposed sewer loadings for the precinct has been undertaken to assist in determining the required infrastructure upgrades associated with each development.

The design criteria used to forecast future sewer loadings for the proposed residential building development, school and open space are generally taken from the *Sewerage Code of Australia WSA 02-2002-2.2* (Sydney Water, 2002) and are expressed as an Equivalent Population for a particular land use.

Table 4 lists the adopted sewer design loading criteria from the code.

In accordance with the code, the Average Dry Weather Flow (ADWF) per Equivalent Population (EP) has been taken as 180 L/day or 0.0021 L/s (ADWF (L/s) = 0.0021 * EP).

Table 4 Sewer design loading criteria

Cherrybrook Precinct Building Type	Adopted WSA 02-2002-2.2 Classification	EP per Unit	Unit
Single Detached	Single occupancy lots	3.5	EP/lot
4-8 Storey Apartment	Single occupancy medium density dwelling units	3	EP/dwelling
8-20 Storey Apartment	High density multi storey apartments	2.5	EP/dwelling

Table 5 presents the estimated ADWF for each site.

Table 5 Estimated net change in Average Dry Weather Flow (ADWF)

Stage	Proposed Estimated ADWF (L/s)
1A	1.65
1B	1.82

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Stage	Proposed Estimated ADWF (L/s)
2A	4.31
2B	3.78
3A	2.12
3B	1.85
4	4.06
TOTAL	**19.60**

It should be noted that the design of sewer main upgrades will apply a peaking factor to the ADWF to get the Peak Daily Dry Weather Flow (PDWF), and include the peak (rainfall dependent) inflow and infiltration and the groundwater (non-rainfall) dependent infiltration. The peaking factor will vary depending on the size of the upstream catchment.

The total ADWF is estimated to be 19.6 L/s for the renewed Sites.

4.3 Reticulation Network

A feasibility application has been submitted to Sydney Water to identify the existing capacity of Sydney Water's local networks to accommodate the proposed development, and the infrastructure augmentations likely required to service the development.

It is anticipated that a new gravity sewer system would be required for discharge into Sydney Water's existing system. As there is an increase in the sewer discharge it may be necessary to provide on-site storage, and depending on the internal building hydraulics, a sewer pump station as well.

4.4 Future Work Plan

A Section 73 Certificate is typically required from the development consent authority if development consent is granted. It is applied for through the Sydney Water accredited Water Servicing Coordinator. Sydney Water will then provide either a Notice of Requirements and Works Agreement or a Certificate which is a definitive statement of Sydney Water's requirements including easements.

Given the development is likely to be constructed in seven stages, payment or developer construction of potential upgrades to Sydney Water assets may also be staged under certain conditions. Sydney Water may also fund the upsizing component of these upgrades where the works will benefit another development.

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5.0 Communications

5.1 Existing Infrastructure

Based on the results of the DBYD application, the Cherrybrook site is currently serviced by the following communications infrastructure providers:

- Optus and/or Uecomm;
- PIPE Networks;
- Telstra.

Telstra supply, operate and maintain communications infrastructure in Highs Road, Castle Hill Road; Matthew Way; Carioca Way; Glenhope Road; and Staley Circuit. There is a significant amount of existing Telstra infrastructure currently servicing the existing tenants and adjacent buildings. The results of the DBYD application indicate that each of the lots within the precinct is currently serviced except for 81 & 83 Bredon Avenue, and 25 Matthew Drive. The infrastructure currently servicing the precinct includes a network of copper and optical fibre underground ducted cables, aerial cables, various above ground / free standing pillars / cabinets and cable jointing pits and access chambers.

The non-Telstra networks usually consist of optical fibre. The Telstra network is a combination of copper and optical fibre network.

Upgrade of the existing telecommunications network to the National Broadband Network (NBN) – Australia's national high speed broadband network – has yet to commence in Cherrybrook; however has commenced already commenced in the Cudgegong Road precinct, with service already available to a number of sites within Rouse Hill, Kellyville, Bella Vista, and Norwest areas (see http://www.nbnco.com.au/when-do-i-get-it/rollout-map.html).

5.2 Demand Assessment

No demand has been calculated for telecommunication infrastructure as it is not estimated in the same way as other utilities.

5.3 Reticulation Network

Local adjustment of the infrastructure is likely required to facilitate a new connection for the development and would result in new pits/pillars as required.

It is likely the precinct's connection will need to be maintained by either protection of the existing services or adjusting for the new works.

Currently, under the Federal Government's Fibre in New Developments Policy, NBN Co will install fibre into new developments of 100 premises (dwellings/units) or more, released over a three year period. Developers with new developments of less than 100 premises will request broadband infrastructure from Telstra or other telecommunications providers. The developer is responsible for the design and installation of conduit infrastructure, with staging works to be accommodated.

Within the development site itself NBN Co would need to install equipment to service the residents, from each unit to a central point (communications room) where a Fibre Distribution Hut (FDH) would be installed. Then fibre would need to be deployed from the communications room to a Trunk Fibre Access Node (TFAN). This would utilise a combination of pathways that the developer would construct and existing infrastructure in the ground.

The fibre to the premises network is shown below in Figure 2.

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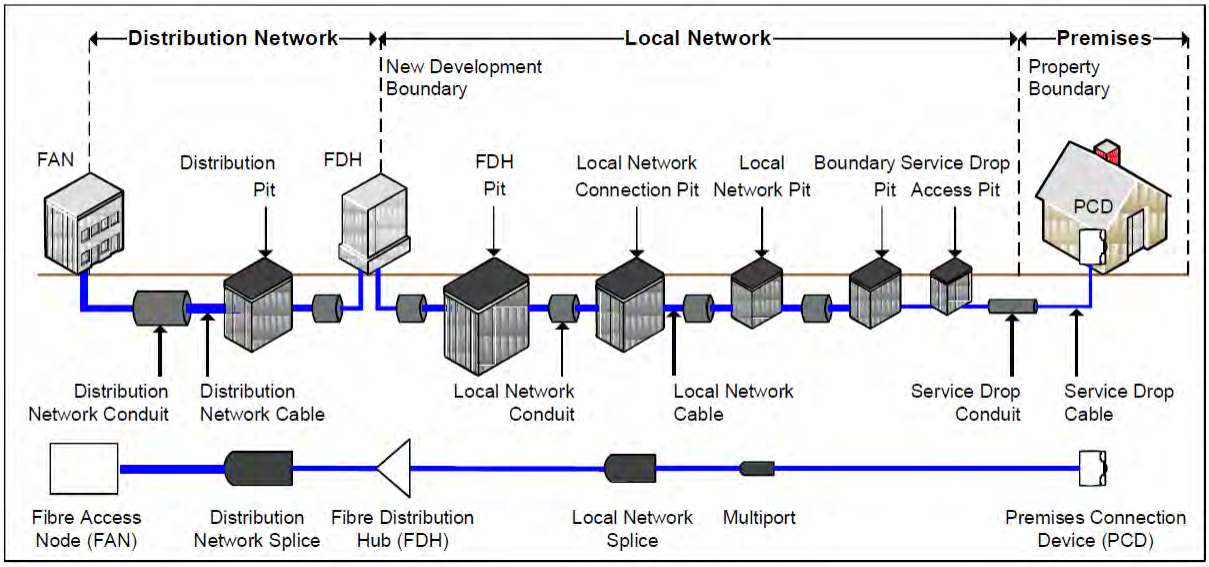
Figure 2 Fibre to the Premises Network



A fibre optic backbone infrastructure is recommended for the site to future proof the development and allows for the following services to be provided:

- Telephony Services;
- Free-to Air Services;
- FOXTEL/ Pay TV;
- Internet Protocol Television (IPTV); and
- High Speed Broadband Services

It should be noted that agreements with NBN Co are sole source and therefore no other service providers would be permitted unless negotiated with NBN Co.

5.4 Future Work Plan

Further correspondence with NBN Co will be required to coordinate connection to the developments.

Under an NBN Co Developer Agreement, NBN Co will cover the cost of fibre infrastructure in new developments with the developer being responsible for designing and installing pit and pipe infrastructure to NBN Co's Pit and Pipe Installation Guidelines. These are then transferred in ownership to NBN Co.

It is expected that the development proposed will fulfil the development requirements under the Federal Government's policy and will be installed by NBN Co.

NBN Co has previously provided advice that the typical build program for the delivery of broadband infrastructure to complying development is approximately within 10 months of submission of a conforming application to connect. However, the roll out of infrastructure is primarily driven by the developer and notification of when the first development lot will be completed.

A change in government policy may change the above conditions. The above information is still valid on the date of issue of this report.

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6.0 Electricity

Endeavour Energy is the service authority responsible for the operation and maintenance of the existing electricity infrastructure, local to the development. The precinct is located within Endeavour Energy's North West network area.

The extent of Endeavour Energy's supply area is to the southern side of Castle Hill Road. Areas north of Castle Hill Road (including the road itself) are supplied by Ausgrid and is located within Ausgrid's North West network area.

6.1 Existing Infrastructure

Based on the results of the DBYD application, existing underground low voltage (LV) cables currently service the lots within the precinct, with electricity cables and conduits located along Glenhope Road, Carioca Way, Willunga Place, Highs Road, Bredon Avenue and Matthew Way.

Endeavour Energy has indicated as part of previous studies in the area that the Cherrybrook area is serviced by the West Pennant Hills zone substation. This zone substation receives bulk supply via an aboveground 132kV transmission line that runs along the eastern border of the precinct, in approximate alignment with Staley Circuit. The proposed development does not appear to conflict with the existing 132kV transmission cables running parallel to Staley Circuit; however specific easement requirements for development in the vicinity of these cables should be reviewed in the further planning and design of the site to ensure there is no impact on the existing cables.

The southern part of Castle Hill Road contains a few lots which are serviced by Ausgrid as there are no reticulation networks by Endeavor Energy in this section. Stages that are serviced by Ausgrid (partially and entirely) include 1A, 2A, 2B and 4.

A feasibility application has been submitted to Endeavour Energy to confirm the current electricity servicing arrangements for the proposed precinct development area.

6.2 Demand Assessment

An assessment of the estimated electricity demand for the developed sites within the precinct has been conducted to assist in determining the required infrastructure upgrades that may be required.

A preliminary assessment has been undertaken of the potential net change in power demand associated with the proposed development.

The projected net change to peak electricity demand is based rates provided in Table 6. The net change in peak electricity demand summarised in Table 7.

Table 6 Peak Power demand unit rate

Building Type	Peak Demand Rate	Unit
Residential BASIX compliant dwellings (incl. Single Detached; Townhouse; 3-6 Storey Apartment; 6-11 Storey Apartment)	4	kVA/dwelling
Residential non-BASIX compliant dwellings (incl. all existing dwellings)	5	kVA/dwelling

Table 7 Estimated net change in peak power demand

Stage	Proposed Estimated Demand kVA
1A	1,260
1B	1,296
2A	3,132

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Stage	Proposed Estimated Demand kVA
2B	2,516
3A	1,520
3B	1,408
4	2,728
TOTAL	**13,860**

The total peak electricity load for the entire precinct is estimated to be 13.86 MVA.

Endeavour Energy will apply a diversity factor to the peak demand to account for variation in usage across the development. This diversity factor commonly applied is 0.8 and is at the discretion of Endeavour Energy. This has not been included for the purpose of this assessment.

6.3 Reticulation Network

It is anticipated that a new electrical reticulation route will be required with kiosk substations provided within the footprint of the development area. The exact requirements would need to be discussed and agreed with Endeavour Energy as the development plans are progressed.

6.4 Future Work Plan

A feasibility application has been submitted to Endeavour Energy to identify the existing capacity of local electricity infrastructure to accommodate the proposed development, and the infrastructure augmentations likely required to service the development.

At the time of writing this report, a response has been received for the new development scenario and the feedback has been summarised below;

(a) The area highlighted in the proposed Cherrybrook Development Plan is serviced by Endeavour Energy for the most part. There is a section of the southern part of Castle Hill Road that is serviced by Ausgrid as there is no electrical reticulation by Endeavour Energy in this section. The attachment shows the Ausgrid serviced lots in Castle Hill Road. This area is the border between the two Network distributors, Endeavour Energy and Ausgrid.

- Endeavour Energy has two residential 11kV feeders from the West Pennant Hills Zone Substation supplying the “southern location” of this plan.
- A 11kV residential feeder from Castle Hill ZS supplies the “western portion” of the plan.
- There are also two dedicated 11kV feeders supplying the North West Rail Link tunnel boring operation at Cherrybrook. There are no residential customers on the North West Rail Link 11kV feeders.

(b) Endeavour Energy would agree that the total capacity of the Proposed Development Plan would be in the order of 14 MVA diversified across feeders.
There is some existing capacity in the area on the 11kV systems. The electrical loading of residential feeders in Summer 2015 is:

- West Pennant Hills ZS Feeder X866 “Crane Rd” 180 A (Spare of 1 MVA)
- West Pennant Hills ZS Feeder X870 “Hill Road” 185A (Spare of 1 MVA)
- Castle Hill ZS Feeder C833 “Rogans Hill” 145A (Spare of 1.8 MVA)

However the spare capacity indicated will not be enough to service the total completed development.

Additional information:-

- The electrical loading of West Pennant Hills ZS in Summer 2015 was 21.9 MVA. West Pennant Hills ZS has a firm rating of 35 MVA.

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(c) Endeavour Energy recently augmented sections of the 66kV transmission system to West Pennant Hills ZS to support the tunnelling load of the NWRL supplies. Castle Hill ZS is also in the final stages of a refurbishment programme to maintain reliability of the site and have adequate capacity to support the Castle Hill area. There are no further programmes for infrastructure works.

(d) Endeavour Energy has received advice that a supply may be needed to power up the M1 – M2 motorway tunnel. It is likely that this would be sourced from the 66kV transmission supplying the West Pennant Hills ZS.

(e) The total load of the proposed Cherrybrook Development will likely require a minimum of **three (3)** 11kV feeders each supplying a minimum of 4.5 MVA of load. It is thought that when the NWRL complete their tunnelling operations that use of those two existing 11kV dedicated feeders could be utilised by the new proposed development. That would allow up to 9 or 10 MVA to be sourced across the two NWRL 11kV feeders.
It is likely that a new feeder be developed to Castle Hill ZS to pick up the remaining load of the proposed development if capacity on the existing system is exhausted.

(f) Limited supply may be made available from 2017 on existing residential 11kV feeders. The NWRL timetable suggests that by 2017 the majority of the tunnelling load will be complete. The partial load of the proposed development can possibly be sourced from these NWRL 11kV feeders as well. The NWRL has indicated that by 2020 the works to establish the rail link will be complete and will remove all their construction loads.
The installation of the 11kV feeder from Castle Hill ZS can only be determined at the time of load application as a clear picture of remaining capacity can be assessed at that time.
Ausgrid should also be contacted regarding the existing electrical supply to the frontage of the section in Castle Hill Rd and what intentions they have with this development. Ausgrid appear to partially or wholly supply what will be Stages 4, 6 and 7.

For the purpose of this assessment it has been assumed that the entire precinct will be services from the Endeavour network through new infrastructure constructed within the proposed road network. Based on the above advice Endeavour Energy has indicated that the development can be supplied from their network depending on progress of the North West Rail Line construction progress.

7.0 Natural Gas

Jemena is the service authority responsible for the operation and maintenance of the existing natural gas infrastructure.

7.1 Existing Infrastructure

Based on the results of the DBYD application, there is an currently an extensive residential Medium Pressure 210kPa network that services the entire precinct, with mains located along Castle Hill Road, Matthew Way; Willunga Place; Carioca Way; Glenhope Road; Bredon Road and Staley Court.

7.2 Demand Assessment

An assessment of the estimated changes in natural gas demand for the individual sites within the precinct has been conducted to assist in determining the required infrastructure upgrades that may be required.

Jemena typically use an energy demand of 20 gigajoules per year to estimate the average annual domestic usage of natural gas for residential dwellings. This usage rate equates to the utilisation of a natural gas hot water tank, cook top and heating point.

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Table 7 summarises the estimated net change in natural gas demand for each site.

Table 8 Estimated net change in natural gas demand

Plot ID	Proposed Estimated Gas Demand (GJ/y)
1	6,300
2	6,480
3	15,660
4	12,580
5	7,600
6	7,040
7	13,640
TOTAL	**69,300**

The total daily natural gas demand is estimated to be approximately 69,300 GJ/y for the renewed development.

7.3 Reticulation Network

A feasibility application has been submitted to Jemena for the new development scenario.().

Appendix A contains a copy of Jemena's response (dated 13 June 2014) to the previous development scenario which is summarised below;

- 8 Lots totalling 670 units will connect from Castle Hill rd 160mm PE. Of these three Lots of 164, 100 and 66 units will be supplied from the 32mm main on Castle Hill Rd.
- 4 Lots totalling 202 units will be supplied from the 32mm gas main in Willunga Pl.(see below)
- 2 Lots totalling 62 units will be supplied from Carioca Ct.(see note below)
- 4 Lots totalling 315 units will be supplied from the 50mm main in Glenhope Rd
- 1 Lot totalling 63 units will be supplied from the 32mm main in Stanley Ct

In response to the most recent updates to the development on the 13th May, 2015; Jemena's response (dated 13 May 2015) indicated that the increased usage is good based on the loads and timings supplied, provided that certain conditions are met. However, Jemena also recommended the extension of Matthew Way to join Highs Road and Bredon Avenue in order to interconnect gas mains for future developments.

Jemena noted the existing mains in Willunga Pl and Carioca Ct do not have capacity and a new 300m gas main extension from the 110mm existing gas main in Highs Rd -connecting to the 32mm gas main in Mathew Way would provide suitable capacity.

7.4 Future Work Plan

Jemena is a private company and makes decisions on investment in infrastructure based on a review of the business case and their expected commercial return.

Jemena is continually reviewing the capacity of its network in relation to potential developments and that expansion of their network is based on an as-needs basis/ long-term planning. Additional capacity would be delivered where a feasible future demand can be confirmed.

It is critical that information on development proposals is provided to them as it becomes available to enable them to undertake a further detailed assessment of gas layouts and costing, and to ensure works can be carried out without delays. Ongoing consultation with Jemena through the development definition and detailed design stages should ensure that allowance is made within Jemena's network planning to service the potential development sites.

D R A F T

If development proceeds in advance of the Jemena network planning, a cost benefit assessment should be undertaken to support a business case for expediting the network expansion.

8.0 Stormwater Drainage

8.1 Existing Stormwater Drainage Network

The Hills Council have in place a substantial stormwater drainage network downstream of the development area.

The site is located adjacent to Castle Hill Road. Castle Hill Road generally follows the ridge line, with land falling relatively steeply to the north east and south west.

The development area is at the top of the catchments, and the extents of the existing Council piped network are generally up to the boundary of the development area.

The stormwater flow paths are generally following the original gully lines in a mixture of natural channel or underground pipes, or contained within roadways. Many of the underground stormwater pipes which follow the existing gully lines are running through private property.

8.2 Proposed Method of Draining the Development Site

The total development area will be able to be connected into Council's existing drainage networks with some extension to connect to the proposed roads.

It is not intended to upgrade Council's network downstream of the site, but to provide facilities within the development area to ensure that post development discharge rates into the existing network are not greater than the existing condition for all rainfall events.

The future stormwater design for the sites within the development area will be defined under a Stormwater Management Plan to accompany the next stage of Development Approval. The design will follow these basic principles:

- Comply with Council's standard stormwater design requirements as specified in *Design Guidelines – Subdivision/Development - 2005*
- Comply with Council's stormwater detention policy, noting that the development area is under the management of the Upper Parramatta River Catchment Trust,
- Identify each existing stormwater branch that drains the development area, identify the existing catchment boundaries and estimate the current flows at the head of each of these branch lines for all rainfall events,
- Define the post development catchments and identify each development site and section of new road within each catchment,
- Undertake an analysis of the potential unrestricted flows generated from each catchment and identify flows from each development site and the roads, and compare to the existing condition,
- Analyse each catchment by applying stormwater detention within each development site, and iterate these volumes and site discharge rates, so that the total discharge from each catchment, matches the existing condition for all rainfall events. This may include compensatory detention to allow for unrestricted road drainage.
- Undertake the stormwater detention calculations for each development site, using the Upper Parramatta River Catchment guidelines,
- Compare the stormwater detention volumes and maximum discharge rates required to match existing conditions, with those stormwater detention volumes and maximum discharge rates using the Upper Parramatta River Catchment guidelines.
- Adopting the process which provides for the highest reduction in discharge rates, provide a schedule, identifying for each development site, and allocate a maximum discharge rate for each development site.

D R A F T

This schedule forms an integral part of the Stormwater Management Plan for the development area, and becomes the guideline for future individual developments. As each individual development proceeds, a maximum site discharge can be conditioned, with each Development Application demonstrating how that maximum site discharge is achieved.

9.0 Conclusions and Recommendations

The intention of this report is to provide a high-level infrastructure assessment of the Cherrybrook precinct.

Power, water, sewer, gas and telecommunications infrastructure are all present either adjacent to or in the vicinity of the precinct.

Based on previous feasibility applications undertaken in June 2014 for the previous development scenario it has been indicated that there is sufficient capacity in the existing systems. However since these applications the development scenario has significantly increased and updated advice has been sought based on the new development scenario.

Revised Feasibility applications have been submitted to Sydney Water, Endeavour Energy, NBN and Jemena to request further information on the capacity of existing infrastructure to accommodate the new proposed development, identify any potential areas of constraint and advise on any infrastructure augmentations that may be required to service the precinct. Responses have been received for the current development scenario from Endeavour Energy and Jemena, this Services Infrastructure Assessment will be updated based on information received from Sydney Water and NBN.

This report has been produced as part of a rezoning application only, and the development layout, demands and uses would be subject to further design progression and investigation. For this reason the infrastructure assessment should be considered high level advice only. Further definition of the services strategy will be required as the detailed design progresses, for example location of electrical kiosk substations and also definition of Sydney Water's requirements.

It should also be noted that advice received from utility companies has been based on the current demand scenario for the area. As the broader North West Growth Centre area will be significantly developed over the coming years, the existing utility demands may change and advice received from the utility companies may vary.

D R A F T

Appendix A

Record of Correspondence

D R A F T

Appendix A Record of Correspondence

Case Number: 139395

4 August 2014

AECOM
c/- QALCHEK PTY LTD

FEASIBILITY LETTER

Developer:	**AECOM**
Your reference:	**PM 12634**
Development:	**Lot 201 DP786607 133 CASTLE HILL RD, West Pennant Hills**
Development Description:	**Proposed re-development of 116,629m2 of land opposite the proposed Cherrybrook Railway Station into 1312 units**
Your application date:	**10 June 2014**

Dear Applicant

This Feasibility Letter (Letter) is a guide only. It provides general information about what Sydney Water's requirements could be if you applied to us for a Section 73 Certificate (Certificate) for your proposed development. **The information is accurate at today's date only.**

If you obtain development consent for that development from your consent authority (this is usually your local Council) they will require you to apply to us for a Section 73 Certificate. You will need to submit a new application (and pay another application fee) to us for that Certificate by using your current or another Water Servicing Coordinator (Coordinator).

Sydney Water will then send you either a:

- Notice of Requirements (Notice) and Developer Works Deed (Deed); or
- Certificate.

These documents will be the definitive statement of Sydney Water's requirements.

There may be changes in Sydney Water's requirements between the issue dates of this Letter and the Notice or Certificate. The changes may be:

1. Developer Charges

(a) Adjustment of charges due to the Consumer Price Index (CPI);
(b) Adjustment of charges because of a scheduled review by the Independent Pricing and Review Tribunal (IPART). After that review and registration of the new charges, Sydney

Water has to apply those charges; or

(c) If there is rezoning of any land within the development proposal then new charges will apply.

2. **Changing the Proposed Development**

- If you change your proposed development, e.g. the development description or the plan/ site layout, after today, the requirements in this Letter could change when you submit your new application; and

- if you decide to do your development in stages then you must submit a new application (and pay another application fee) for each stage.

No warranties or assurances can be given about the suitability of this document or any of its provisions for any specific transaction. It does not constitute an approval from Sydney Water and to the extent that it is able, Sydney Water limits its liability to the reissue of this Letter or the return of your application fee. You should rely on your own independent professional advice.

What You Must Do To Get A Section 73 Certificate in the Future

To get a Section 73 Certificate in the future you must do the following things. You can also find out about this process by visiting www.sydneywater.com.au > Plumbing, building & developing > Developing.

1. **Obtain Development Consent from the consent authority for your development proposal.**

2. **Engage a Water Servicing Coordinator (Coordinator).**

   You must engage your current or another authorised Coordinator to manage the design and construction of works that you must provide, at your cost, to service your development. If you wish to engage another Coordinator (at any point in this process) you must write and tell Sydney Water.

   For a list of authorised Coordinators, either visit www.sydneywater.com.au > Plumbing, building & developing > Developing or call **13 20 92.**

   The Coordinator will be your point of contact with Sydney Water. They can answer most questions that you might have about the process and developer charges and can give you a quote or information about costs for services/works (including Sydney Water costs).

3. **Developer Works Deed**

   It would appear that your feasibility application is served from existing mains and does not require any works to be constructed at this time. Sydney Water will confirm this with you after you have received Development Approval from Council and your Coordinator has submitted a new Development application and Sydney Water has issued you with a formal Notice of Requirements.

4. **Drinking Water, Recycled Water and Sewer Works**

   4.1 **Drinking Water**

   Your development must have a frontage to a water main that is the right size and can be used for connection.

   Sydney Water has assessed your application and found that:

   - The drinking water main available for connection is the 250mmmain on the Northern side of Castle Hill Road.

   - No Works to be permitted inside the easement without Sydney Water approval.

   4.2 **Recycled Water**

   Your development must have a frontage to a recycled water main that is the right size and can be used for connection.

Sydney Water has assessed your application and found that:

- No recycled water service.

4.3 Sewer

Your development must have a sewer main that is the right size and can be used for connection. That sewer must also have a connection point within your development's boundaries.

Sydney Water has assessed your application and found that:

- There is multiple 150mm wastewater mains located within the property.
- The proposed development site is traversed by a number of wastewater mains.
- Where proposed works are in close proximity to a Sydney Water asset, the developer may be required to carry out additional works to facilitate there development and protect the wastewater main. Subject to the scope of development, servicing options may involve adjustment/deviation and or compliance with the Guidelines for building over/adjacent to Sydney Water assets. Refer to your WSC for details of requirements.

5. Ancillary Matters

5.1 Asset adjustments

If any Sydney Water drinking water main, recycled water main, sewer or stormwater asset constructed or under construction is found, after the issue of this Notice, to require adjustment or deviation as a result of your development; then you will need to do this work as well as any other works we have detailed above at your cost. The work must meet the conditions of this Notice and you will need to complete it **before we can issue the Certificate**. Sydney Water will need to see the completed designs for the work and we will require you to lodge a security. The security will be refunded once the work is completed.

6. Stamping and Approval of your Building Plans

You must have your building plans stamped and approved **before the Certificate can be issued. Building construction work MUST NOT commence until Sydney Water has granted approval.** Approval is needed because construction/building works may affect Sydney Water's assets (e.g. water and sewer mains).

Your Coordinator can tell you about the approval process including:

- Your provision, if required, of a "Services Protection Report" (also known as a "pegout"). This is needed to check whether the building and engineering plans show accurately where Sydney Water's assets are located in relation to your proposed building work.

Your Coordinator will then either approve the plans or make requirements to protect those assets before approving the plans;

- Possible requirements;
- Costs; and
- Timeframes.

You can also find information about this process (including technical specifications) if you either:

- Visit www.sydneywater.com.au > Building and Developing > Building and Renovating. Here you can find Sydney Water's *Guidelines for Building Over/Adjacent to Sydney Water Assets;* or
- Call 13 20 92.

Notes:

- **The Certificate will not be issued until the plans have been approved and, if required, Sydney Water's assets are altered or deviated;**
- **You can only remove, deviate or replace any of Sydney Water's pipes using temporary pipework if you have written approval from Sydney Water's Urban Growth Business. You must engage your Coordinator to arrange this approval; and**
- **You must obtain our written approval before you do any work on Sydney Water's systems. Sydney Water will take action to have work stopped on the site if you do not have that approval. We will apply Section 44 of the *Sydney Water Act 1994.***

OTHER THINGS YOU NEED TO DO:

Shown below are other things you need to do that are NOT a requirement for the Certificate. They may well be a requirement of Sydney Water in the future because of the impact of your development on our assets. You must read them before you go any further.

Individual metering of units

From 1 September 2014, it will become **mandatory** for new multi-level developments to be designed for individual unit metering.
To get ready, visit www.sydneywater.com.au > Plumbing > Meters & metered standpipes and look at our *Multi-level individual metering guide*.

Backflow Prevention Water supply connections

A backflow prevention containment device appropriate to the property's hazard rating must be installed at the property boundary. The device is to be installed on all water supplies entering the property, regardless of the supply type or metering arrangements. It is needed to reduce the risk of contamination by backflow from these supplies.

A licensed plumber with backflow accreditation can advise you of the correct requirements for your property. To view a copy of Sydney Water's Backflow Prevention Policy and a list of backflow accredited plumbers visit www.sydneywater.com.au > Plumbing, building & developing > Plumbing > Backflow prevention.

Fire Fighting

Your firefighting service must be drawn from the recycled water system.
Definition of fire fighting systems is the responsibility of the developer and is not part of the Section 73 process. It is recommended that a consultant should advise the developer regarding the fire fighting flow of the development and the ability of Sydney Water's system to provide that flow in an emergency. Sydney Water's Operating Licence directs that Sydney Water's mains are only required to provide domestic supply at a minimum pressure of 15 m head.

Disused Sewerage Service Sealing

Please do not forget that you must pay to disconnect all disused private sewerage services and seal them at the point of connection to a Sydney Water sewer main. This work must meet Sydney Water's standards in the Plumbing Code of Australia (the Code) and be done by a licensed drainer. The licensed drainer must arrange for an inspection of the work by a NSW Fair Trading Plumbing Inspection Assurance Services (PIAS) officer. After that officer has looked at the work, the drainer can issue the Certificate of Compliance. The Code requires this.

Soffit Requirements

Please be aware that floor levels must be able to meet Sydney Water's soffit requirements for property connection and drainage.

Other fees and requirements
The requirements in this Advice Letter relate to your future Certificate application only. Sydney Water may be involved with other aspects of your development and there may be other fees or requirements. These include:

- construction/building plan stamping fees;
- plumbing and drainage inspection costs;
- the installation of backflow prevention devices; and
- council fire fighting requirements. (It will help you to know what the fire fighting requirements are for your development as soon as possible. Your hydraulic consultant can help you here.)

No warranties or assurances can be given about the suitability of this document or any of its provisions for any specific transaction. It does not constitute an approval from Sydney Water and to the extent that it is able, Sydney Water limits its liability to the reissue of this Letter or the return of your application fee. You should rely on your own independent professional advice.

END

2 May 2015

Endeavour Energy Ref: ENL2463 – 2015/05269/001
Customer Ref:

AECOM Australia Pty Ltd
Level 21, 420 George Street
SYDNEY NSW 2000

Attention: T Tang

Dear Sir

ENL2463 – CONNECTION OF LOAD APPLICATION LOT 1 - 2, 10 - 12, 4, 92, 201, 2 DP 864230, 789295, 1012463, 1111817, 812859 & 1174729 - CASTLE HILL & GLENHAVEN ROADS, CHERRYBROOK

Endeavour Energy acknowledges your application which is registered under the Endeavour Energy reference number shown above. Please quote this number on any further correspondence.

Endeavour Energy will assess your application and provide you with an appropriate response which will address your requirements generally within two weeks.

This letter does not allow release of plans from the Constituent Council or from your Private Certifier.

Should you need to contact Endeavour Energy regarding this application, please use contact details provided below.

Yours faithfully,

Jeanette Howard

Jeanette Howard
Contestable Works Administrator
Ph: 9853 7977
Fax: 9853 7925
Email: cwadmin@endeavourenergy.com.au

Tang, Terrence

From: David Ho <David.Ho@endeavourenergy.com.au>
Sent: Wednesday, 13 May 2015 3:39 PM
To: Tang, Terrence
Cc: John Phillips
Subject: ENL2463 - Cherrybrook Development | Castle Hill Road CHERRYBROOK
Attachments: Endeavour Application Letter 150424.pdf; Stage Base.pdf; ENL2463 Sketch.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Dear Terrence ,

Thank you for your enquiry regarding the proposed residential development at above areas . This enquiry has been registered under our reference numbers – ENL2463. Please quote this number for all future correspondence.

Endeavour Energy acknowledges that the proposed Cherrybrook Development has significantly changed and the associated demands have increased. Below is the summary of the projected residential growth, loos demand and development staging plan: -

Stage	Existing Dwellings	Proposed Units	Potential Construction Start Date	Net Peak Demand (kVA)
1	3	362	April 2017	1,433
2	3	263	April 2017	1,037
3	5	430	April 2018	1,695
4	4	402	April 2019	1,588
5	7	441	April 2017	1,729
6	7	176	April 2018	669
7	11	971	April 2020	3,829
8	23	594	April 2020	2,261
Total	63	3,639		14,241

In response to your feasibility Assessment Request, Endeavour Energy provides the following information to the best of its knowledge.

(a) The area highlighted in the provided proposed Cherrybrook Development Plan is serviced by Endeavour Energy for the most part. There is a section of the southern part of Castle Hill Road that is serviced by Ausgrid as there is no electrical reticulation by Endeavour Energy in this section. The attachment shows the Ausgrid serviced lots in Castle Hill Road. This area is the border between the two Network distributors, Endeavour Energy and Ausgrid

Endeavour Energy has two residential 11kV feeders from the West Pennant Hills Zone Substation supplying the "southern location" of this plan.
A 11kV residential feeder from Castle Hill ZS supplies the "western portion" of the plan.
There are also two dedicated 11kV feeders supplying the North West Rail Link tunnel boring operation at Cherrybrook. There are no residential customers on the North West Rail Link 11kV feeders.

(b) Endeavour Energy would agree that the total capacity of the Proposed Development Plan would be in the order of 14 MVA diversified across feeders.

There is some existing capacity in the area on the 11kV systems. The electrical loading of residential feeders in Summer 2015 is:

- West Pennant Hills ZS Feeder X866 "Crane Rd" 180 A (Spare of 1 MVA)
- West Pennant Hills ZS Feeder X870 "Hill Road" 185A (Spare of 1 MVA)
- Castle Hill ZS Feeder C833 "Rogans Hill" 145A (Spare of 1.8 MVA)

However the spare capacity indicated will not be enough to service the total completed development.

Additional information:-

- The electrical loading of West Pennant Hills ZS in Summer 2015 was 21.9 MVA. West Pennant Hills ZS has a firm rating of 35 MVA.
- The electrical loading of Castle Hill ZS in Summer 2015 was 22.0 MVA. Castle Hill has a firm rating of 42 MVA.

(c) Endeavour Energy recently augmented sections of the 66kV transmission system to West Pennant Hills ZS to support the tunnelling load of the NWRL supplies. Castle Hill ZS is also in the final stages of a refurbishment programme to maintain reliability of the site and have adequate capacity to support the Castle Hill area. There are no further programmes for infrastructure works.

(d) Endeavour Energy has received advice that a supply may be needed to power up the M1 – M2 motorway tunnel. It is likely that this would be sourced from the 66kV transmission supplying the West Pennant Hills ZS.

(e) The total load of the proposed Cherrybrook Development will likely require a minimum of three (3) 11kV feeders each supplying a minimum of 4.5 MVA of load. It is thought that when the NWRL complete their tunnelling operations that use of those two existing 11kV dedicated feeders could be utilised by the new proposed development. That would allow up to 9 or 10 MVA to be sourced across the two NWRL 11kV feeders.

It is likely that a new feeder be developed to Castle Hill ZS to pick up the remaining load of the proposed development if capacity on the existing system is exhausted.

(f) Limited supply may be made available from 2017 on existing residential 11kV feeders. The NWRL timetable suggests that by 2017 the majority of the tunnelling load will be complete. The partial load of the proposed development can possibly be sourced from these NWRL 11kV feeders as well. The NWRL has indicated that by 2020 the works to establish the rail link will be complete and will remove all their construction loads.

The installation of the 11kV feeder from Castle Hill ZS can only be determined at the time of load application as a clear picture of remaining capacity can be assessed at that time.

Ausgrid should also be contacted regarding the existing electrical supply to the frontage of the section in Castle Hill Rd and what intentions they have with this development . Ausgrid appear to partially or wholly supply what will be Stages 4, 6 and 7.

Please note that the advice provided is in response to an enquiry only and does not constitute a formal method of supply or a reservation of electrical capacity. An application must be submitted and subsequent designs have been certified or approvals granted will Endeavour Energy reserve capacity on the network.

Regards,

David Ho
Contestable Works Project Manager | Network Connections | Network Operations
☎ Direct: (02) 9853 7901 | Fax: (02) 9853 7903
✉ Email: david.ho@endeavourenergy.com.au

PO Box 811, Seven Hills 1730

51 Huntingwood Drive, Huntingwood NSW 2148

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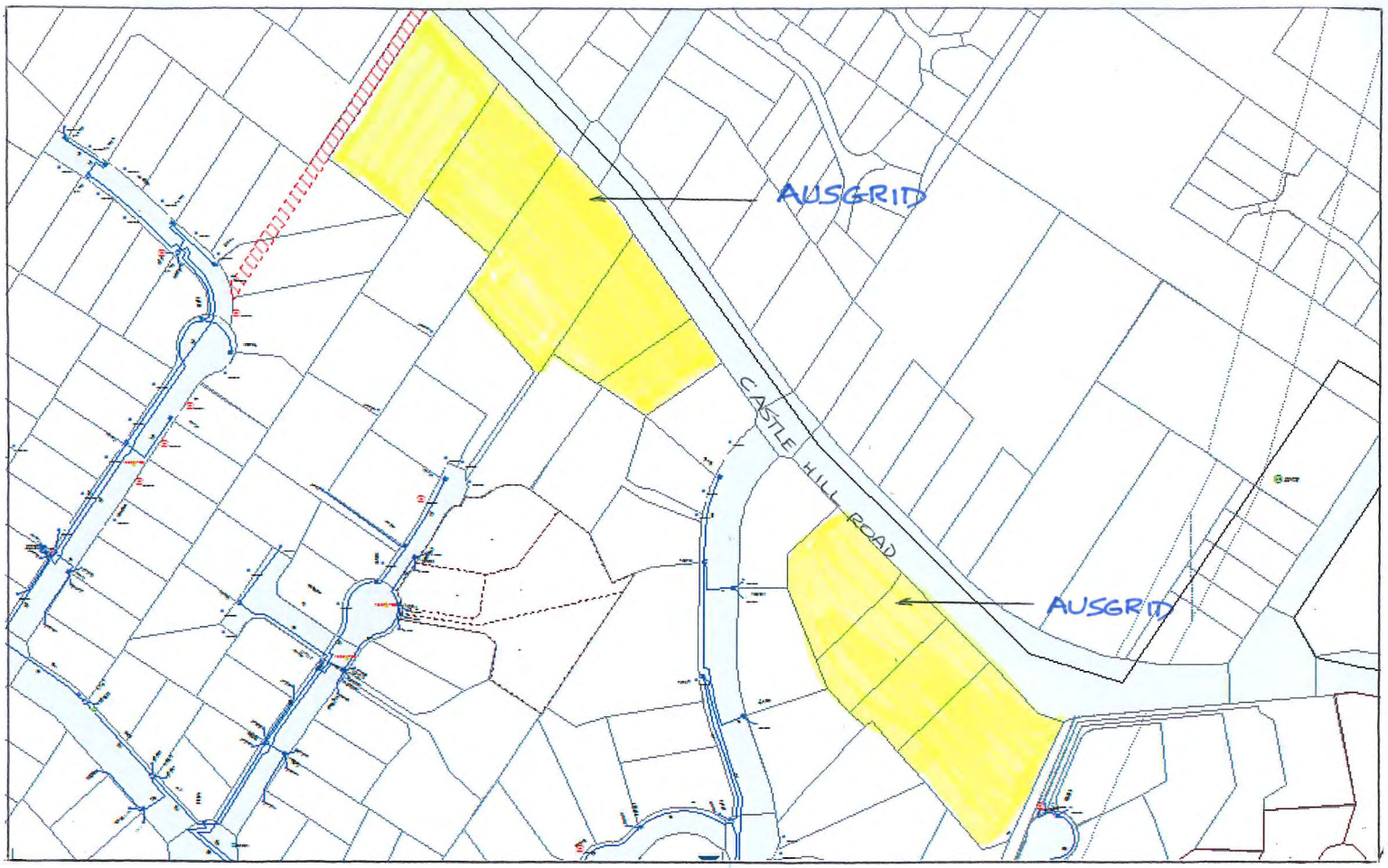

Ausgrid low voltage customers highlighted

Endeavour Energy

Rogans Hill 11kV Feeder

Crane Rd 11kV Feeder

Hill Rd 11kV Feeder

2 x NWRL 11kV Feeders

CASTLE HILL ZONE SUB

WEST PENNANT HILLS ZONE SUB

Endeavour Energy existing 11kV supply near Castle Hill Rd

11/05/2015 9:01:05 AM

AddHoc_HV_A3_9000_LND.gfw

Tang, Terrence

From: Philip Glasscock <Philip.Glasscock@jemena.com.au>
Sent: Wednesday, 13 May 2015 5:37 PM
To: Tang, Terrence; Price, Duncan
Cc: Neale Hilton
Subject: FW: Cherrybrook - Jemena Feasibility Application
Attachments: Aecom Cherrybrook 13-05-2015.dot

Hi Duncan,

Please find the attached response to your enquiry. Please call if you have nay questions.

Regards,

Philip Glasscock
Network Development Manager – NSW/ACT
Jemena
Level 14, 99 Walker St, North Sydney, NSW, 2060
(02) 9867 7139 | 0439 073 741
philip.glasscock@jemena.com.au | www.jemena.com.au

From: Neale Hilton
Sent: Friday, 24 April 2015 2:19 PM
To: Philip Glasscock
Subject: FW: Cherrybrook - Jemena Feasibility Application

Neale Hilton
Network Development Manager
Jemena
Level 14, 99 Walker St, North Sydney, NSW 2060
M 0402 060 151
neale.hilton@jemena.com.au | www.jemena.com.au

From: Tang, Terrence [mailto:Terrence.Tang@aecom.com]
Sent: Friday, 24 April 2015 2:04 PM
To: Neale Hilton
Cc: Price, Duncan
Subject: Cherrybrook - Jemena Feasibility Application

Hi Neale,

In regards to our previous request for supply enquiry we would like to request for another application due to the updates in the Cherrybrook Development. The proposed development has significantly increased and as such the associated demands have increased. We would welcome the opportunity to discuss this proposal further with you.

Please see attached for the revised application and stage plan.

If you need more information please contact me. Thank you for your consideration and we look forward to hearing from you.

Warm Regards,

Terrence Tang
Graduate Civil Engineer
D +61 2 8934 0030
Terrence.Tang@aecom.com

AECOM
Level 21, 420 George Street, Sydney, NSW 2000
PO Box Q410, QVB PO, Sydney, NSW, 1230
T +61 2 8934 0000 F +61 2 8934 0001
www.aecom.com

13 May 2015
AECOM
Level 21/420 George Street
SYDNEY NSW 2000
Attn. Duncan Price

Jemena Limited
ABN 95 052 167 405

Level 9-15
99 Walker St
North Sydney NSW 2060
PO Box 1220
North Sydney NSW 2060
T +61 2 9867 7000
F +61 2 9867 7010
www.jemena.com.au

RE: **Cherrybrook - Jemena Feasibility Application**

Dear Sir,

Thank you for your letter 24 April 2015 in regards to increased usage in the Cherrybrook area.

We have reviewed your request and the prospects of increased usage are good based on the loads and timings supplied, provided certain conditions are met. As always, we cannot reserve capacity for this development and the situation may change from now until the formal request.

On the map provided there is a road from the end of Matthew Way that joins Highs Road that runs mainly through “10 & 12 Highs”. There is also a road from the end of Bredon Avenue that joins this extension of Matthew Way that runs mainly through “24 & 26 Bred”. Both of these roads will need to be gazetted roads so that we can interconnect gas mains along Bredon Avenue, Matthew Way and Highs Road.

If these roads are not gazetted then this will greatly reduce the ability to service these sites. Please consider this in regards to your final layout of streets and whether they are private or gazetted roads.

If you have any further questions please contact me.

Regards,
Philip Glasscock

Philip Glasscock
Network Development Manager – NSW/ACT
Jemena
Level 14, 99 Walker St, North Sydney, NSW, 2060
(02) 9867 7139 | 0439 073 741
philip.glasscock@jemena.com.au | www.jemena.com.au

D R A F T

Appendix B

Utility Reticulation Plans

D R A F T

Appendix B Utility Reticulation Plans

ISO A1 594mm x 841mm

NOTES:

1. ALL SERVICES TO BE INSTALLED ACCORDING TO NSW STREETS OPENING CONFERENCE (SOC) STANDARDS).
2. LOCATION OF ELECTRICAL KIOSK SUBSTATIONS TO BE COORDINATED DURING DETAILED DESIGN STAGES.
3. PROPOSED SEWER NETWORK IS A GRAVITY SYSTEM.
4. SEWER STORAGE REQUIREMENTS AND EXISTING MAIN CAPACITY TO BE CONFIRMED BY SYDNEY WATER.

LEGEND

- EXISTING COMMUNICATIONS
- EXISTING ELECTRICAL
- EXISTING ELECTRICAL LV
- EXISTING ELECTRICAL 11kV
- EXISTING GAS
- EXISTING SEWER
- EXISTING WATER
- EXISTING COMMUNICATIONS TO BE REMOVED
- EXISTING GAS TO BE REMOVED
- EXISTING SEWER TO BE REMOVED
- EXISTING WATER TO BE REMOVED
- PROPOSED COMUNICATIONS
- PROPOSED ELECTRICAL
- PROPOSED GAS
- PROPOSED SEWER
- PROPOSED WATER
- PROPOSED DRAINAGE PIT AND PIPE

REFER TO DRG-C-20-3002

REFER TO DRG-C-20-3003

REFER TO DRG-C-20-3004

REFER TO DRG-C-20-3005

CASTLE HILL ROAD

ROAD No.4

HIGHS ROAD

BREDON AVENUE

YANAGIN PLACE

GLENHOPE ROAD

OVERALL PLAN

SCALE 1:1500

NOT FOR CONSTRUCTION

AECOM

PROJECT

CHERRYBROOK
RE-ZONING
CONCEPT ROAD LAYOUT

CLIENT

GRIMSHAW ARCHITECTS
LEVEL 3, 24 HICKSON ROAD
SYDNEY NSW 2000
02 9253 0200 tel
Prepared for: GRIMSHAW ARCHITECTS P/L
A.B.N 40 124 418 364

CONSULTANT

AECOM Australia Pty Ltd
A.B.N 20 093 846 925
www.aecom.com

CONSULTANTS

REGISTRATION

PROJECT MANAGEMENT INITIALS

-	-	-
DESIGNER	CHECKED	APPROVED

ISSUE/REVISION

I/R	DATE	DESCRIPTION

KEY PLAN

PROJECT NUMBER

60310614

SHEET TITLE

COMBINED UTILITIES PLAN

SHEET 1

SHEET NUMBER

60310614-DRG-C-20-3001

Last saved by: WONGJ3(2015-06-01) Last Plotted: 2015-06-01
Filename: P:\603X\60310614\5. CAD\02-SHEETS\60310614-DRG-C-20-3001.DWG

ISO A1 594mm x 841mm

NOTES:

1. ALL SERVICES TO BE INSTALLED ACCORDING TO NSW STREETS OPENING CONFERENCE (SOC) STANDARDS).
2. LOCATION OF ELECTRICAL KIOSK SUBSTATIONS TO BE COORDINATED DURING DETAILED DESIGN STAGES.
3. PROPOSED SEWER NETWORK IS A GRAVITY SYSTEM.
4. SEWER STORAGE REQUIREMENTS AND EXISTING MAIN CAPACITY TO BE CONFIRMED BY SYDNEY WATER.

HIGHS ROAD

ROAD No.4

EXISTING Ø500mm TRUNK MAIN TO BE RELOCATED ALONG ROAD No.4

VILLAGE STREET

ROAD No.3

CASTLE HILL ROAD

REFER TO DRG-C-20-3003 FOR CONTINUATION

LEGEND

- EXISTING COMMUNICATIONS
- EXISTING ELECTRICAL
- EXISTING ELECTRICAL LV
- EXISTING ELECTRICAL 11kV
- EXISTING GAS
- EXISTING SEWER
- EXISTING WATER
- EXISTING COMMUNICATIONS TO BE REMOVED
- EXISTING GAS TO BE REMOVED
- EXISTING SEWER TO BE REMOVED
- EXISTING WATER TO BE REMOVED
- PROPOSED COMUNICATIONS
- PROPOSED ELECTRICAL
- PROPOSED GAS
- PROPOSED SEWER
- PROPOSED WATER
- PROPOSED DRAINAGE PIT AND PIPE

NOT FOR CONSTRUCTION

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the AECOM quality assurance system to ISO 9001:2000.

AECOM

PROJECT

CHERRYBROOK
RE-ZONING
CONCEPT ROAD LAYOUT

CLIENT

GRIMSHAW ARCHITECTS
LEVEL 3, 24 HICKSON ROAD
SYDNEY NSW 2000
02 9253 0200 tel
Prepared for: GRIMSHAW ARCHITECTS P/L
A.B.N 40 124 418 364

CONSULTANT

AECOM Australia Pty Ltd
A.B.N 20 093 846 925
www.aecom.com

CONSULTANTS

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1:500

REGISTRATION

PROJECT MANAGEMENT INITIALS

-	-	-
DESIGNER	CHECKED	APPROVED

ISSUE/REVISION

I/R	DATE	DESCRIPTION

KEY PLAN

PROJECT NUMBER

60310614

SHEET TITLE

COMBINED UTILITIES PLAN

SHEET 2

SHEET NUMBER

60310614-DRG-C-20-3002

Last saved by: WONGJ3(2015-06-01) Last Plotted: 2015-06-01
Filename: P:\603X\60310614\5. CAD\02-SHEETS\60310614-DRG-C-20-3002.DWG

ISO A1 594mm x 841mm

REFER TO DRG-C-20-3002 FOR CONTINUATION

NOTES:

1. ALL SERVICES TO BE INSTALLED ACCORDING TO NSW STREETS OPENING CONFERENCE (SOC) STANDARDS).
2. LOCATION OF ELECTRICAL KIOSK SUBSTATIONS TO BE COORDINATED DURING DETAILED DESIGN STAGES.
3. PROPOSED SEWER NETWORK IS A GRAVITY SYSTEM.
4. SEWER STORAGE REQUIREMENTS AND EXISTING MAIN CAPACITY TO BE CONFIRMED BY SYDNEY WATER.

UPGRADE EXISTING WATER TO Ø500mm TRUNK MAIN

EXISTING Ø500mm TRUNK MAIN TO BE RELOCATED ALONG ROAD No.4 AND No.6

WILLUNGA PLACE

ROAD No.6

CARIOCA COURT

ROAD No.5

VILLAGE STREET

CASTLE HILL ROAD

LEGEND

- EXISTING COMMUNICATIONS
- EXISTING ELECTRICAL
- EXISTING ELECTRICAL LV
- EXISTING ELECTRICAL 11kV
- EXISTING GAS
- EXISTING SEWER
- EXISTING WATER
- EXISTING COMMUNICATIONS TO BE REMOVED
- EXISTING GAS TO BE REMOVED
- EXISTING SEWER TO BE REMOVED
- EXISTING WATER TO BE REMOVED
- PROPOSED COMUNICATIONS
- PROPOSED ELECTRICAL
- PROPOSED GAS
- PROPOSED SEWER
- PROPOSED WATER
- PROPOSED DRAINAGE PIT AND PIPE

NOT FOR CONSTRUCTION

REFER TO DRG-C-20-3004 FOR CONTINUATION

AECOM

PROJECT

CHERRYBROOK
RE-ZONING
CONCEPT ROAD LAYOUT

CLIENT

GRIMSHAW ARCHITECTS
LEVEL 3, 24 HICKSON ROAD
SYDNEY NSW 2000
02 9253 0200 tel
Prepared for: GRIMSHAW ARCHITECTS P/L
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SHEET TITLE

COMBINED UTILITIES PLAN

SHEET 3

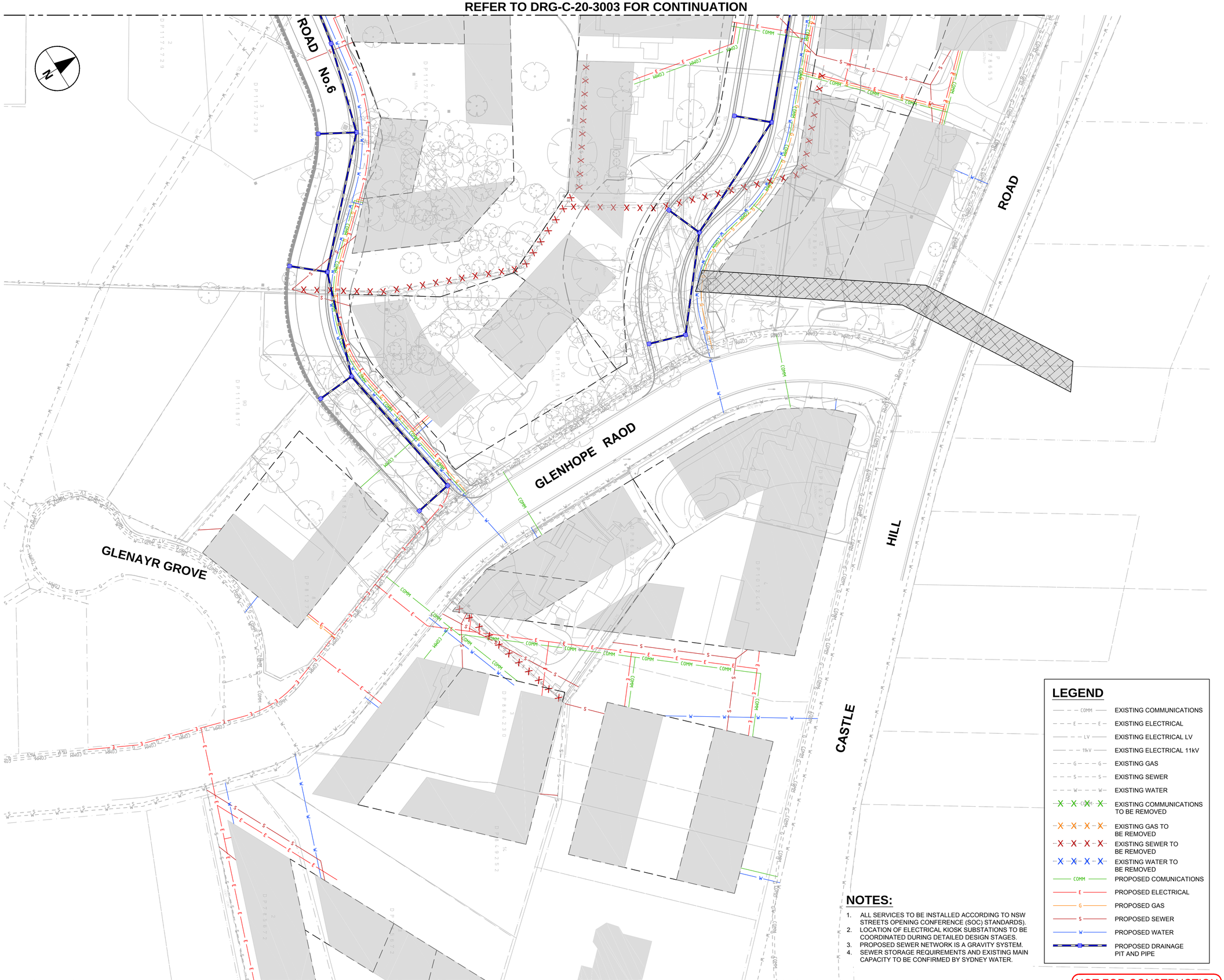
SHEET NUMBER

60310614-DRG-C-20-3003

Last saved by: WONGJ3(2015-06-01) Last Plotted: 2015-06-01
Filename: P:\60\X\60310614\5. CAD\02-SHEETS\60310614-DRG-C-20-3003.DWG

ISO A1 594mm x 841mm

REFER TO DRG-C-20-3003 FOR CONTINUATION



LEGEND

- EXISTING COMMUNICATIONS
- EXISTING ELECTRICAL
- EXISTING ELECTRICAL LV
- EXISTING ELECTRICAL 11kV
- EXISTING GAS
- EXISTING SEWER
- EXISTING WATER
- EXISTING COMMUNICATIONS TO BE REMOVED
- EXISTING GAS TO BE REMOVED
- EXISTING SEWER TO BE REMOVED
- EXISTING WATER TO BE REMOVED
- PROPOSED COMUNICATIONS
- PROPOSED ELECTRICAL
- PROPOSED GAS
- PROPOSED SEWER
- PROPOSED WATER
- PROPOSED DRAINAGE PIT AND PIPE

NOTES:

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NOT FOR CONSTRUCTION

REFER TO DRG-C-20-3005 FOR CONTINUATION

AECOM

PROJECT

CHERRYBROOK
RE-ZONING
CONCEPT ROAD LAYOUT

CLIENT

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02 9253 0200 tel
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1:500

REGISTRATION

PROJECT MANAGEMENT INITIALS

-	-	-
DESIGNER	CHECKED	APPROVED

ISSUE/REVISION

I/R	DATE	DESCRIPTION

KEY PLAN

PROJECT NUMBER

60310614

SHEET TITLE

COMBINED UTILITIES PLAN

SHEET 4

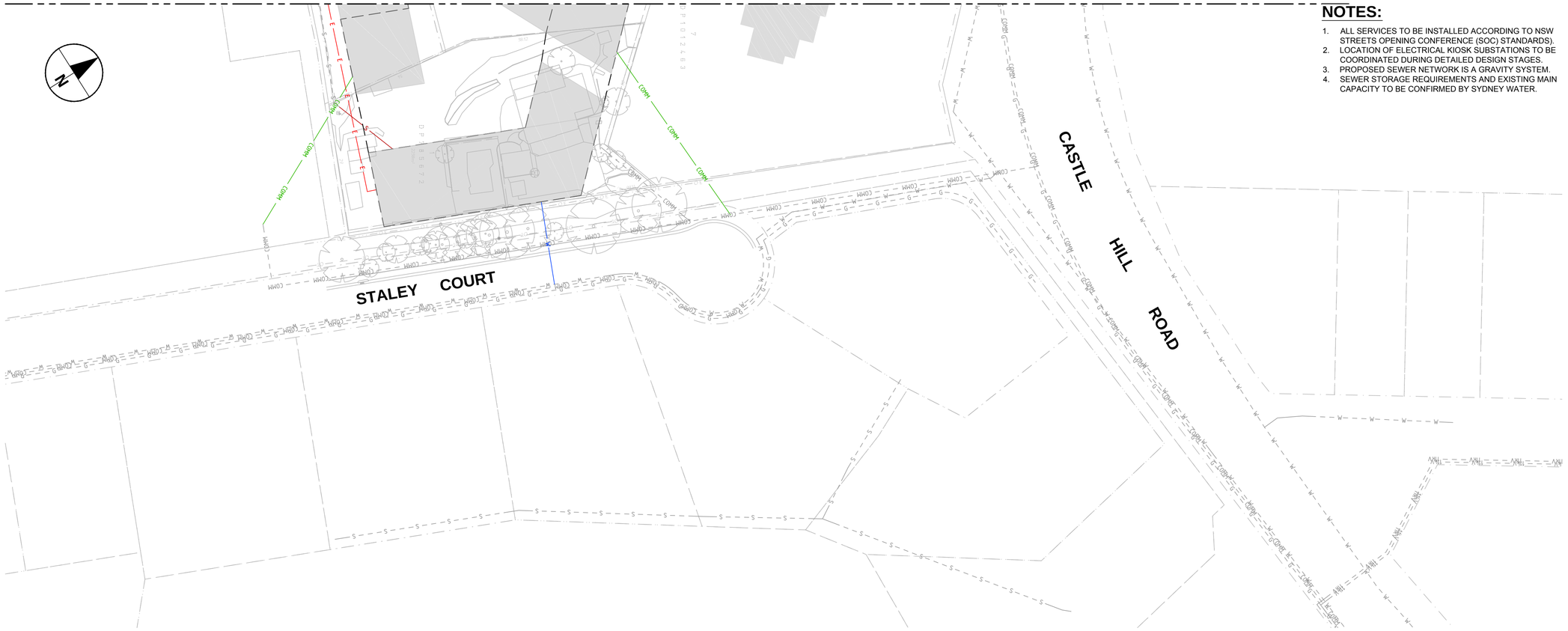
SHEET NUMBER

60310614-DRG-C-20-3004

Last saved by: WONGJ3(2015-06-01) Last Plotted: 2015-06-01
Filename: P:\60XX\60310614\5. CAD\02-SHEETS\60310614-DRG-C-20-3004.DWG

ISO A1 594mm x 841mm

REFER TO DRG-C-20-3004 FOR CONTINUATION



NOTES:

1. ALL SERVICES TO BE INSTALLED ACCORDING TO NSW STREETS OPENING CONFERENCE (SOC) STANDARDS).
2. LOCATION OF ELECTRICAL KIOSK SUBSTATIONS TO BE COORDINATED DURING DETAILED DESIGN STAGES.
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LEGEND

- EXISTING COMMUNICATIONS
- EXISTING ELECTRICAL
- EXISTING ELECTRICAL LV
- EXISTING ELECTRICAL 11kV
- EXISTING GAS
- EXISTING SEWER
- EXISTING WATER
- EXISTING COMMUNICATIONS TO BE REMOVED
- EXISTING GAS TO BE REMOVED
- EXISTING SEWER TO BE REMOVED
- EXISTING WATER TO BE REMOVED
- PROPOSED COMUNICATIONS
- PROPOSED ELECTRICAL
- PROPOSED GAS
- PROPOSED SEWER
- PROPOSED WATER
- PROPOSED DRAINAGE PIT AND PIPE

NOT FOR CONSTRUCTION

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the AECOM quality assurance system to ISO 9001:2000.

AECOM

PROJECT

CHERRYBROOK
RE-ZONING
CONCEPT ROAD LAYOUT

CLIENT

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LEVEL 3, 24 HICKSON ROAD
SYDNEY NSW 2000
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DESIGNER	CHECKED	APPROVED

ISSUE/REVISION

I/R	DATE	DESCRIPTION

KEY PLAN

PROJECT NUMBER

60310614

SHEET TITLE

COMBINED UTILITIES PLAN

SHEET 5

SHEET NUMBER

60310614-DRG-C-20-3005

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