

Holsworthy Projects Pty Ltd

**2 Macarthur Drive, Holsworthy –
Masterplan**

**Servicing and Utilities Infrastructure
Strategy Report**

Draft | 02 August 2017

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 253293

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1 Executive Summary

Holsworthy Projects Pty. Ltd. has begun evaluating the development of Lot 5 (DP 825745) on a vacant lot to the North of Holsworthy Military Base, adjacent Heathcote Road. The architectural proposal for this redevelopment includes multi-storey residential, a dedicated retail level, childcare facilities, parking, and green spaces. This report evaluates servicing and utility infrastructure impacts associated with the potential development.

The following services have been evaluated as part of this report: water supply, sewerage, electric, gas, and telecommunications. Potable water will be supplied via trunk mains running nearby the site, with a new water main ringing the perimeter of the site to provide supply to multiple building tie-ins. Sewerage for the site will ultimately drain to the existing 225mm pipe below Macarthur Drive. Preliminary calculations suggest that there should be sufficient capacity in the pipe to meet proposed development's demands, although formal confirmation from Sydney Water Corporation will not be received until the lodgement of the Section 73 application.

There is existing electric ductwork that runs below Macarthur Drive which is to be extended to the building basement, where it will connect to substations prior to distribution around the buildings. A gas service will be provided to the site via connection to the existing 150mm gas network main on the development side of Macarthur Drive. Preliminary calculations and consultation with Jemena suggest that there should be sufficient capacity for the development. Telecommunication data is expected to connect to one of two National Broadband Network (NBN Co) / Telstra existing pits on Macarthur Drive.

It is suggested that discussions with the impacted service providers, including Endeavour, Jemena, Telstra and NBN Co, commence / are further developed after the lodgement of a Development Application (DA) in order to attain approval for connection and receive formal confirmation that there is sufficient network capacity.

From the review of the utilities surrounding the development all of the required utilities to service the project appear to be in the vicinity of the development.

Other civil considerations such as bulk earthworks and site grading rely on proposed floor levels and up to date accurate survey information; thus it is suggested that an up-to-date site-wide 3D survey be commissioned. This will assist in informing future civil engineering works such as in-ground utilities coordination, site grading and drainage.

2 Existing Site

The existing site is currently owned by Holsworthy Projects Pty Ltd. The roughly triangular shaped site is bounded by Macarthur Drive to the northwest, Heathcote Road to the northeast and the Rail Corridor to the south. The Holsworthy Military Base (Holsworthy Barracks) is located on the opposite side of the rail corridor.

The currently vacant site was part of an earlier mixed retail and residential development; however construction works never progressed past the initial construction stages. As part of these previous works, initial utility works were undertaken to accommodate the development. Some of these works included utility extensions across Macarthur Drive and the relocation of a private water main servicing the Holsworthy Barracks.



Figure 1: Existing Site

3 Architectural Design

The Proposed Architectural Layout of the site can be seen in the image below:



Figure 2: Architectural Layout

The architectural proposal for this redevelopment includes multi-storey residential buildings, parking, a dedicated retail level, childcare facility and green spaces.

3.1 Architectural Yields

The following table reflects the proposed yields based on the draft master plan received on the 23 June 2017.

Table 1: Architectural Yields

Lot (Use)	Level	No. of Units	Gross Building Area
Residential			
Level 1 - North	L1	24	1420*
Level 1 – West	L1	11	3110*
Building A	L3+	48	5280
Building B	L3+	88	9570
Building C	L3+	54	5670
Building D	L3+	78	9240
Building E	L3+	17	1560
Building F	L3+	83	8820
Building G	L3+	35	3750
Non-Residential			
Retail**	G	7	11044
Childcare	L3	1	986
Parking	B, L1, L2	N/A	26334

*Estimated based on the ratio of units compared to the total area

**For the purposes of calculating the service supply retail was taken as a total area including corridors, service rooms and amenities.

4 Servicing Strategy

4.1 Water Supply

4.1.1 Existing:

The potable water supply for the site is serviced by Sydney Water Corporation (SWC). Their plans show a 150mm diameter water main located on the opposite side of Macarthur Drive, along with 150mm and 250mm mains running on the opposite side Heathcote Road. Additionally, there is a 375mm private water trunk main servicing the nearby Holsworthy Military Base. SWC plans indicate that this line runs north south across the site; however Arup has been informed that this main was relocated outside of the site boundary as part of previous early development works and now runs along Macarthur Drive. The exact location and size of this trunk main has not been determined; a survey will be needed to identify the exact location, if desired/required.

4.1.2 Proposed Layout:

It is intended to create a looped network around the site with a 200mm main ringing the perimeter of the development, with multiple building connection points off of this looped network (based upon the hydraulic engineer's requirements). The Section 73 Certificate issued as part of the previous development indicated that the 150mm in Macarthur Drive had sufficient capacity for the development. It should be noted that this approval was based on the 2005 DA consent that included approximately 90% less residential apartments and 50% less retail than the current proposed development.

With the development proposing residential blocks above 8 storeys, SWC requirements state that development shall connect to a minimum 200mm water main. As such, the development is expected to connect across Heathcote Road and connect to the existing 250mm main to meet the requirement. (It is noted that there are a few exceptions, so this could be waived during consultation with and approval from SWC.) Figure 3 below depicts the proposed water layout.

A secondary connection has been made to the 150mm main across Macarthur Drive to provide an alternative supply should it be needed and thus then eliminates a single ended feed.

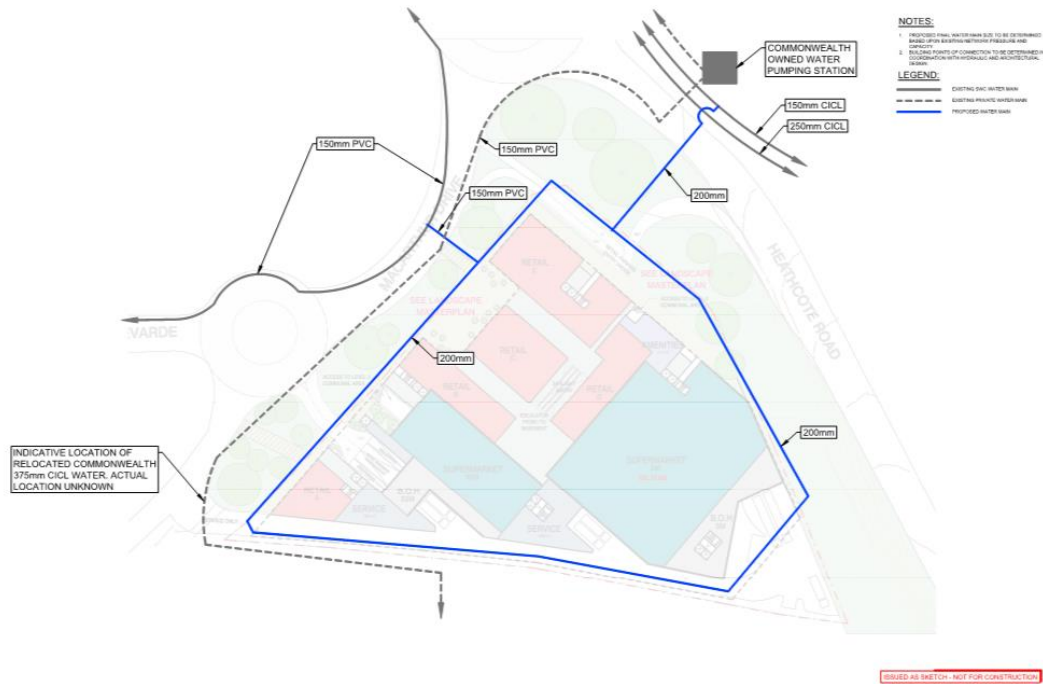


Figure 3: Existing & Proposed Water Layout

4.1.3 Proposed Demand:

Water demands have been projected utilizing SWC (September, 2014) planning metrics. The applicable metrics are below:

Table 2: Water Demand Rates

Usage	Projected Max Daily Demand	Projected Peak Flow
Residential Apartment (>140 Units)	800 L/unit/day	0.0185 L/unit/s
Commercial	6.3 L/m ² /day	1.46 L/ha/s

Based upon the Architectural Yields, the following table reflects projected Maximum Daily Demand (L/day) per Option:

Table 3: Projected Maximum Daily Water Demand and Peak Flow

	Max Daily Demand <i>(L/day)</i>	Max Peak Flow <i>(L/s)</i>
Residential		
Building L2	28,000	0.648
Building A	38,400	0.889
Building B	70,400	1.630
Building C	43,200	1.000
Building D	62,400	1.444
Building E	13,600	0.315
Building F	66,400	1.537
Building G	28,000	0.648
TOTAL	350,400	8.111
Commercial		
Retail	69,577	1.612
Childcare	6,212	0.144
TOTAL	75,789	1.756
TOTAL	426,189	9.867

The capacity of the adjacent water mains to supply the projected Maximum Daily Demand and Maximum Peak Flow stem from both the pressure and current usage of the existing mains. This information is based upon Sydney Water's network information and is not public; thus formal advice related to pressure and capacity will not be provided until the Section 73 application is submitted. Pressure tests can be requested from SWC for a fee prior to the submission of the Section 73 application, if desired.

These projected demand values are preliminary and subject to refinement as design and consultation with SWC progresses.

4.2 Sewerage

4.2.1 Existing:

Sewerage infrastructure adjacent to the development site is owned and maintained by Sydney Water Corporation (SWC). The existing infrastructure is located to the north of the proposed development and currently services the existing housing estate. The network has been extended across the northern end of Macarthur Drive via a concrete encased 225mm diameter pipe. This extension shall act as the connection point for the proposed development. SWC’s GIS model shows that the pipe invert level at the point of connection is approximately RL 7.63 (2.79m below the pit surface level). Figure 4 depicts the approximate location of the existing sewerage infrastructure.

4.2.2 Proposed Layout:

As there is one outlet point currently provided for the site to the SWC network, the design intent is to collect and direct sewage flows around the perimeter of the building. This approach allows for multiple sewerage discharge points from the building, based upon the hydraulic engineer’s requirements. Flows collected from the western half of the building (Line A) will run clockwise around the building to the SWC connection point, while flows from the eastern half of the building (Line B) will flow anticlockwise to the SWC connection point. This approach allows for gravity fed discharge from the building connection to the SWC network (assuming building sewerage IL’s are above 9.22m). Figure 4 below depicts the proposed sewerage layout.

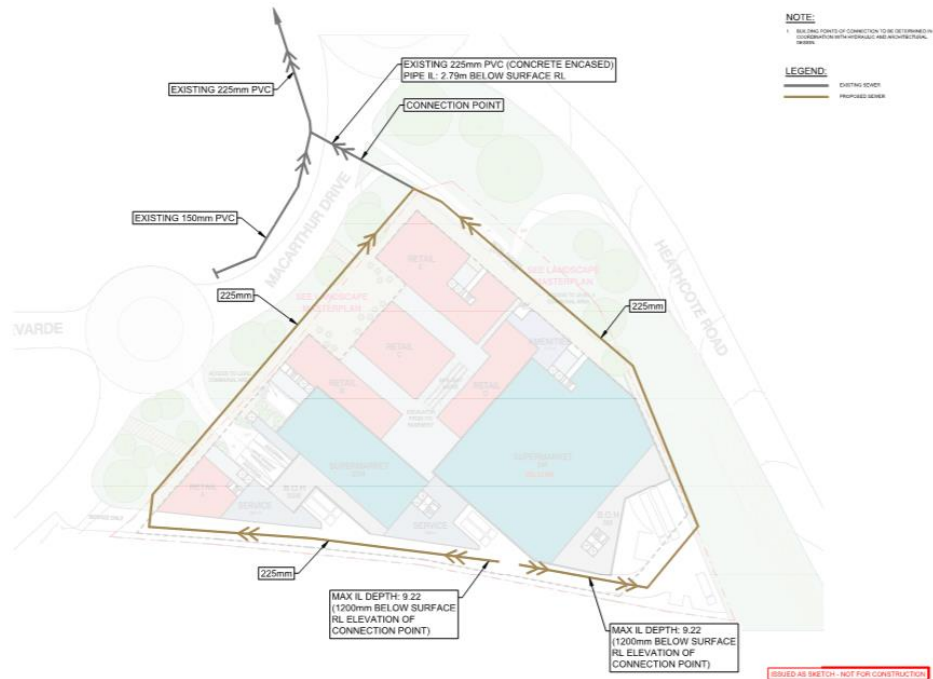


Figure 4: Existing & Proposed Sewer Layout

For the purpose of preliminary demand prediction for each of the lines, flows were directed to the nearest line with the exception of the retail usage which was

split evenly between the two. A more accurate representation of the allocation of the flows would require detailed hydraulic investigation and is not appropriate for this stage of the development.

4.2.3 Proposed Demand:

SWC methodology was used to estimate the proposed sewage demand for the site, in accordance with “Sewerage Code of Australia, Sydney Water Edition”.

SWC uses Equivalent Population (EP) ratios to estimate expected sewerage flow by usage. A summary of the EP ratios and calculation of EP’s based of the Architectural Yields are provided below in Table 4 and Table 5, respectively. It was conservatively assumed that the total number of persons (children + carers) for the childcare centre is 150 (based on the provision of outdoor space and minimum requirements for carers.)

Table 4: Equivalent Population (EP) Ratios

Usage	Calculation
Residential (Multi-Storey)	2.5 EP / Unit
Retail	75 EP / ha GFA
Childcare	0.2 EP / Person

Table 5: Estimated Equivalent Population Numbers

Equivalent Population (EP)	
LINE A	
Building L1	27.5
Building D	195
Building E	42.5
Building F	207.5
Building G	87.5
Retail	41.5
Childcare	30
<i>TOTAL</i>	<i>631.5</i>
LINE B	
Building L1	60
Building A	120
Building B	220
Building C	135
Retail	41.5
<i>TOTAL</i>	<i>576.5</i>
TOTAL	1208

Based upon the expected EP’s for the site, the following are the expected Average Dry Weather Flows and Peak Dry Weather Flows per line into the SWC sewerage system:

Table 6: Estimated Average and Peak Dry Weather Sewer Flows

Lot (Use)	Average (L/s)	Peak (L/s)
LINE A	1.10	4.20
LINE B	1.00	3.96
TOTAL	2.10	6.56

SWC acknowledges that peak flows occur at different times based upon usage type. Therefore, Peak Dry Weather Flows are not summed linearly.

The predicted EP falls within the prescribed limit of 1600 EP's for a 225mm pipe, indicating that the existing sewerage pipe across Macarthur Drive should have sufficient capacity to handle the design flows. Sydney Water will need to confirm the downstream capacity impacts after the flows enter their network, based upon the greater catchment network. Formal SWC approval will be provided after the lodgement of the Section 73 application.

These projected demand values are preliminary and subject to refinement as design and consultation with SWC progresses.

4.3 Electricity Supply

4.3.1 Existing:

Electricity to the site is supplied by Endeavour Energy. Their plans reflect existing ducts located to the northwest of the proposed development. There is an existing substation located on the corner of Macarthur Drive and The Boulevard. Underground conduits extend across the northern end of Macarthur Drive, providing network connectivity to the site. The duct bank holds two direct buried cables and four conduits, with only one conduit being shown as currently occupied. Figure 5 depicts the approximate location of the existing electrical infrastructure.

Discussions with Endeavour Energy to determine capacity within the existing system can be commenced after the lodgement of a Development Application.

4.3.2 Proposed Layout:

Installation of additional transformers will be required as part of the proposed development. Endeavour Energy will require direct unimpeded heavy vehicle access to be provided. If it is the architectural intent to place the substations within the building basement and distribute electricity around the building from this point, this can be accommodated via extending the existing ducts to the basement, assuming unimpeded access is maintained and special dispensation is obtained. The substation and electrical service rooms shall ideally be placed along the western side of the building to minimize the length of in-ground duct bank installation.

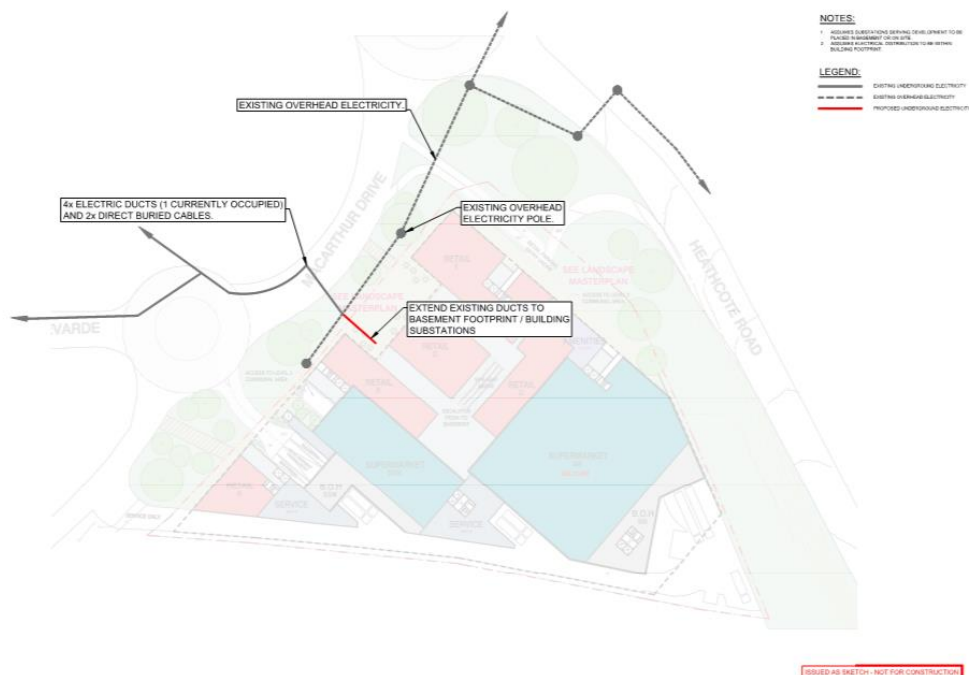


Figure 5: Existing & Proposed Electric Layout

4.3.3 Proposed Demand:

The proposed electric demand is based upon guidance provided within AS/NZS 3000: Wiring Rules (2007) and compared to values obtained from Arup's experience on similar projects. Utilizing a worst case scenario, these demands assume electric air conditioning/heating, stoves and hot water devices to be used.

Table 7: Projected Peak Electric Demand Rates

Usage	Projected Peak Demand
Residential Apartment	4.6 kVA/apartment
Commercial	120 VA/m ²
Outdoor Lighting	5 VA/m ²
Structured Parking	15 VA/m ²

Commercial peak demands are averages inclusive of the expected commercial/retail uses (supermarkets, cafes, small retail and childcare); larger electric uses, such as commercial kitchens, will require a higher projected peak demand. Structured parking electricity rates are averages and inclusive of both ventilation (10 VA/m²) and lighting (5 VA/m²) requirements.

Electricity loads associated with communal areas such as elevators, hallways and communal facilities were approximated based on the floor plans illustrated on the Draft Masterplan.

The following reflect expected peak electricity loads for the development:

Table 8: Projected Peak Electric Loads

	Peak Power (kVA)
Residential	
Apartments	2023
Communal	168
Non-Residential	
Retail	1325
Childcare	99
Other	
Outdoor Lighting	60
Parking	395
TOTAL	4070

The apartment max demand of 2023 kVA is based on fixed wall single phase air-conditioning units used for heating and cooling requirements. This accounts for approximately 60% of the electricity requirements and significant reductions in peak power could be achieved should natural ventilation be implemented.

These loads are expected to require the installation of a 3 x 1.5MVA transformers across the site.

These projected demand values are preliminary and subject to refinement as design progresses.

4.4 Natural Gas

4.4.1 Existing:

A Natural Gas service for the site is provided by Jemena. Their plans reflect an existing 150mm diameter, 210 kPa gas main along Macarthur Drive, which is expected to be the connection point for the site. This main, including a 5m wide easement, turns east towards the site south of the roundabout. Survey undertaken in October 2007 indicates that this main, and associated easement, is located on the inside of the site’s southern boundary, offset approximately 1m. As such, this easement shall adhere to Jemena’s gas easement requirements, including that portion of the site being kept free of permanent obstruction and minimum cover over the pipe being maintained. During preliminary discussions with Jemena, they conveyed that there are no current plans for extension of the gas main located within the easement.

There is also an existing high pressure Ethane line and easement located adjacent the rail corridor to the south of the site.

4.4.2 Proposed Layout:

It is intended to provide a single connection point from the existing gas main to the building basement where it will be distributed throughout the building. Providing the gas service room along the western side of the building will minimize the length of the in-ground gas service to be installed.

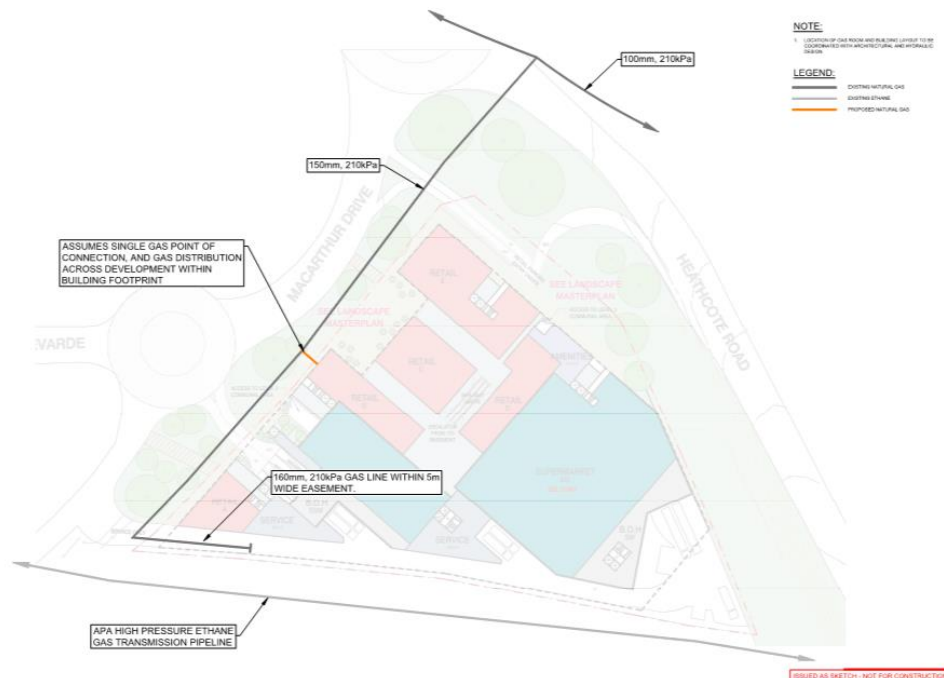


Figure 6: Existing & Proposed Gas Layout

4.4.3 Proposed Demand:

The proposed gas demand is based upon the following metrics, which are reflected from industry standards and Arup’s experience on similar projects. As a worst case scenario these demands assume gas stoves and gas hot water devices to be used within apartment units.

Table 9: Projected Peak Gas Demand Rates

Usage	Projected Peak Demand
Residential Apartment	35 kW/unit
Retail	0.134 kW/m ²

The projected peak gas flow for these options are:

Table 10: Projected Peak Gas Flow Rates

	Peak Demand (kW)	Peak Demand (m ³ /s)
Residential		
Building L2	1120	0.028
Building A	1536	0.039
Building B	2816	0.071
Building C	1728	0.044
Building D	2496	0.063
Building E	544	0.014
Building F	2656	0.067
Building G	1120	0.028
Commercial		
Retail	1480	0.037
TOTAL	15496	0.390

The presence of a 150mm diameter network main (assumed to be currently in service) gives confidence that there should be adequate capacity for the development, however confirmation will be required from Jemena.

These projected demand values are preliminary and subject to refinement as design progresses with Jemena. During preliminary discussions with Jemena, they indicated that the existing 210kPA 160mm main would be suitable to supply the development.

4.5 Telecommunication

4.5.1 Existing:

Telecommunication services for the site is provided by Telstra, via the National Broadband Network (NBN Co). Along Macarthur Drive, this is comprised of a duct bank with multiple conduits. There is also small scale Telstra infrastructure in the area confined to the western side of Macarthur Drive, primarily serving the residential demand.

Discussions with NBN Co to determine capacity within the existing system and connection costs are ongoing.

4.5.2 Proposed Layout:

It is intended to provide a single connection point from the existing NBN Co duct to the building basement where it will be distributed throughout the building. There are two nearby telecommunication pits adjacent to Macarthur Drive which could serve as possible connection points. The preference for which pit will act as the connection point will become more apparent as the architectural layout and in-ground services design are further developed.

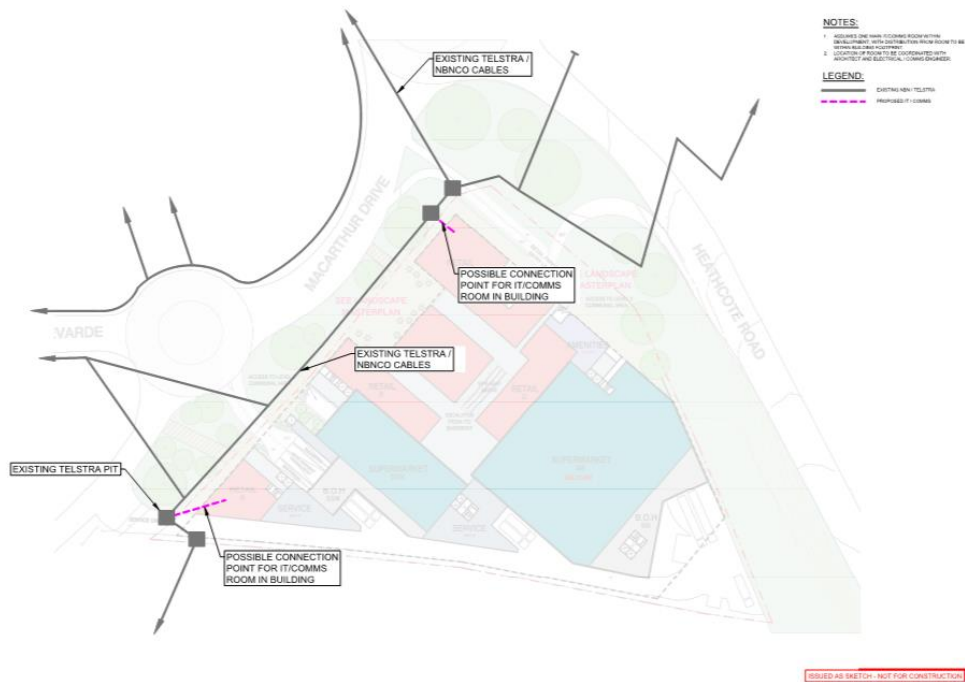


Figure 7: Existing & Proposed Telecommunication Layout

5 Other Civil Considerations

The civil engineering considerations raised in this report are based off the Architectural layouts received and information obtained from the 2007 survey.

- An additional 3D site survey and geotechnical report are suggested to be procured as design development proceeds.
- From the 2007 site survey it appears that approximately 1.5m of excavation was undertaken during the previous development. It is unclear to what extent these works were completed but it is likely that further excavation is required. The extent of further excavation required will depend on the ground level tie-in point to Macarthur Drive and the amount of ground build up surrounding the basement. This will become more apparent as the architectural design is further developed and 3D topographical survey is undertaken. Consideration for the provision of appropriate site levels, retaining walls, bulk earthworks, and finish floor levels can be determined after those are completed.
- Further coordination with APA and Jemena will be required if ground anchors associated with basement excavation crosses into the high-pressure Ethane easement or the Jemena 150mm natural gas easement.

6 Conclusion

In conclusion, a servicing strategy has been suggested for major utilities and projected demands. Potable water will be supplied via trunk mains running nearby the site, with a new water main ringing the perimeter of the site to provide supply to required building tie-ins. Sewerage for the site will ultimately drain to the existing 225mm sewer pipe that extends below Macarthur Drive. Preliminary calculations suggest that there should be sufficient capacity in the pipe to meet the proposed development's demands, although confirmation from Sydney Water Corporation will not be received until the lodgement of the Section 73 application. This should be conducted after the lodgement of a Development Application (DA).

The existing electric ductwork that runs below Macarthur Drive is to be extended to the building basement, where it will connect to future substations prior to distribution around the building. It is suggested that discussions with Endeavour Energy commence after the lodgement of a DA to attain approval for the positioning of substations within the building basement.

Gas service will be provided to the site via connection to the existing 150mm network main on the development side of Macarthur Drive. Preliminary calculations suggest that there should be sufficient capacity in this main for the development and discussions with Jemena appear to confirm this. Consideration shall be given to the easement requirements with the 160mm network main in the southwest of the site.




Telecommunication data is expected to connect to one of two National Broadband Network / Telstra existing pits on Macarthur Drive. Discussions with NBN Co to determine connection costs are ongoing.

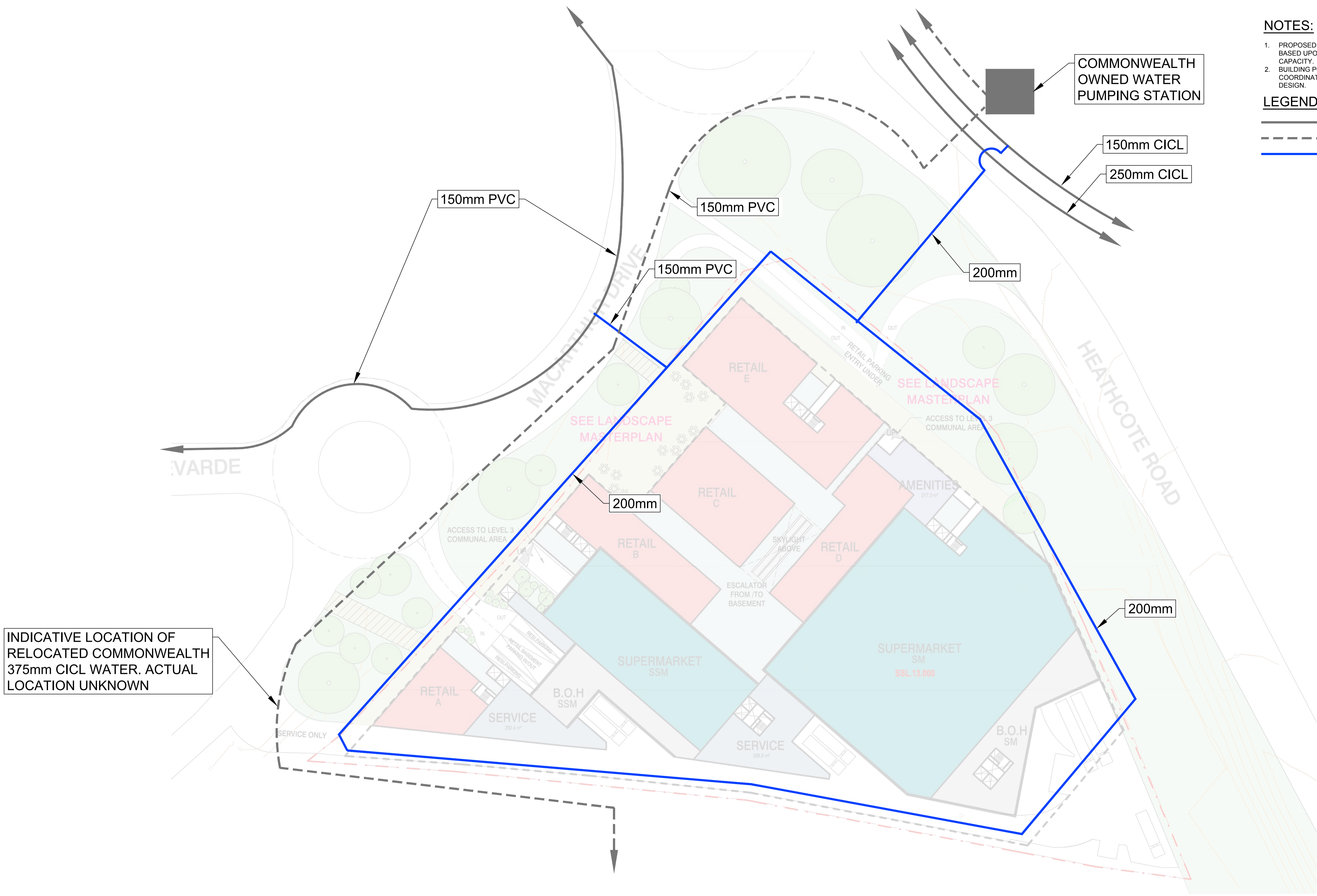
A 3D site survey, geotechnical investigation and proposed floor levels are required to provide vital information on site levels, grading, and up-to-date location of periphery underground utilities. This will assist in informing future civil engineering works such as in-ground services coordination, site grading and drainage.

NOTES:

1. PROPOSED FINAL WATER MAIN SIZE TO BE DETERMINED BASED UPON EXISTING NETWORK PRESSURE AND CAPACITY.
2. BUILDING POINTS OF CONNECTION TO BE DETERMINED IN COORDINATION WITH HYDRAULIC AND ARCHITECTURAL DESIGN.

LEGEND:

-  EXISTING SWC WATER MAIN
-  EXISTING PRIVATE WATER MAIN
-  PROPOSED WATER MAIN



INDICATIVE LOCATION OF RELOCATED COMMONWEALTH 375mm CICL WATER. ACTUAL LOCATION UNKNOWN

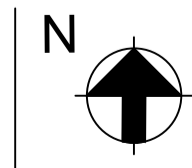
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ISSUED FOR INFORMATION				
Issue	Date	By	Chkd	Appd



Project
HOLSWORTHY DEVELOPMENT
WORKS

Drawing Title
WATER SUPPLY



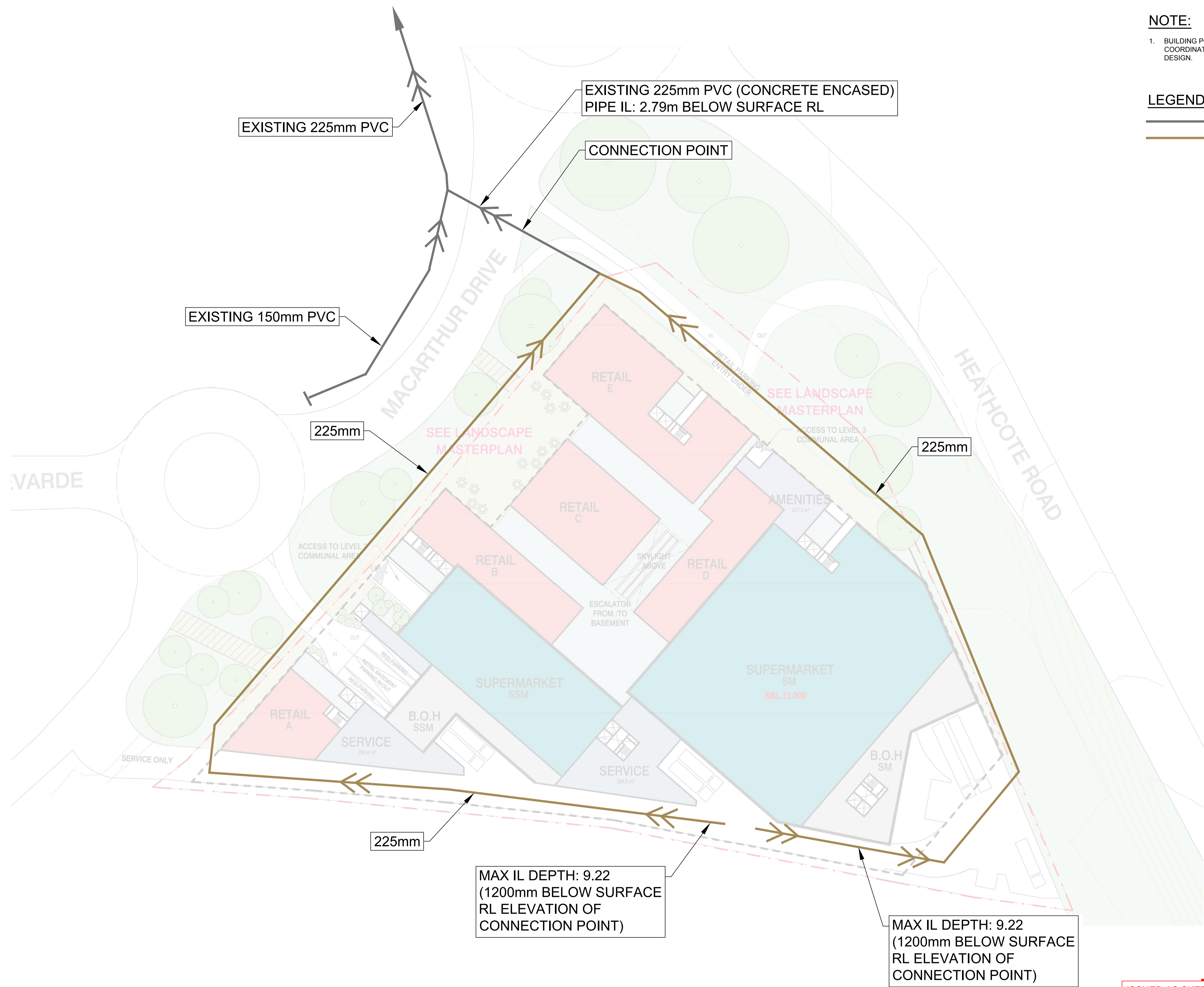
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Discipline	CIVIL
Job No	253293
Drawing Status	
Drawing No	SK01
Issue	0

NOTE:

1. BUILDING POINTS OF CONNECTION TO BE DETERMINED IN COORDINATION WITH HYDRAULIC AND ARCHITECTURAL DESIGN.

LEGEND:

— EXISTING SEWER
 — PROPOSED SEWER



ISSUED AS SKETCH - NOT FOR CONSTRUCTION

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ISSUED FOR INFORMATION				
Issue	Date	By	Chkd	Appd

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Project
 HOLSWORTHY DEVELOPMENT
 WORKS

Drawing Title
 SEWERAGE

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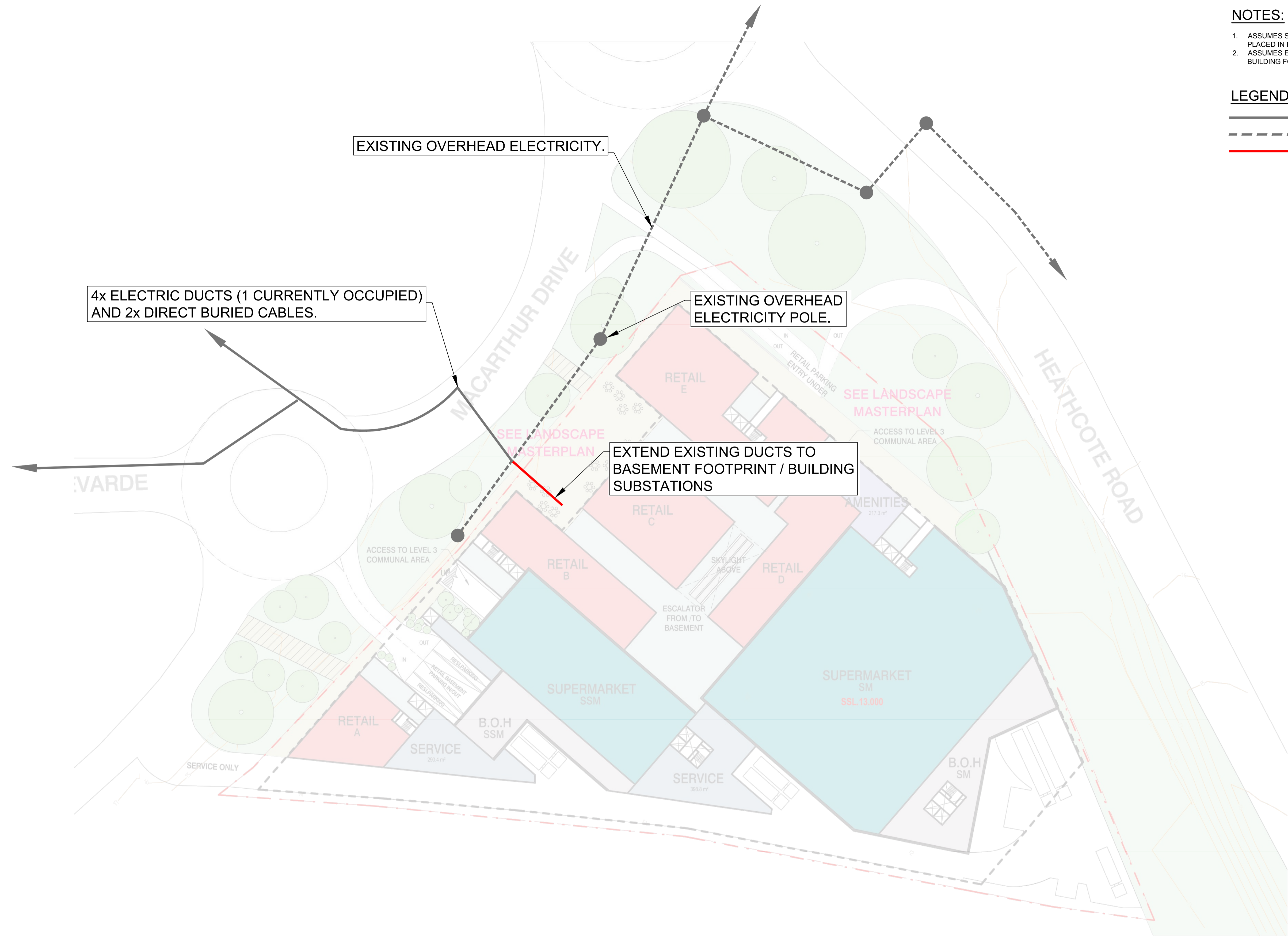
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 Drawing No SK02
 Issue 0

NOTES:

1. ASSUMES SUBSTATIONS SERVING DEVELOPMENT TO BE PLACED IN BASEMENT OR ON SITE.
2. ASSUMES ELECTRICAL DISTRIBUTION TO BE WITHIN BUILDING FOOTPRINT.

LEGEND:

- EXISTING UNDERGROUND ELECTRICITY
- - - EXISTING OVERHEAD ELECTRICITY
- PROPOSED UNDERGROUND ELECTRICITY



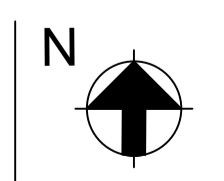
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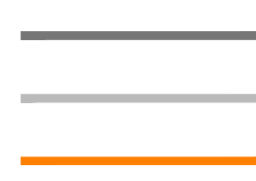
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HOLSWORTHY DEVELOPMENT
WORKS

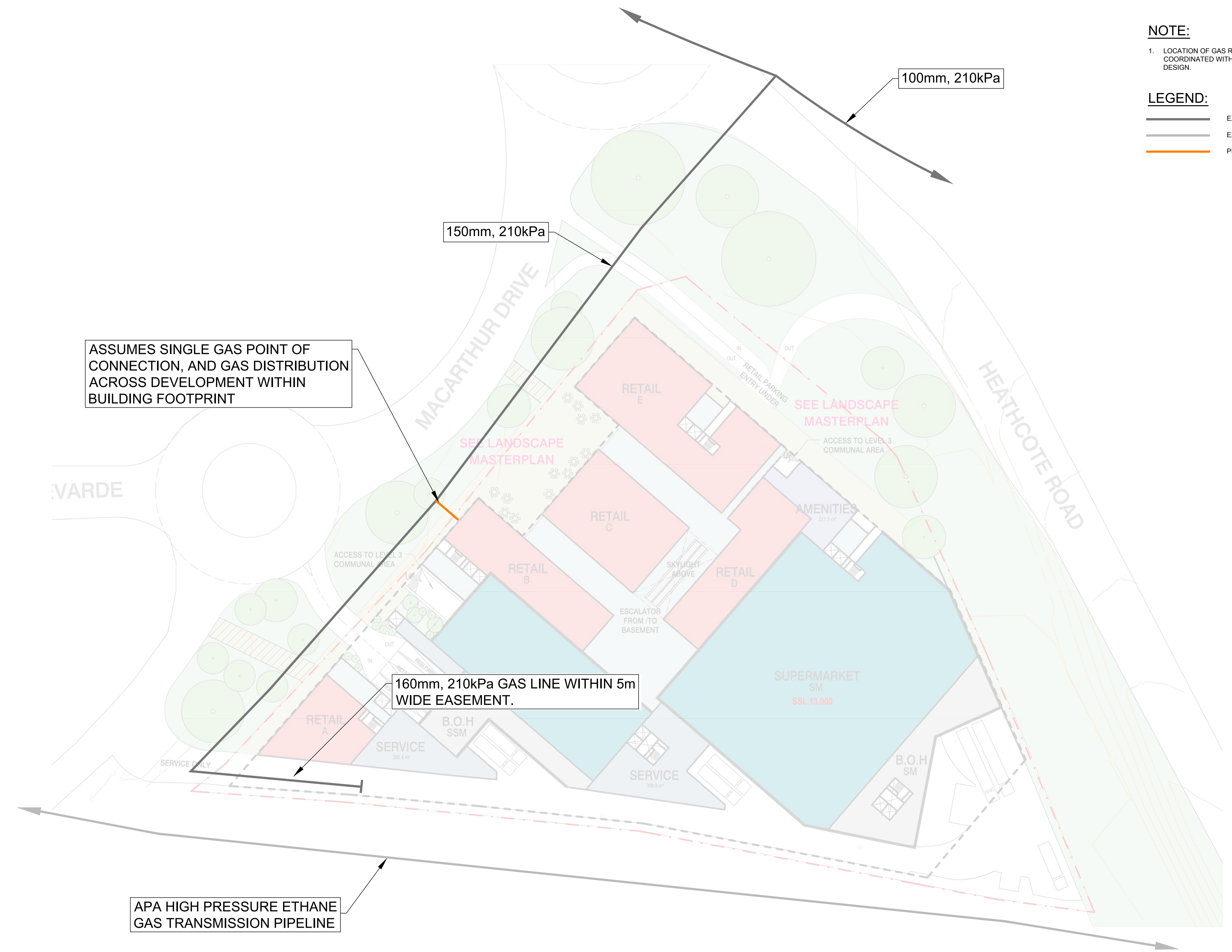
Drawing Title
ELECTRICITY



Scale at A1	NTS
Discipline	CIVIL
Job No	253293
Drawing Status	
Drawing No	SK03
Issue	0

NOTE:
1. LOCATION OF GAS ROOM AND BUILDING LAYOUT TO BE COORDINATED WITH ARCHITECTURAL AND HYDRAULIC DESIGN.

LEGEND:

 EXISTING NATURAL GAS
 EXISTING ETHANE
 PROPOSED NATURAL GAS



ISSUED AS SKETCH - NOT FOR CONSTRUCTION

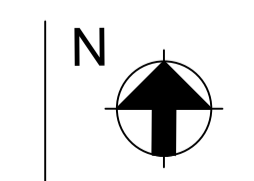
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Project
HOLSWORTHY DEVELOPMENT WORKS

Drawing Title
NATURAL GAS



Scale at A1 NTS

Discipline CIVIL

Job No 253293

Drawing Status

Drawing No SK04

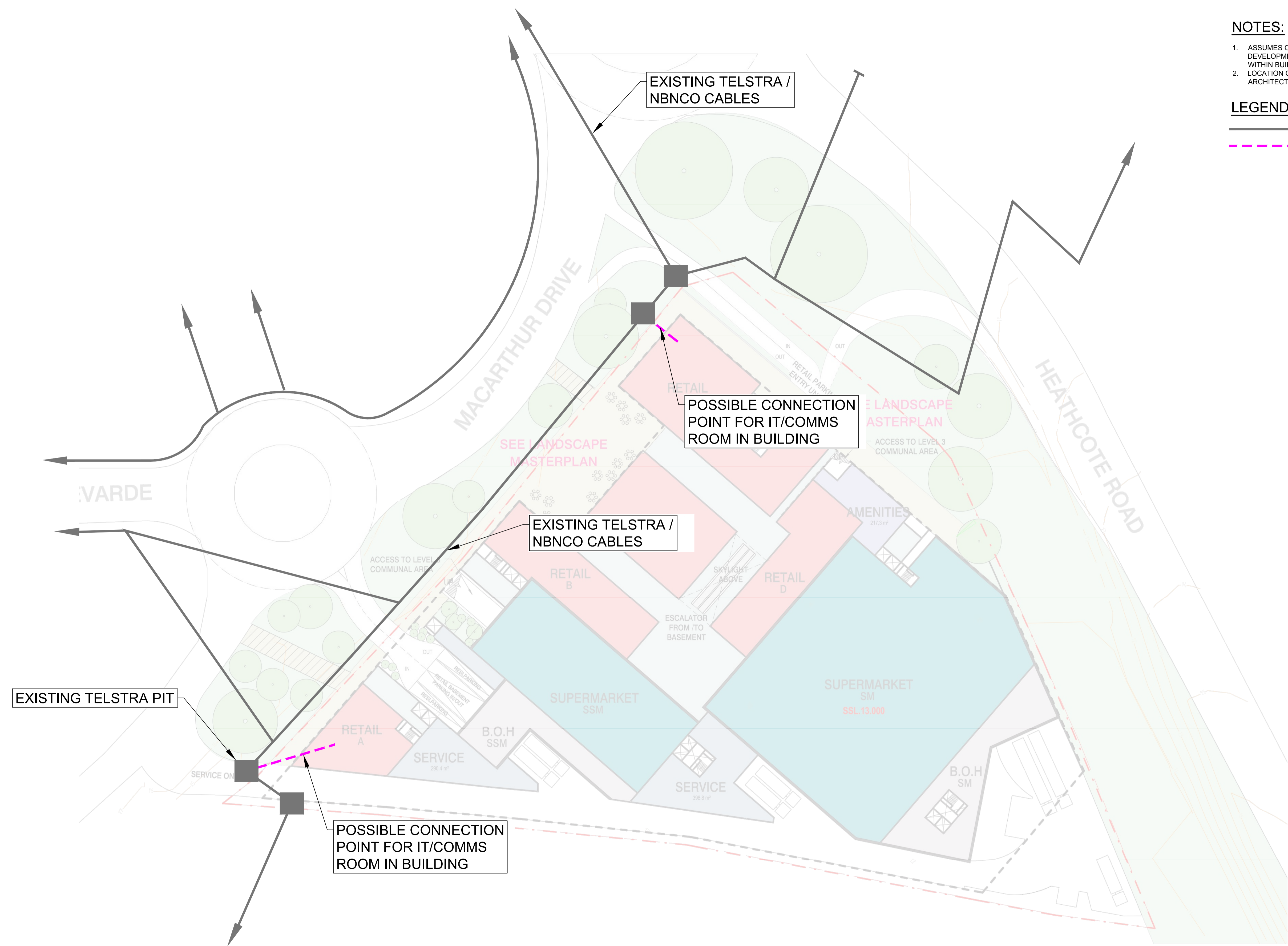
Issue 0

NOTES:

1. ASSUMES ONE MAIN IT/COMMS ROOM WITHIN DEVELOPMENT, WITH DISTRIBUTION FROM ROOM TO BE WITHIN BUILDING FOOTPRINT.
2. LOCATION OF ROOM TO BE COORDINATED WITH ARCHITECT AND ELECTRICAL / COMMS ENGINEER.

LEGEND:

- EXISTING NBN / TELSTRA
- - - PROPOSED IT / COMMS



ISSUED AS SKETCH - NOT FOR CONSTRUCTION

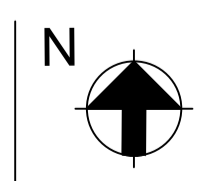
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Project
HOLSWORTHY DEVELOPMENT
WORKS

Drawing Title
IT / COMMUNICATIONS



Scale at A1	NTS
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