Stantec Australia Pty Ltd
Level 6, Building B, 207 Pacific Highway
St Leonards NSW 2065
Tel: +61 2 8484 7000
Email: enquiries.sdy@stantec.com www.stantec.com

30 September 2021

Enquiries: Rowan Barwood
Project No: 33584

Winston Langley PTY Limited
145 Pacific Highway St Leonards, NSW 2065

Attention: David Hynes

Dear David

RE: North Ryde RSL and Eastwood Rugby Club
Infrastructure Services Report

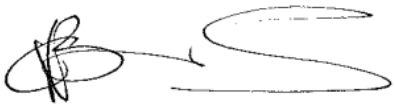
Wood & Grieve Engineers (now part of Stantec) undertook a services infrastructure report for a proposed mixed use development for 146-150 Vimiera Road Marsfield for Toga. The report is titled 'Eastwood Rugby Club – Hydraulic, Electrical and Civil Services Due Diligence Report' and is dated 12.01.2018.

We confirm that at the time of the report (12.01.2018), the information contained in the report was correct and can be relied on by the new party (Winston Langley) involved on the project.

Please do not hesitate to contact the undersigned if you have any queries.

Yours sincerely

Stantec Australia Pty Ltd



Rowan Barwood
Electrical Project Engineer, Director

Encl

cc Attention:

WOOD & GRIEVE ENGINEERS

EASTWOOD RUGBY CLUB

Hydraulic, Electrical and Civil Services Due Diligence Report

Prepared for:

Chris Webster
Toga

Date:
12th January 2018

Prepared by:

Rowan Barwood, Antonio Lo Monte, Ian Harris
Project No. 33584
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Level 6, Building B, 207 Pacific Highway, St Leonards NSW 2065
T: (02) 8484 7000 **F:** (02) 8484 7100 **E:** sydney@wge.com.au
www.wge.com.au

REVISION

Revision

Site Address:	146-150 Vimiera Road Marsfield NSW 2122 Australia
Proposed Development:	Mixed Used Development
Client:	Toga
Local Authority	Ryde City Council
Authority Reference #:	N/A
Wood & Grieve Reference:	33584-SYD-MD-RE-002

Ian Harris BEng (Hons)
For and on behalf of
Wood & Grieve Engineers

REVISION	DATE	COMMENT	APPROVED BY
A	12.01.18	Issued for Information	IH

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1. Introduction

The purpose of this report is to provide Toga with information on the current provision and condition of the existing public utilities and likely authority requirements to support the new development:

This report is based on the following sources of information:

- Dial Before You Dig information;
- Publically available information.

At this time no discussions have been had with authorities for the project.

Site Contains

- Land Area – 61,844m^2

Potential Construction:

WGE understand that the proposed development will include -

- Approx. 395 apartments
- Approx. 95 terraces
- Approx. 6,000sqm licensed club and 1,800sqm childcare facility – note this is replacing an existing licenced club and child care facility on site

Indicative Layout Plan

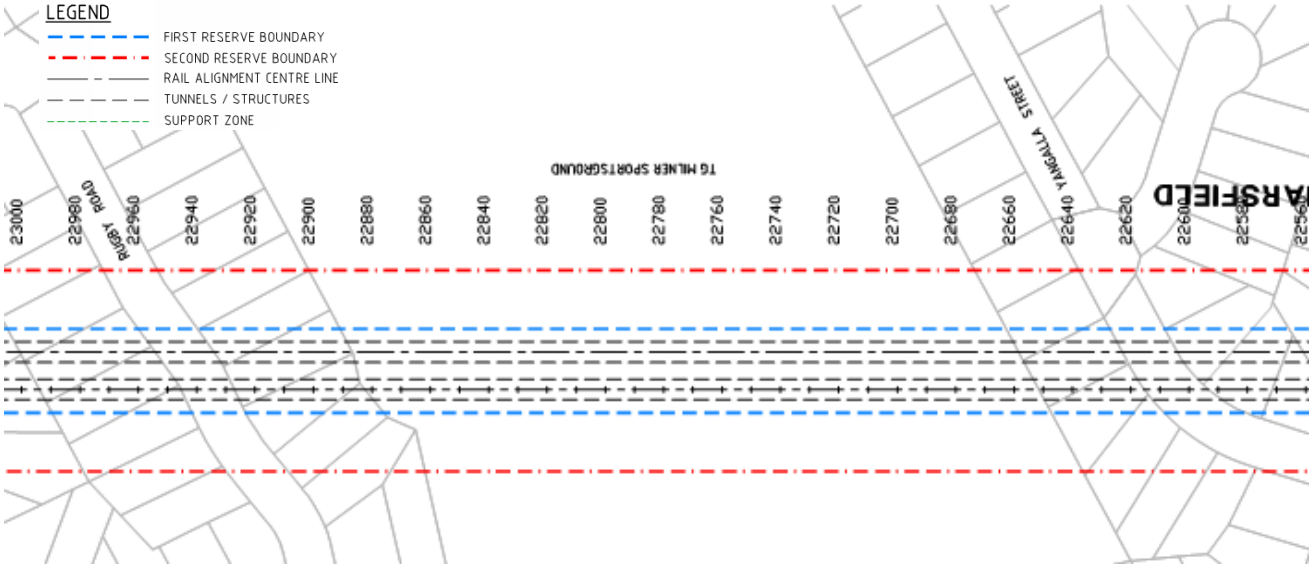
Introduction

Limitations of this report are as follows:

- No calculations were performed to check system capacities.
- No taking or testing of material samples was carried out.
- All information provided by others, particularly verbal information has been taken at face value.
- No testing for or advice is provided with respect to asbestos, microbiological or other contaminates.
- No detailed survey and detailed authority information is available.
- No formal discussions with Authorities (feedback only available through a formal submission)

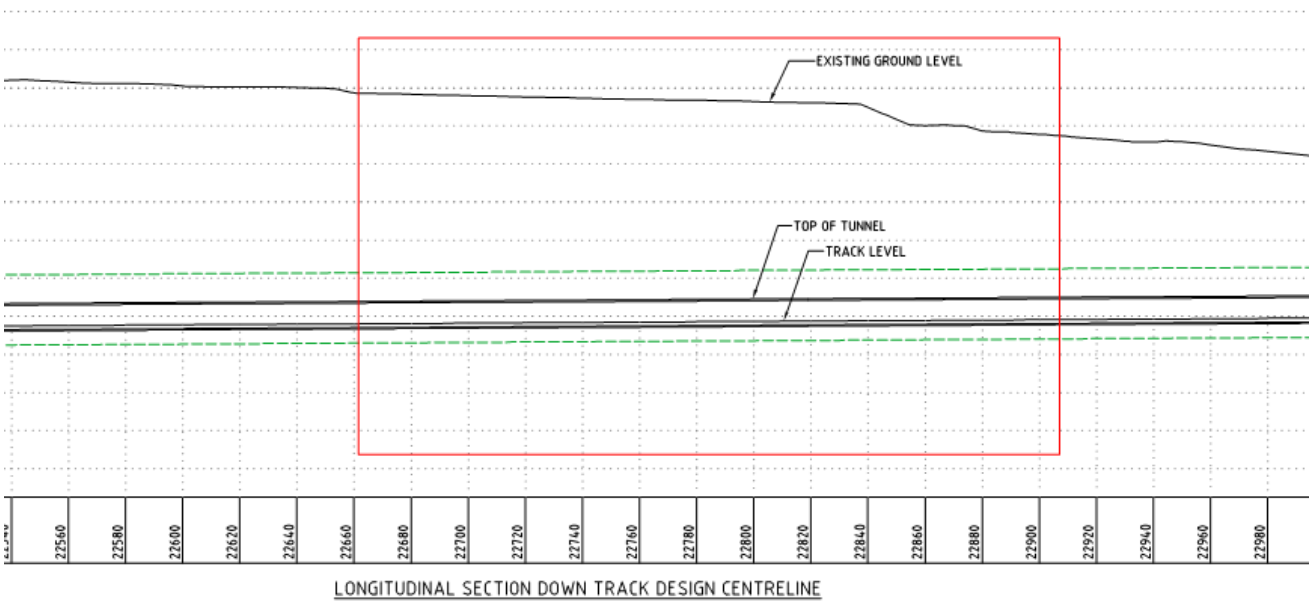
2. Rail Tunnel

The Epping to Chatswood Rail tunnel runs diagonally across the site as can be seen below.



Rail Tunnel Location (Source: DBYD Sydney Trains)

Rail Tunnel Elevation



Rail Tunnel Elevation (Source: ECRL Underground Infrastructure Protection Guidelines Report No. 20007300 / PO-4532)

Transport for NSW have strict regulations on what can be constructed over a rail tunnel easement. These restrictions are discussed in their document ECRL Underground Infrastructure Protection Guidelines Report No. 20007300 / PO-4532.

Rail Tunnel

The guide states the following:

First Reserve
Proposed developments within the First Reserve, but outside of the Support Zone are typically required to have an engineering assessment of the impact of the works.

Second Reserve
The Second Reserve zone covers the areas where some development works have the potential to impact on the performance of the support elements or the tunnel lining although many works would be unlikely to have a significant impact. The development guidelines for the Second Reserve zone typically comprise an engineering assessment only for those particular works that have potential for impact on the underground infrastructure.

A preliminary engineering assessment by the projects structural engineer should be undertaken as soon as possible to ascertain whether the proposed building will impact on the tunnel infrastructure.

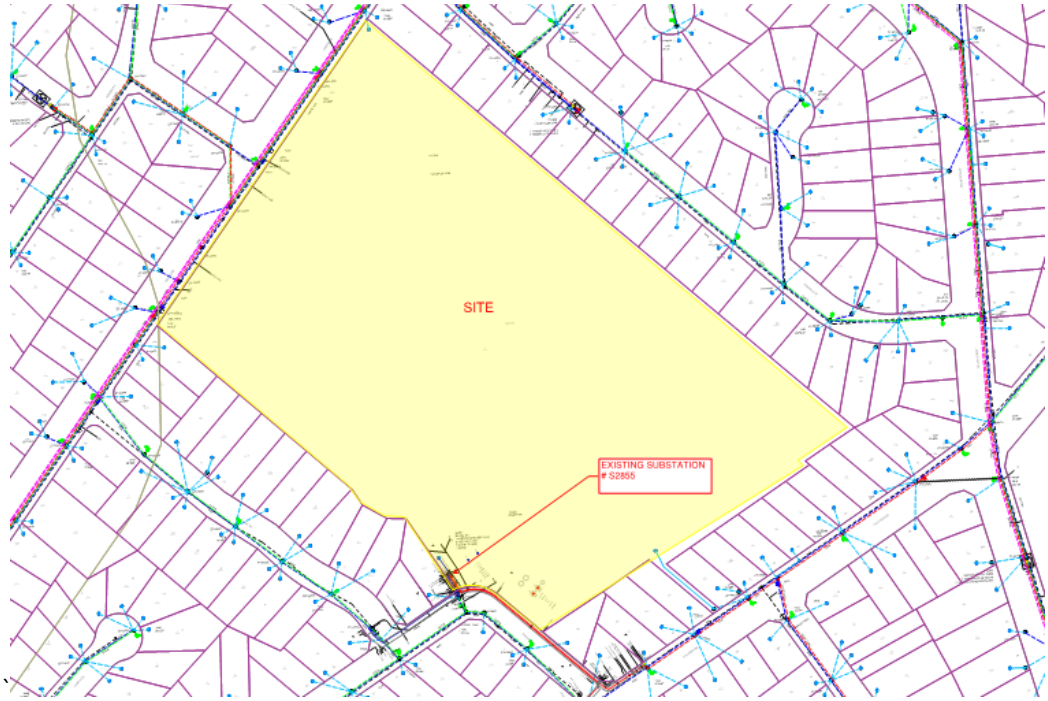
As the tunnel is located 50m below ground level it is unlikely that the proposed development will have an impact on the tunnel.

3. Electrical Services

3.1 Power Supply

3.1.1 Existing Supply Authority Network

The Supply Authority is Ausgrid. The existing Supply Authority network is depicted in image below.



Existing Supply Authority network adjacent site

From the Ausgrid WebGIS information there is an existing substation (# S.2855) on the South of the site located off Thelma Street. It is noted that this substation has 3 off distributors (Eastwood Rugby Club, Thelma LV Street Network and Rugby Road LV Street Network).

Existing Overhead Services (LV and Carrier Services) in Vimiera Road

It is noted that there are overhead LV conductors and Carrier services in Vimiera Road. It is not known whether Council will require these to be undergrounded. An allowance for undergrounding of these services has been allowed for in Annexure A : Infrastructure Costs

3.1.2 Calculated Maximum Demand

It is intended to retain the existing substation to supply the Eastwood Rugby Club. The calculated maximum demand for the proposed residential portion of the development (based on 395 Apartments, 95 Terrace Houses and 12,000m^2 of car parking) equates to 2,690 Amps per phase (1,861kVA).

A summary of the calculated Maximum Demand (residential) is depicted below :

MAXIMUM DEMAND CALCULATION					DATE	12-Jan-18
PROJECT NO	146-150 Vimiera Road, Marsfield					
AS/NZS 3000:2007 Wiring Rules Appendix C1						
			Total Number of Units + Terrace Houses			490
TABLE C1			Number of Units per Phase			164
	1	2	3	4	5	
LOAD GROUP	**DESCRIPTION**	**Single Domestic electrical installation**	**2 to 5 Units per Phase**	**6 to 20 Units per Phase**	**21 or more Units per Phase**	**LOAD (A)**
Ai	Lighting	3A for 1 to 20 points + 2A for each additional 20 points or part thereof	6A	5A + 0.25 per unit	0.5 per unit	82
Aii	Outdoor lighting	75% of connected Load	No assessment for purpose			0
Bi	Socket Outlets not exceeding 10A	10A for 1 to 20 points + 5A for each additional 20 points or part thereof	10A + 5A per living unit	15A +3.75A per living unit	50A + 1.9A per living unit	361.6
Bii	Socket Outlets not exceeding 10A (SSO above 2.3m, perm installed heatering or combination SSO) in Buildings with Permanent heating/cooling	10A				10
Biii	Socket Outlets exceeding 10A (SSO above 2.3m or combination)	15A				15
C	Appliances for cooking, instant water heaters, heating and cooling	50% of connected load	15A	2.8A per living Unit		459.2
D	Fixed space heating or air conditioning equipment, saunas or socket outlets rated at more than 10%	75% of connected load				1230
E	Instantaneous water heaters	33.3% of connected load	6A per living Unit		100A + 0.8A per unit	0
F	Storage water heaters	33.3% of connected load	6A per living Unit		100A + 0.8A per unit	0
G	Swimming Pools. Spas	75% of largest spa, plus 75% of largest swimming pool, plus 25% of remainder				0
Loading not associated with individual units - connected to each phase (communal lighting, laundry, lifts, motors etc)						
H	Communal Lighting	N/A	Full connected load			60
I	Socket outlets not included in groups J and M below. Permanently connected electrical equipment not exceeding 10A	N/A	2A per point, up to maximum of 15A			0
Ji	Appliances rated at more than 10A : Clothes dryers, water heaters, self heating washing machines	N/A	50% of connected load			0
Jii	Appliances rated at more than 10A : Fixed space heating, air conditioners	N/A	50% of connected load			0
Jiii	Appliances rated at more than 10A : Spa and swimming pool heaters	N/A	75% of largest spa plus 75% of largest swimming pool, plus 25% of remainder			0
K	Lifts	Largest lift motor : 125%, nest largest lift : 75%, Remaining lift motors : 50%				300
L	Motors	Largest motor : 125%, next motor : 75%, Remaining motors : 50%				0
M	Appliances, including socket outlets other than those set out in groups A to L above	Connected load 10A or less : no assessment ; Connected load over 10A : By assessment	Connected load 10A or less : no assessment ; Connected load over 10A : By assessment			0
Other	Basement Carpark	12,00m2 @ 10VA/m2				173
TOTAL						**2690 Amps**

3.1.3 Substation Requirements

It is intended to retain the existing substation (S.2855) supplying the Eastwood Rugby Club. Based on the maximum demand calculation for the residential portion, an addition 2 off 1,000kVA substations would be required to service the site.

Substation options would largely depend on final site layout. The following substation options would exist to supply the site with power

- 2 x 1,000kVA kiosk type substation. Easement requirement of 5,300mm x 3,300mm per substation.
- 2 x 1,000kVA mini chamber substations (spatial requirements of 4,200mm street frontage x 4,600mm deep x 3,200mm clear headroom or 5,600mm street frontage x 2,800mm deep x 3,200mm clear headroom)

3.1.4 Infrastructure Delivery Timeframes

An expected electrical infrastructure delivery period would be as follows:

1.	Application for Connection' submitted to Supply Authority. Initial review by Ausgrid and 'Letter of Offer' by Supply Authority	4 weeks
2.	If substation required. Monopoly fees to be paid by client and Supply Authority produces a Design Information Package (DIP)	6 weeks
3.	Appointment of Level 3 Designer (These works are contestable and the client would normally tender the works described in the DIP to three accredited service providers (Level 3 designers)	2 weeks
4.	Level 3 Design Process	8 weeks
	Supply Authority Approval of Level 3 design	4 weeks
	Connection Offer and acceptance thereof	2 weeks
	Construction : Level 1 installation	8-10 weeks

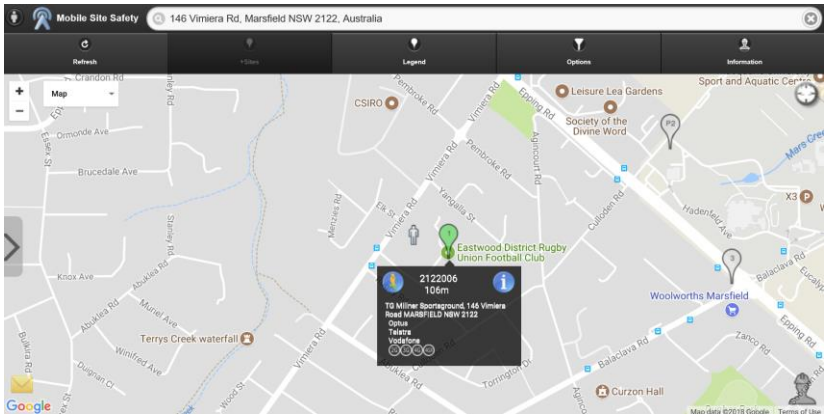
3.2 Telecommunications

3.2.1 Existing Carrier Services Infrastructure

The existing Carrier infrastructure in the vicinity of the site is depicted in the images below. It is noted that no diversions/relocations are envisaged apart from the carrier cables associated with the Mobile Base Station.

MOBILE BASE STATIONS

From the Mobile Site Safety website, there is a Mobile Base Station located on site (all 3 carriers have equipment associated with the site)



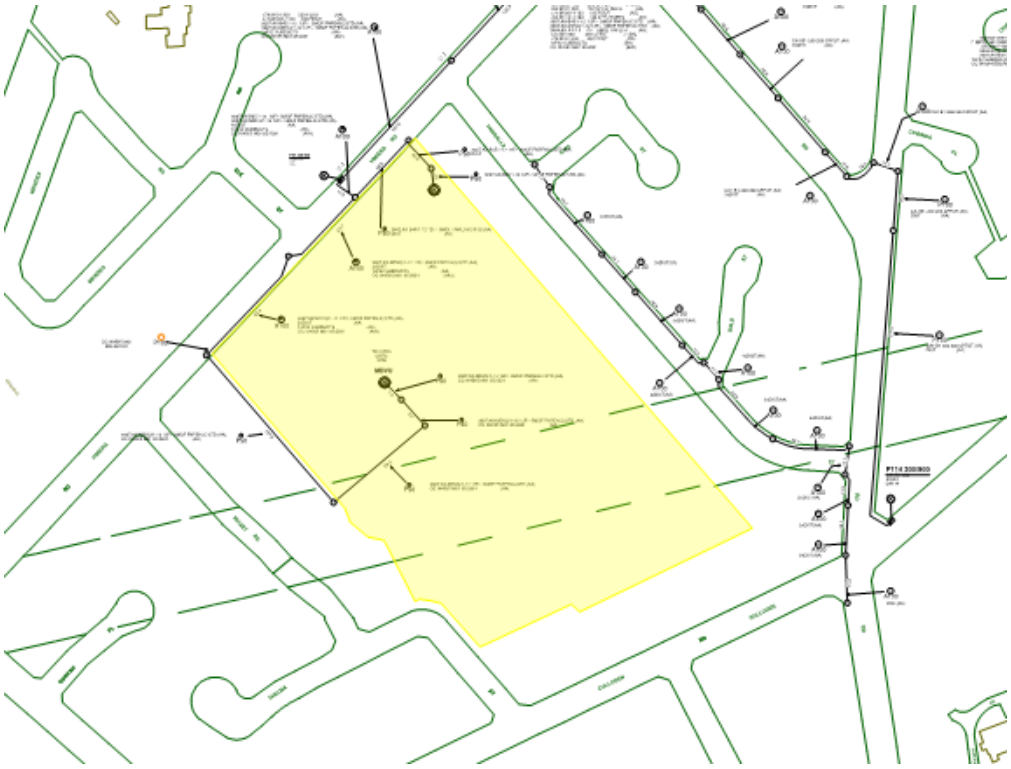
Mobile Carrier Base Station

Mobile Carrier Base Station mounted on mast

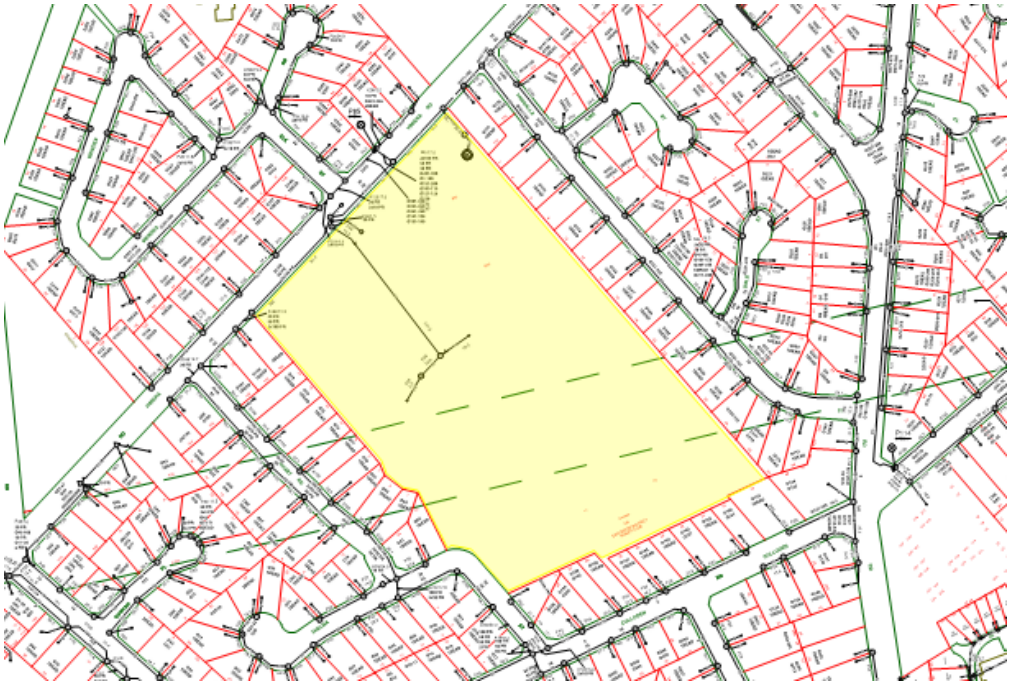
It would be necessary to relocate the Mobile Carrier Base Station. An allowance for relocation (including in-ground carrier cables to Mobile Base Station) have been allowed for in Annexure A : Infrastructure Costs

Electrical Services

TELSTRA



Telstra Mains Cable Plan

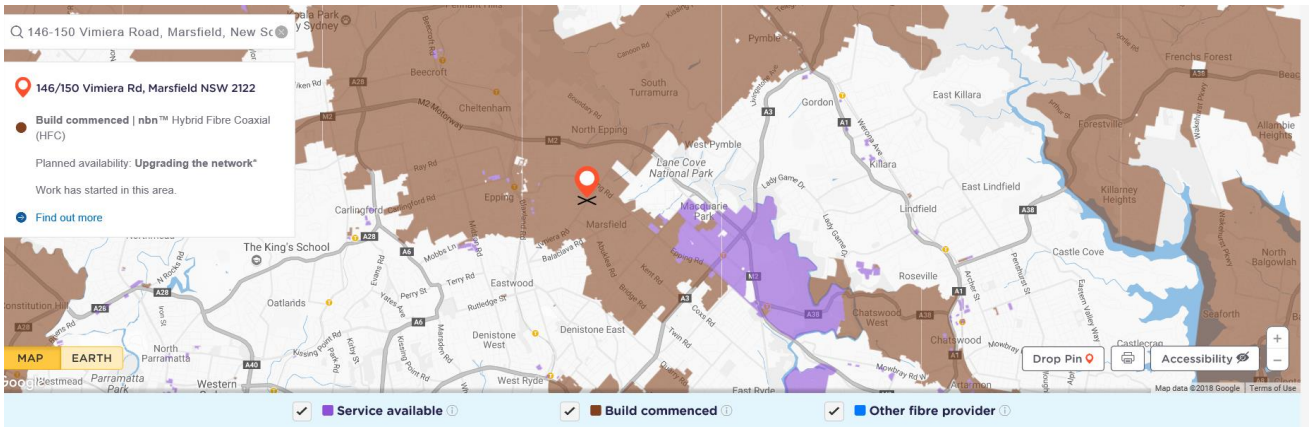


Telstra Cable Plan

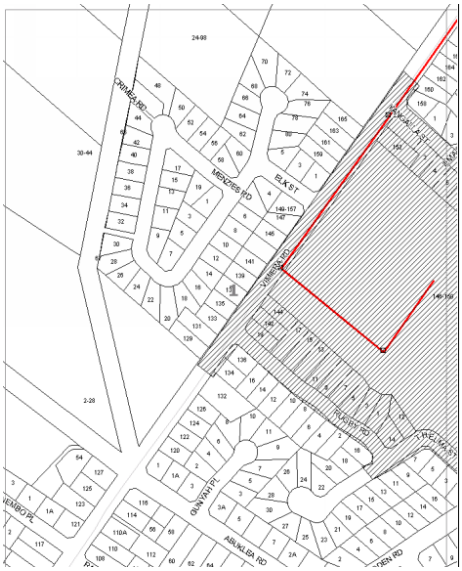
Electrical Services

NBN

As noted in image below, NBN is currently rolling out in the area of the site



OPTUS



3.2.2 NBN application

An application for carrier services would need to be lodged with a licensed telecommunications carrier such as NBN Co. An expected timeframe would be as follows:

1.	Application made to NBN Company	
2.	NBN Company response	2 weeks
3.	NBN issue Development Agreement	2 weeks
4.	TOGA accepts Agreement and returns to NBN Company	1-2 weeks
	Design process	3 weeks
	NBN review and accepts process	4-6 weeks
	Construction Process	As per Builders Program

It is noted that from 01 March 2015, NBN Co will levy an infrastructure deployment charge of $400 per multi dwelling unit. This cost has been included in Annexure A : Infrastructure Costs

4. Hydraulic Services

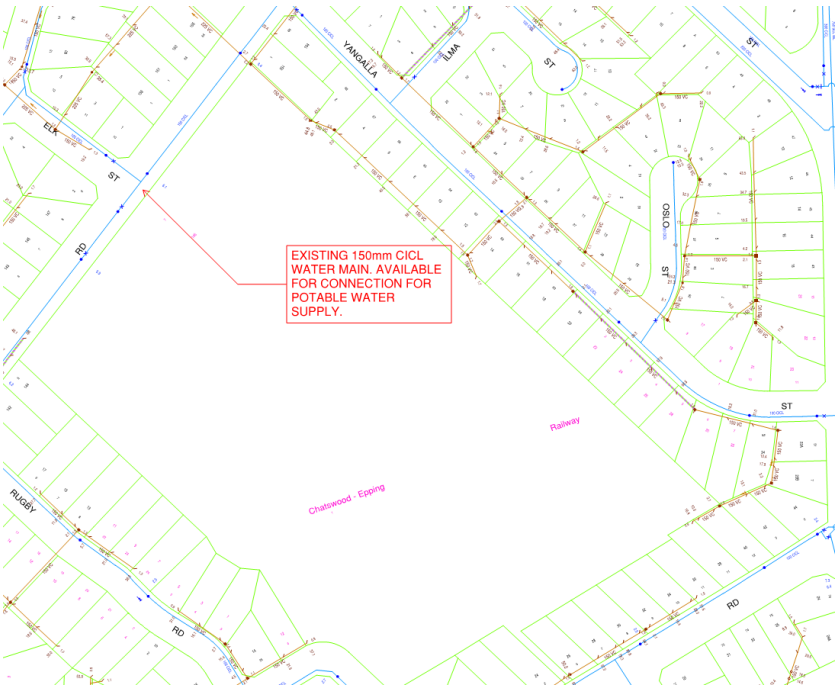
4.1 Authority Services

4.1.1 Water Supply

The critical Sydney Water asset within proximity to the site is the 150mm Cast Iron Cement Lined (CICL) main extending along Vimiera Road. As there may be building developments on the site above 4 storeys in height, Sydney Water requires a property to be connected to a 150mm diameter size minimum water main. We expect this main more than capable of providing the required flow rates for both potable drinking and fire fighting purposes.

POTABLE WATER CAPACITY

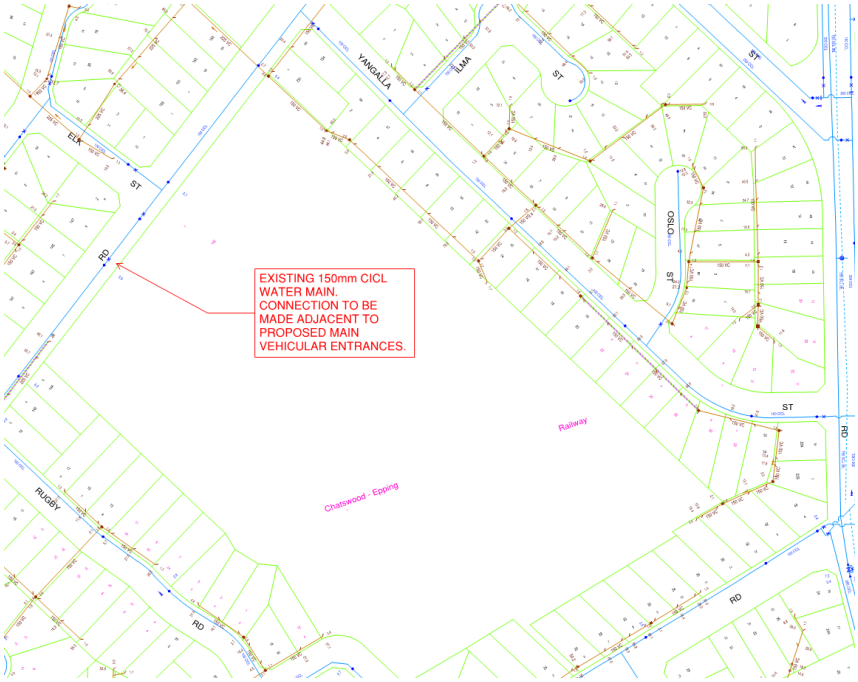
The potable water demand for the site is estimated to be approximately 90-110l per person/day, based on an estimated population of 2,000 persons. This may vary depending on the final development product and system selections (eg mechanical). With a peak demand around lunchtime for 1.5hrs, we would expect a peak flow of approximately 30L/s, the 150mm CICL main in Vimiera Road is more than capable of providing this flow rate. Refer to image below for available water main to be used for connection.



Water Mains

FIRE WATER SUPPLY

The proposed development will require a site wide fire hydrant system to provide coverage to all buildings within the property. From the proposed site classification and size parameters, the site isn't expected to be sprinklered. Basement carpark facilities in excess of 40 spots will require protection to these areas only. The site is bounded by a 150mm CICL water main on Vimiera Road, this Sydney Water asset would be best suited for connection to provide the require performance criteria. Refer to image below for available water main to be used for connection.



Water Mains

4.1.2 Sewer Services

The proposed development site includes 150mm Vitrified Clay (VC) sewer mains traversing along and adjacent to the bounding roads of the site currently collecting Torrens title housing developments. There are no trunk mains or major infrastructure spanning across the site to note.

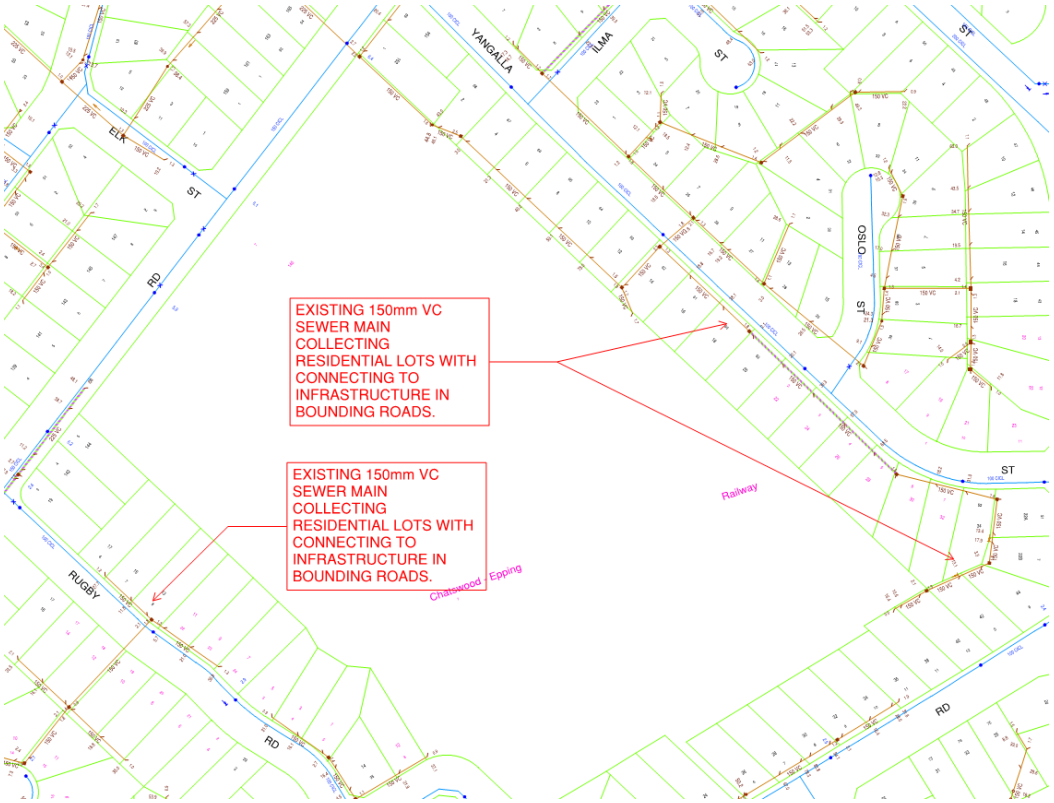
The existing services have the ability to be re-used subject to excavation details, typology design and level set-outs. We anticipate the site is to be provided with several sewer connections to achieve necessary falls, fixture unit loadings and invert levels.

Hydraulic Services

SEWER CAPACITY

The proposed development would discharge up to 70-90l/person of waste water discharge from the site per day. This is based on an estimated population of circa 2,000 persons. The peak discharge time would be around lunchtime where 40-60% of the flow may form the peak over a 1.5hr period. This would equate to approximately 24 L/s.

The 150mm sewer infrastructure bounding the site is considered to be more than adequate to cater for this flow amount taking into consideration several connections in lieu of one major connection which would require potential sewer upgrades to cater for the proposed loadings.

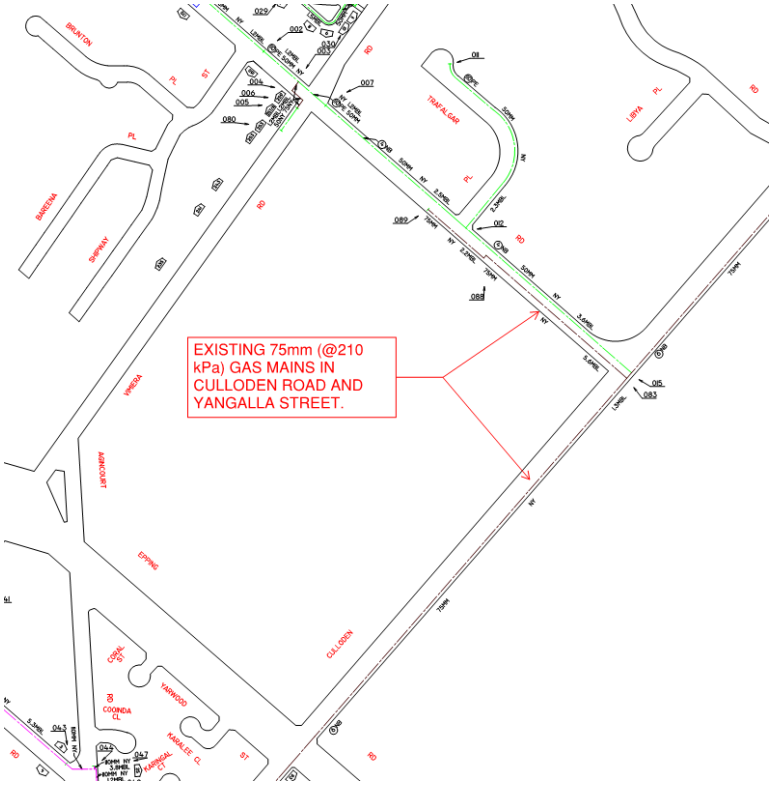


Sewer Mains

4.1.3 Gas Services

The proposed development gas load consists of both commercial and residential purposes. The allowances for gas would include the following:
Gas cooking for both club and residential use.
Gas hot water heating for both club and residential use.

Based on our experience we would expect this gas load to be approximately 8,000MJ/hr. This is considered to be a minor load and would be serviced from either the 75mm 210kPa main within Culloden Road. Allowance should be made for a road under bore or road crossing to access the 75mm main on the opposite side of Culloden Road to the site.



Gas Services Mains

5. Civil Engineering

5.1 Stormwater Management

5.1.1 Existing Stormwater

The proposed development is located within the Ryde City Council LGA. Ryde City Council do not have electronic access to records of their in ground stormwater network. Assessment of the existing stormwater drainage infrastructure has been completed by visual inspection only.

Main Downstream Drainage Infrastructure (Source: Visual Inspection)

Visual inspection indicates that the main downstream authority drainage infrastructure is located on Vimiera Road mid-block adjacent to Elk Street draining to the North West under Elk Street.

No assessment can be made regarding the capacity of the existing stormwater infrastructure without site survey however, the incorporation of OSD for the site will reduce the discharge flows to the public drainage network meaning it is unlikely that upgrades will be required.

5.1.2 Stormwater Management Requirements.

Council have prepared a Stormwater and Floodplain Management Technical Manual for all developments within their boundaries. This manual identifies what stormwater management infrastructure is required for the development of sites. The following information is a high level summary of the likely requirements for stormwater management on the site.

5.1.2.1 Stormwater Conveyance

Council's technical manual states the following design ARI's for drainage systems:

The manual continues to state:

Drainage Item	**Design ARI storm event**
Piped Road drainage (minor system generally longitudinally):	
Urban Residential	20 year
Commercial	20 year
Industrial	20 year
Road drainage (major system) for all types of development:	100 year
Road Crossings (minor system with unobstructed floodway):	
Local/Collector	20 year
Sub-Arterial	20 year
Arterial	100 year
Access to Emergency Facilities	100 year
Road Crossings (major system) for all types of development:	100 year
Piped inter-allotment drainage (minor system):	
Urban Residential	20 year
Commercial	100 year

5.1.2.1.1 Minor Drainage System

The minor drainage system shall be capable of controlling flows from frequent run-off events up to and including the ARI's as specified in this Section.

The following requirements shall be provided in the design of minor system drainage:

a. The water surface level for inlet pits shall be 0.15 metres below the invert of gutter or 0.15 metres below the underside of the lid for junction pits.
b. System blockages shall be assessed when designing for the minor event.
c. Kerb and gutter shall be provided on both sides of all roads except where the relevant Development Control Plan advises otherwise.
d. Kerb inlets shall be provided at locations such that the flow in the gutter generally does not exceed 1.5m in any location.
e. Inter-allotment drainage shall be provided at the lowest point of all allotments together with the creation of an easement over all downstream pipework to the legal point of discharge.
f. Full piped drainage from all kerb inlets and other inlets shall be provided to the boundary of the subdivision, or approved point of discharge, unless otherwise approved by the Manager.
g. Bypass from any pit on grade shall not exceed 15% of the total gutter flow at the pit (full capture desirable).

5.1.2.1.2 Major Drainage System

“Many of the flooding problems in older areas occur due to inadequate provision of overland flow paths. Thus, all urban drainage designs shall incorporate an assessment of major system flows.

The major drainage system in the form of overland flow paths shall be capable of controlling flows which exceed the capacity of the minor drainage system from run-off events up to and including the 100yr ARI storm event. In drainage sensitive areas identified by Council it may be necessary to provide adequate stormwater management controls for events larger than the 100yr ARI. An overland flow system shall be designed to convey waters through the subdivision or development clear of, and with the required freeboard to allotments and buildings.

Please note an overland flow path must be provided for drainage systems even where the 100 year ARI flows can be maintained within the pipe system. This is to ensure that a safe and adequate "Escape route" is achieved for storm events above that of the pipe system design and in case the minor system fails (i.e. if there is a 50% pipe blockage). This route should be a properly sized overland flow path preferably along a road and pathway system.

Roads and pathways will generally form the flow path by which the major system flows are routed, either to the street drainage system or to a low point with sufficient hydraulic capacity to capture the flows. Special consideration shall be given to trapped low points where the overland flow path may divert surcharge into properties. This is especially important when designing "Downhill" cul-de-sac and kerb returns adjacent to a sag vertical curve. In the former case the overland flow path shall incorporate a depressed pathway with reverse crossfall in the footway. In the latter case consideration shall be given to grading the kerb return such that water flows around the return and away before it breaks over the top of kerb at the low point.”

5.1.2.2 Point of Discharge

The likely point of discharge from the proposed development will be to the existing council drainage infrastructure under Vimiera Road, which will then drain North West towards Elk Street.

5.1.3 Stormwater Detention

Ryde City Council specify in their stormwater management guidelines that:

“The OSD must be designed to ensure the level of stormwater runoff discharged from the area of development must not to exceed the peak stormwater discharge arising from the post-developed works, during a 5 year ARI storm event.”

This confirms that On Site Detention will be required for the development site. Initial modelling indicates that, if there is not any existing OSD on the site, it is likely that the OSD requirement for the site would be 1,600m³. This would restrict the site discharge to the 5-year predevelopment discharge flow of 2.07m³/s.

If OSD does exist, this would reduce. Further identification of existing OSD would be required to ascertain what OSD would be required for the development.

5.1.4 Stormwater Quality Treatment

Council's DCP states that the following water pollutant reduction targets must be achieved for all new developments;

"WSUD measures incorporated into the development must satisfy the following pollutant target controls;

WSUD Stormwater Quality Performance Targets:

Gross Pollutants	90%
Total Suspended Solids	85%
Total Phosphorus	60%
Total Nitrogen	45%

All treatments are to be located inside the confines of the property."

Water quality can be provided in the form of the following treatment methods:

- Filtration sacks in stormwater pits;
- Filter cartridge units;
- Biofiltration basins;
- Raingardens;
- Gross Pollutant Traps;
- Rainwater Tanks.

5.2 Flooding

5.2.1 Existing Flooding

The development site is located within the Terry's Creek stormwater catchment. Flows from this catchment are conveyed in a westerly direction towards Terry's Creek.

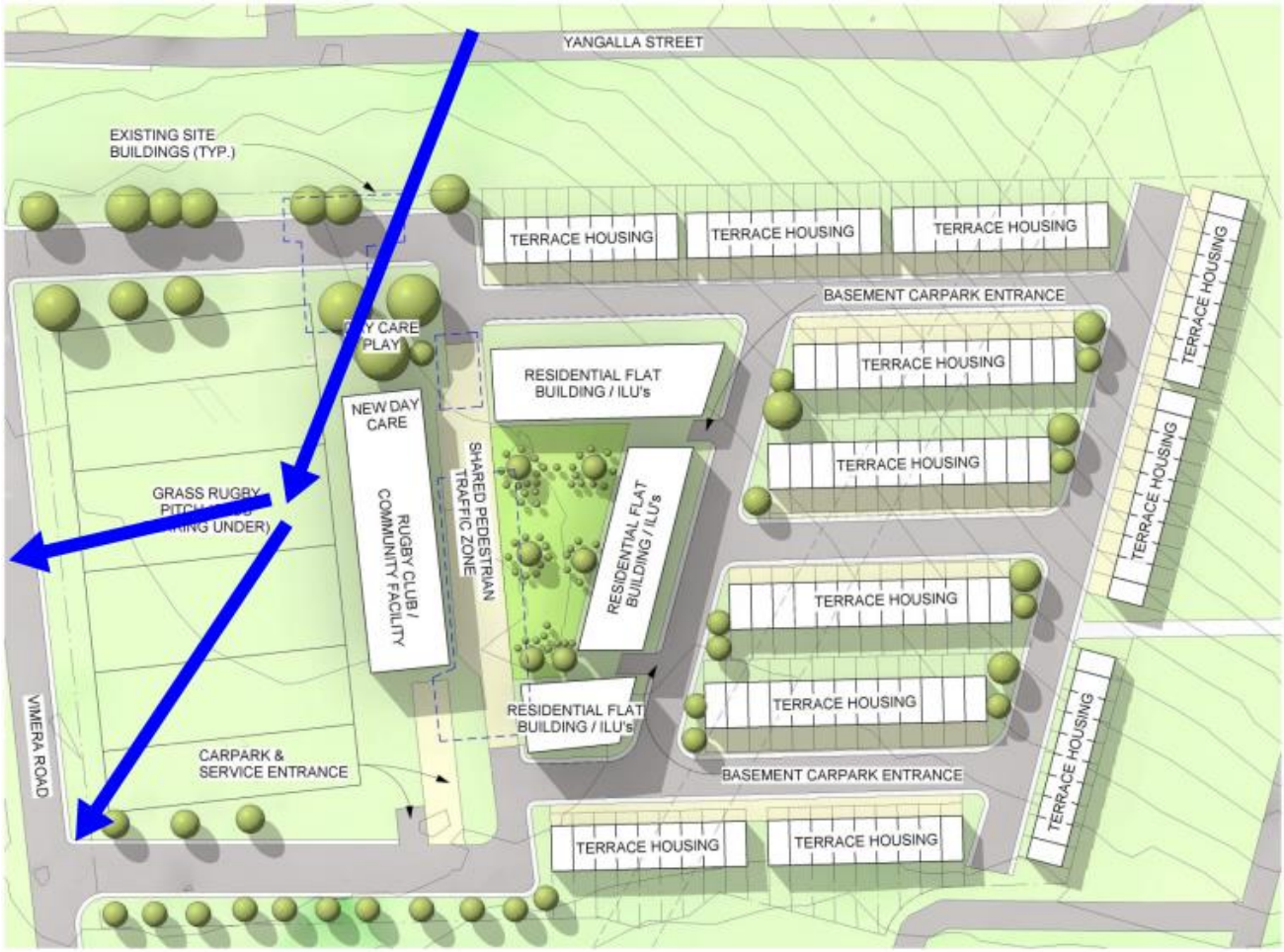
Modelling of the flood impacts through this catchment has been undertaken and recorded in the Eastwood and Terry Creek Catchment Floodplain Risk Management Study prepared by Bewsher for Ryde City Council.

Flood maps have been created as part of the Eastwood and Terry Creek Catchment Floodplain Risk Management Study that show the extent of flooding through the catchment during storm events of varying magnitude. These maps have been referred to in the preparation of this report.

The flood mapping indicates that the site is flood affected in the 100 year flood events. This is due to the conveyance of overland flow through the site in events when the in ground drainage network has reached capacity. The flows running from Yangalla Street through the site towards Vimeria Road, discharging at the Elk Street intersection and at the south western corner of the site.

100 Year Flood Extent (Source: Eastwood and Terry Creek Catchment Floodplain Risk Management Study)

Civil Engineering



100 Year Overland Flow Conveyance (Source: Eastwood and Terry Creek Catchment Floodplain Risk Management Study)

Allowance will need to be made to maintain this conveyance across the site following development of the site. Indications suggest that the overland flow will be across the west section of the site where the rugby pitch and club car parking will be located.

Flows can either be conveyed overland through the site with flood mitigation measures incorporated into the design of the development or the flows can be conveyed through formal drainage infrastructure across the site. Formal drainage infrastructure is likely to be of a large size and may impact on the development opportunity of the western side of the site.

Further detailed investigation into the impact of overland flow on the site should be considered in the development application stage of the project to assess the best possible conveyance strategy for the site.

Appendix A – Infrastructure Costs

Infrastructure Cost Estimates

Electrical

	DESCRIPTION	AMOUNT
1.	2 x 1,000kVA substations and associated HV cabling (envisaged that substations located within the development)	$500,000
2.	Telecommunications Carrier Lead-in	$40,000
3.	Undergrounding of LV overheads : Vimiera Road	$450,000
4.	Undergrounding of Carrier Services : Vimiera Road	$100,000
5.	Relocation of existing Mobile Base Station	$500,000
6.	4 x new streetlight due to undergrounding	$20,000
7.	NBN connection costs (490 x $400)	196,000
	Total	**$1,806,000**

Notes
1. It is intended to retain existing substation (# S.2855) to service the Eastwood Rugby Club

Hydraulics (Sewer, Water & Gas)

	DESCRIPTION	AMOUNT
1.	150dia capping off works (80m)	$100,000
3.	Water main extension	0
4.	Water main connection (potable & fire water)	$50,000
5.	Gas Main extension	0
6.	Gas Main connection (to opposite site of road)	$40,000
	Total	**$190,000**

Stormwater Management & Treatment

	DESCRIPTION	AMOUNT
1.	Stormwater Detention Building (1,600m³)	$1,600,000
2.	Stormwater Treatment Devices Buildings (2No)	$100,000
3.	Overland Flow Conveyance Infrastructure	TBC
	Total	**$1,700,000**